CHADALAWADA RAMANAMMA ENGINEERING COLLEGE
(AUTONOMOUS)
Approved by AICTE, New Delhi & Affiliated to JNTUA, Anantapur, A.P
Accredited by NAAC with "A" Grade, An ISO 9001 - 2015 Certified Institution

Metric: 1.2.1.1 and 1.2.1.2

The Total number of **NON REPITITIVE COURSES** those are offered during the last five assessment period are: **949**

The detailed list and a certified copy of all such courses in all the programs offered by the Institute is appended.

The number of new courses introduced during the same five **assessment period is :
100**

These newly introduced courses are highlighted in the total list of 949 courses. The approved syllabus copies of the all the newly introduced courses are also appended.

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TOTAL NUMBER OF NON-REPETITIVE COURSES DURING THE LAST 5 YEARS

S.No	Program code	Program name	Course code	Course name	Year of offering the course
1	2	B.Tech EEE	20CA54101	Mathematics –I	2021-22
2	2	B.Tech EEE	20CA51101	Engineering Chemistry	2021-22
3	2	B.Tech EEE	20CA52101	Communicative English	2021-22
4	2	B.Tech EEE	20CA03101	Engineering Graphics & Design	2021-22
5	2	B.Tech EEE	20CA03102	Basic Civil & Mechanical Engineering	2021-22
6	2	B.Tech EEE	20CA52102	Communicative English Lab	2021-22
7	2	B.Tech EEE	20CA51102	Engineering Chemistry Lab	2021-22
8	2	B.Tech EEE	20CA54201	Mathematics - II	2021-22
9	2	B.Tech EEE	20CA55101	Engineering Physics	2021-22
10	2	B.Tech EEE	20CA02201	Electrical Circuits - I	2021-22
11	2	B.Tech EEE	20CA04301	Electronic Devices and Circuits	2021-22
12	2	B.Tech EEE	20CA05101	Problem Solving with Programming in C	2021-22
13	2	B.Tech EEE	20CA55102	Engineering Physics Lab	2021-22
14	2	B.Tech EEE	20CA05102	Problem Solving with Programming in C Lab	2021-22
15	2	B.Tech EEE	20CA02202	Electrical Electronics Engineering Workshop	2021-22
16	2	B.Tech EEE	20CA51201	Environmental Science (Mandatory course- I)	2021-22
17	2	B.Tech EEE	20CA54301	Mathematics - III	2021-22
18	2	B.Tech EEE	20CA02301	Electrical Circuits - II	2021-22
19	2	B.Tech EEE	20CA02302	Electrical Machines - I (DC Machines and transformers	2021-22
20	2	B.Tech EEE	20CA02303	Electromagnetic Fields	2021-22
21	2	B.Tech EEE	20CA04201	Digital Electronics and Logic Design	2021-22
22	2	B.Tech EEE	20CA02304	Electrical Circuits – I Lab	2021-22
23	2	B.Tech EEE	20CA04304	Electronic Devices and Circuits Lab	2021-22
24	2	B.Tech EEE	20CA02305	Electrical Machines – I Lab	2021-22
25	2	B.Tech EEE	20CA02306	Skill Oriented Course-I	2021-22
26	2	B.Tech EEE	20CA53201	Universal Human Values and Ethics Mandatory course - II	2021-22
27	2	B.Tech EEE	19CA54401	Mathematics - IV	2021-22
28	2	B.Tech EEE	20CA02401	Control Systems	2021-22
29	2	B.Tech EEE	20CA02402	Power System - I	2021-22
30	2	B.Tech EEE	20CA02403	Electrical Machines - II	2021-22
31	2	B.Tech EEE	20CA04406	Analog and Digital IC Applications	2021-22
32	2	B.Tech EEE	20CA02404	Electrical Circuits – II Lab	2021-22
33	2	B.Tech EEE	19CA02405	Electrical Machines – II Lab	2021-22
34	2	B.Tech EEE	20CA52401	Advanced Communicative English Lab	2021-22
35	2	B.Tech EEE	20CA02406	Skill oriented course - II	2021-22
36	2	B.Tech EEE	19CA04510	Linear & Digital Electronics	2021-22
37	2	B.Tech EEE	19CA04504	Microprocessors and Microcontrollers	2021-22
38	2	B.Tech EEE	19CA02501	Power Systems - II	2021-22
39	2	B.Tech EEE	19CA02502	Power Electronics	2021-22
40	2	B.Tech EEE	19CA02505	Modern Control Theory	2021-22
41	2	B.Tech EEE	19CA05403	Java Programming	2021-22
42	2	B.Tech EEE	19CA04511	Microprocessors & Microcontrollers Lab	2021-22
43	2	B.Tech EEE	19CA02503	Electrical Machines - II Lab	2021-22
44	2	B.Tech EEE	19CA02504	Power Electronics Lab	2021-22
45	2	B.Tech EEE	19CA05505	AI Tools, Techniques and Applications	2021-22
46	2	B.Tech EEE	19CA02601	Electrical Measurements and Instrumentation	2021-22
47	2	B.Tech EEE	19CA02602	Power System Analysis	2021-22
48	2	B.Tech EEE	19CA05201	Python Programming	2021-22
49	2	B.Tech EEE	19CA53601	Managerial Economics and Financial Analysis	2021-22
50	2	B.Tech EEE	CA52601	Soft Skills	2021-22
51	2	B.Tech EEE	19CA02603	Power System Analysis Lab	2021-22
52	2	B.Tech EEE	19CA02604	Electrical Measurements and Instrumentation Lab	2021-22

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					2021-22
53	2	B.Tech EEE	19CA05404	OOPs Through Java Programming Lab	2021-22
54	2	B.Tech EEE	19CA02605	Socially Relevant Project III	2021-22
55	2	B.Tech EEE	17CA02701	Power System Operation and Control	2021-22
56	2	B.Tech EEE	17CA02702	Utilization of Electrical Energy	2021-22
57	2	B.Tech EEE	17CA02705	Flexible Alternating Current Transmission Systems	2021-22
58	2	B.Tech EEE	17CA02713	PLC and Automation Laboratory	2021-22
59	2	B.Tech EEE	17CA02714	Power System Computer Aided Design Laboratory	2021-22
60	2	B.Tech EEE	17CA02715	Technical Seminar	2021-22
61	2	B.Tech EEE	17CA57711	AI Master Class Using Matlab (VAC-II)	2021-22
62	2	B.Tech EEE	17CA02717	Wind Energy	2021-22
63	2	B.Tech EEE	17CA02718	Solar Energy Basics	2021-22
64	2	B.Tech EEE	17CA02719	Electrical Utilities Fundamentals Future	2021-22
65	2	B.Tech EEE	17CA02720	Wireless Communication for Energy Body	2021-22
66	2	B.Tech EEE	17CA02721	Advance in UHV Transmission & Distribution	2021-22
67	2	B.Tech EEE	17CA02722	Introduction to Smart Grid	2021-22
68	2	B.Tech EEE	17CA02723	Power System Protection and Switch Gear	2021-22
69	2	B.Tech EEE	17CA02724	Electric Power System	2021-22
70	2	B.Tech EEE	17CA02801	HVDC & FACTS	2021-22
71	2	B.Tech EEE	17CA02804	Advanced Control Systems	2021-22
72	2	B.Tech EEE	17CA02806	Comprehensive Online Examination	2021-22
73	2	B.Tech EEE	17CA02807	Project Work	2021-22
74	3	B.Tech MECH	20CASS103	Engineering Physics	2021-22
75	3	B.Tech MECH	20CA02101	Essential Electrical and Electronic Engineering	2021-22
76	3	B.Tech MECH	20CA03201	Engineering Graphics	2021-22
77	3	B.Tech MECH	20CA03202	Engineering Mechanics	2021-22
78	3	B.Tech MECH	20CA03203	Material Science and Engineering	2021-22
79	3	B.Tech MECH	20CA02205	Essential Electrical and Electronic Engineering Lab	2021-22
80	3	B.Tech MECH	20CA03301	Kinematics of Machinery	2021-22
81	3	B.Tech MECH	20CA03302	Strength of Materials	2021-22
82	3	B.Tech MECH	20CA03303	Manufacturing Processes	2021-22
83	3	B.Tech MECH	20CA03304	Thermodynamics	2021-22
84	3	B.Tech MECH	20CA03305	Material Science and Engineering Lab	2021-22
85	3	B.Tech MECH	20CA03306	Strength of Materials Lab	2021-22
86	3	B.Tech MECH	20CA03307	Manufacturing Processes Lab	2021-22
87	3	B.Tech MECH	SC-I	Skill Oriented Course	2021-22
88	3	B.Tech MECH	20CA54402	Probability and Statistics	2021-22
89	3	B.Tech MECH	20CA03401	Dynamics of Machinery	2021-22
90	3	B.Tech MECH	20CA03402	Machine Tools	2021-22
91	3	B.Tech MECH	20CA03403	Thermal Engineering	2021-22
92	3	B.Tech MECH	20CA03404	Machine Drawing	2021-22
93	3	B.Tech MECH	20CA03405	Machine Tools Lab	2021-22
94	3	B.Tech MECH	20CA03406	Thermal Engineering Lab	2021-22
95	3	B.Tech MECH	SC-II	Skill Oriented Course	2021-22
96	3	B.Tech MECH	19CA03501	Applied Thermodynamics	2021-22
97	3	B.Tech MECH	19CA03502	Manufacturing Technology	2021-22
98	3	B.Tech MECH	19CA03503	Fluid Mechanics and Hydraulic Machinery	2021-22
99	3	B.Tech MECH	19CA03504	Design of Machine Elements-I	2021-22
100	3	B.Tech MECH	19CA03507	Industrial Engineering and Management	2021-22
101	3	B.Tech MECH	19ca04508	Introduction to MEMS	2021-22
102	3	B.Tech MECH	19CA03510	Applied Thermodynamics Lab	2021-22
103	3	B.Tech MECH	19CA03511	Manufacturing Technology Lab	2021-22
104	3	B.Tech MECH	19CA03512	Fluid Mechanics and Hydraulic Machinery Lab	2021-22
105	3	B.Tech MECH	19CA03513	Socially Relevant Project II	2021-22
106	3	B.Tech MECH	19CA03601	Design of Machine Elements-II	2021-22
107	3	B.Tech MECH	19CA03602	Heat Transfer	2021-22
108	3	B.Tech MECH	19CA03603	CAD/CAM	2021-22
109	3	B.Tech MECH	19CA03607	Total Quality Management	2021-22
110	3	B.Tech MECH	19CA03608	Heat Transfer Lab	2021-22

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111	3	B.Tech MECH	19CA03609	CAD/CAM Lab	2021-22
112	3	B.Tech MECH	19CA03610	Socially Relevant Project III	2021-22
113	3	B.Tech MECH	17CA03701	Metrology and Measurements	2021-22
114	3	B.Tech MECH	17CA03702	Computer Aided Design/Computer Aided Manufacturing	2021-22
115	3	B.Tech MECH	17CA03706	Energy Management	2021-22
116	3	B.Tech MECH	17CA03707	Design for Manufacture (MOOC-I)	2021-22
117	3	B.Tech MECH	17CA03710	Advanced Production Technology (MOOC-II)	2021-22
118	3	B.Tech MECH	17CA03713	CAM Laboratory	2021-22
119	3	B.Tech MECH	17CA03714	Metrology and Measurements Laboratory	2021-22
120	3	B.Tech MECH	17CA03715	Technical Seminar	2021-22
121	3	B.Tech MECH	17CA57708	CATIA V6 (Value Added Course – II)	2021-22
122	3	B.Tech MECH	17CA03801	Automobile Engineering	2021-22
123	3	B.Tech MECH	17CA03804	Total Quality Management	2021-22
124	3	B.Tech MECH	17CA03806	Comprehensive Examination	2021-22
125	3	B.Tech MECH	17CA03807	Project Work	2021-22
126	4	B.Tech ECE	20CA02203	Network Analysis	2021-22
127	4	B.Tech ECE	20CA02204	Network Analysis Lab	2021-22
128	4	B.Tech ECE	20CA04302	Random Signals & Systems	2021-22
129	4	B.Tech ECE	20CA04303	Analog Communications	2021-22
130	4	B.Tech ECE	20CA02307	Principles of Electrical Engineering	2021-22
131	4	B.Tech ECE	20CA04305	Analog Communications Lab	2021-22
132	4	B.Tech ECE	20CA04306	Basic Simulation & Electrical Engineering Lab	2021-22
133	4	B.Tech ECE	20CA54401	Mathematics-IV	2021-22
134	4	B.Tech ECE	20CA04401	Analog Electronic Circuits	2021-22
135	4	B.Tech ECE	20CA04402	Digital Communications	2021-22
136	4	B.Tech ECE	20CA04403	Electromagnetic & Transmission Lines	2021-22
137	4	B.Tech ECE	20CA04404	Analog Electronic Circuits Lab	2021-22
138	4	B.Tech ECE	20CA04405	Digital Communications Lab	2021-22
139	4	B.Tech ECE	19CA04501	Antennas & Wave Propagation	2021-22
140	4	B.Tech ECE	19CA04502	Analog & Digital Communications	2021-22
141	4	B.Tech ECE	19CA04503	Integrated Circuits & Applications	2021-22
142	4	B.Tech ECE	19CA04506	Digital System Design	2021-22
143	4	B.Tech ECE	19CA04509	Analog & Digital Communications Lab	2021-22
144	4	B.Tech ECE	19CA04512	Socially Relevant Project-II	2021-22
145	4	B.Tech ECE	19CA04601	Microwave & Optical Communication	2021-22
146	4	B.Tech ECE	19CA05604	Internet of Things (IoT)	2021-22
147	4	B.Tech ECE	19CA04602	VLSI Design	2021-22
148	4	B.Tech ECE	19CA05511	AI Tools, Techniques and Applications Lab	2021-22
149	4	B.Tech ECE	19CA04606	Microwave & Optical Communication Lab	2021-22
150	4	B.Tech ECE	19CA04607	Socially Relevant Projects	2021-22
151	4	B.Tech ECE	17CA04701	Embedded System	2021-22
152	4	B.Tech ECE	17CA04702	Optical Communications	2021-22
153	4	B.Tech ECE	17CA04703	Radar Systems & Navigational Aids	2021-22
154	4	B.Tech ECE	17CA04708	RF Integrated Circuits (MOOC-I)	2021-22
155	4	B.Tech ECE	17CA04711	Advanced 3G & 4G Wireless Communication (MOOC-II)	2021-22
156	4	B.Tech ECE	17CA04713	Microwave & Optical Communications Lab	2021-22
157	4	B.Tech ECE	17CA04714	VLSI & Embedded systems lab	2021-22
158	4	B.Tech ECE	17CA57704	Value Added Course - II	2021-22
159	4	B.Tech ECE	17CA04801	Digital Image Processing	2021-22
160	4	B.Tech ECE	17CA04802	Wireless Sensor Networks And Architecture	2021-22
161	4	B.Tech ECE	17CA04806	Comprehensive Online Exam	2021-22
162	4	B.Tech ECE	17CA04807	Main Project Work	2021-22
163	5	B.Tech CSE	20CA05201	Java Programming Language	2021-22
164	5	B.Tech CSE	20CA05202	Java Programming LAB	2021-22
165	5	B.Tech CSE	20CA05203	IT Workshop LAB	2021-22
166	5	B.Tech CSE	20CA05301	Discrete Mathematics	2021-22
167	5	B.Tech CSE	20CA05302	Software Engineering	2021-22
168	5	B.Tech CSE	20CA05303	Data Structures	2021-22

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169	5	B.Tech CSE	20CA05304	Database Management Systems	2021-22
170	5	B.Tech CSE	20CA05305	Data Structures LAB	2021-22
171	5	B.Tech CSE	20CA05306	Database Management Systems LAB	2021-22
172	5	B.Tech CSE	20CA05307	Software Engineering LAB	2021-22
173	5	B.Tech CSE	20CA05308	C, Java Skills in User Interface	2021-22
174	5	B.Tech CSE	20CA53301	Universal Human Values and Ethics	2021-22
175	5	B.Tech CSE	20CA05401	Python Programming	2021-22
176	5	B.Tech CSE	20CA05402	Computer Organization	2021-22
177	5	B.Tech CSE	20CA05403	Operating Systems	2021-22
178	5	B.Tech CSE	20CA05404	Theory of Computation	2021-22
179	5	B.Tech CSE	20CA05406	Python Programming LAB	2021-22
180	5	B.Tech CSE	20CA05407	Operating Systems LAB	2021-22
181	5	B.Tech CSE	20CA05408	Mobile Application Development	2021-22
182	5	B.Tech CSE	19CA05502	Design and Analysis of Algorithms	2021-22
183	5	B.Tech CSE	19CA05503	Database Management Systems	2021-22
184	5	B.Tech CSE	19CA05504	Operating Systems	2021-22
185	5	B.Tech CSE	19CA04513	Embedded Systems	2021-22
186	5	B.Tech CSE	19CA05509	Database Management Systems Lab	2021-22
187	5	B.Tech CSE	19CA05510	Operating Systems Lab	2021-22
188	5	B.Tech CSE	19CA05601	Compiler Design	2021-22
189	5	B.Tech CSE	19CA05602	Advanced Python Programming	2021-22
190	5	B.Tech CSE	19CA05603	Cryptography and Network Security	2021-22
191	5	B.Tech CSE	19CA05607	Machine Learning	2021-22
192	5	B.Tech CSE	19CA05608	Advanced Python Programming & Cryptography & Network Security	2021-22
193	5	B.Tech CSE	19CA05609	Compiler Design Lab	2021-22
194	5	B.Tech CSE	19CA05610	Socially Relevant Project-III	2021-22
195	5	B.Tech CSE	17CA05701	Big Data	2021-22
196	5	B.Tech CSE	17CA05702	Mobile Application Development	2021-22
197	5	B.Tech CSE	17CA05703	Cyber Security	2021-22
198	5	B.Tech CSE	17CA05707	E-Commerce (MOOC-I)	2021-22
199	5	B.Tech CSE	17CA05711	Intrusion Detection Systems (MOOC-II)	2021-22
200	5	B.Tech CSE	17CA05713	Big Data Laboratory	2021-22
201	5	B.Tech CSE	17CA05714	Mobile Application Development Laboratory	2021-22
202	5	B.Tech CSE	17CA05715	Technical Seminar	2021-22
203	5	B.Tech CSE	17CA57707	Six Sigma(Value Added Course –II)	2021-22
204	5	B.Tech CSE	17CA05801	Software Project Management	2021-22
205	5	B.Tech CSE	17CA05802	Cloud Computing	2021-22
206	5	B.Tech CSE	17CA05806	Comprehensive Examination	2021-22
207	5	B.Tech CSE	17CA05808	Main Project	2021-22
208	EO	MBA	20CE00101	Management &OrganisationalBehaviour	2021-22
209	EO	MBA	20CE00102	Managerial Economics	2021-22
210	EO	MBA	20CE00103	Accounting for Managers	2021-22
211	EO	MBA	20CE00104	Business Research Methods	2021-22
212	EO	MBA	20CE00105	Business Communication	2021-22
213	EO	MBA	20CE00106	Business Statistics	2021-22
214	EO	MBA	20CE00107	Information Technology	2021-22
215	EO	MBA	20CE00108	Business Communication Lab – I	2021-22
216	EO	MBA	20CE00109	Information Technology Lab	2021-22
217	EO	MBA	20CE00201	Human Resource Management	2021-22
218	EO	MBA	20CE00202	Financial Management	2021-22
219	EO	MBA	20CE00203	Marketing Management	2021-22
220	EO	MBA	20CE00204	Operations Research	2021-22
221	EO	MBA	20CE00205	Business Environment	2021-22
222	EO	MBA	20CE00206	Operations Management	2021-22
223	EO	MBA	20CE00207	Management Information Systems	2021-22
224	EO	MBA	20CE00208	Business Analytics Lab	2021-22
225	EO	MBA	20CE00209	Business Communication Lab –II	2021-22
226	EO	MBA	20CE00210	Entrepreneurship Development	2021-22

227	E0	MBA	20CE00311	Services Marketing	2021-22
228	E0	MBA	20CE00313	Product and brand Management	2021-22
229	E0	MBA	20CE00321	Security Analysis & Portfolio Management	2021-22
230	E0	MBA	20CE00322	Financial Institutions and Markets	2021-22
231	E0	MBA	20CE00331	Performance Management	2021-22
232	E0	MBA	20CE00334	Employee Empowerment	2021-22
233	E0	MBA	20CE00302	Business Simulation Lab II	2021-22
234	E0	MBA	20CE00401	Strategic Management	2021-22
235	E0	MBA	20CE00402	International Business Management	2021-22
236	E0	MBA	20CE00403	Legal Aspects of Business	2021-22
237	E0	MBA	20CE00404	Project –II Viva-Voce & Report Presentation & Submission	2021-22
238	E0	MBA	20CE00414	Advertisement and Sales Promotion Management	2021-22
239	E0	MBA	20CE00424	Financial Derivatives	2021-22
240	E0	MBA	20CE00432	International Human Resource Management	2021-22
241	F0	MCA	20CF00101	Mathematical Foundations of Computer Science	2021-22
242	F0	MCA	20CF00102	Data structures	2021-22
243	F0	MCA	20CF00103	Computer Organization and architecture	2021-22
244	F0	MCA	20CF00104	Operating Systems	2021-22
245	F0	MCA	20CF00105	Computer Networks	2021-22
246	F0	MCA	20CF00106	Python Programming	2021-22
247	F0	MCA	20CF00107	Data structures Through C++ Lab	2021-22
248	F0	MCA	20CF00108	Python Programming Lab	2021-22
249	F0	MCA	20CF00109	Office Automation Lab	2021-22
250	F0	MCA	20CF00201	Database Management Systems	2021-22
251	F0	MCA	20CF00202	Object Oriented Programming through Java	2021-22
252	F0	MCA	20CF00203	Artificial Intelligence	2021-22
253	F0	MCA	20CF00204	Software Engineering	2021-22
254	F0	MCA	20CF00205	Object Oriented Analysis and Design	2021-22
255	F0	MCA	20CF00208	Data Mining	2021-22
256	F0	MCA	20CF00211	Database Management Systems Lab	2021-22
257	F0	MCA	20CF00212	Object Oriented Programming through Java Lab	2021-22
258	F0	MCA	20CF00213	Artificial Intelligence using R Lab	2021-22
259	F0	MCA	20CF00301	Full Stack Technologies	2021-22
260	F0	MCA	20CF00302	Machine Learning	2021-22
261	F0	MCA	20CF00303	Mobile Application Development	2021-22
262	F0	MCA	20CF00304	Fundamentals of Data Science	2021-22
263	F0	MCA	20CF00307	Software Testing	2021-22
264	F0	MCA	20CF00309	Internet of Things	2021-22
265	F0	MCA	20CF00311	Full Stack Technologies Lab	2021-22
266	F0	MCA	20CF00312	Machine Learning Lab	2021-22
267	F0	MCA	20CF00313	Mobile Application Development Lab	2021-22
268	F0	MCA	20CF00401	Main Project	2021-22
269	F0	MCA	20CF00402	MOOC-I	2021-22
270	F0	MCA	20CF00403	Seminar	2021-22
271	D83	M.Tech (PE&D)	21CD02101	Advanced Power Semiconductor Devices	2021-22
272	D83	M.Tech (PE&D)	21CD02102	Machine Modeling and Analysis	2021-22
273	D83	M.Tech (PE&D)	21CD02103	Solid-State DC Drives	2021-22
274	D83	M.Tech (PE&D)	21CD02104	Applications of Power Electronics to Power Systems	2021-22
275	D83	M.Tech (PE&D)	21CD02107	Advanced Digital Signal Processing	2021-22
276	D83	M.Tech (PE&D)	21CD02109	Solid State Lighting and Control	2021-22
277	D83	M.Tech (PE&D)	21CD02111	MOOC Course	2021-22
278	D83	M.Tech (PE&D)	21CD02114	Power Electronics and Simulation Lab	2021-22
279	D83	M.Tech (PE&D)	21CD02201	Advanced Power Converters	2021-22
280	D83	M.Tech (PE&D)	21CD02202	Power Quality	2021-22
281	D83	M.Tech (PE&D)	21CD02203	Advanced Drives & Control	2021-22
282	D83	M.Tech (PE&D)	21CD02204	Renewable Energy Conversion Systems	2021-22
283	D83	M.Tech (PE&D)	21CD02207	HVDC & EHVAC Transmission Systems	2021-22
284	D83	M.Tech (PE&D)	21CD02209	Energy Efficient Electrical Systems	2021-22

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285	D83	M.Tech (PE&D)	21CD53301	Research Methodology	2021-22
286	D83	M.Tech (PE&D)	21CD02304	Technical Seminar I	2021-22
287	D83	M.Tech (PE&D)	21CD02305	Project work – Phase I	2021-22
288	D83	M.Tech (PE&D)	21CD02401	Technical Seminar II	2021-22
289	D83	M.Tech (PE&D)	21CD02402	Project work – Phase II	2021-22
290	D04	M.Tech (CAD/CAM)	21CD54101	Computational Methods	2021-22
291	D04	M.Tech (CAD/CAM)	21CD03301	Advanced Finite Element Methods	2021-22
292	D04	M.Tech (CAD/CAM)	21CD03102	Computer Integrated Manufacturing	2021-22
293	D04	M.Tech (CAD/CAM)	21CD03103	Rapid Prototyping	2021-22
294	D04	M.Tech (CAD/CAM)	21CD03105	Computer Aided Process & Planning	2021-22
295	D04	M.Tech (CAD/CAM)	21CD03107	Materials Technology	2021-22
296	D04	M.Tech (CAD/CAM)	21CD03111-	MOOC Course	2021-22
297	D04	M.Tech (CAD/CAM)	21CD03110	Modeling and Analysis Lab	2021-22
298	D04	M.Tech (CAD/CAM)	21CD03201	Advanced Optimization Techniques	2021-22
299	D04	M.Tech (CAD/CAM)	21CD03202	Industrial Robotics and Expert systems	2021-22
300	D04	M.Tech (CAD/CAM)	21CD03203	CNC Technology & programming	2021-22
301	D04	M.Tech (CAD/CAM)	21CD03204	Composite Materials	2021-22
302	D04	M.Tech (CAD/CAM)	21CD03206	Special Manufacturing Process	2021-22
303	D04	M.Tech (CAD/CAM)	21CD03209	Global Integrated Manufacturing	2021-22
304	D04	M.Tech (CAD/CAM)	21CD53201	Research Methodology	2021-22
305	D04	M.Tech (CAD/CAM)	21CD03211	CAD/CAM Lab	2021-22
306	D04	M.Tech (CAD/CAM)	21CD03302	Seminar - I	2021-22
307	D04	M.Tech (CAD/CAM)	21CD03303	Project work – Phase I	2021-22
308	D04	M.Tech (CAD/CAM)	21CD03401	Seminar - II	2021-22
309	D04	M.Tech (CAD/CAM)	21CD03402	Project work – Phase II	2021-22
310	D57	M.Tech (VLSI&SD)	21CD04101	Digital System Design	2021-22
311	D57	M.Tech (VLSI&SD)	21CD04102	CMOS Analog IC Design	2021-22
312	D57	M.Tech (VLSI&SD)	21CD04103	CMOS Digital IC Design	2021-22
313	D57	M.Tech (VLSI&SD)	21CD04104	VLSI Signal Processing	2021-22
314	D57	M.Tech (VLSI&SD)	21CD04107	Advanced Computer Architecture	2021-22
315	D57	M.Tech (VLSI&SD)	21CD04109	CPLD and FPGA Architectures and Applications	2021-22
316	D57	M.Tech (VLSI&SD)	21CD04111	MOOC Course	2021-22
317	D57	M.Tech (VLSI&SD)	21CD04114	Digital System Design Lab	2021-22
318	D57	M.Tech (VLSI&SD)	21CD04201	Low Power VLSI Design	2021-22
319	D57	M.Tech (VLSI&SD)	21CD04202	Test & Testability	2021-22
320	D57	M.Tech (VLSI&SD)	21CD04203	CMOS Mixed Signal Design	2021-22
321	D57	M.Tech (VLSI&SD)	21CD04204	Embedded System Design	2021-22
322	D57	M.Tech (VLSI&SD)	21CD04206	Semiconductor Memory Design and Testing	2021-22
323	D57	M.Tech (VLSI&SD)	21CD04210	Hardware & Software Design of embedded Systems	2021-22
324	D57	M.Tech (VLSI&SD)	21CD045201	Research Methodology	2021-22
325	D57	M.Tech (VLSI&SD)	21CD04211	VLSI System Design Lab	2021-22
326	D57	M.Tech (VLSI&SD)	21CD04301	Technical Seminar I	2021-22
327	D57	M.Tech (VLSI&SD)	21CD04302	Project Work – Phase I	2021-22
328	D57	M.Tech (VLSI&SD)	21CD04401	Technical Seminar II	2021-22
329	D57	M.Tech (VLSI&SD)	21CD04402	Project Work – Phase II	2021-22
330	D58	M.Tech (CSE)	21CD05101	Advanced Data Structures and Algorithms	2021-22
331	D58	M.Tech (CSE)	21CD05102	Fundamentals of Data Science	2021-22
332	D58	M.Tech (CSE)	21CD05103	Computer Organization & Architecture	2021-22
333	D58	M.Tech (CSE)	21CD05104	Advanced Operating System	2021-22
334	D58	M.Tech (CSE)	21CD05105	Software Engineering	2021-22
335	D58	M.Tech (CSE)	21CD05110	Machine Learning	2021-22
336	D58	M.Tech (CSE)	21CD05113	MOOCS	2021-22
337	D58	M.Tech (CSE)	21CD05114	Advanced Data Structures and Algorithms lab	2021-22
338	D58	M.Tech (CSE)	21CD05201	Advanced Python Programming	2021-22
339	D58	M.Tech (CSE)	21CD05202	Big Data Analytics	2021-22
340	D58	M.Tech (CSE)	21CD05203	Internet of Things	2021-22
341	D58	M.Tech (CSE)	21CD05	Mobile Application Development	2021-22
342	D58	M.Tech (CSE)	21CD05	Design Patterns	2021-22

343	D58	M.Tech (CSE)	21CD05206	Human Computer Interaction	2021-22
344	D58	M.Tech (CSE)	21CD05207	Pattern Recognition	2021-22
345	D58	M.Tech (CSE)	21CD05208	Cyber Security	2021-22
346	D58	M.Tech (CSE)	21CD05209	R Programming	2021-22
347	D58	M.Tech (CSE)	21CD05210	Computer Vision	2021-22
348	D58	M.Tech (CSE)	21CD05211	Cloud Computing	2021-22
349	D58	M.Tech (CSE)	21CD05212	Advanced Databases	2021-22
350	D58	M.Tech (CSE)	21CD05213	Map Reduce Programming Lab	2021-22
351	D58	M.Tech (CSE)	21CD05301	Technical Seminar - I	2021-22
352	D58	M.Tech (CSE)	21CD05302	Project Work- PHASE - I	2021-22
353	D58	M.Tech (CSE)	21CD05401	Technical Seminar - II	2021-22
354	D58	M.Tech (CSE)	21CD05402	Project Work- PHASE - II	2021-22
355	2	B.Tech EEE	19CA54301	Mathematics- III	2020-21
356	2	B.Tech EEE	19CA02301	Electrical Circuits II	2020-21
357	2	B.Tech EEE	19CA04301	Electronic Devices and Circuits	2020-21
358	2	B.Tech EEE	19CA02302	Engineering Electromagnetics	2020-21
359	2	B.Tech EEE	19CA02303	Electrical Machines - I	2020-21
360	2	B.Tech EEE	19CA05301	Data Structures	2020-21
361	2	B.Tech EEE	19CA56301	Essence of Indian Traditional Knowledge	2020-21
362	2	B.Tech EEE	19CA02304	Electrical Circuits and Simulation Lab	2020-21
363	2	B.Tech EEE	19CAD4304	Electronic Devices and Circuits Lab	2020-21
364	2	B.Tech EEE	19CAS2401	Communicative English II	2020-21
365	2	B.Tech EEE	19CA02401	Control Systems	2020-21
366	2	B.Tech EEE	19CA58301	Life Sciences for Engineers	2020-21
367	2	B.Tech EEE	19CA02402	Generation and Transmission	2020-21
368	2	B.Tech EEE	19CA02403	Electrical Machines - II	2020-21
369	2	B.Tech EEE	19CA02404	Control Systems Lab	2020-21
370	2	B.Tech EEE	19CAS2402	Communicative English II	2020-21
371	2	B.Tech EEE	19CA02406	Socially Relevant Project I	2020-21
372	2	B.Tech EEE	17CA02501	Control Systems	2020-21
373	2	B.Tech EEE	17CA02502	Power Electronics	2020-21
374	2	B.Tech EEE	17CA02503	Transmission and Distribution Systems	2020-21
375	2	B.Tech EEE	17CA04511	Digital Circuits and Systems	2020-21
376	2	B.Tech EEE	17CA02504	AC Machines – II	2020-21
377	2	B.Tech EEE	17CA02508	Power Quality	2020-21
378	2	B.Tech EEE	17CA02509	Control Systems and Simulation Laboratory	2020-21
379	2	B.Tech EEE	17CA02510	AC Machines Laboratory	2020-21
380	2	B.Tech EEE	17CA52501	Soft Skills Lab	2020-21
381	2	B.Tech EEE	17CA02601	Power System Analysis	2020-21
382	2	B.Tech EEE	17CA02602	Solid State Electric Motor Drives	2020-21
383	2	B.Tech EEE	17CA04604	Micro Processors and Microcontrollers	2020-21
384	2	B.Tech EEE	17CA02603	Power System Protection	2020-21
385	2	B.Tech EEE	17CA02606	Energy Audit and Management	2020-21
386	2	B.Tech EEE	17CA052601	Soft Skills-II	2020-21
387	2	B.Tech EEE	17CA02610	Power Electronics and Simulation Lab	2020-21
388	2	B.Tech EEE	17CAD4610	Microprocessors And Microcontrollers Laboratory	2020-21
389	2	B.Tech EEE	17CA02611	Mini Project	2020-21
390	2	B.Tech EEE	19CA02801	Project Part-II	2020-21
391	3	B.Tech MECH	19CA53303	Design Thinking	2020-21
392	3	B.Tech MECH	19CA03301	Engineering Mechanics	2020-21
393	3	B.Tech MECH	19CA03302	Strength of Materials	2020-21
394	3	B.Tech MECH	19CA03303	Manufacturing Processes	2020-21
395	3	B.Tech MECH	19CA03304	Strength of Materials Lab	2020-21
396	3	B.Tech MECH	19CA03305	Manufacturing Processes Lab	2020-21
397	3	B.Tech MECH	19CA03401	Thermodynamics	2020-21
398	3	B.Tech MECH	19CA0____	Kinematics and Theory of Machines	2020-21
399	3	B.Tech MECH	19C_____5	AI Tools, Techniques and Applications	2020-21
400	3	B.Tech MECH	19____403	Metrology and Measurements	2020-21

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No.	Dept No	Branch	Course Code	Course Title	Year
401	3	B.Tech MECH	19CA03404	Computer Aided Machine Drawing	2020-21
402	3	B.Tech MECH	19CA05406	AI Tools, Techniques and Applications Lab	2020-21
403	3	B.Tech MECH	19CA03405	Metrology and Measurements Lab	2020-21
404	3	B.Tech MECH	19CA03406	Socially Relevant Project I	2020-21
405	3	B.Tech MECH	17CA03501	Machine Tools	2020-21
406	3	B.Tech MECH	17CA03502	Dynamics of Machinery	2020-21
407	3	B.Tech MECH	17CA03503	Machine Design-I	2020-21
408	3	B.Tech MECH	17CA03504	Thermal Engineering-II	2020-21
409	3	B.Tech MECH	17CA03505	Fluid Mechanics and Hydraulic Machines	2020-21
410	3	B.Tech MECH	17CA03509	Power Plant Engineering	2020-21
411	3	B.Tech MECH	17CA03510	Machine Tools Laboratory	2020-21
412	3	B.Tech MECH	17CA03511	Fluid Mechanics and Hydraulic Machines Laboratory	2020-21
413	3	B.Tech MECH	17CA03601	Finite Element Methods	2020-21
414	3	B.Tech MECH	17CA03602	Machine Design-II	2020-21
415	3	B.Tech MECH	17CA03603	Heat Transfer	2020-21
416	3	B.Tech MECH	17CA03604	Metal forming Process	2020-21
417	3	B.Tech MECH	17CA03607	Modern Manufacturing Methods	2020-21
418	3	B.Tech MECH	17CA03610	CAE Laboratory	2020-21
419	3	B.Tech MECH	17CA03611	Heat Transfer Laboratory	2020-21
420	3	B.Tech MECH	17CA03612	Mini Project	2020-21
421	4	B.Tech ECE	19CA04302	Random Signals & Systems	2020-21
422	4	B.Tech ECE	19CA04303	Digital Electronics & Logic Design	2020-21
423	4	B.Tech ECE	19CA02305	Network Analysis and Transmission Lines	2020-21
424	4	B.Tech ECE	19CA04305	Basic Simulation Lab	2020-21
425	4	B.Tech ECE	19CA04401	Electromagnetic Theory	2020-21
426	4	B.Tech ECE	19CA04402	Analog Electronic Circuits	2020-21
427	4	B.Tech ECE	19CA04403	Digital Electronics & Logic Design Lab	2020-21
428	4	B.Tech ECE	19CA04404	Analog Electronic Circuits Lab	2020-21
429	4	B.Tech ECE	19CA04405	Socially Relevant Project	2020-21
430	4	B.Tech ECE	17CA04501	Digital Communication Systems	2020-21
431	4	B.Tech ECE	17CA04502	Digital System Design	2020-21
432	4	B.Tech ECE	17CA04503	Antennas & Wave Propagation	2020-21
433	4	B.Tech ECE	17CA04504	Electronic Measurements and Instrumentation	2020-21
434	4	B.Tech ECE	17CA05403	Computer Organization	2020-21
435	4	B.Tech ECE	17CA04506	Artificial Neural Networks and Fuzzy Logic	2020-21
436	4	B.Tech ECE	17CA04509	Linear & Digital IC Applications Lab	2020-21
437	4	B.Tech ECE	17CA04510	Digital Communication lab	2020-21
438	4	B.Tech ECE	17CA04601	Digital Signal Processing	2020-21
439	4	B.Tech ECE	17CA04602	VLSI System Design	2020-21
440	4	B.Tech ECE	17CA04603	Microwave Engineering	2020-21
441	4	B.Tech ECE	17CA04605	Satellite Communication	2020-21
442	4	B.Tech ECE	17CA04609	Digital Signal Processing lab	2020-21
443	4	B.Tech ECE	17CA04611	Mini Project	2020-21
444	5	B.Tech CSE	19CA54302	Numerical Methods	2020-21
445	5	B.Tech CSE	19CA05302	Discrete Mathematics	2020-21
446	5	B.Tech CSE	19CA04306	Digital Logic Design	2020-21
447	5	B.Tech CSE	19CA05303	Software Engineering	2020-21
448	5	B.Tech CSE	19CA53301	Design Thinking & Product Innovation	2020-21
449	5	B.Tech CSE	19CA05304	Data Structures Lab	2020-21
450	5	B.Tech CSE	19CA05305	Software Engineering Lab	2020-21
451	5	B.Tech CSE	19CA53302	Design Thinking & Product Innovation Lab	2020-21
452	5	B.Tech CSE	19CA05401	Computer Organization	2020-21
453	5	B.Tech CSE	19CA05402	Formal Languages and Automata Theory	2020-21
454	5	B.Tech CSE	19CA03103	Basic Civil and Mechanical Engineering	2020-21
455	5	B.Tech CSE	19CA03206	Basic Civil and Mechanical Engineering Lab	2020-21
456	5	B.Tech CSE	19CA05408	Socially Relevant Project-I	2020-21
457	5	B.Tech CSE	17CA05501	Operating Systems	2020-21
458	5	B.Tech CSE	17CA05502	Computer Networks	2020-21

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459	5	B.Tech CSE	17CA05503	Compiler Design	2020-21
460	5	B.Tech CSE	17CA05504	Object Oriented Analysis and Design	2020-21
461	5	B.Tech CSE	17CA05505	Data Warehousing and Data Mining	2020-21
462	5	B.Tech CSE	17CA05507	Software Testing Methodologies	2020-21
463	5	B.Tech CSE	17CA05509	Object Oriented Analysis and Design Laboratory	2020-21
464	5	B.Tech CSE	17CA05510	Data Mining Laboratory	2020-21
465	5	B.Tech CSE	17CA05506	Design Patterns	2020-21
466	5	B.Tech CSE	17CA05601	Artificial Intelligence	2020-21
467	5	B.Tech CSE	17CA05602	Web Programming	2020-21
468	5	B.Tech CSE	17CA05603	Advanced Python Programming	2020-21
469	5	B.Tech CSE	17CA05604	Information Security	2020-21
470	5	B.Tech CSE	17CA05606	Distributed Systems	2020-21
471	5	B.Tech CSE	17CA05611	Web Programming Laboratory	2020-21
472	5	B.Tech CSE	17CA05612	Advanced Python Programming Laboratory	2020-21
473	5	B.Tech CSE	17CA05613	Mini Project	2020-21
474	D04	M.Tech (CAD/CAM)	17CD54101	Computational Methods	2020-21
475	D04	M.Tech (CAD/CAM)	17CD03101	Advanced Finite Element Methods	2020-21
476	D04	M.Tech (CAD/CAM)	17CD03102	Computer Integrated Manufacturing	2020-21
477	D04	M.Tech (CAD/CAM)	17CD03103	Advances in Manufacturing Technology	2020-21
478	D04	M.Tech (CAD/CAM)	17CD03110	Modelling And CNC Lab	2020-21
479	D04	M.Tech (CAD/CAM)	17CD03201	Advanced Optimization Techniques	2020-21
480	D04	M.Tech (CAD/CAM)	17CD03202	Industrial Robotics and Expert systems	2020-21
481	D04	M.Tech (CAD/CAM)	17CD03203	CNC Technology & programming	2020-21
482	D04	M.Tech (CAD/CAM)	17CD03204	Mechatronics Applications in Manufacturing	2020-21
483	D04	M.Tech (CAD/CAM)	17CD03211	CAD/CAM Lab	2020-21
484	D04	M.Tech (CAD/CAM)	17CD53301	Research Methodology	2020-21
485	D04	M.Tech (CAD/CAM)	17CD03301	MOOC Course(Design for Manufacturing)	2020-21
486	D04	M.Tech (CAD/CAM)	17CD03304	Teaching Assignment	2020-21
487	D04	M.Tech (CAD/CAM)	17CD03305	Project work – Phase I	2020-21
488	D04	M.Tech (CAD/CAM)	17CD03401	Seminar	2020-21
489	D04	M.Tech (CAD/CAM)	17CD03402	Project work – Phase II	2020-21
490	D57	M.Tech (VLSI&SD)	17CD04101	Structural Digital System Design	2020-21
491	D57	M.Tech (VLSI&SD)	17CD04102	CMOS Analog IC Design	2020-21
492	D57	M.Tech (VLSI&SD)	17CD04103	CMOS Digital IC Design	2020-21
493	D57	M.Tech (VLSI&SD)	17CD04104	Hardware Description Languages	2020-21
494	D57	M.Tech (VLSI&SD)	17CD04106	Professional Elective-I(Low Power VLSI Design)	2020-21
495	D57	M.Tech (VLSI&SD)	17CD04109	Professional Elective-II(Embedded System Design)	2020-21
496	D57	M.Tech (VLSI&SD)	17CD04111	Digital System Design Lab	2020-21
497	D57	M.Tech (VLSI&SD)	17CD04201	CPLD and FPGA Architecture Applications	2020-21
498	D57	M.Tech (VLSI&SD)	17CD04202	Testing & Testability	2020-21
499	D57	M.Tech (VLSI&SD)	17CD04203	CMOS Mixed Signal Design	2020-21
500	D57	M.Tech (VLSI&SD)	17CD04204	Algorithms for VLSI Design Automation	2020-21
501	D57	M.Tech (VLSI&SD)	17CD04205	Professional Elective-III(Internet of Things)	2020-21
502	D57	M.Tech (VLSI&SD)	17CD04208	Professional Elective-IV(RF IC Design)	2020-21
503	D57	M.Tech (VLSI&SD)	17CD04211	Mixed signal Lab	2020-21
504	D57	M.Tech (VLSI&SD)	17CD05301	Research Methodology	2020-21
505	D57	M.Tech (VLSI&SD)	17CD04302	MOOC Course I (Development of Real Time Systems)	2020-21
506	D57	M.Tech (VLSI&SD)	17CD04304	Teaching Assignment	2020-21
507	D57	M.Tech (VLSI&SD)	17CD04305	Project Work – Phase I	2020-21
508	D57	M.Tech (VLSI&SD)	17CD04401	Technical Seminar	2020-21
509	D58	M.Tech (CSE)	17CD05101	Advanced Data Structures and Algorithms	2020-21
510	D58	M.Tech (CSE)	17CD05102	Fundamentals of Data Science	2020-21
511	D58	M.Tech (CSE)	17CD05103	Computer Organization & Architecture	2020-21
512	D58	M.Tech (CSE)	17CD05104	Advanced Operating System	2020-21
513	D58	M.Tech (CSE)	17CD05105	Professional Elective-I(Software Engineering)	2020-21
514	D58	M.Tech (CSE)	17CD05109	Professional Elective-II(Data Mining and Knowledge Discovery)	2020-21

515	D58	M.Tech (CSE)	17CD05113	Advanced Data Structures and Algorithms Lab	2020-21
516	D58	M.Tech (CSE)	17CD05201	Object Oriented Analysis &Design	2020-21
517	D58	M.Tech (CSE)	17CD05202	Big Data Analytics	2020-21
518	D58	M.Tech (CSE)	17CD05203	Internet of Things	2020-21
519	D58	M.Tech (CSE)	17CD05204	Mobile Application Development	2020-21
520	D58	M.Tech (CSE)	17CD05206	Professional Elective-III(Human Computer Interaction)	2020-21
521	D58	M.Tech (CSE)	17CD05211	Professional Elective-IV(Cloud Computing)	2020-21
522	D58	M.Tech (CSE)	17CD05213	Map Reduce Programming Lab	2020-21
523	D58	M.Tech (CSE)	17CD05303	MOOC Course(Distributed Systems)	2020-21
524	D58	M.Tech (CSE)	17CD05304	Teaching Assignment	2020-21
525	D58	M.Tech (CSE)	17CD05305	Project work – Phase I	2020-21
526	D58	M.Tech (CSE)	17CD05401	Seminar	2020-21
527	D58	M.Tech (CSE)	17CD05402	Project work – Phase II	2020-21
528	D83	M.Tech (PE&D)	17CD02101	Advanced Power Semiconductor Devices	2020-21
529	D83	M.Tech (PE&D)	17CD02102	Machine Modeling and Analysis	2020-21
530	D83	M.Tech (PE&D)	17CD02103	Solid-State DC Drives	2020-21
531	D83	M.Tech (PE&D)	17CD02104	Applications of Power Electronics to Power Systems	2020-21
532	D83	M.Tech (PE&D)	17CD02107	Professional Elective-I(Advanced Digital Signal Processing)	2020-21
533	D83	M.Tech (PE&D)	17CD02109	Professional Elective-II(Solid State Lighting and Control)	2020-21
534	D83	M.Tech (PE&D)	17CD02111	Power Electronics and Simulation Lab	2020-21
535	D83	M.Tech (PE&D)	17CD02201	Advanced Power Converters	2020-21
536	D83	M.Tech (PE&D)	17CD02202	Power Quality	2020-21
537	D83	M.Tech (PE&D)	17CD02203	Advanced Drives & Control	2020-21
538	D83	M.Tech (PE&D)	17CD02204	Renewable Energy Conversion Systems	2020-21
539	D83	M.Tech (PE&D)	17CD02207	Professional Elective-III(HVDC & EHVAC Transmission Systems)	2020-21
540	D83	M.Tech (PE&D)	17CD02209	Professional Elective-IV(Engergy Efficient Electrical Systems)	2020-21
541	D83	M.Tech (PE&D)	17CD02211	Electrical Drives and Simulation Lab	2020-21
542	D83	M.Tech (PE&D)	17CD02302	MOOC Course(Industrial Automation and Control)	2020-21
543	D83	M.Tech (PE&D)	17CD02304	Teaching Assignment	2020-21
544	D83	M.Tech (PE&D)	17CD02305	Project work – Phase I	2020-21
545	D83	M.Tech (PE&D)	17CD02401	Seminar	2020-21
546	D83	M.Tech (PE&D)	17CD02402	Project work – Phase II	2020-21
547	02	B.Tech EEE	19CA54101	Mathematics - I	2019-2020
548	02	B.Tech EEE	19CA51101	Engineering Chemistry	2019-2020
549	02	B.Tech EEE	19CA03101	Engineering Graphics & Design	2019-2020
550	02	B.Tech EEE	19CA51103	Environmental Science	2019-2020
551	02	B.Tech EEE	19CA51102	Engineering Chemistry Lab	2019-2020
552	02	B.Tech EEE	19CA51104	Basic Civil & Mechanical Engineering	2019-2020
553	02	B.Tech EEE	19CA02101	Basic Electrical Engineering Workshop	2019-2020
554	02	B.Tech EEE	19CA54201	Mathematics - II	2019-2020
555	02	B.Tech EEE	19CA55103	Applied Physics	2019-2020
556	02	B.Tech EEE	19CA02201	Electrical Circuits - I	2019-2020
557	02	B.Tech EEE	19CA52101	Communicative English - I	2019-2020
558	02	B.Tech EEE	19CA05101	Problem Solving & Programming	2019-2020
559	02	B.Tech EEE	19CA56201	Constitution of India	2019-2020
560	02	B.Tech EEE	19CA55104	Applied Physics Lab	2019-2020
561	02	B.Tech EEE	19CA02202	Electrical Circuits – I Lab	2019-2020
562	02	B.Tech EEE	19CA05102	Problem Solving & Programming Lab	2019-2020
563	02	B.Tech EEE	19CA03102	Basic Engineering Workshop	2019-2020
564	02	B.Tech EEE	19CA52102	Communicative English – ILab	2019-2020
565	03	B.Tech MECH	19CA03201	Engineering Graphics	2019-2020
566	03	B.Tech MECH	19CA03202	Material Science and Engineering	2019-2020
567	03	B.Tech MECH	19CA03203	Material Science and Engineering Lab	2019-2020
568	03	B.Tech MECH	19CA03204	Mechanical Engineering Workshop	2019-2020
569	04	B.Tech ECE	19CA02203	Principles of Electrical Engineering	2019-2020
570	04	B.Tech ECE	19CA03201	Electronics & Communication Engineering Workshop	2019-2020
571	04	B.Tech ECE	19CA02204	Principles of Electrical Engineering Lab	2019-2020

572	05	B.Tech CSE	19CA54202	Probability and Statistics	2019-2020
573	05	B.Tech CSE	19CA02102	Essential Electrical and Electronic Engineering Lab	2019-2020
574	05	B.Tech CSE	19CA05202	Python Programming Lab	2019-2020
575	05	B.Tech CSE	19CA05203	Computer Science and Engineering Workshop	2019-2020
576	E0	MBA	17CE00101	Management & Organisational Behaviour	2019-2020
577	E0	MBA	17CE00102	Managerial Economics	2019-2020
578	E0	MBA	17CE00103	Accounting for Managers	2019-2020
579	E0	MBA	17CE00104	Business Statistics	2019-2020
580	E0	MBA	17CE00105	Business Communication	2019-2020
581	E0	MBA	17CE00106	Business Research Methods - I	2019-2020
582	E0	MBA	17CE00107	Information Technology for Managers	2019-2020
583	E0	MBA	17CE00108	Business Comunication Lab - I	2019-2020
584	E0	MBA	17CE00109	Information Technology Lab	2019-2020
585	E0	MBA	17CE00201	Human Resource Management	2019-2020
586	E0	MBA	17CE00202	Financial Management	2019-2020
587	E0	MBA	17CE00203	Marketing Management	2019-2020
588	E0	MBA	17CE00204	Operations Research	2019-2020
589	E0	MBA	17CE00205	Business Environment	2019-2020
590	E0	MBA	17CE00206	Operations Management	2019-2020
591	E0	MBA	17CE00207	Management Information Systems	2019-2020
592	E0	MBA	17CE00208	Business Analytics Lab	2019-2020
593	E0	MBA	17CE00209	Business Communication Lab-II	2019-2020
594	E0	MBA	17CE00301	Entrepreneurship Development	2019-2020
595	E0	MBA	17CE00302	Business Research Methods - 2	2019-2020
596	E0	MBA	17CE00303	Business Simulation Laboratory	2019-2020
597	E0	MBA	17CE00401	Strategic Management	2019-2020
598	E0	MBA	17CE00402	International Business Management	2019-2020
599	E0	MBA	17CE00403	Legal Aspects of Business	2019-2020
600	E0	MBA	17CE00404	Project Viva Voce & Report Submission	2019-2020
601	02	B.Tech EEE	17CA54301	Mathematics -III	2019-2020
602	02	B.Tech EEE	17CA02301	DC Machines	2019-2020
603	02	B.Tech EEE	17CA02302	Electrical Circuits-II	2019-2020
604	02	B.Tech EEE	17CA02303	Electrical Measurements and Instrumentation	2019-2020
605	02	B.Tech EEE	17CA04301	Electronic Devices and Circuits	2019-2020
606	02	B.Tech EEE	17CA02304	Electromagnetic Field Theory	2019-2020
607	02	B.Tech EEE	17CA56301	Mandatory Course(Human Values and Professional Ethics)	2019-2020
608	02	B.Tech EEE	17CA02305	Electrical Circuits and Simulation Laboratory	2019-2020
609	02	B.Tech EEE	17CA04305	Electronic Devices and Circuits Laboratory	2019-2020
610	02	B.Tech EEE	17CA02401	Power Generation Systems	2019-2020
611	02	B.Tech EEE	17CA02402	AC Machines - I	2019-2020
612	02	B.Tech EEE	17CA04407	Linear and Digital Integrated Circuits	2019-2020
613	02	B.Tech EEE	17CA53501	Business Economics and Financial Analysis	2019-2020
614	02	B.Tech EEE	17CA54401	Mathematics -IV Analog Electronic Circuits	2019-2020
615	02	B.Tech EEE	17CA57401	Value Added Course – I (Matlab)	2019-2020
616	02	B.Tech EEE	17CA02403	DC Machines Laboratory	2019-2020
617	02	B.Tech EEE	17CA02404	Electrical Measurements and Instrumentation Laboratory	2019-2020
618	03	B.Tech MECH	17CA03301	Thermodynamics	2019-2020
619	03	B.Tech MECH	17CA03302	Engineering Mechanics	2019-2020
620	03	B.Tech MECH	17CA03303	Manufacturing Technology	2019-2020
621	03	B.Tech MECH	17CA53301	Managerial Economics and Financial Analysis	2019-2020
622	03	B.Tech MECH	17CA03304	Engineering Drawing for Mechanical Engineers	2019-2020
623	03	B.Tech MECH	17CA03305	Computer Aided Drafting Laboratory	2019-2020
624	03	B.Tech MECH	17CA03306	Manufacturing Technology Laboratory	2019-2020
625	03	B.Tech MECH	17CA54302	Probability and Statistics	2019-2020
626	03	B.Tech MECH	17CA02405	Basic Electrical And Electronic Technology	2019-2020
627	03	B.Tech MECH	17CA03___	Mechanics of Solids	2019-2020
628	03	B.Tech MECH	17CA___	Thermal Engineering-I	2019-2020
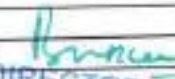
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629	03	B.Tech MECH	17CA03403	Machine Drawing	2019-2020
630	03	B.Tech MECH	17CA03404	Kinematics of Machinery	2019-2020
631	03	B.Tech MECH	17CA03405	Mechanics of Solids Laboratory	2019-2020
632	03	B.Tech MECH	17CA03406	Thermal Engineering Laboratory	2019-2020
633	03	B.Tech MECH	17CA57408	Value added Course-I(HVAC Duct Design)	2019-2020
634	04	B.Tech ECE	17CA04302	Switching Theory and Logic Design	2019-2020
635	04	B.Tech ECE	17CA04303	Probability Theory & Stochastic Processes	2019-2020
636	04	B.Tech ECE	17CA04304	Signals and Systems	2019-2020
637	04	B.Tech ECE	17CA02306	Basic Electrical Technology	2019-2020
638	04	B.Tech ECE	17CA02307	Electrical Technology and Simulation Laboratory	2019-2020
639	04	B.Tech ECE	17CA04401	Electronic Circuit Analysis	2019-2020
640	04	B.Tech ECE	17CA04402	Analog Communications	2019-2020
641	04	B.Tech ECE	17CA04403	Linear IC Application	2019-2020
642	04	B.Tech ECE	17CA04404	Electromagnetic Theory & Transmission Lines	2019-2020
643	04	B.Tech ECE	17CA04405	Electronic Circuit Analysis Lab	2019-2020
644	04	B.Tech ECE	17CA04406	Analog Communications Lab	2019-2020
645	04	B.Tech ECE	17CA57406	Value Added Course(Microsoft Certified Engineer)	2019-2020
646	05	B.Tech CSE	17CA04306	Digital Logic Design	2019-2020
647	05	B.Tech CSE	17CA05301	Discrete Mathematical Structures	2019-2020
648	05	B.Tech CSE	17CA05302	Database Management Systems	2019-2020
649	05	B.Tech CSE	17CA02308	Basic Electrical and Electronics Engineering	2019-2020
650	05	B.Tech CSE	17CA05303	Database Management Systems Laboratory	2019-2020
651	05	B.Tech CSE	17CA02309	Basic Electrical and Electronics Laboratory	2019-2020
652	05	B.Tech CSE	17CA05401	Theory of Computation	2019-2020
653	05	B.Tech CSE	17CA05402	Software Engineering	2019-2020
654	05	B.Tech CSE	17CA05404	Statistics & R	2019-2020
655	05	B.Tech CSE	17CA05405	Java Programming	2019-2020
656	05	B.Tech CSE	17CA05406	Design and Analysis of Algorithms	2019-2020
657	05	B.Tech CSE	17CA05407	Statistics & R Laboratory	2019-2020
658	05	B.Tech CSE	17CA05408	Java Programming Laboratory	2019-2020
659	05	B.Tech CSE	17CA04512	Microprocessors and Interfacing Laboratory	2019-2020
660	05	B.Tech CSE	17CA05609	Software Testing Methodologies Laboratory	2019-2020
661	05	B.Tech CSE	17CA05610	Digital Signal Processing lab	2019-2020
662	02	B.Tech EEE	15A02701	Electrical Distribution Systems	2019-2020
663	02	B.Tech EEE	15A04603	Digital Signal Processing	2019-2020
664	02	B.Tech EEE	15A02702	Power System Operation and Control	2019-2020
665	02	B.Tech EEE	15A02703	Utilization of Electrical Energy	2019-2020
666	02	B.Tech EEE	15A02705	CBCC-II(Switched Mode Power Converters)	2019-2020
667	02	B.Tech EEE	15A02707	CBCC-III(Smart Grid)	2019-2020
668	02	B.Tech EEE	15A04608	Digital Signal Processing Laboratory	2019-2020
669	02	B.Tech EEE	15A02710	Power Systems & Simulation Laboratory	2019-2020
670	02	B.Tech EEE	15A02802	MOOCS – II(Power System Dynamics and Control)	2019-2020
671	02	B.Tech EEE	15A02804	MOOCS – III(HVDC Transmission)	2019-2020
672	02	B.Tech EEE	15A02806	Comprehensive Viva Voce	2019-2020
673	02	B.Tech EEE	15A02807	Technical Seminar	2019-2020
674	02	B.Tech EEE	15A02808	Project Work	2019-2020
675	03	B.Tech MECH	15A52601	Management Science	2019-2020
676	03	B.Tech MECH	15A03701	Automobile Engineering	2019-2020
677	03	B.Tech MECH	15A03702	CAD/CAM	2019-2020
678	03	B.Tech MECH	15A03703	Metrology and Measurements	2019-2020
679	03	B.Tech MECH	15A03704	CBCC-II(Refrigeration and Air Conditioning)	2019-2020
680	03	B.Tech MECH	15A03707	CBCC-III(Computational Fluid Dynamics)	2019-2020
681	03	B.Tech MECH	15A03710	CAD/ CAM Laboratory	2019-2020
682	03	B.Tech MECH	15A03711	Metrology and Measurements Laboratory	2019-2020
683	03	B.Tech MECH	15A03708	MOOCS-II(Computaional Fluid Dynamics)	2019-2020
684	03	B.Tech MECH	15A03804	MOOCS-III(Power Plant Engineering)	2019-2020
685	03	B.Tech MECH	15A03807	Comprehensive Viva Voce	2019-2020
686	03	B.Tech MECH	15A03808	Technical Seminar	2019-2020

					2019-2020
687	03	B.Tech MECH	15A03809	Project work	2019-2020
688	04	B.Tech ECE	15A04701	Optical Fiber Communication	2019-2020
689	04	B.Tech ECE	15A04702	Embedded Systems	2019-2020
690	04	B.Tech ECE	15A04703	Microwave Engineering	2019-2020
691	04	B.Tech ECE	15A04704	Data Communications and Networking	2019-2020
692	04	B.Tech ECE	15A04705	CBCC-II(Radar Systems)	2019-2020
693	04	B.Tech ECE	15A04708	CBCC-III(Digital Image Processing)	2019-2020
694	04	B.Tech ECE	15A04711	Microwave and Optical Communication Laboratory	2019-2020
695	04	B.Tech ECE	15A04712	VLSI & Embedded Systems Laboratory	2019-2020
696	04	B.Tech ECE	15A04802	MOOCS-II*(Low Power VLSI Circuits & Systems)	2019-2020
697	04	B.Tech ECE	15A04804	MOOCS-III *(RF Integrated Circuits)	2019-2020
698	04	B.Tech ECE	15A04805	Comprehensive Viva Voce	2019-2020
699	04	B.Tech ECE	15A04806	Technical Seminar	2019-2020
700	04	B.Tech ECE	15A04807	Project Work	2019-2020
701	05	B.Tech CSE	15A05701	Grid & Cloud Computing	2019-2020
702	05	B.Tech CSE	15A05702	Information Security	2019-2020
703	05	B.Tech CSE	15A05703	Mobile Application Development	2019-2020
704	05	B.Tech CSE	15A05704	CBCC-II(Software Architecture)	2019-2020
705	05	B.Tech CSE	15A05707	CBCC-III(Software Project Management)	2019-2020
706	05	B.Tech CSE	15A05710	Grid & Cloud Computing Laboratory	2019-2020
707	05	B.Tech CSE	15A05711	Mobile Application Development Laboratory	2019-2020
708	05	B.Tech CSE	15A05802	MOOCS-II(Mobile Computing)	2019-2020
709	05	B.Tech CSE	15A05804	MOOCS-III(Building Large Scale Software Systems)	2019-2020
710	05	B.Tech CSE	15A05807	Comprehensive Viva-Voce	2019-2020
711	05	B.Tech CSE	15A05808	Technical Seminar	2019-2020
712	05	B.Tech CSE	15A05809	Project Work	2019-2020
713	E0	MBA	17CE00311	Services Marketing	2019-2020
714	E0	MBA	17CE00331	Performance Management	2019-2020
715	E0	MBA	17CE00322	Financial Institutions, Markets and Services	2019-2020
716	E0	MBA	17CE00332	Human Resource Development	2019-2020
717	E0	MBA	17CE00321	Security Analysis & Portfolio Management	2019-2020
718	E0	MBA	17CE00333	Organisational Development	2019-2020
719	E0	MBA	17CE00314	Retail Management	2019-2020
720	E0	MBA	17CE00334	Employee Engagement and Empowerment	2019-2020
721	E0	MBA	17CE00312	Internet Marketing	2019-2020
722	E0	MBA	17CE00411	International Marketing	2019-2020
723	E0	MBA	17CE00431	Knowledge Management	2019-2020
724	E0	MBA	17CE00424	Financial Derivatives	2019-2020
725	E0	MBA	17CE00432	International Human Resource Management	2019-2020
726	E0	MBA	17CE00414	Advertisement and Sales Promotion Management	2019-2020
727	F0	MCA	17CF00301	Database Management Systems	2019-2020
728	F0	MCA	17CF00302	Computer Networks	2019-2020
729	F0	MCA	17CF00303	Linux Programming	2019-2020
730	F0	MCA	17CF00304	Software Engineering	2019-2020
731	F0	MCA	17CF00305	Java Programming	2019-2020
732	F0	MCA	17CF00306	Database Management Systems Lab	2019-2020
733	F0	MCA	17CF00307	Linux Programming Lab	2019-2020
734	F0	MCA	17CF00308	Java Programming Lab	2019-2020
735	F0	MCA	17CF00401	Object Oriented Analysis and Design	2019-2020
736	F0	MCA	17CF00402	Web Technologies	2019-2020
737	F0	MCA	17CF00403	Data Warehousing and Mining	2019-2020
738	F0	MCA	17CF00405	Information Security (Elective – I)	2019-2020
739	F0	MCA	17CF00408	Distributed Systems (Elective – II)	2019-2020
740	F0	MCA	17CF00410	Object Oriented Analysis and Design Lab	2019-2020
741	F0	MCA	17CF00411	Web Technologies Lab	2019-2020
742	F0	MCA	17CF00412	Data Warehousing and Mining Lab	2019-2020
743	D04	M.Tech (CAD/CAM)	17 05	PE-I(Computer Aided Process Planning)	2019-2020
744	D04	M.Tech (CAD/CAM)	9108	PE-II(Rapid Prototyping)	2019-2020

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745	D04	M.Tech (CAD/CAM)	17CD03206	PE-III(Special Manufacuirng Process)	2019-2020
746	D04	M.Tech (CAD/CAM)	17CD03209	PE-IV(Global integrated Manufacturing)	2019-2020
747	2	B.Tech EEE	17CA52101	Functional English	2018-2019
748	2	B.Tech EEE	17CA54101	Mathematics-I	2018-2019
749	2	B.Tech EEE	17CA05101	Computer Programming	2018-2019
750	2	B.Tech EEE	17CA55101	Engineering Physics	2018-2019
751	2	B.Tech EEE	17CA03101	Engineering Drawing	2018-2019
752	2	B.Tech EEE	17CA52102	English Language and Communication Skills Lab	2018-2019
753	2	B.Tech EEE	17CA55102	Engineering Physics Lab	2018-2019
754	2	B.Tech EEE	17CA05102	Computer Programming Lab	2018-2019
755	2	B.Tech EEE	17CA50101	Foundation of Yoga (Audit Course)	2018-2019
756	2	B.Tech EEE	17CA52201	English for Professional Communication	2018-2019
757	2	B.Tech EEE	17CA54201	Mathematics -II	2018-2019
758	2	B.Tech EEE	17CA51101	Engineering Chemistry	2018-2019
759	2	B.Tech EEE	17CA51102	Environmental Studies	2018-2019
760	2	B.Tech EEE	17CA02201	Electrical Circuits-I	2018-2019
761	2	B.Tech EEE	17CA03203	Engineering & I.T.Workshop	2018-2019
762	2	B.Tech EEE	17CA51103	Engineering Chemistry Laboratory	2018-2019
763	2	B.Tech EEE	17CA02202	Electrical Circuits Laboratory	2018-2019
764	2	B.Tech EEE	17CA50201	Clinical Psychology(Audit Course)	2018-2019
765	3	B.Tech MECH	17CA03202	Material Science and Engineering	2018-2019
766	3	B.Tech MECH	17CA03204	Material Science and Engineering Laboratory	2018-2019
767	4	B.Tech ECE	17CA02203	Network Analysis	2018-2019
768	4	B.Tech ECE	17CA02204	Network Analysis Laboratory	2018-2019
769	5	B.Tech CSE	17CA05201	Data Structures	2018-2019
770	5	B.Tech CSE	17CA03201	Engineering & I.T.Workshop	2018-2019
771	5	B.Tech CSE	17CA05202	Python Programming & Engineering Chemistry Laboratory	2018-2019
772	5	B.Tech CSE	17CA05203	Data Structures Laboratory	2018-2019
773	FO	MCA	17CF54101	Probability and Statistics	2018-2019
774	FO	MCA	17CF52101	Technical Communication Skills	2018-2019
775	FO	MCA	17CF53101	Accounting and Financial Management	2018-2019
776	FO	MCA	17CF00101	Mathematical Foundations of Computer Science	2018-2019
777	FO	MCA	17CF00102	Introduction to Problem Solving and Programming	2018-2019
778	FO	MCA	17CF52102	English Language Communication Skills Lab	2018-2019
779	FO	MCA	17CF00103	Computer Programming Lab	2018-2019
780	FO	MCA	17CF00104	IT Workshop	2018-2019
781	FO	MCA	17CF53201	Organization Structure and Human Resource Management	2018-2019
782	FO	MCA	17CF00201	Data Structures	2018-2019
783	FO	MCA	17CF00202	Computer Organization	2018-2019
784	FO	MCA	17CF00203	Operating Systems	2018-2019
785	FO	MCA	17CF00204	Object Oriented Programming Through C++	2018-2019
786	FO	MCA	17CF52201	Advanced Communication Skills Lab	2018-2019
787	FO	MCA	17CF00205	Data Structures through C++ Lab	2018-2019
788	FO	MCA	17CF00206	Python Programming Lab	2018-2019
789	02	B.Tech EEE	17CA04408	Analog Electronic Circuits	2018-2019
790	02	B.Tech EEE	15A02501	Electrical Measurements	2018-2019
791	02	B.Tech EEE	15A04509	Linear & Digital IC Applications	2018-2019
792	02	B.Tech EEE	15A02502	Electrical Power Transmission Systems	2018-2019
793	02	B.Tech EEE	15A02503	Power Electronics	2018-2019
794	02	B.Tech EEE	15A02504	Electrical Machines – III	2018-2019
795	02	B.Tech EEE	15A04510	MOOCS -I Digital Circuits and Systems	2018-2019
796	D2	B.Tech EEE	15A02505	MOOCS -I Networks Signals and Systems	2018-2019
797	02	B.Tech EEE	15A02506	Electrical Machines Laboratory – II	2018-2019
798	02	B.Tech EEE	15A02507	Electrical Measurements Laboratory	2018-2019
799	02	B.Tech EEE	15A99501	Audit course – Social Values & Ethics	2018-2019
800	02	B.Tech EEE	15A02601	Power Semiconductor Drives	2018-2019
801	02	B.Tech EEE	15A0262	Power System Protection	2018-2019
802	02	B.Tech EEE	15A0	Microprocessors & Microcontrollers	2018-2019

803	02	B.Tech EEE	15A02603	Power System Analysis		2018-2019
804	02	B.Tech EEE	15A02604	CBCC-II(Neural Networks and Fuzzy Logic)		2018-2019
805	02	B.Tech EEE	15A04607	Microprocessors & Microcontrollers Laboratory		2018-2019
806	02	B.Tech EEE	15A02607	Power Electronics & Simulation Laboratory		2018-2019
807	02	B.Tech EEE	15A52602	Advanced English Language Communication Skills (AELCS) Laboratory	2018-2019
808	02	B.Tech EEE	15A02608	Comprehensive Online Examination - II		2018-2019
809	03	B.Tech MECH	15A01510	Fluid Mechanics and Hydraulic Machines		2018-2019
810	03	B.Tech MECH	15A03501	Thermal Engineering - II		2018-2019
811	03	B.Tech MECH	15A03502	Dynamics of Machinery		2018-2019
812	03	B.Tech MECH	15A03503	Machine Tools		2018-2019
813	03	B.Tech MECH	15A03504	Design of Machine Members - I		2018-2019
814	03	B.Tech MECH	15A03506	MOOCS -I(Nano Technology)		2018-2019
815	03	B.Tech MECH	15A01511	Fluid Mechanics and Hydraulic Machines Laboratory		2018-2019
816	03	B.Tech MECH	15A03508	Machine Tools Laboratory		2018-2019
817	03	B.Tech MECH	15A03601	Operations Research		2018-2019
818	03	B.Tech MECH	15A03602	Design of Machine Members – II		2018-2019
819	03	B.Tech MECH	15A03603	Heat Transfer		2018-2019
820	03	B.Tech MECH	15A03604	Finite Element Method		2018-2019
821	03	B.Tech MECH	15A03605	Metal forming Process		2018-2019
822	03	B.Tech MECH	15A03606	CBCC-I(Non Conventional Source of Energy)		2018-2019
823	03	B.Tech MECH	15A03609	Heat Transfer Laboratory		2018-2019
824	03	B.Tech MECH	15A03610	Computer Aided Engineering Laboratory		2018-2019
825	03	B.Tech MECH	15A03611	Comprehensive Online Examination - II		2018-2019
826	04	B.Tech ECE	15A04511	Computer Organization		2018-2019
827	04	B.Tech ECE	15A04501	Antennas and Wave Propagation		2018-2019
828	04	B.Tech ECE	15A04502	Digital Communication Systems		2018-2019
829	04	B.Tech ECE	15A04503	Linear Integrated Circuits and Applications		2018-2019
830	04	B.Tech ECE	15A04504	Digital System Design		2018-2019
831	04	B.Tech ECE	15A04506	MOOCS-I(MEMS & MicroSystems)		2018-2019
832	04	B.Tech ECE	15A04507	IC Applications Laboratory		2018-2019
833	04	B.Tech ECE	15A04508	Digital Communication Systems Laboratory		2018-2019
834	04	B.Tech ECE	15A52301	Managerial Economics and Financial Analysis		2018-2019
835	04	B.Tech ECE	15A04602	Electronic Measurements and Instrumentation		2018-2019
836	04	B.Tech ECE	15A04604	VLSI Design		2018-2019
837	04	B.Tech ECE	15A04605	CBCC-I(Matlab Programming)		2018-2019
838	04	B.Tech ECE	15A04609	Comprehensive Online Examination-II		2018-2019
839	05	B.Tech CSE	15A05501	Operating Systems		2018-2019
840	05	B.Tech CSE	15A05502	Computer Networks		2018-2019
841	05	B.Tech CSE	15A05503	Object Oriented Analysis and Design		2018-2019
842	05	B.Tech CSE	15A05504	Principles of Programming Languages		2018-2019
843	05	B.Tech CSE	15A05505	Software Testing		2018-2019
844	05	B.Tech CSE	15A05507	MOOCS-I(R Programming)		2018-2019
845	05	B.Tech CSE	15A05509	Object Oriented Analysis and Design & Software Testing Laboratory	2018-2019
846	05	B.Tech CSE	15A05510	Operating Systems Laboratory		2018-2019
847	05	B.Tech CSE	15A05601	Compiler Design		2018-2019
848	05	B.Tech CSE	15A05602	Data Warehousing & Mining		2018-2019
849	05	B.Tech CSE	15A05603	Design Patterns		2018-2019
850	05	B.Tech CSE	15A05604	Design and Analysis of Algorithms		2018-2019
851	05	B.Tech CSE	15A05605	Web and Internet Technologies		2018-2019
852	05	B.Tech CSE	15A05606	CBCC-I(Optimization Techniques)		2018-2019
853	05	B.Tech CSE	15A05609	Web and Internet Technologies Laboratory		2018-2019
854	05	B.Tech CSE	15A05610	Data Warehousing & Mining Laboratory		2018-2019
855	05	B.Tech CSE	15A05611	Comprehensive Online Examination-II		2018-2019
856	02	B.Tech EEE	15A02706	CBCC-II(Energy Auditing and Demad Side Management)		2018-2019
857	03	B.Tech MECH	15A03803	MOOCS-II(Composite Materials)		2018-2019
858	02	B.Tech EEE	15A5430?	Mathematics –III		2017-2018
859	02	B.Tech EEE	15A0?	Electrical Circuits – II		2017-2018
860	02	B.Tech EEE	15A0?	Electrical Machines – I		2017-2018

861	02	B.Tech EEE	15A02303	Control Systems Engineering	2017-2018
862	02	B.Tech EEE	15A04301	Electronic Devices & Circuits	2017-2018
863	02	B.Tech EEE	15A05201	Data Structures	2017-2018
864	02	B.Tech EEE	15A02305	Electric Circuits Simulation Laboratory	2017-2018
865	02	B.Tech EEE	15A04305	Electronic Devices & Circuits Laboratory	2017-2018
866	02	B.Tech EEE	15A54402	Mathematics – IV	2017-2018
867	02	B.Tech EEE	15A02401	Electrical Machines – II	2017-2018
868	02	B.Tech EEE	15A02402	Electrical Power Generating Systems	2017-2018
869	02	B.Tech EEE	15A02403	Electromagnetic Fields	2017-2018
870	02	B.Tech EEE	15A04409	Analog Electronic Circuits	2017-2018
871	02	B.Tech EEE	15A02404	Electrical Machines Laboratory – I	2017-2018
872	02	B.Tech EEE	15A02405	Control Systems & Simulation Laboratory	2017-2018
873	02	B.Tech EEE	15A02406	Comprehensive Online Examination – I	2017-2018
874	03	B.Tech MECH	15A01308	Mechanics of Solids	2017-2018
875	03	B.Tech MECH	15A03301	Engineering Drawing for Mechanical Engineers	2017-2018
876	03	B.Tech MECH	15A03302	Engineering Mechanics	2017-2018
877	03	B.Tech MECH	15A03303	Thermodynamics	2017-2018
878	03	B.Tech MECH	15A01309	Mechanics of Solids Lab	2017-2018
879	03	B.Tech MECH	15A03304	Computer Aided Drafting Lab	2017-2018
880	03	B.Tech MECH	15A54401	Probability and Statistics	2017-2018
881	03	B.Tech MECH	15A99301	Basic Electrical and Electronics Engineering	2017-2018
882	03	B.Tech MECH	15A03401	Machine Drawing	2017-2018
883	03	B.Tech MECH	15A03402	Kinematics of Machines	2017-2018
884	03	B.Tech MECH	15A03403	Thermal Engineering - 1	2017-2018
885	03	B.Tech MECH	15A03404	Manufacturing Technology	2017-2018
886	03	B.Tech MECH	15A03405	Thermal Engineering Laboratory	2017-2018
887	03	B.Tech MECH	15A03406	Manufacturing Technology Laboratory	2017-2018
888	03	B.Tech MECH	15A03407	Comprehensive Online Examination-I	2017-2018
889	04	B.Tech ECE	15A04302	Switching Theory and Logic Design	2017-2018
890	04	B.Tech ECE	15A04303	Signals and Systems	2017-2018
891	04	B.Tech ECE	15A04304	Probability Theory and Stochastic Processes	2017-2018
892	04	B.Tech ECE	15A02306	Electrical Technology	2017-2018
893	04	B.Tech ECE	15A02307	Electrical Technology and Basic Simulation Laboratory	2017-2018
894	04	B.Tech ECE	15A04401	Electronic Circuit Analysis	2017-2018
895	04	B.Tech ECE	15A04402	Analog Communication Systems	2017-2018
896	04	B.Tech ECE	15A04403	Electromagnetic Theory and Transmission Lines	2017-2018
897	04	B.Tech ECE	15A04404	Electronic Circuit Analysis Laboratory	2017-2018
898	04	B.Tech ECE	15A04405	Analog Communication Systems Laboratory	2017-2018
899	04	B.Tech ECE	15A04406	Comprehensive Online Examination-I	2017-2018
900	05	B.Tech CSE	15A05301	Database Management Systems	2017-2018
901	05	B.Tech CSE	15A05302	Discrete Mathematics	2017-2018
902	05	B.Tech CSE	15A04306	Digital Logic Design	2017-2018
903	05	B.Tech CSE	15A05303	Database Management Systems Laboratory	2017-2018
904	05	B.Tech CSE	15A99302	Basic Electrical and Electronics Laboratory	2017-2018
905	05	B.Tech CSE	15A05401	Software Engineering	2017-2018
906	05	B.Tech CSE	15A05402	Computer Organization	2017-2018
907	05	B.Tech CSE	15A04407	Microprocessors & Interfacing	2017-2018
908	05	B.Tech CSE	15A05403	Object Oriented Programming using Java	2017-2018
909	05	B.Tech CSE	15A05404	Formal Languages and Automata Theory	2017-2018
910	05	B.Tech CSE	15A04408	Microprocessors & Interfacing Laboratory	2017-2018
911	05	B.Tech CSE	15A05405	Java Programming Laboratory	2017-2018
912	05	B.Tech CSE	15A05406	Comprehensive Online Examination-I	2017-2018
913	F0	MCA	15F05301	Java Programming	2017-2018
914	F0	MCA	15F05302	Computer Networks	2017-2018
915	F0	MCA	15F05303	Design and Analysis of Algorithms	2017-2018
916	F0	MCA	15F05304	Software Engineering	2017-2018
917	F0	MCA	15F05305	Operating Systems	2017-2018
918	F0	MCA	15F05306	Algorithm Analysis Lab	2017-2018

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919	F0	MCA	15F05307	Operating Systems Lab	2017-2018
920	F0	MCA	15F05308	Java Programming Lab.	2017-2018
921	F0	MCA	15F05401	Web Technologies and Scripting Languages	2017-2018
922	F0	MCA	15F05402	Linux Programming	2017-2018
923	F0	MCA	15F05403	Software Testing Methodologies	2017-2018
924	F0	MCA	15F05404	Elective – I / CBCS(Management Information System)	2017-2018
925	F0	MCA	15F05408	Elective – II(Operations Research)	2017-2018
926	F0	MCA	15F05412	Linux Programming Lab	2017-2018
927	F0	MCA	15F05413	Web Technologies Lab.	2017-2018
928	F0	MCA	15F05414	Software Testing Lab	2017-2018
929	F0	MCA	15F05501	Cloud Computing	2017-2018
930	F0	MCA	15F05502	Data Warehousing & Mining	2017-2018
931	F0	MCA	15F05503	Object Oriented Analysis and Design	2017-2018
932	F0	MCA	15F05504	Elective – III (MOOC)(Introduction to Big Data by Harvard Univesity)	2017-2018
933	F0	MCA	15F05505	Introduction to internet of things	2017-2018
934	F0	MCA	15F05506	Human Computer Interaction by California Univ via corsevera	2017-2018
935	F0	MCA	15F05507	Visual Design by Harward Univ via edx	2017-2018
936	F0	MCA	15F05508	Big Data Analytics by IIT Madras, Chennai	2017-2018
937	F0	MCA	15F05509	Computer Maintenances	2017-2018
938	F0	MCA	15F05510	Web Performance Optimization	2017-2018
939	F0	MCA	15F05511	Introduction to Hadoop and Mapreduce	2017-2018
940	F0	MCA	15F05512	Introduction to Reverse Engineering Software	2017-2018
941	F0	MCA	15F05513	Elective – IV(Web Services)	2017-2018
942	F0	MCA	15F05514	Distributed Databases	2017-2018
943	F0	MCA	15F05515	Distributed Computing	2017-2018
944	F0	MCA	15F05516	Mobile Application Development	2017-2018
945	F0	MCA	15F05517	Object Oriented Analysis and Design Lab	2017-2018
946	F0	MCA	15F05518	Cloud Computing Lab	2017-2018
947	F0	MCA	15F05519	Data Warehousing & Mining Lab	2017-2018
948	F0	MCA	15F05601	Project Seminar	2017-2018
949	F0	MCA	15F05602	Dissertation / Project Work	2017-2018

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ENGINEERING GRAPHICS

I B. Tech – I/II Semester: ECE, EEE & CSE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Tot al
20CA03101	Core	1	-	4	3	30	70	100

Contact Classes:17	Tutorial Classes: Nil	Practical Classes: 51	Total Classes: 68

OBJECTIVES:

1. To know the basics of Engineering Drawing and its applications
2. To understand the projection of solids
3. To understand the Isometric Projections of Regular Solids
4. To analyze the orthographic projections

UNIT – I	INTRODUCTION ENGINEERING GRAPHICS	Classes: 12

Introduction to drawing instruments & principles of Engineering Drawing - Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Parabola, Ellipse, Hyperbola and Rectangular Hyperbola (General method only) b) Cycloid, Epicycloid and Hypocycloid.

UNIT – II	PROJECTION OF POINTS & LINES	Classes: 12

Projection of points: Positions, notation system and projections in any quadrant.
Projection of Lines: Projection of lines parallel to one plane and perpendicular to the other, parallel to both planes, inclined to one plane or both planes.

UNIT – III	PROJECTIONS OF PLANES	Classes: 14

Projection of planes: Parallel to on plane and perpendicular to the other, perpendicular to both planes, inclined to one or both planes.

UNIT – IV	PROJECTIONS OF SOLIDS	Classes: 15

Projection of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

UNIT – V	ISOMETRIC PROJECTIONS	Classes: 15

Principles of isometric projection- Isometric scale; Isometric views: planes, simple solids. Conversion of orthographic to isometric view Vice Versa.

Text Books:

1. D.M Kulkarni, A.P. Rastogi and A.M. Sarkar, Engineering Graphics with Auto CAD, PHI learning Private Limited, New Delhi 2009.
2. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
3. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

References

1. Dhanajay A Jolhe, Engineering Drawing: with an introduction to Auto CAD, Tata McGraw-Hill, 2008
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Web References:

1. Youtube: http-sewor,Carleton.cag.kardos/88403/drawings.html conic sections-online, red yoods.edu

Note: Evaluation is to be done based on performance in Practice classes, Mid and End Examination.

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COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI (R20)
(w.e.f Academic Year 2020-21)

BASIC CIVIL AND MECHANICAL ENGINEERING

I B. Tech – I Semester: ECE, EEE & CSE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CA03102	Foundation	3	-	-	3	30	70	100

Contact Classes:51	Tutorial Classes:-	Practical Classes: Nil	Total Classes:51

Objectives:
- Impart basic principles of stress, strain, shear force, bending moment and torsion.
- To teach principles of strain measurement using electrical strain gauges
- Describe technical details of power plants, gas turbines, hydro power plants and nonconventional energy sources.
- Teach different types of drives for power transmission
- Impart concepts of CAD, CAM & CIM

UNIT – I:	Beams	Classes:11

Basic Definitions of Force – Stress – Strain – Elasticity. Shear force – Bending Moment – Torsion. Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.

UNIT – II:	Internal Combustion Engines	Classes:10

Classification – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.

UNIT – III:	Power Plant Engineering	Classes:10

Classification of Power plants – Steam Power Plants – Nuclear Power Plants – Gas turbines – Hydro Power Plants – Solar energy – wind energy.

UNIT - IV	Belt Drives	Classes:10

Transmission of Power – Belt and Rope Drives – Types of Belts – Materials – Velocity ratio – Speed Ratio – V-Belt – Flat Belt.

UNIT –V	Manufacturing Processes	Classes:10

Foundry - green sand mould casting. Metal forming - forging, rolling, extrusion, drawing. Metal joining – Metal Arc welding(MIG&TIG) and Gas welding(Oxy-acetylene). Basic Metal machining- Turning, Facing, Knurling & Thread cutting (operation only).

Text Books:
1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd.

References:
1. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies.
2. Venugopal K. and Prabu Raja V., "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam.

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ELECTRICAL ELECTRONICS ENGINEERING WORKSHOP

II Semester EEE

Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
20CA02202	Engineering Science	0	0	3	1.5	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 51	Total Classes:51

Course Objectives:
- To demonstrate the usage of measuring equipment
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring

COURSE OUTCOMES
After completing this lab the student will be able to
- Explain the limitations, tolerances, Safety aspects of electrical systems and wiring. (L2)
- Select wires/cables and other accessories used in different types of wiring. (L3)
- Make simple lighting and power circuits. (L3)
- Measure current, voltage and power in a circuit. (L3)

EXP.1	Study of various electrical tools and symbols.
EXP.2	Study of types of sizes of wires and making "T" joint and straight joint for wires.
EXP.3	Measurement of Electrical quantities (like current, voltage ,power, power factor in RLC circuits)
EXP.4	Study of measurement of Energy (using single phase and three phase energy meter)by connecting different loads
EXP.5	Study and performance of residential wiring (using Energy meter, Fuses, Switches, Indicator, lamps, etc.)
EXP.6	Study of Fluorescent lamp wiring
EXP.7	Study of PV Cell.
EXP.8	Study of Induction Motor and transformer
EXP.9	Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc.)
EXP.10	Identification of color code, resistors, ICs, Transistors, capacitors, diodes, SCRs, IGBTs etc.
EXP.11	Introduction to basics of Electronic components: Solder practice, Multi meter, PowerSupply
EXP.12	Study of earthing and measurement of earth resistance.

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DIGITAL LOGIC DESIGN

III Semester EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
20CA04208	Professional Core	L	T	P	C	CIA	SEE	Total
		3	0	-	3	30	70	100
Contact Classes: 54	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 54			

OBJECTIVES:

- Understanding basic number systems, codes and logical gates.
- Acquiring the skills to manipulate on different simplification methods for minimizing Booleanfunctions.
- To outline procedures for the analysis and design of combinational and sequential logiccircuits.
- Obtaining the knowledge about various types of memories.

UNIT-I	FUNDAMENTALS OF DIGITAL SYSTEMS	Classes: 11

Review of Number systems: Binary, Octal, Decimal, and Hexa decimal, Number Base Conversions methods, Complements of Numbers, Signed Binary Numbers binary codes: Binary coded decimal, excess-3, gray codes, error detecting and error correcting codes.

UNIT-II	BOOLEAN ALGEBRA AND MINIMIZATION	Classes: 10

Boolean algebra: Postulates and theorems, Logic gates and truth tables. Representation of switching functions, sum of products and product of sums forms, NAND& NOR Implementation, karnaugh map representation, simplification of logic functions using Karnaugh maps, Don't Care Conditions, Quine - McClusky method.

UNIT-III	COMBINATIONAL CIRCUITS	Classes: 11

Introduction and Design of Combinational Circuits using conventional logic gates, Half adder, fulladder, Subtractor, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers and DeMultiplexers.

UNIT-IV	SEQUENTIAL CIRCUITS	Classes: 11

Synchronous Sequential Circuits: Latches, Flip-flops, analysis of clocked sequential circuits, Register and Counters: Registers, Shift registers, Ripple counters, Synchronous counters and other counters.

UNIT-V	PROGRAMMABLE LOGIC DEVICES	Classes: 11

Memory and Programmable Logic: Introduction to Random Access Memory, Memory Decoding,Read Only Memory, Programmable Logic Array, Programmable Array Logic and Sequential Programmable Devices.

Text Books:

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Edition, PearsonEducation, 2013.
2. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory", 3rd Edition, Tata McGraw Hill,2010.
3. A. Anand Kumar, "Switching Theory and Logis Design", Prentice Hall of India, 1st Edition.

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ANALOG AND DIGITAL IC APPLICATIONS

II Semester ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CA04406	Engineering Science	3	0	-	3	30	70	100
Contact Classes: 54	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 54		

OBJECTIVES:
The aim of this course is

- To familiarize the student with the design of differential and operational amplifier circuits.
- To understand the basic concepts in the design of linear integrated circuits and their applications.
- To be able to use computer-aided design tools for development of complex digital logic circuits.
- To be able to design tests for digital logic circuits, and design for testability.

UNIT-I	DIFFERENTIAL AND OPERATIONAL AMPLIFIERS	Classes: 11

Differential Amplifier: DC and AC analysis of Dual input Balanced output Configuration; Properties of differential amplifier configuration: Dual Input Unbalanced Output, Single Ended Input, Balanced/ Unbalanced Output; DC Coupling and Cascade Differential Amplifier Stages, Level translator.

OP-Amps: Op-amp Block Diagram, ideal and practical Op-amp specifications, Op-Amp parameters & Measurement: Input & Out put Off set voltages & currents, Slew rate, CMRR, PSRR, drift. Introduction to dual op-amp TL082 as a general purpose JFET input operational amplifier.

UNIT-II	TIMERS, PHASE LOCKED LOOPS & D-A AND A-D CONVERTERS	Classes: 11

Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, PLL – Introduction, block schematic, principles and description of individual blocks of 565.

Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC specifications.

UNIT-III	ACTIVE FILTERS & OSCILLATORS	Classes: 11

Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation- RC, Wien, and Quadrature type, Waveform generators- Triangular, Sawtooth, Square wave and VCO.

UNIT-IV	CMOS LOGIC	Classes: 10

Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families.
Bipolar Logic and Interfacing; Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, emitter coupled logic, comparison of logic families. Familiarity with standard 74-series and CMOS 40- series-ICs - specifications.

UNIT-V	HARDWARE DESCRIPTION LANGUAGE	Classes: 11

Hardware Description Language: Design flow, Program Structure, Types and constants, functions and

Procedures, Libraries and Packages.

The VHDL design elements: Structural design elements, data flow design elements, behavioral designelements, Time dimension and simulation synthesis.

Text Books:

1. Linear Integrated Circuits – D.RoyChowdhury, New Age International (p) Ltd, 2nd Edition., 2003.
2. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.

Reference Books:

1. Operational Amplifiers & Linear Integrated Circuits – R.F.Coughlin& Fredric F.Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications – Denton J.Daibey, TMH.
3. Design with Operational amplifiers & Analog Integrated circuits-Sergio Franco, Mc Graw Hill, 3rd Edition , 2002.
4. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition 2005.

Course Outcomes: Up on successful completion of this course, the Student will able to
- Analyze the linear, non-linear and specialized applications of operational amplifiers.
- Understand the theory of ADC and DAC.
- Able to model, simulate, verify, analyze, and synthesize with hardware description languages.
- Able to design tests for digital logic circuits, and design for testability.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2							1	1	2		
CO2	3	3	2	1							1	1	3		
CO3	2	1	2	1							1	1	3		
CO4	2	1	2	1							1	1	2		

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MODERN CONTROL THEORY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA02505	Professional Elective	3	-	-	3	30	70	100
Contact Classes: 54	Tutorial Classes: -		Practical Classes: Nil			Total Classes: 54		

OBJECTIVES:

The course should enable the students to:

I. Concept of State Variable analysis and design
II. Analyze Solution of State equations
III. Tests for controllability and observability.
IV. Analyze stability in the sense of Lyapunov
V. Design of Phase plane analysis.

UNIT-I	STATE VARIABLE ANALYSIS AND DESIGN	Classes:10

Introduction, definitions, State space formulation, State model, Derivation of transfer function from a state model, Derivation of state model from transfer function, State diagram representation, state diagram of standard state model, State model of electrical systems.

UNIT - II	SOLUTION OF STATE EQUATIONS	Classes:11

Introduction, Solution of non-homogeneous state equation, State transition matrix and its properties, Evaluation of state transition matrix by -Power series method, Inverse Laplace transforms method, Cayley Hamilton theorem.

UNIT - III	CONTROLABILITY AND OBSERVABILITY	Classes:11

Concept of controllability and observability, Methods of testing the state equations, Principle of Duality, Problems.

UNIT - IV	LYAPOUNOV'S STABILITY ANALYSIS	Classes:11

Stability in the sense of Lyapunov's. Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov's for the linear and Nonlinear continuous time autonomous system.

UNIT - V	PHASE PLANE ANALYSIS	Classes:11

Introduction, methods of analysis-phase plane analysis, Singular points, Construction of phase trajectories, Numerical problems

Text Books:

1. M Gopal, "Modern Control System Theory", New Age International Publishers, Revised 2nd Edition, 2005.
2. K Ogata, "Modern Control Engineering", Prentice Hall, 5th Edition, 2010.
3. N C Jagan, "Control Systems", BS Publications, 1st Edition, 2007.

Reference Books:

1. J Nagrath, M Gopal, "Control Systems Engineering", New Age International Publications, 4th Edition.
2. DRoy Choudhury, "Modern Control Engineering", PHI Learning private Limited, 2015
3. Anand Kumar, "Control Systems", PHI Learning, 1st Edition, 2007.
4. S Palani, "Control Systems Engineering", Tata McGraw Hill Publications, 1st Edition, 2001.
5. N K Sinha, "Control Systems", New Age International Publishers, 1st Edition, 2002.

Web References:

1. https://www.researchgate.net

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2. https://www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. https://www.electrical4u.com
5. https://www.erectirupati.com

E-Text Books:

1. https://www.jntubook.com/
2. https://www.freeengineeringbooks.com

Course Outcomes:

At the end of course, the student will be able to

- Able to design a state diagram of a state model
- Able to find the solutions of a state equation
- Able to test whether a given system is controllable and/or observable
- Understand the Lyapunov criterion and determine stability of a given system
- Understand the Phase plane analysis

Course Outcomes (COs)	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03	PS04
CO 1	3	1	2											2		1
CO 2	1	1	2											1		
CO 3	1	1	2											1		2
CO 4	1	1	2											1		
CO 5	1	1	2													

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PYTHON PROGRAMMING

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05201	Foundation	3	-	-	3	30	70	100

Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 45

Objectives:

The course should enable the students to:

- To educate problem solving through python programming language.
- To train in development of solutions using modular concepts.
- To teach practical Pythonic solution patterns.
- To introduce function-oriented programming paradigm through python.

UNIT-I	INTRODUCTION TO PYTHON	Classes: 10

Introduction to Python: Python- Numbers, Strings, Variables, operators, expressions, statements, String Operations, Math function calls, Input/Output statements.

UNIT-II	CONTROL STATEMENTS	Classes: 09

Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions.

UNIT-III	DATA STRUCTURES AND IDIOMATIC PROGRAMMING IN PYTHON	Classes: 08

Lists, Tuples, Dictionaries, Strings, Files and their libraries, Beautiful Idiomatic approach to solve programming problems

UNIT-IV	PYTHON OBJECT ORIENTED PROGRAMMING	Classes: 08

Introduction to oops: Concept of class, object and instances, Method, Inheritance, Polymorphism, Data Abstraction, Encapsulation.

Oops through Python: Data hiding, Polymorphism, Inheritance, Class and static variables, Class methods and Static methods, Constructors and Destructors.

UNIT-V	EVENT DRIVEN PROGRAMMING	Classes: 10

Turtle bar Chart, Event Driven programming, Key press events, Mouse events, timer events.

Text Book:

1. http://www.ict.ru.ac.za/Reso_____spw_thinkcspy3/thinkcspy3.pdf
2. https://zhanxw.com/blog/w__content/uploads/2013/03/BeautifulCode_2.pdf
3. Allen B. Downey," Think____ho____like a computer scientist ", 2nd edition, GreenTea Press
4. Mark Lutz, "Programming____on," O'Reilly Publications, Fourth Edition, 2011

Reference Books:

- Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd, —Exploring Pythonl, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
- Kenneth A. Lambert, —Fundamentals of Python: First Programsl, CENGAGE Learning, 2012
- Kenneth Lambert and B.L. Juneja, Fundamentals of Python, Cengage Learning, Third Edition, 2012
- John V Guttag, —Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013

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OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

II B.Tech(CSE), II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05404	Core	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 42				Total Classes: 42		

Course Objectives:

The course will enable the students to:

- Learn to use object orientation to solve problems and use java language to implement them
- To experiment with the syntax and semantics of java language and gain experience with java programming

Week-1	Installation and Practice

1.Preparing and practice – Installation of Java software, study of any Integrated development environment, sample programs on Java. Learn to compile, debug and execute Java programs.

Week-2	Basic Programs

1. Write a Java program to solve Quadratic equation.
2. Write a Java program to generate Fibonacci series
    a. Using Iterative procedure
    b. Using Recursive procedure

Week-3	Matrices, Overloading

1. Write a Java program to multiply two Matrices.
2. Write a Java program on Method overloading

Week-4	Method Overriding. Constructor overloading

1.Write a Java program on Method overriding.
2.Write a Java program on Constructor overloading

Week-5	Number and String Palindrome, abstract class

1. Write a Java program that checks whether given number is Palindrome or not.
2. Write a Java program that checks whether given string is Palindrome or not.
3. Write a Java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area() so that it returns the area of a rectangle and triangle respectively.

Week-6	Sorting Names, Dynamic method dispatch

1.Write a Java program to sort a list of names in ascending order.
2. Write a Java program that performs Dynamic method dispatch.

Week-7	Inheritance, Interface

1.Write Java program(s) on use of inheritance, preventing inheritance using final
2.Write Java program(s) on ways of implementing interface

Week-8	Exception Handling

1.Write Java Program(s) which uses the exception handling features of the language. creates exceptions and handles them properly.
    a). Uses the predefined exceptions.
    b). Create own exceptions.

Week-9	Creating threads, Command line Arguments

1.Write a Java Program on creating multiple threads.
    a). Using extending thread class.
    b). Using implementing runnable interface

	2.Write a Java Program that demonstrate Command Line Arguments

Week-10	Applets

1. Write a Java Program to develop an Applet that demonstrate a simple message.
2. Write a Java Program to pass parameters to an Applet

Week-11	Multithreading

1.Develop an applet for waving a Flag using Applets and Threads.
2.Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

Week-12	Files, Keyboard Events

1. Write a Java program to find and replace pattern in a given file.
2.Write a Java program to handle keyboard events.

Week-13	AWT Controls, Layout Managers

1.Write a Java Program to create the following
    a). AWT Button
    b). AWT checkbox
    c). Scrollbar
2. Write Java Programs to demonstrate Layout Managers

Week-14	Caluculator

Design a simple calculator which performs all arithmetic operations. The interface should look like the calculator application of the operating system. Handle the exceptions if any

Reference Books:

1P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.
2.P. Radha Krishna, "Object Oriented Programming through Java"Universities Press, 2nd Edition,2007
3 Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.
4 Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5th Edition.

Web References:

1.www.niecdelhi.ac.in
2.https://www.linkedin.com/in/achin-jain-85061412
3.www.rank1infotech.com

Course Outcomes :

- Ability to use an IDE to develop, run and test Java Programs
- Ability to solve the problems using object oriented approach and develop solutions which are robust
- Ability to develop portable programs which work in all environments

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ADVANCED IN UHV TRANSMISSION AND DISTRIBUTION

VII Semester – EEE

Course Code	Category	Hours/ Week			Credits	Maximum		
		L	T	P	C	CIA	SEE	Total
17CA02710	Professional Elective	2	0	0	2	30	70	100
ContactClasses: 67	TutorialClasses: Nil	PracticalClasses:Nil				TotalClasses:67		

COURSE OBJECTIVES:

The course should enable the students to:

1. Identify the necessity of HV transmission system.
2. Analyze various tests for identifying the performance of equipment in HV transmission system.
3. Distinguish various clearances in HV towers.
4. Assess various parameters during UHV substation design.
5. Appraise insulation coordination in UHV systems.

UNIT-I	RECENT ADVANCES IN UHV POWER TRANSMISSION SYSTEMS	Classes: 12

Necessity of high voltage transmission, Important components of a transmission system, Insulation coordination, Over voltages in power systems, Design/selection of insulators, Importance of grading/ce rings, Performance of non ceramic insulators.

UNIT-II	EQUIPMENT PROTECTION	Classes: 11

Importance of reliability, Pollution flashover phenomena, Different tests on HV equipment, High voltage testing techniques.Conductors used for EHV/UHV transmission, Corona and interference on transmission lines, Use of HTLS conductors.Mechanical considerations of HV conductors.

UNIT-III	TOWERS FOR UHV TRANSMISSION	Classes: 10

Introduction to towers, Selection of clearances for HV towers,Right of way, Design optimization for UHV towers, Electrical line parameters, Bundle alternatives, Tower loading, Loading due to conductor and earth wire.

UNIT-IV	DESIGN CONSIDERATION OF UHV SUBSTATIONS	Classes: 13

System model, Planning of substations, Power system studies, Short circuit studies, Stability studies, Transmission substation, Distribution substation, Collector substation, Basic concepts of GIS substation, Hybrid substation.

UNIT-V	INSULATION COORDINATION FOR UHV SYSTEMS	Classes: 21

Isolators, Circuit breakers, Insulation coordination, Voltage stress, Over voltages, Surge arrester, Preventive maintenance of substation, Earthing and grounding, Earthing for substations, Methods for reduction of earth resistance, Safety measures.

TextBooks:

1. C.L. Wadhwa, "High voltage engineering", New Age International (P) Limited Publishers, 2006.
2. M.S. Naidu, V. Kamaraju, "High voltage engineering", Tata McGraw-Hill Publishing Company Limited, 3rd Edition, 2007.

ReferenceBooks:

1. Sunil S. Rao, "Switchgear protection and power systems",Khanna Publishers, 1th Edition, 2005.
2. A.S. Pabla, "Electric power distribution", Tata McGraw-Hill Publishing Company Limited, 5th Edition, 2008.

WebReferences:

1. https://drive.google.com/file/d/1qxcMrT0_yN7qdvfSu5oKVt2wQxqE4aFi/view

COURSE OUTCOMES:
Upon the successful completion of the course, the student will be able to
1. Assess the importance of HV transmission system by analyzing recent advances and various components used in it.
2. Evaluate the performance of different equipment and identify suitable conductor.
3. Assess various clearances in HV towers by identifying various loadings on them.
4. Evaluate various parameters to choose reliable and economical UHV substation.
5. Discuss the significance of insulation coordination, earthing and safety measures in UHV system.

CourseOutcomesmappingwithProgrammeOutcomes

COs	CO/ PO Mapping											
	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1		1	1	1	1	1	1	1	2
CO2	3	2	1		2	1	2	1	1	1	1	2
CO3	3	2	1		2	1	2	1	1	1	1	2
CO4	3	2	1		2	1	2	1	1	1	1	2
CO5	3	2	2		2	1	2	1	1	1	1	2

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SMART GRID TECHNOLOGY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA02802	Elective	2	2	-	3	30	70	100
Contact Classes: 30	Tutorial Classes: 30	Practical Classes: Nil			Total Classes: 60			

OBJECTIVES:

The course should enable the students to:

- Discuss the concepts and design of Smart grid.
- Describe the communication and measurement technologies employed in smart grid.
- Demonstrate the tools for the performance analysis and stability analysis of smart grid.
- Discuss the renewable energy resources and storages integrated with smart grid.

UNIT-I	SMART GRID ARCHITECTURAL DESIGNS	Classes: 12

Introduction comparison of power grid with smart grid power system enhancement, communication and standards, general view of the smart grid market drivers, stakeholder roles and function, measures representative architecture, functions of smart grid components, wholesale energy market in smart grid smart vehicles in smart grid.

UNIT - II	SMART GRID COMMUNICATIONS AND MEASUREMENT TECHNOLOGY	Classes: 12

Communication and measurement, monitoring, phasor measurement unit, smart meters, wide area monitoring systems, advanced metering infra structure and Google mapping tools.

UNIT - III	PERFORMANCE ANALYSIS TOOLS FOR SMART GRID DESIGN	Classes: 12

Introduction to load flow studies, challenges to load flow in smart grid and weaknesses of the present load flow methods, load flow state of the art: classical, extended formulations, and algorithms.

Load flow for smart grid design, contingencies studies for smart grid.

UNIT - IV	STABILITY ANALYSIS TOOLS FOR SMART GRID	Classes: 12

Voltage stability analysis tools voltage stability assessment techniques, voltage stability indexing application and implementation plan of voltage stability in smart grid, angle stability assessment in smart grid approach smart grid to state estimation, energy management in smart grid.

UNIT - V	RENEWABLE ENERGY AND STORAGE	Classes: 12

Renewable energy resources sustainable energy options for the smart grid penetration and variability issues associated with sustainable energy technology demand response issues electric vehicles and plug-in hybrids, plug in hybrid electric vehicles (PHEV), technology environmental implications, storage technologies, grid integration issues of renewable energy sources.

Text Books:

1. James Momoh, "Smart Grid: Fundamentals of design and analysis", John Wiley & sons Inc, 2nd Edition, 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & sons inc,1st Edition, 2012.
3. Fereidoon PSioshansi, "Smart Grid: Integrating Renewable, Distributed & Efficient Energy", Academic Press, 2nd Edition, 2012.

Reference Books:

1. Clark WGellings, "The smart grid: Enabling energy efficiency and demand response", Fairmont Press Inc, 2nd Edition, 2009.

Web References:

1. https://www.researchgate.net
2. https://www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. https://www.electrical4u.com
5. https://www.crectirupati.com

E-Text Books:

1. https://www.jntubook.com/
2. https://www.freeengineeringbooks.com

Course Outcomes:

The student should have learnt about:

1. How to meet the standards for information exchange and for smart metering
2. How to preserve data and Communication security by adopting encryption and decryption procedures.
3. Monitoring, operating, and managing the transmission and distribution tasks under smart grid environment

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ADVANCED CONTROL SYSTEMS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA02804	Elective	2	2	-	3	30	70	100
Contact Classes: 30	Tutorial Classes: 30	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:
The course should enable the students to:
- Apply phase plane analysis to linear and non linear control systems.
- Analyze the stability of the systems using different techniques.
- Illustrate the design of optimal controller.
- Demonstrate state variable analysis, non-linear systems and optimal control.

UNIT - I	STATE VARIABLE ANALYSIS	Classes:12

Concept of state , state variable and state model, state models for linear and continuous time systems, solution of state and output equation, controllability and observability, pole placement, state observer design of control systems with observers.

UNIT - II	PHASE PLANE ANALYSIS	Classes:12

Features of linear and non linear systems, common physical non-linearity's , methods of line arising non-linear systems, concept of phase portraits, singular points, limit cycles, construction of phase portraits, phase plane analysis of linear and non-linear systems, isoclines method.

UNIT - III	DESCRIBING FUNCTION ANALYSIS	Classes:12

Basic concepts, derivation of describing functions for common non-linearities.
Describing function analysis of non-linear systems, Conditions for stability, Stability of oscillations.

UNIT - IV	STABILITY ANALYSIS	Classes:12

Introduction, Liapunov's stability concept, Liapunov's direct method, Lure's transformation, Aizerman's and Kaman's conjecture, Popov's criterion, Circle criterion.

UNIT - V	OPTIMAL CONTROL	Classes:12

Introduction, decoupling, time varying optimal control, linear quadratic regulator (LQR), steady state optimal control, optimal estimation, multivariable control design.

Text Books:

1. I J Nagrath and MGopal, 'Control Systems Engineering', New Age International Publishers, 1st Edition, 2003.
2. Ashish Tewari, 'Modern control Design with Matlab and Simulink', John Wiley, 2nd Edition, 2002.

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Reference Books:

1. George JThaler, "Automatic Control Systems", Jaico Publishers,1st Edition, 1993.
2. MGopal, "Modern control system theory", New Age International Publishers,1st Edition, 2002.
3. Gene F Franklin, J David Powell, Abbasemami-Naeini, "Feedback Control of DynamicSystems", 4thEdition, Pearson Education, 1st Edition 2002.

Web References:

1. https://www.nptel.ac.in/courses/108103007/
2. https://www.textofvideo.nptel.iitm.ac.in/108103007/lec1.pdf
3. https://www.file:///C:/Users/Administrator/Downloads/lecture_note_3823111150307220.pdf

E-Text Books:

1. https://www.file:///C:/Users/Administrator/Downloads/adv_control_eng.pdf
2. https://www.textbooksonline.tn.nic.in/
3. https://www.faadooengineers.com/threads/32837-Control-Systems-Engineering-by-Norman-S-Nise-full-books-pdf-download

Course Outcomes:

At the end of course, the student will be able to

- Understand the state variable analysis
- Understand the adequate knowledge in the phase plane analysis.
- Understand the basic knowledge in describing function analysis.
- Understand the stability of the systems using different techniques.
- Understand the design of optimal controller.

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I B. Tech – II Semester: ME

ENGINEERING DRAWING

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Tot al
20CA03201	Core	1	-	4	3	30	70	100

Contact Classes:17	Tutorial Classes: Nil	Practical Classes: 51	Total Classes: 68

OBJECTIVES:

1. To know the basics of Engineering Drawing and its applications
2. To understand the projection of solids
3. To understand the Isometric Projections of Regular Solids
4. To analyze the orthographic projections

UNIT – I	INTRODUCTION ENGINEERING GRAPHICS & SCALES	Classes: 12

Introduction to drawing instruments & principles of Engineering Drawing - Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Parabola, Ellipse, Hyperbola and Rectangular Hyperbola (General method only) b) Cycloid, Epicycloid and Hypocycloid. Involute curves (Circle & Polygon).
Scales: Diagonal & Vernier Scales.

UNIT – II	PROJECTION OF POINTS & LINES	Classes: 12

Projection of points, Projection of Lines: Projection of lines parallel to one plane and perpendicular to the other, parallel to both planes, inclined to one plane or both planes, Traces.

UNIT – III	PROJECTIONS OF PLANES	Classes: 14

Projection of planes: Parallel to on plane and perpendicular to the other, perpendicular to both planes, inclined to one or both planes.

UNIT – IV	PROJECTIONS & SECTIONS OF SOLIDS	Classes: 15

Projection of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.
Sections of Solids: Projections of Section of Cylinder, Prism & Pyramids.

UNIT – V	ISOMETRIC PROJECTIONS	Classes: 15

Principles of isometric projection- Isometric scale; Isometric views: planes, simple solids. Conversion of orthographic to isometric view Vice Versa.

Text Books:

- D.M Kulkarni, A.P. Rastogi and A.M. Sarkar, Engineering Graphics with Auto CAD, PHI learning Private Limited, New Delhi 2009.
- K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
- N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

References

- Dhanajay A Jolhe, Engineering Drawing: with an introduction to Auto CAD, Tata McGraw-Hill, 2008
- Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
- Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
- K.C.John, Engineering Graphics, 2/e, PHI, 2013

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APPLIED THERMODYNAMICS

III B.Tech I Semester: ME

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA03501	Core	2	1	-	3	30	70	100
Contact Classes: 36	**Tutorial Classes:18**	**Practical Classes: Nil**				**Total Classes:54**		

Course prerequisites : Basic knowledge in Thermodynamics

OBJECTIVES:

The course should enable the students to:

1. To learn about of I law for reacting systems and heating value of fuels.

2. To learn about gas and vapor cycles and their first law and second law efficiencies.

3. To understand about the properties of dry and wet air and the principles of psychrometry.

4. To learn about gas dynamics of air flow and steam through nozzles.

5. To learn the about reciprocating compressors with and without intercooling.

6. To analyze the performance of steam turbines.

UNIT-I	INTRODUCTION	Classes:11

Introduction to solid, liquid and gaseous fuels - Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature Chemical equilibrium and equilibrium composition calculations are using freeenergy.

UNIT-II	POWER CYCLES, FUEL AND COMBUSTION	Classes:11

Vapour Power cycles: Vapor power cycles Rankine cycle with superheat, reheat and regeneration, exergy analysis. Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT-III	I.C.ENGINES	Classes:10

I.C. Engines: Classification of IC engines, Combustion of SI engine and CI engine, Detonation and factors affecting detonation and control, Performance analysis of I.C Engines, heat balance, Morse test, IC Engine fuels, Ratings and Alternate Fuels. Ideal and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison.

UNIT-IV	BOILERS AND CONDENSER	Classes:11

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT-V	NOZZLES AND TURBINES	Classes:11

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.

Steam Turbines: Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

Text Books:

1. V. Ganesan, I.C. Engines. TMH. 4th edition, 2012
2. Thermal Engineering, Rathore. TMH, 2010
3. Heywood, I.C. Engines. McGrawHill. 1st edition, 2017

Reference Books:

1. Basic and Applied Thermodynamics by P.K. Nag, mcgraw hill india.
2. Applied thermodynamics by Onkar Singh, New Age International.
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education.
4. Applied Thermodynamics by Venkanna And Swati, PHI.
5. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
6. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
7. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
8. Theory of Stream Turbine by WJ Kearton.

Course Outcomes:

After completing this course,

1. After completing this course, the students will get a good understanding of various fuel types and flame equilibrium conditions. (L3)
2. They will understand the power cycles, fuel and combustion characteristics. (L3)
3. They will be able to analyze energy conversion in various thermal devices such as IC engine, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors. (L4)
4. They will be able to understand phenomena of different flows on boilers, condenser. (L4)
5. It will help to understand the different types of boilers, condensers, steam nozzles and turbines and its application. (L3)

* **Tables/Codes: Steam Table books are to be supplied in examination.**

Mapping of COs, POs and PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	3	2	-	-	-	-	1	2	1
CO2	3	3	2	1	-	3	3	-	-	-	-	1	2	2
CO3	3	3	2	1	-	3	3	-	-	-	-	1	2	1
CO4	3	2	2	-	-	3	2	-	-	-	-	1	2	1
CO5	3	1	2	-	-	3	1	-	-	-	-	1	2	1

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INTRODUCTION TO MEMS

V Semester ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA04508	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:
1. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
2. To educate on the rudiments of Micro fabrication techniques.
3. To introduce various sensors and actuators
4. To introduce different materials used for MEMS
5. To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT-I	INTRODUCTION TO MEMS & MICRO SYSTEMS	Classes: 09

Introduction to MEMS & Microsystems, Introduction to Micro sensors, Evaluation of MEMS, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties

UNIT-II	MICROELECTRONIC TECHNOLOGY FOR MEMS	Classes: 09

Microelectronic Technology for MEMS, Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micro machined Microstructure, Micro stereo lithography.

UNIT-III	MICRO SENSORS	Classes: 09

MEMS Micro sensors, Thermal Micro sensors, Mechanical Micro machined Micro sensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micro machined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor

UNIT-IV	MEMS ACCELEROMETERS	Classes: 08

Micro machined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezo resistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application

UNIT-V	MEMS APPLICATIONS	Classes: 10

Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Interface Electronics for MEMS, Introduction to BioMEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS)

TEXT BOOKS:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS:

1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2001.
3. Julian w. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, JohnWiley & Son LTD, 2002.
4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005.
5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.
6. Varadan, V KandVaradan "Microsensors, actuators, MEMS, and electronics for smart structures" Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Micro fabrication, SPIE Optical Engineering Press.

COURSE OUTCOMES:

1. Able to know about the basics of MEMS.
2. Able to explain about various materials and technology of MEMS.
3. Able to understand the operation of micro devices, micro systems and their applications.
4. Ability to design the micro devices, micro systems using the MEMS fabrication process.

Course Outcomes mapping with Programme Outcomes

COs	CO-PO Mapping														
	Programme Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1										1	3	2	
CO2	2	1										1	3	2	
CO3	2	1										1	3	2	
CO4	2	1										1	2	2	

APPLIED THERMODYNAMICS LABORATORY

III B.Tech I Semester: ME

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA03510	Core	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

Course prerequisites : APPLIED THERMODYNAMICS

OBJECTIVES:

The courses should enable the students to:

1. Estimate the basic fuel properties of diesel, petrol, and some other alternative fuel.
2. Estimate the performance of IC Engine and turbine.
3. Determine the dryness fraction of the steam.
4. Demonstration of application of IC engine, turbines.
5. Estimation of valve timing diagram of IC engines

LIST OF EXPERIMENTS

Expt. 1	Performance evaluation of single cylinder - stroke diesel engine with rope dynamometer
Expt. 2	Performance evaluation of single cylinder 2- stroke petrol engine
Expt. 3	Performance evaluation of 4- cylinder 4- stroke petrol engine
Expt. 4	Heat balance sheet on single cylinder diesel engine
Expt. 5	To find flash, fire point of a sample of fuel using open/closed cup point thermal device.
Expt. 6	Performance evaluation of steam turbine (Reaction / Impulse).
Expt. 7	To investigate the performance characteristics of two stage Air Compressor.
Expt. 8	Determination of Dryness Fraction of Steam using Steam Bench.
Expt. 9	Study of port timing and valve timing diagram
Expt. 10	To find calorific value of a sample of fuel using Bomb calorimeter.

Reference Books:

1. V. Ganesan, I.C. Engines, TMH, 4th edition, 2012
2. Rathore, Thermal Engineering, TMH, 2010
3. Heywood, I.C. Engines, McGrawHill, 1st edition, 2017.

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Analyze the modes of IC problems in the practical perspective. (L4)
2. Develop the calculation of turbines and engines. (L4)
3. Acquire the real time steady state and transient engine and other alternative energy source. (L4)
4. Analyze the fuel properties of two reactivity fuels.
5. Basic knowledge accrues on low to high grade engine modifications its basic movements.

Mapping of COs, POs and PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	1	-	-	1	-	3	-	2	3	2	2
CO2	3	3	-	2	-	-	2	-	3	-	2	3	2	2
CO3	3	2	-	2	-	-	-	-		-	1	3	2	2
CO4	3	2	-	2	-	2	-	-		-	2	3	2	2
CO5	3	2		1	-		1				1	3	2	2
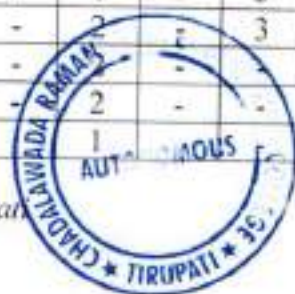
ENERGY MANAGEMENT (17CA03706)

IV B.Tech I Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA03706	Elective	2	2	-	3	30	70	100
Contact Classes: 34	**Tutorial Classes: 34**	**Practical Classes: Nil**				**Total Classes: 68**		

OBJECTIVES:

1. Energy auditing in engineering and process industry.
2. Energy conservation.

UNIT-I	ENGINEERING ECONOMICS	Classes: 14

Managerial objectives – steps in planning- Capital budgeting- Classification of costs- Interest Types- Nominal and effective interest rates Discrete and continuous compounding – discounting – Time value of money – Cash flow diagrams – Present worth factor, Capital recovery factor, Equal annual payments – Equivalence between cash flows.

UNIT-II	DEPRECIATION & COST ANALYSIS	Classes: 14

Aims-Physical depreciation-Functional depreciation- Methods of depreciation-Straight line method, Declining balance method, Sum of years digits method, Sinking fund method, Service output method- Capital recovery with return-Service life estimation- Morality curves. Break even analysis and break even chart- Minimum cost analysis- Benefit cost analysis- Life cycle cost analysis.

UNIT-III	PROJECT MANAGEMENT	Classes: 14

Methods of investment appraisal- Rate of return method, Payback period method, Net present value method (NPV)- Internal Rate of Return method(IRR)- Adoption of the methods in energy conservation campaign- Types of projects- Purpose of project management – Classification – Role and qualities of project manager – Types of budgets – Budget committee – budgeting. Energy Management Programs: Necessary steps of energy management programmer – Concepts of Energy management – General principles of energy management – Energy management in L T P C 3 - - 3 manufacturing and process industries- Qualities and functions of Energy manager – Language of Energy manager-Checklist for top management.

UNIT-IV	ENERGY AUDITING	Classes: 12

Energy Auditing: Definition- Objectives- Level of responsibility- Control of Energy- Uses of Energy checklists – Energy conservation- Energy index – Cost index – Pie charts-sankey diagrams Load profiles – Types of energy audits- Questionnaire – Energy audit of industries – General energy audit- Detailed energy audit – Energy saving potential.

UNIT-V	ENERGY POLICY, SUPPLY, TRADE& PRICES	Classes: 14

Energy resources in India – level of power generation – transmission & distribution of power, Indian energy policy,Energy trade & its economic impacts – domestic energy production –
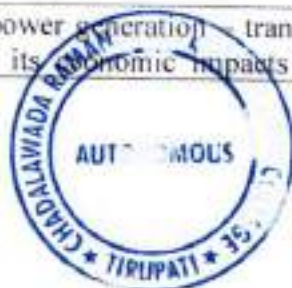
Energy transformation & distribution & energy self sufficiency. International & National crude oil prices – domestic fuel prices – natural gas, LPG, kerosene and firewood – pricing policy.

Text Books:

1. Albert Thumann, Handbook of Energy Audits, The Fairmont Press Inc., Atlanta gergia, 1979.
2. Murphy W.R and Mckay G, Energy Management, Butterworths, London, 1982.
3. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, Van Nost and Reinhold Co., Newyork.

Reference Books:

1. Energy Audits, E.E.O.-Book-lets, U.K. 1988.
2. Craig B.Smith, "Energy Management Principles", Pergamon Press.
3. The role of Energy Manager, E.E.O., U.K.
4. The Energy conservation Design Resource Hand Book-The Royal architectural Institute of Canada.

Course Outcomes:

At the end of this course the student will be able to:
1. Apply of management, different costs, money value. (L3)
2. Evaluate the depreciation and cost analysis. (L4)
3. Apply the principles energy management for conservation.(L3)
4. Describe the energy rate structures.(L4)
5. Discussion of energy policies, prices and its trading. (L3)

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DESIGN FOR MANUFACTURE (17CA03707)

IV B.Tech VII Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA03707	Elective	-	-	-	3	30	70	100

Contact Classes:	Tutorial Classes:	Practical Classes: Nil	Total Classes:

UNIT-I	Introduction	10

Introduction: Design philosophy – steps in Design process – General Design rules for manufacturability – basic principles of designing for economical production – creativity in design.

UNIT-II	Materials	10

Selection of Materials for design – Developments in Material technology – criteria for material selection – Material selection interrelationship with process selection – process selection charts.

UNIT-III	Machining Process	12

Overview of various machining processes – general design rules for machining - Dimensional tolerance and surface roughness – Design for machining, Ease – Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT-IV	Metal Casting	12

Appraisal of various casting processes, selection of casting process, - general design considerations for casting – casting tolerances – use of solidification simulation in casting design – product design rules for sand casting.

UNIT-V	Metal Joining	12

Metal Joining: Appraisal of various welding processes, Factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints.

Text Books:

1. **Design for Manufacture** / John Cobert / Adisson Wesley, 1995.
2. **ASM Handbook**, Vol.20.
3. **Product design and Manufacturing** / A.K Chitale and R.C Gupta / Prentice – Hall of India, New Delhi, 2003.

Reference Books:

1. **Engineering Design- A Material and Processing Approach** / George E. Deiter / McGraw Hill Intl., 2nd Edition, 2000.

2. **Design and Manufacturing** / Surendra Kumar & Goutham Sutradhar / Oxford & IBH Publishing Co. Pvt .Ltd., New Delhi, 1998.

ADVANCED PRODUCTION TECHNOLOGY

(17CA03710)

B.TECH IV- I SEMESTER (R17)
MECHANICAL ENGINEERING

UNIT-I: Metal casting

Metal casting processes: Sand casting shell moulding – expandable pattern casting - plaster mould and ceramic mould castings- investment casting – vacuum casting – permanent mould casting – slush casting – squeeze casting and semi solid metal casting.

UNIT-II: Welding Processes

solid state welding processes: cold welding – ultrasonic welding – friction welding. Resistance welding – explosion welding – diffusion welding – adhesive joining – joining plastics- thermal spraying

UNIT-III: Metal Cutting

Mechanics of chip formation-Geometry of Single point cutting tool – cutting forces – cutting power – tool life – selection ofcutting tool materials and cutting fluids – machining –economics.

UNIT-IV: Advanced Machining Processes

Electro discharge machining – electro chemical grinding – electron beam machining – abrasive jet machining – micromachining– applications.

UNIT-V: Processing of Powders, Ceramics and Plastics

Production, compaction, sintering of powders – design considerations – shaping of ceramics – forming and shaping of glass – Processing methods for plastics, tool making and die making for plastics.

Text Books:

1. **Manufacturing engineering and technology** by Serope Kalpajian, SR Schmid.

2. **Modern materials and manufacturing processes by** RG Bruce, WK Dalton

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RANDOM SIGNALS & SYSTEMS

III Semester ECE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
20CA04302	Core	L	T	P	C	CIA	SEE	Total
		3	1	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

COURSE OBJECTIVES:

1. To gain basic concepts about signals and systems.
2. To understand the behavior of signals and systems in both time and frequency domain.
3. To understand the stability of systems through the concept of ROC.
4. To get an in-depth knowledge about signals, systems and analysis of the same using various transforms.

UNIT - I	INTRODUCTION TO SIGNALS & SYSTEMS	Classes: 12

Analogy between vectors and signals – Orthogonality - Mean Square Error, Definition and classification of signal and systems (Continuous time and Discrete time), Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals. Fourier Series Representation of Periodic Signals: Representation of Fourier series, Dirichlet's conditions, Trigonometric & Exponential Fourier series.

UNIT - II	FOURIER TRANSFORM	Classes: 12

CONTINUOUS TIME FOURIER TRANSFORM: Deriving Fourier transform from Fourier series, Definition, Computation and properties of Fourier Transform for different types of signals. Statement and proof of sampling theorem of low pass signals and systems. **DISCRETE TIME FOURIER TRANSFORM:** Definition, Computation and properties of Fourier Transform for different types of signals.

UNIT - III	SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS	Classes: 12

Linear system, impulse response, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer functions of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power Spectral Densities.

UNIT - IV	LAPLACE TRANSFORM	Classes: 12

Definition, ROC, ROC-Properties, Inverse Laplace transforms: S-plane, BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Relation between Laplace transforms and Fourier transform of a signal.

UNIT - V	Z–TRANSFORM	Classes: 12

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform.
Z-Transform Properties: Linearity, time shifting, change of scale, Z-domain differentiation, differencing, accumulation, convolution in discrete time, initial and final value theorems. Poles and Zeros in Z –plane, inverse Z-Transform.
System analysis: Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions.

Text Books:

1. Signals, Systems & Communications, B.P-Lathi, 2009, BS Publications.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn.
3. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition

Reference Books:

1. Signals and Systems – A. Ramakrishna Rao - 2008, TMH.
2. Linear Systems and Signals – B. P. Lathi, Second Edition, Oxford University press, 2008.
3. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
4. Signals, Systems and Transforms - C. L. Philips, J. M. Parr and Eve A. Riskin, Pearson education 3rd Edition.

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

CO1: Differentiate various signal functions.
CO2: Represent any arbitrary signal in time and frequency domain.
CO3: Understand the characteristics of linear time invariant systems
CO4: Analyze the signals with different transform technique.

Course Outcomes mapping with Programme Outcomes

COs	CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3							1			3	3	1
CO2	3	2	3							1		1	3	3	1
CO3	3	2	3							1			3	3	1
CO4	3	2	3							1		2	3	3	1

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ANALOG ELECTRONIC CIRCUITS

IV Semester ECE

Course Code	Category	Hours / Week			Credit	Maximum		
		L	T	P	C	CIA	SEE	Tot
20CA04401	Core	3	0	0	3	30	70	100
Contact Classes:	**Tutorial Classes:**	**Practical Classes: Nil**				**Total Classes: 60**		

COURSE OBJECTIVES:

The course should enable the students to :

1. To perform analysis of FET and BJT amplifiers at low & high frequencies, cascade and Darlington amplifiers.
2. To familiarize with the feedback concept in amplifiers and stability issues.
3. To perform analysis of Oscillators, Power and Tuned amplifiers.
4. To familiarize with the operation and characteristics of multivibrators, time base generators and sweep circuits.

UNIT-I	SINGLE STAGE AND MULTISTAGE AMPLIFIERS	Classes: 10

Classification of amplifiers, Various types of distortions in amplifiers, Analysis of CB, CE and CC transistor amplifiers circuit using simplified h-parameter model, Millers theorem and its dual, Design of Single stage RC coupled amplifier using BJT, Low frequency response of BJT amplifier, Effect of coupling and bypass capacitor.

Multistage amplifiers: Different coupling schemes used in amplifiers, RC coupled amplifiers, Transformer coupled amplifiers and Direct coupled amplifiers, Cascode amplifier, Analysis of Cascaded RC coupled amplifiers, Darlington pair amplifier, Analysis of Multi-stage CS and CD amplifiers using FET.

UNIT-	HIGH FREQUENCY RESPONSE OF TRANSISTOR	Classes: 08

The hybrid-π Common Emitter transistor model, Hybrid-π conductance and Hybrid-π capacitances, Common Emitter short circuit current gain, Current gain with resistive load, α and β cut-off frequencies, Gain Bandwidth product, Emitter follower at high frequencies, Analysis of CS and CD amplifiers at high frequencies.

UNIT-	FEEDBACK AMPLIFIERS AND OSCILLATORS	Classes: 10

Feedback amplifiers: Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Analysis of voltage series, voltage shunt, current series and current shunt feedback configurations.

Oscillators: Classification of Oscillators, Conditions for oscillations, Generalized analysis of LC oscillators, Hartley and Colpitt's oscillators, RC phase shift oscillator, Wien bridge and Crystal oscillators, Frequency and Amplitude stability of oscillators.

UNIT-	LARGE SIGNAL AND TUNED AMPLIFIERS	Classes: 09

LARGE SIGNAL AMPLIFIERS: Class A large signal amplifier, Transformer coupled Class A audio power amplifiers, Efficiency of Class A amplifier, Class B amplifier, Class B push-pull amplifier, Complementary symmetry Class B push-pull amplifier, Efficiency of Class B amplifier, Phase inverters, Thermal stability and Heat sinks.

TUNED AMPLIFIERS: Series and Parallel resonant circuits, Q - factor, Small Signal Tuned amplifiers, Effect of cascading Single and Double Tuned amplifiers on bandwidth, Staggered Tuned amplifiers, and Stability of Tuned amplifiers.

UNIT-	MULTIVIBRATORS AND TIME BASE GENERATORS	Classes: 08

MULTIVIBRATORS: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

TIME BASE GENERATORS: General features of a Time base Signal, Methods of Generating Time Base Waveform, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, UJT Sawtooth generator.

Text Books:

1. Jacob Millman, Christor C Halkias, "Integrated Electronics", Tata McGraw Hill, 1st Edition, 2008.
2. Sedra A.S., K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 6th Edition, 2013.
3. Donald A Neamen, "Electronic Circuits Analysis and Design", Tata McGraw Hill, 3rd Edition, 2007.

Reference Books:

1. David A. Bell "Electronic Devices & Circuits" 5th Edition,. Oxford university press, 7th Edition, 2009.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson education, 9th Edition, 2008.
3. S.Salivahana, N. Suresh kumar, "Electronic circuit analysis", McGraw Hill education, 1st Edition, 2011.
4. B.Razavi, "Fundamentals of Micro electronics", Wiley.

Web References:

1. http://www.igniteengineers.com
2. http://www.ocw.nthu.edu.tw
3. http://www.uotechnology.edu.iq

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

CO1: **Demonstrate** the concept of single stage and multistage amplifiers and **analyze** various parameters using frequency response of transistor in CE configuration.

CO2: Demonstrate the hybrid-Π model on CE configuration of a transistor to formulate the gain, bandwidth and gain bandwidth product and Analyze its frequency response at higher frequencies.

CO3: Analyze the concept of feedback in amplifiers using negative feedback and frequency of oscillators for audio and radio frequency ranges.

CO4: Demonstrate and Analyze various power and tuned amplifiers to measure the efficiency and formulate the Q-factor and Bandwidth.

CO5: Able to Identify appropriate Multivibrator and Time base circuit based on the application in display devices.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
							CO-PO/PSO Mapping							
CO1	3	3	2	2									3	
CO2	3	3	2	2									3	
CO3	3	3	2	2									3	
CO4	3	3		2									3	
CO5	3	3		2									3	
	3	3	2	2									3	

ANALOG AND DIGITAL COMMUNICATIONS

V Semester ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA04502	Core	3	0	0	3	30	70	100

Contact Classes: 54	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 54

COURSE OBJECTIVES:

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of pulse shaping in baseband transmissions.

UNIT-I	AMPLITUDE MODULATION	Classes: 12

Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, SSB modulation - time and frequency domain description, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT-II	ANGLE MODULATION	Classes: 12

Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal-Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM, Concept of Pre-emphasis and de-emphasis.

UNIT-III	TRANSMITTERS AND RECEIVERS	Classes: 10

Transmitters: Classification of Transmitters AM Transmitters, FM Transmitters.
Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super hetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, Automatic Gain Control, Amplitude limiting, FM Receiver.

UNIT-IV	PULSE MODULATION & PULSE CODE MODULATION	Classes: 10

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM.
Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT-V	PULSE SHAPING AND DIGITAL MODULATION TECHNIQUES	Classes: 10

Pulse Shaping: Base-band Transmission, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, Ideal Nyquist channel, Raised cosine filter & its spectrum, Eye diagrams.
Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK and Differential PSK.

Text Books:

1. S. S. Haykin, "Communication Systems, Wiley Eastern, 2nd Edition, 2006.
2. Taub, Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 4th Edition, 2013.

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3. B.P. Lathi, "Signals, Systems and Communications", BS Publications, 5th Edition, 2009.
4. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
5. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

Reference Books:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, GoutamSaha, 3 rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4 th Edition , PEA, 2004
3. John G. Proakis, Masond, Salehi, "Fundamentals of Communication Systems", PEA, 1st Edition,2006.
4. George Kennedy,Bernard Davis, "Electronics and Communication System", Tata McGraw Hill , 5th Edition, 2011.
5. B.P. Lathi, Zhi Ding, "Modern analog and digital Communication Systems", Oxford Publication, 4th Edition, 2011.

Web References:

1. http://www.web.eecs.utk.edu
2. https://everythingvtu.wordpress.com
3. http://nptel.ac.in/
4. http://www.iare.ac.in

E-Text Books:

1. http://www.bookboon.com/
2. http://www.jntubook.com
3. http://www.smartzworld.com
4. http://www.archive.org

COURSE OUTCOMES:

CO1: Understand the effect of noise present in continuous wave and angle modulation techniques.

CO2: Attain the knowledge about AM , FM Transmitters and Receivers

CO3: Analyze and design the various Pulse Modulation Techniques.

CO4: Understand the concepts of Digital Modulation Techniques and pulse shaping in Baseband transmission.

Course Outcomes mapping with Programme Outcomes

COs	CO-PO Mapping														
	Programme Outcomes (POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3						3	2	3	1	3	2	
CO2	3		2						3	2	3	1	3	2	
CO3	3	2	2	2	3				3	2	3	2	3	2	
CO4	2	2		1	3					2	2	3	2		

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Course Code	Category	Hours / Week			Credits	Maximum Marks				
							CIA		SEE	Total
19CA05602	PE	L	T	P	C	CIE	AAT	TOT		
		3	-	-	3	25	05	30	70	100
Classes: 48 Hrs.	Tutorial: Nil	Practical Classes: Nil				Total Classes: 48Hrs.				

Course Objectives:

1. To learn the fundamentals of Python.
2. To discuss the concepts of Functions and Exceptions.
3. Illustrate the Object-oriented Programming concepts in Python & Demonstrate the basic database design for storing data as part of a multi-step data gathering, analysis, and processing.
4. To familiarize with Python libraries for Data Analysis and Data Visualization.
5. To introduce preliminary concepts in Pattern Recognition and Machine learning.
6. To provide an overview of Deep Learning and Data Science models.

UNIT-I
8Hrs.

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements. Strings: Creating strings and basic operations on strings, string testing methods. Lists, , Tuples, Dictionaries, Functions and Exceptions, Files and its operations.

UNIT-II
11Hrs.

Classes in Python: OOPS Concepts, Classes and objects , Classes in Python, Constructors, Data hiding, Creating Classes, Instance Methods, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes, Iterators, generators and decorators.

An Introduction to relational databases: SQL statements for data manipulation, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event, working with components.

UNIT-III
10Hrs.

Introduction to NumPy, Pandas, Matplotlib. Exploratory Data Analysis (EDA), Data Science life cycle, Descriptive Statistics, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. Data Visualization: Scatter plot, bar chart, histogram, boxplot, heat maps, etc.

UNIT-IV
9Hrs.

Introduction to Pattern Recognition and Machine Learning: Patterns, features, pattern representation, the curse of dimensionality, dimensionality reduction. Classification—linear and non-linear. Bayesian, Perceptron, Nearest neighbor classifier, Logistic regression, Naive-Bayes, decision trees and random forests; boosting and bagging. Clustering---partitional and hierarchical; k-means clustering. Regression, cost functions, training and testing a classifier, Cross-validation, Class-imbalance – ways of handling, Confusion matrix, evaluation metrics.

UNIT-V   10Hrs.

Introduction to Deep Learning: Multilayer perceptron. Backpropagation. Loss functions. Hyperparameter tuning, Overview of RNN, CNN and LSTM. Overview of Data Science Models: Applications to text, images, videos, recommender systems, image classification, Social network graphs.

Textbooks:

1. 1.Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. 2. Michael Urban and Joel Murach, Python Programming, Shroff/Murach,2016
3. 3. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

Reference Books:

1. 1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
2. 2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
3. 3. EMC2: Data Science and Big Data Analytics, EMC Education Services, EMC 2 , Wiley Publication, 2015.
4. 4. V. Susheela Devi and M. Narasimha Murty. Pattern Recognition – An Introduction. Universities Press (Indian Edition; there is an expensive Springer version of the same)
5. 5. Goodfellow and YoshuaBengio and Aaron Courville. Deep Learning. MIT Press. Book available online at https://www.deeplearningbook.org/.
6. 6. J. Leskovec, A. Rajaraman, J.D. Ullman. Mining of Massive Datasets. Cambridge University Press. (Indian Edition; Online pdf is available for download)

Course Outcomes:

CO1	Apply the features of Python language in various real applications.
CO2	Identify the appropriate data structure of Python for solving a problem
CO3	Demonstrate data analysis, manipulation and visualization of data using Python libraries
CO4	Enumerate machine learning algorithms.
CO5	Analyze the various applications of Data Science.
CO6	Design solutions for real-world problems using Python.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
III B. Tech (CSE), VI SEMESTER – 2021-22
COURSE: CRYPTOGRAPHY & NETWORK SECURITY

Course Code	Category	Hours / Week			Credits	Maximum Marks				
						CIA			SEE	Total
19CA05603	Core	L	T	P	C	CIE	AAT	TOT		
		3	-	-	3	25	05	30	70	100
Classes: 48 Hrs.	Tutorial: Nil	Practical Classes: Nil				Total Classes: 48Hrs.				

Objectives:

The course should enable the students to:

1. Learn the basic categories of threats to computers and networks.
2. Understand various cryptographic algorithms and be familiar with public-key cryptography.
3. Apply authentication functions for providing effective security.
4. Analyze the application protocols to provide web security.
5. Discuss the place of ethics in the Information Security Area.

UNIT - I   SECURITY TRENDS
9Hrs.

OSI Security Architecture – Security Attacks – Security Services – Security mechanisms – A Model for Network Security – Symmetric Cipher Model – Substitution Techniques- Transposition Techniques - Block Cipher Principles – The Data Encryption Standard – The Strength of DES – Differential linear cryptanalysis Block cipher design principles – Evaluation criteria for AES - The AES Cipher.

UNIT - II
PRINCIPLES OF SYMMETRIC& ASYMMETRIC KEY CIPHERS
10Hrs.

Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream cipher and RC4 – Placement of Encryption function - Traffic confidentiality - Key Distribution Principle of Public Key Cryptosystems – The RSA Algorithm – Key management - Diffie Hellman Key Exchange – Elliptic curve cryptography.

UNIT-III
MESSAGE AUTHENTICATION ALGORITHM AND HASH FUNCTIONS
10Hrs.

Message Authentication and Hash functions: Authentication Requirements-Authentication functions - Message Authentication codes - Hash functions - Security of hash functions and MAC's - Secure hash Algorithm – Whirlpool – HMAC – CMAC – Digital Signatures – Authentication protocols –Digital signature standard - Kerberos – X.509 Authentication Service – Public Key Infrastructure.

UNIT-IV   E-MAIL SECURITY
10Hrs.

Pretty Good Privacy – S/MIME – IP Security Overview - IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations, Key management.

UNIT-V   WEB SECURITY

9Hrs.

Web Security Considerations – Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction – Intruders – Intrusion Detection – Password Management – Viruses and related threads – Virus countermeasures – Distributed denial of services attack – Firewall Design principles – Trusted System – Common Criteria for Information Technology Security Evaluation.

Textbooks:

1. William Stallings, "Cryptography and Network Security", Pearson Education, 4th Edition, 2005.
2. Atul Kahate, "Cryptography and Network Security", McGraw Hill, 2nd Edition, 2009.
3. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, (4e) Mc Graw Hill

Reference Books:

1. Man Young Rhee, Internet Security, Wiley, 2003. ISBN: 0-470-85285-2.
2. Bruce Schneier, Applied Cryptography: Protocols, Algorithms and Source code in C, Second Edition, Pearson Education. ISBN: 9971-51-348-X.

COURSE OUTCOMES:

CO1   Apply the features of Python language in various real applications.

CO2   Identify the appropriate data structure of Python for solving a problem

CO3   Demonstrate data analysis, manipulation and visualization of data using Python libraries

CO4   Enumerate machine learning algorithms.

CO5   Analyze the various applications of Data Science.

CO6   Design solutions for real-world problems using Python.

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Reinforcement Learning: Introduction, Elements of Reinforcement Learning, Model-Based Learning, Partially Observable States.

Guidelines for Machine Learning Experiments; Cross-Validation and Re-sampling Methods – K-Fold Cross-Validation, 5×2 Cross-Validation, Bootstrapping.

Textbooks:

1. Introduction to Machine Learning Third Edition, Ethem Alpaydın. The MIT Press Cambridge, Massachusetts London, England, © 2014 Massachusetts Institute of Technology

References:

1. Tom Michel, Machine Learning, McGraw Hill, 1997

E-Text Books:

1. Murphy, K. (2012). Machine Learning: A probabilistic perspective. MIT Press.
2. An accessible survey of machine learning from a probabilistic perspective.
3. **Deep Learning** Ian Goodfellow, Yoshua Bengio, and Aaron Courville
4. **Python Machine Learning** Sebastian Raschka and Vahid Mirjalili

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COURSE: ADVANCED PYTHON PROGRAMMING & CRYPTOGRAPHY & NETWORK SECURITY LABORATORY

Course Code	Category	Hours / Week	Credits	Maximum Marks		
				CIA	SEE	Total

Course Objectives:

1. To train the students in solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To understand the fundamentals of Python programming concepts and its applications.
4. Practical understanding of building different types of models and their evaluation
5. To learn different cipher techniques
6. To implement the algorithms DES, RSA, MD5, SHA-1
7. To use network security tools and vulnerability assessment tools

LIST OF EXPERIMENTS

Week -1   BASICS

a. Write a program to demonstrate different numeric data types.
b. Write a python script to perform basic arithmetic operations on two values which are accepted from the user.

Week -2   LISTS, TUPLES AND DICTIONARIES

a. Write a program to create, append, and remove lists in Python.
b. Write a program to demonstrate working with tuples in Python.
c. Write a program to demonstrate working with dictionaries in Python.

Week-3   FILES, EXCEPTIONS AND DATABASE

a. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file.
b. Write a program to demonstrate the Exception Handling.
c. Write a program to connect python with MySQL using database connectivity

Week-4   DATA SCIENCE AND STATISTICS

a. Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy.
b. Write a program to compute summary statistics such as mean, median, mode, standard deviation, and variance of the given different types of data

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E-COMMERCE

MOOCS: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA05707	MOOC-II	2	2	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

Objectives:

The course should enable the students to:

- To demonstrate a profound awareness of market opportunities arising in societies, identify these and create an e-commerce plan around these.
- The learner will gain a better understanding of the use of financial methodologies through the utilization of research knowledge.
- Students will engage in understanding the need to critically evaluate their personal behavior and analytical skills. This will be reflected in critical thinking, inquiry, and reflection.
- To gain the skills to bring together knowledge gathered about the different components of building a web presence.

Unit-I	Electronic Commerce	Classes: 12

Electronic Commerce: Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.
Consumer Oriented Electronic commerce: Mercantile Process models.

Unit-II	Electronic Payment Systems	Classes: 12

Electronic payment systems: Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.
Inter Organizational Commerce: EDI, EDI Implementations, and Value added networks.

Unit-III	Inter Organizational Commerce	Classes: 13

Inter Organizational Commerce: Work Flow, Automation Customization and internal Commerce, Supply chain Management.
Corporate Digital Library: Types of Digital Documents, Corporate Data Warehouses, e-Advertising and Marketing, Advertising on the Internet, On-line Marketing Process, and Market Research.

Unit-IV	Consumer Search	Classes: 11

Consumer Search: Search and Resource Discovery Paradigms, Information Search and Retrieval, Electronic Commerce Catalogs (Directories), Overview of the Directory Business, Information Filtering, Consumer-Data Interface.

Unit-V	Multimedia and e-Commerce	Classes: 12

Multimedia and e-Commerce: Digital Video and e-commerce, Desktop Video Processing, Desktop Video Conferencing.

Text Books:

1. Electronic Commerce, Pete Loshin/ Ohn Vacca, Fourth Edition, Firewall Media.
2. Electronic Commerce, Efraim Turban, Fourth Edition, Pearson.

Reference Books:

1. Introduction to E-Commerce, Second Edition, Jeffrey F. Rayport, Bernard J. Jaworski, TMH.
2. Global Electronic Commerce: Theory and Case Studies, J.Christopher Westland, Theodore H. K. Clark, Universities Press.
3. Ecommerce: Strategy, Technology and Implementation, Gary P. Schneider, Cengage Learning
4. E-Commerce: The Cutting Edge of Business, Second Edition, Kamlesh K. Bajaj, Debjani Nag, TMH.

Web References:

1. www.quicksprout.com › best-payment-methods-for-yo...
2. www.bigcommerce.com › blog › payment-gateways
3. www.tutorialspoint.com › e_commerce › e_commerce ...

E-Text Books:

1. www.ecommerce-digest.com
2. www.ncertbooks.guru › e-commerce-full-notes
3.www.valorebooks.com › business-economics › e-comm...

Outcomes:

- Define and describe the 9 major ecommerce business models.
- Identify the differences and similarities among customers and their perception of value in B2B and B2C e-commerce.
- Compare and contrast developing a marketing mix in B2B and B2C ecommerce.
- Summarize ways of moving money in e-commerce and related issues.
- Discuss major trends that are impacting both the e-commerce world and society in general.

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INTRUSION DETECTION SYSTEMS

VII Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA05711	MOOC	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Objectives:

The course should enable the students to:

- To impart knowledge on application of Intrusion Detection Systems (IDS), Network security monitoring, Network Forensics and Intrusion Prevention system (IPS).
- To develop skills for identifying, resolving, and documenting network crises and activating the response team.

Unit-I	INTRODUCTION TO INTRUSIO DETECTION SYSTEMS	Classes: 09

Basic Concepts of Security, Introduction to Intrusions, Need of Intrusion Detection, Taxonomy of Intrusion Detection Systems (IDSs), , Audit, Concept and definition , Distributed intrusion detection system.

Password Management-Password protection, Password Selection Strategies.

Unit-II	HOST-BASED AND NETWORK-BASED INTRUSION DETECTION	Classes: 09

HOST-BASED INTRUSION DETECTION: Host Vulnerability, Security Attacks, Security Services and Security Mechanisms, A Model for Network Security, Standard for Network Security.

NETWORK-BASED INTRUSION DETECTION: Network Vulnerabilities and Attacks – Routing Attacks, IP Attacks, ICMP Attacks, TCP Attacks, DNS Attacks, Denial of Service (DoS) Attacks and Distributed Denial of Service attacks(DDoS).

Unit-III	ARCHITECTURE AND IMPLEMENTATION OF IDS	Classes: 09

Architecture and Implementation: Centralized – Distributed – Cooperative Intrusion Detection - Tiered architecture

Unit-IV	INTRUSION PREVENTION SYSTEM	Classes: 09

Intrusion Prevention Overview, Signatures and Actions: Types, Triggers and actions, Operational Tasks, deploying & configuring IPS device and applications, Monitoring IPS activities, Securing IPS communications.

Types of Prevention systems: Introduction to Host-based and Network-Based Intrusion prevention systems- Capabilities, Benefits, Limitations

Unit-V	LEGAL ISSUES AND ORGANIZATIONS STANDARDS	Classes : 09

Legal Issues and Organizations Standards: Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.

Text Books:

1. R. D. Pietro & L. V. Mancini, "Intrusion Detection Systems", Handbook of Advances in Information Security, Springer, 2008

Reference Books:

1. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals," First Edition, Pearson Education, New Delhi, 2002.
2. Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer, 2010.
3. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
4. Richard Bejtlich, "Extrusion Detection: Security Monitoring for Internal Intrusions," First Edition. Pearson Education, New Delhi, 2004.

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BUSINESS RESEARCH METHODS

Course Code	Category	I MBA I Semester :							
		Hours/Week			Credits	Maximum Marks			
20CE00104	Foundation	L	T	P	C	Internal	External	Total	
		3	-	-	4	40	60	100	
Contact classes:50	Tutorial Classes:15	Practical classes: Nil				Total classes:65			

COURSE OBJECTIVES:

To expose the students to the principles of scientific methodology in business enquiry ; to develop analytical skills of business research; to develop the skills for scientific communications.

COURSE OUTCOMES: The student is able to

CO1: Adapt the fundamentals of Business research methodology. [K6]
CO2: Identify research problem and apply measuring techniques. [K3]
CO3: Design data collection techniques. [K6]
CO4: Develop data processing procedures and apply tools. [K6]
CO5: Draft thesis/report writing. [K2]

SYLLABUS:

UNIT-I: INTRODUCTION TO RESEARCH

Introduction, Meaning, Definition, purpose, motivation in research, types of research, Research process, Technique involved in Defining research problem, Important concepts relating to research design.

UNIT-II: SAMPLING DESIGN& DATA COLLECTION-METHODS

Meaning and Definition of sample, Steps in sample design, Types of sample design (Probabilistic and Non-probabilistic sampling), errors in sampling, advantages and limitations of sampling.

collection of primary data, observation method, Interview method, collection of data through Questionnaire and schedules- Collection of secondary data- selection of appropriate method for Data collection-Guidelines for developing Questionnaire, successful interviews.

UNIT-III: MEASUREMENT AND SCALING TECHNIQUES

Measurement in research, scales, Techniques of developing measurement tools, scale classification. Likert's scale, semantic scale, Thurston Scale, Interval Scale and multi-dimensional scaling.

UNIT-IV: PROCESSING AND ANALYSIS OF DATA

Editing, Coding, classification, Tabulation of data; and data validation-methods of data presentation- types of data analysis: Quantitative and Qualitative – Statistics in Research; Descriptive and inferential Statistics-Descriptive statistics: measures in central tendency, Dispersion, Asymmetry, and Cross-tabulations, Limited problems on testing of hypotheses like parametric and non-parametric t-test, z-test, Anova.

UNIT-V: RESEARCH REPORT WRITING

Meaning of report, Types, Steps, Format of research report, Criteria of good research report, Pre-writing considerations-Final presentations of the Research Report-Idea of referencing, Bibliography, Footnotes and end notes, formats of publications in Research journals.

Relevant cases have to be discussed in each unit

TEXT BOOKS:

1. Business Research Methods, William G. Zikmund; Cengage publications, 2006.
2. Research methodology Methods & Techniques, C.R. Kothari; 2/e, New Age international, 2004.
3. N.D.Vohra: ―*Quantitative Techniques in Management*‖, Tata- McGraw Hill Private Limited, New Delhi, 2011.
4. D P Apte: ―*Operation Research and Quantitative Techniques*‖, 12. Excel Publication, New Delhi, 2013.

REFERENCE BOOKS:

1. Business Research Methodology, J.K. Sachdeva; Himalaya, 2009.
2. An introduction to statistical Methods, C.B.Gupta&Vijay Gupta; Vikas, 2009.
3. Anand Sharma: ―**Quantitative Techniques for Business decision** 10. **Making**‖,Himalaya Publishers, New Delhi, 2012.
4. Donald R Cooper and Pamela S Schindler, **Research Methods**, 9th edition, Tata McGrawHill Publishing Company Limited, New Delhi, 2009.

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Legal Aspects of Business

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		II MBA II Semester :						
		L	T	P	C	Internal	External	Total
20CE00403	Foundation	3	-	-	4	40	60	100
Contact classes:50	Tutorial Classes:15	Practical classes: Nil				Total classes:65		

COURSE OBJECTIVES:

To sensitize the students as also help they appreciate the overall legal framework within which business activities are carried out. To create awareness in respect of rules and regulations affecting various managerial functions.

COURSE OUTCOMES:

CO1: Analyze the Indian Contract Act. [K4]

CO2: Evaluate Sales of Goods Act and the machinery for redressal of consumer grievances. [K5]

CO3: Elaborate rights and duties of agent and principal, Principal's liability for the acts of agent and the procedure for termination of agency. [K6]

CO4: Examine the rights and duties of partners, dissolution of partnership firm and the formation of company, amendments act in 2013. [K4]

CO5: Explain the kinds of Negotiable Instruments and Goods and Services Act. [K5]

UNIT –I: THE INDIAN CONTRACT ACT, 1872

Nature of the Act - – Essentials of a Valid Contract – Classification of Contracts- Capacity – Free Consent —Performance of a Contract – Discharge of a Contract – Remedies for Breach of a Contract

UNIT –II: SALES OF GOODS ACT, 1930 & CONSUMER PROTECTION ACT,

1986 Distinction between Sales and Agreement to Sell –Conditions and Warranties – Performance of Contract of Sale – Rights of an Unpaid Seller.Consumer Protection Act, 1986: Consumer Rights–Machinery for Redressal of Consumer Grievances- District Consumer Forum – State Level Commission – National Level Commission.

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UNIT –III: CONTRACT OF AGENCY ACT, 1872

Kinds of Agents –Creation of Agency-Rights and Duties of Principal – Rights and Duties of Agent - Principal's Liability for the Acts of the Agent-Liability of Agent – Termination of Agency.

UNIT-IV: INDIAN PARTNERSHIP ACT, 1932

Meaning and Essentials of Partnership Firm –Registration Deed – Tests of Partnership- Rights and Duties of Partners –Dissolution of Partnership.

UNIT –V: COMPANIES ACT 2013 & NEGOTIABLE INSTRUMENTS ACT, 1881

(i) Nature and Types of Companies – Formation of a Company –Memorandum of Association-Articles of Association-Kinds of Shares – Company Act amended in 2013 - Duties of Directors-Winding up Procedure.

(ii) Kinds of Negotiable Instruments and Endorsement- Presentation of a Negotiable Instrument Discharge of a Negotiable Instrument – Goods and Services Tax Act,2017

Relevant cases have to be discussed in each unit

TEXT BOOKS:

1. "Legal Aspects of Business" Ravindra Kumar: Cengage Learning, New Delhi, 2011
2. "Business Legislation for Management", Kuchhal M C, DeepaPrakash: Vikas Publishing House, New Delhi, 2012

REFERENCE BOOKS:

1. "Legal Aspects of Business", Pathak: Tata McGraw Hill, New Delhi, 2010
2. "A Manual of Business Laws", S.N.Maheshwari, S.K.Maheshwari: Himalaya Publishing House, 2013.
3. "Legal Aspects of Business", P.K.Padhi: PHI Learnings, New Delhi, 2013
4. "Business Law", S.S Gulshan: Excel Books, New Delhi, 2012.

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DATA STRUCTURES THROUGH C++ LAB

I-Semester

Course Code	Category	Hours / Week				Credits	Maximum Marks		
		L	T	P	C		CIA	SEE	Total
20CF00107	Core	-	-	4	2		40	60	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Course Objectives:

- To write and execute programs in C++ to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
- To write and execute write programs in C++ to implement various sorting and searching methods.
- Exemplify and implement how abstract data types such as stack, queue and linked list can be implemented to manage the memory using static and dynamic allocations.

Course Outcomes:

- Know about the basic concepts of Function, Array and Link-list.
- Understand how several fundamental algorithms work particularly those concerned with Stack, Queues, Trees and various Sorting algorithms.
- Design new algorithms or modify existing ones for new applications and able to analyze the space & time efficiency of most algorithms.
- Be capable to identify the appropriate data structure for given problem.
- Have practical knowledge on the application of data structures.

Week-1

a) Write a C++ Program to Implement Stack Operations by using Array and Linked Lists.
b) Write a C++ Program to Implement the Operations of Double Linked Lists

Week-2

a) Write a C++ program that uses stack operations to convert a given infix expression into its postfix expression.
b) Write a C++ Program to Implement Queue Operations by using Array and Linked Lists.

Week-3

Write a C++ Program to Implement Circular Queue Operations by using Array and Linked Lists

Week-4

Write a Program to Sort the set of elements by using
 i). Quick Sort   ii). Heap Sort.   iii). Merge Sort

Week-5

Write a Program to Implement the Binary Search Tree Operations.

Week-6

Week-7	Write a Program to Perform the Tree Traversal Techniques by using the Iterative Method

Week-8	Write C++ programs for implementing the following graph traversal algorithms: a)Depth first traversal b)Breadth first traversal

Week-9	Write a Program to Implement All functions of a Dictionary by using Hashing

Week-10	Write a Program to Implement Skip List Operations

Week-11	Write a Program to Implement Insertion, Deletion and Search Operations on SPLAY Trees

Week-12	Write a program to Implement Insertion and Deletion Operations on AVL Trees,

Write a Program to Implement Insertion and Deletion Operations on B – Trees.

Text Books:

1. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palugiri, Pearson Education.
2. Data Structures A Pseudocode Approach with C++, India Edition, R.F.Gilberg and B.A.Forouzan, Cengage Learning.

Reference Books:

1. Programming Principles and Practice using C++, B.Stroustrup, Addison-Wesley(Pearson education).
2. Data Structures and STL., W.J.Collins, Mc Graw Hill, International edition.
3. Data structures and Algorithms with OODesign patterns in C++, H.B.Priess, John Wiley& sons.
4. The Art, Philosophy, and Science of OOP with C++, Rick Miller, C++ for Programmers, P.J.Deitel and H.M.Deitel, PHI/Pearson.

Web References:

* http://www.cprogramming.com/tutorial.html

E-Text Books:

* http://www.cplusplus.com/

* http://cplusplus.happycodings.com/

OFFICE AUTOMATION LAB

I - Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CF00109	Foundation	-	-	4	2	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil			Practical Classes: 45		Total Classes: 45		

Course Objectives:

- Learning about the Computer internal components.
- Practice on operating system installation and configuration settings.
- Prepare productivity tools like word processors, spreadsheets, presentations.

Course Outcomes:

- Able to Assemble and dissemble the computer components.
- Able to prepare power point presentations
- Able to construct data charts and graphs.
- Able to generate reports.
- Prepare professional documents, perform accounting operations, and prepare professional multimedia presentations.

Exp-1	Learn about computer internal parts & Peripherals.
Exp-2	Assembling & Disassembling a Computer.
Exp-3	Installation of various Operating Systems.
Exp-4	Networking two or more computers and document the process.
Exp-5	Browsing Internet and creating an email account: Studying various web browsers and their features.
Exp-6	**Word Processor**: Introduction to Word:Creating project Certificate; Abstract features to be covered; Formatting Styles: Inserting table, bullets and numbering, changing text direction, cell alignment, footnote, hyperlink, symbols, spell check, images from files and clipart, drawing toolbar and Word Art, formatting images, textboxes and paragraphs, Page numbers, Header and Footer, Mail merge, Macro.
Exp- 7	**Spreadsheet-I**: Spreadsheet basics, modifying worksheets, formatting cells, formulas and functions.
Exp-8	**Spreadsheet-II**: Sorting and filtering, charts, naming and inserting worksheets, hyper linking, count function, sorting, and conditional formatting.

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Exp-9	**Presentations**: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Optional Tasks:

Exp-10	A report on specifications of Laboratory Equipment
Exp-11	A report on different Antivirus softwares and their installation, usage.

References:

1. Introduction to Computers, Peter Norton, Mc Graw Hill.
2. "MOS study guide for word, Excel, Power point & Outlook Exams", John Lambert, Joyce Cox, PHI.

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ARTIFICIAL INTELLIGENCE

II- Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CF00203	Elective	3	-	-	3	40	60	100

Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 50

Course Objectives:

- To Introduce Artificial Intelligence
- To Teach about the machine learning environment
- To Present the searching Techniques for Problem Solving
- To Introduce Natural Language Processing and Perception

Course Outcomes:

- Apply searching techniques for solving a problem
- identify and describe artificial intelligence techniques, including search heuristics, knowledge representation, automated planning and agent systems, machine learning, and probabilistic reasoning;
- identify and apply AI techniques to a wide range of problems, including complex problem solving via search, knowledge-base systems, machine learning, probabilistic models, agent decision making, etc.;
- design and implement appropriate AI solution techniques for such problems;
- Communicate clearly and effectively using the technical language of the field correctly.

UNIT-I	Classes: 10

The AI problems, what is an AI technique, the levels of the model, the underlying assumption, problems; **Problem spaces and search**: Defining the problem as a state space search, production systems, problem characteristics and production system characteristics; **Problem-solving**: Uninformed search strategies; Informed search strategies: Heuristic search strategies, local search algorithms and optimization problems, backtracking search for CSP.

UNIT-II	Classes: 10

Logical agents, knowledge-based agents, the wumpus world and propositional logic, reasoning patterns in propositional logic and agents based on propositional logic; **First-order logic**: Syntax and semantic of first-order logic, knowledge engineering in first-order logic; **Inference in first-order logic**: Propositional vs first-order inference, unification and lifting, forward chaining, backward chaining, resolution.

UNIT-III	Classes: 10

Categories and objects, actions, situations and events, mental events and mental objects: The internet shopping world, truth maintenance systems., Uncertain knowledge and reasoning: Uncertainty, acting under uncertainty, basic probability
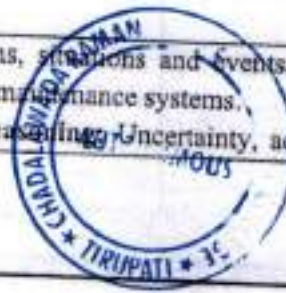
notation, the axioms of probability, inference using full joint distributions, independence, Baye's rule and its use.

UNIT-IV	Classes: 10

Learning from observations, forms of learning, Inductive learning: Learning decision trees, ensemble learning; Why learning works: Computational learning theory.

UNIT-V	Classes: 10

Knowledge in learning: A logical formulation of learning, knowledge in learning; Neural networks; Fuzzy logic systems: Introduction, crisp sets, fuzzy sets, some fuzzy terminology. fuzzy logic control, sugeno style of fuzzy inference processing, fuzzy hedges, α cut threshold.

Text Books:

1. Russell, Norvig-"Artificical Intelligence-A Modern Approach",2e, 2004, PEA
2. Giarrntano, Riley-"Expert Systems-Principles and Programming", 3e,2003, Thomson

Reference Books:

1. George F Luger – "Artificial Intelligence-Structures and strategies for Complex problem Solving", 4e, 2004, PEA.
2. Rich, Knight, Nair – "Artificial Intelligence", 3e, TMH.

Web References:

* https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_overview.htm
* http://www.ggu.ac.in/download/ClassNote13/Artificial%20Intelligence%20and%20xpert%20System_24.10.13.pdf
* https://sumytsaju.files.wordpress.com/2016/05/cource-outline.pdf
* nptel.ac.in/syllabus/syllabus_pdf/106106126.pdf
* http://www.udacity.com/
* http://www.library.thinkquest.org/2705/
* http://www.ai.eecs.umich.edu/
* http://www.macs.hw.ac.uk/alison/ai3notes/chapter2_5.html

E-Text Books:

* http://web.cecs.pdx.edu/~mperkows/CLASS_479/2017_ZZ_00/02__GOOD_Russel=Norvig=Artificial%20Intelligence%20A%20Modern%20Approach%20(3rd%20Edition).pdf
* https://bookauthority.org/books/best-artificial-intelligence-ebooks
* http://www.stpk.cs.rtu.lv/sites/all/.../Artificial%20Intelligence%20A%20Modern%20Approach.pdf
* http://www.bookboon.com/en/artificial-intelligence-ebooks
* http://www.onlineprogrammingbooks.com/ai-and-robotics
* http://www.e-booksdirectory.com

SOFTWARE ENGINEERING

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DATA MINING

II- Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CF00208	Elective	3	-	-	3	40	60	100
Contact Classes:50	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:50		

Course Objectives:

- Understand data warehouse and online analytical processing technology for data mining.
- Make mining association with rules in large databases, do classification and prediction with different techniques.
- Conceptualize the architecture of a data warehouse and the need for pre-processing.

Course Outcomes:

- To understand the basic principles, concepts and applications of data warehousing and data mining.
- Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- Have a good knowledge of the fundamental concepts that provide the foundation of data mining.
- Develop and understand data mining applications and trends of data mining.
- Analyze the major techniques of preprocessing for different types of data.

Unit - I	Classes:10

Data Warehousing: Introduction to data mining: Motivation, importance, definition of data mining, kinds of data mining, kinds of patterns, data mining technologies, kinds of applications targeted, major issues in data mining; Preprocessing: data objects and attribute types, basic statistical descriptions of data, data visualization, data quality, data cleaning, data integration, data reduction, data transformation and data discretization.

Unit - II	Classes:10

Business Analysis: Data warehouse and OLAP technology for data mining, what is a data warehouse, multi-dimensional data model, data warehouse architecture, data warehouse implementation, development of data cube technology, data warehousing to data mining; Data preprocessing: Data summarization, data cleaning, data integration and transformation data reduction, discretization and concept hierarchy generation.

Unit - III	Classes:10

Data Mining: Data mining primitives: Define a data mining, data mining query language, designing graphical user interfaces based on a data mining query language. Concept description: Characterization and comparison, analytical characterization, mining class comparison, mining, descriptive statistical measures in large databases.

Unit - IV	Classes:10

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Association Rule Mining And Classification: Mining frequent patterns, associations and correlations, mining methods, mining various kinds of association rules, correlation analysis, constraint based association mining, classification and prediction, basic concepts, decision tree induction, Bayesian classification, rule based classification, classification by back propagation.

Unit –V	
	Classes:10

Clustering And Trends In Data Mining: Cluster analysis: Types of data, categorization of major clustering methods, K-means partitioning methods, hierarchical methods, density based methods, grid based methods, model based clustering methods, clustering, high dimensional data, constraint based cluster analysis, outlier analysis; Trends in data mining: Data mining applications, data mining system products and research prototypes, social impacts of data mining.

Text Books:

1. Jiawei Han, Michelin Kamber, "Data Mining-Concepts and techniques", Morgan Kaufmann Publishers, Elsevier, 2nd Edition, 2006.
2. Alex Berson, Stephen J. Smith, "Data Warehousing Data Mining and OLAP", Tata McGraw-Hill, 2nd Edition, 2007.

References:

1. Arun K Pujari, "Data Mining techniques", Universities Press, 3rd Edition, 2005
2. Pualraj Ponnaiah, "Data Warehousing Fundamentals", Wiley, Student Edition.2004,
3. E. Balagurusamy, "Programming in ANSI C", Mc Graw Hill Education, 6th Edition, 2012.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", Wiley, Student Edition, 2006.
5. Vikram Pudi, P Radha Krishna, "Data Mining", Oxford University, 1st Edition, 2007.

Web References

* http://www.anderson.ucla.edu
* https://www.smartzworld.com
* http://iiscs.wssu.edu

E-Text Books:

* https://www.cisco.com/application/pdf/en/us/guest/products/ps2011/c2001/ccmigration_09 186a00802342cf.pdf
* https://www.jntubook.com
* http://ftp.utcluj.ro/pub/users/cemil/dwdm/dwdm_Intro/0_5311707.pdf.

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ARTIFICIAL INTELLIGENCE USING R LAB

II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CF00213	Core	-	-	4	2	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total Classes: 45		

Course Objectives:

- Able to Install and use R for simple programming tasks.
- To Extend the functionality of R by using add-on packages
- Understand basic idea of how to program in R and its working environment.
- Understand how to write simple facts using R
- Extract data from files and other sources and perform various data manipulation tasks on them.

Course Outcomes:

- Create a software application using the Java programming language.
- Debug a software application written in the Java programming language.
- Test a software application written in the Java programming language.
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments

Week-1

1. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing using R.

Week-2

1. Write a program to solve 8 queens problem using R.

Week-3

1. Write a Program to Solve any problem using depth first search using R.
2. Write a Program to Solve any problem using best first search using R.

1. Write a program to implement factorial, Fibonacci of a given number using R.

Week-5

1. Write a program to solve Robot (traversal) problem using means End Analysis using R.

Week-6

1. Write a program to solve traveling salesman problem using R.

Week-7

1. Write a program to solve water jug problem using R.

Week-8

1. Write a program to solve the Monkey Banana problem using R.

Week-9

1. Write a program to solve 8-puzzle problem using best first search

Web References:

- https://www.dbit.ac.in/cse/syllabus/artificial-intelligence-lab.pdf
- https://www.brcmcet.edu.in/downloads/files/n51c82bcca56b1.pdf

FULL STACK TECHNOLOGIES

III – Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CF00301	Core	3	-	-	3	40	60	100
Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 50		

Course Objectives:

From the course the student will learn
- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
- Write backend code in Python/Java, PHP languages and Writing optimized front end code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement.

Course Outcomes:

At the end of the course, student will be able to

- Identify the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Creating & Running Applications using JSP libraries
- Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form
- Working with the Files in React JS and Constructing Elements with Data

Unit-I		

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. **Markup Languages:** XHTML an Introduction to HTML, History, Versions, Basic, XHTML Syntax and Semantics Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-FormsHTML 5.0. **Classes: 10**

Unit-II		

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow-CSS3.0, Boot strap basics, Boot strap CSS3, Introduction to Java Script, Jscript basics, JScripts objects, JSON, Don. **Classes: 10**

Unit-III		

Separating Programming and Presentation: JSP Technology, Introduction to JSP and Servlets Running JSP Applications, Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files Support for the Model-View-Controller Paradigm- Mongo DB, JQuery, Mean stackFundamentals. **Classes: 10**

Unit-IV		

Classes: 10

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Introducing AngularJS, Starting Out with AngularJS, Basic AngularJS, Directives and Controllers, AngularJS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in AngularJS, Forms, Inputs, and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ngModelOptions, Nested Forms with ng-form, Other Form Controls.

Unit-V	
	Classes: 10

Introduction to React, Obstacles and Roadblocks, keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, React DOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories

Text Books:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006

2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007

3. AngularJS: Up and Running Enhanced Productivity with Structured Web Apps By Brad Green, Shyam Seshadri Publisher: O'Reilly Media

4. Learning React Functional Web Development with React and Redux By Alex Banks, Eve Porcello Publisher: O'Reilly Media

5. Head First Java, 2nd Edition by Bert Bates, Kathy Sierra Publisher: O'Reilly Media, Inc

Reference Books:

1. An Introduction to web Design and Programming –Wang-Thomson
2. Web Applications Technologies Concepts-Knuckles, John Wiley

Web References:

* http://www.jkmaterials.yolasite.com/resources/materials/webtechnology/JWT/Web-Technologies-Notes.pdf

E-Text Books:

* http://iiti.ac.in/people/~tanimad/JavaTheCompleteReference.pdf
* http://www.sebizfinishingschool.com/ebook/java/Java%202%20%20The%20Complete%20Reference%20(5th%20Edition).pdf
* https://rungringjung.files.wordpress.com/2010/10/javaserver-pages-jsp.pdf

MACHINE LEARNING

III – Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20F00302	Elective	3	-	-	3	40	60	100
Contact Classes: 50	Tutorial Classes: Nil	Practical Classes: Nil				Total classes:50		

Course Objectives:

The course should enable the students to:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Analyze a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

Course Outcomes:

- Explain the definition and usage of the term 'the internet of things' in different contexts.
- Demonstrate on various network protocols used in IoT.
- Analyze on various key wireless technologies used in IoT systems, such as WiFi,6LoWPAN, Bluetooth and ZigBee.
- Illustrate on the role of big data, cloud computing and data analytics in IoT system.
- Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software.

Unit-I	Classes: 10

Introduction: Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

Unit-II	Classes: 10

Supervised Learning- Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

Unit-III	Classes: 10

Statistical Learning- Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

Unit-IV	Classes: 10

Support Vector Machines (SVM) Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data, Linear

Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines.

Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

Unit-V	
	Classes: 10

Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. Decision Tree Learning: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

Text Books:

1. Applied Machine Learning, M. Gopal, McGraw Hill Education
2. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012
3. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2009 (freely available online)

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007
2. Programming Collective Intelligence: Building Smart Web 2.0 Applications - Toby Segaran
3. Building Machine Learning Systems with Python - WilliRichert, Luis Pedro Coelho

Web References:

* https:// medium.com/machine-learning

E-Text Books:

https://www.kdnuggets.com/2016/10/5-free-ebooks-machine-learning

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Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CF00311	Core	-	-	3	2	40	60	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes:45

Course Objectives:

From the course the student will Learn
- The core concepts of both the frontend and backend programming course.
- Get familiar with the latest web development technologies.
- Learn all about SQL and Mongo databases.

Course Outcomes:

At the end of the course, student will be
- Able to Identify the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Creating & Running Applications using JSP libraries
- Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form Working with the Files in React JS and Constructing Elements with Data
- Creating Our First Controller Working with and Displaying an Online fee payment form using JScript and MangoDB

List of Programs

Week-1	Implementation of 'get' and 'post' methods
Week-2	CSS implementation in colors, boarder padding
Week-3	CSS implementation button frames tables, navigation bars.
Week-4	Create registration and login forms with validations using Jscript query.
Week-5	Jscript to retrieve student information from student database using database connectivity.
Week-6	Angular Js data binding
Week-7	Angular JS directives and Events
Week-8	Using angular Js fetching data from MySQL.
Week-9	Using React Js creating constructs data elements.
Week-10	Using React Js implementations DoM
Week-11	Invoking data using Jscript with Mongo DB
Week-12	Create an Online fee payment form using Script and MangoDB

Reference Books

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
3. Angular JS: Up and Running Enhanced Productivity with Structured Web Apps By Brad Green, Shyam Seshadri Publisher: O'Reilly Media

Machine Learning Lab.

20CF00312	core	L	T	P	C	CIA	SEE	Total
		-	-	3	2	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total classes:45		

Course Objectives:
- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Identify and apply Machine Learning algorithms to solve real world problems

Course Outcomes:
- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Building an Artificial Neural Network for machine learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Week-1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
Week-2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
Week-3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
Week-4	Build an Artificial Neural Network by implementing the Back propagation Algorithm and test the same using appropriate data sets..
Week-5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test datasets.
Week-6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
Week-7	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
Week-8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
Week-9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem
Week-10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs..

References:

COMPUTER INTEGRATED MANUFACTURING

I M.Tech. I SEMESTER :CAD/CAM

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD03102	Core	4	-	-	4	40	60	100
Contact Classes: 64	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 64		

Course Objectives:

This course will enable the student

1. To gain knowledge about the basic fundamental of CAD and in-depth coverage of computer Integrated Manufacturing
2. To gain knowledge on how computers are integrated at various levels of planning and manufacturing
3. To understand computer aided planning and control and co   mputer monitoring.
4. This subject contains a high proportion of hands-on study, particularly in the areas of computer Aided Design and Computer Aided Manufacturing.

UNIT-I	Introduction

Introduction: Fundamental concepts in Manufacturing and Automation, Automation Strategies, Economic analysis in production, fundamentals of CAD / CAM, product cycle and CAD/CAM, Automation and CAD/CAM, Scope of CIM, Automated flow lines, Transfer mechanisms, methods of Line balancing.   Classes: 12

Numerical control machines: Introduction- basic components of an NC system-the NC procedure- NC coordinate system, NC motion control system- application of numerical control-Economics of Numerical control.

UNIT-II	NC part programming:

Introduction - The Bunch tape in NC - Tape code format - manual part programming. NC programming with manual data input. NC Program for regular shape objects   Classes: 14

UNIT-III	Computer controls in NC & Group Technology:

Computer controls in NC: Introduction to NC controllers' technology - Computer Numerical Control (CNC), Direct Numerical control (DNC).   Classes: 14

Group Technology: Part families, parts classification and coding, production flow analysis, Composite part concept, Machine cell design, benefits of Group Technology.

UNIT-IV	Flexible Manufacturing Systems & Computer Aided Planning systems:

Flexible Manufacturing Systems: Components of FMS, FMS Work stations, Material Handling Systems, and Computer Control system, FMS layout configurations and benefits of FMS, Machine vision.   Classes: 14

Computer aided planning systems: Approaches to Computer aided Process Planning (CAPP) - Generative and Retrieval CAPP systems, benefits of CAPP, Material Requirement Planning (MRP), mechanism of MRP, benefits, and Capacity Planning.

UNIT-V	Computer integrated manufacturing

Computer integrated manufacturing: Adaptive control machining systems. Adaptive control optimization system, adaptive control constraint system, applications to machining processes, computer process monitoring. hierarchical structure of computers in manufacturing, and computer process control. Knowledge-Based Systems, Expert Systems Technology   Classes: 14

Text Books:

1. Automation, Production systems and Computer Integrated Manufacturing Systems – Mikel P.Groover, PHI Publishers.
2. Xun Xu, Integrating advanced Computer Aided Design, Manufacturing and Numerical Control, IGI Global, 2009, UK

Reference Books:

1. J.A. Rehg & H. W. Kraebber, Computer Integrated Manufacturing, Pearson Education, 2005, India
2. CAD/CAM - Mikell P.Groover, and Emory Zimmers.Jr. PHI Publishers.
3. Computer Aided Design and Manufacturing. K. Lalit Narayan, K. Mallikarjuna Rao, MMM Sarcar. PHI Publishers.
4. CAD/CAM/CIM, Radhakrishnan and Subramanian, New Age Publishers.

RAPID PROTOTYPING

Course Code	Category	Hours / Week			Credits	Maximum Marks		
21CD03103	Core	L	T	P	C	CIA	SEE	Total
		4	-	-	4	40	60	100
Contact Classes: 64	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 64		

UNIT-I	INTRODUCTION TO RAPID PROTOTYPING	Classes : 14

Introduction: Need for the compression in product development, History of RP system, Survey of applications, Growth of RP industry and classification of RP system. RPT and its role in modern manufacturing mechanical design.

Stereo Lithography System: Principle, Process parameter, Process details, Data preparation, Data files and machine details, Applications.

UNIT-II	FUSION DECOMPOSITION MODELING & SOLID GROUND CURING	Classes : 14

Fusion Decomposition Modeling: Principle, process parameter, Path generation, Applications.
Solid ground curing: Principle of operation, Machine details, Applications,

UNIT-III	Laminated Object Manufacturing & CONCEPTS MODELERS	Classes: 12

Laminated Object Manufacturing: Principle of Operation, LOM materials, Process details, Applications.
Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer, Genisys Xs printer HP system 5, Object Quadra system.

UNIT-IV	LASER ENGINEERING NET SHAPING (LENS)	Classes : 14

LASER ENGINEERING NET SHAPING (LENS)

Rapid Tooling: Indirect Rapid tooling- Silicon rubber tooling- Aluminum filled epoxy tooling, Spray metal tooling, Cast kriksite, 3Q keltool, etc, Direct Rapid Tooling Direct. AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft, Tooling vs. hard tooling.

Software for RP: STL files, Overview of Solid view, magics, imics, magic communication, etc. Internet based software, Collaboration tools.

UNIT-V	RAPID MANUFACTURING PROCESS OPTIMIZATION	Classes : 14

Factors influencing accuracy, Data preparation error, Part building error, Error in finishing, Influence of build orientation.

Text Books:

1. Rapid Prototyping Technology, Kenneth G. Cooper, Marcel Dekker,INC.
2. Rapid Manufacturing, Flham D.T & Dinjoy S.S, Verlog London 2001.
3. Rapid Prototyping theory & practice, Manufacturing System Engineering Series, Ali K.Kamarani, Springer Verlag.

References:

1. Rapid prototyping, Andreas Gebhardt, Hanser Gardener Publications, 2003
2. Rapid Prototyping and Engineering applications: A tool box for prototype development, Liou W.Liou, Frank W.Liou, CRC Press, 2007.

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PROFESSIONAL ELECTIVE-III
SPECIAL MANUFACTURING PROCESS

I M.Tech. II SEMESTER: CAD/CAM

Course Code	Category	Hours / Week			Credits	Maximum Marks		
21CD03206	Core	L	T	P	C	CIA	SEE	Total
		4	-	-	4	40	60	100
Contact Classes: 64	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 64		

UNIT-I	SURFACE TREATMENT	Classes : 14

Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT-II	PROCESSING OF CERAMICS	Classes : 14

Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application, finishing of ceramics. Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

UNIT-III	FABRICATION OF MICROELECTRONIC DEVICES	Classes: 12

Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in micro electronics, surface mount technology, Integrated circuit economics

UNIT-IV	ADVANCED MACHINING PROCESSES	Classes : 14

EDM, WireEDM, ECM, LBM, EBM, AJM, WJM – Principle, working, limitations and applications.

UNIT-V	RAPID PROTOTYPING	Classes : 14

Working Principles, Methods, Stereo Lithography, Laser Sintering, Fused Deposition Method, Applications and Limitations, Rapid tooling, Techniques of rapid manufacturing

Text Books:

1. Manufacturing Engineering and Technology I Kalpakijian / Adisson Wesley, 1995.
2. Process and Materials of Manufacturing / R. A. Lindburg / 1th edition, PHI 1990.

Reference Books:

1 Microelectronic packaging handbook / Rao. R. Thummala and Eugene, J. Rymaszewski / Van Nostrand Renihold,
2 MEMS & Micro Systems Design and manufacture / Tai — Run Hsu / TMGH
3 Advanced Machining Processes / V.K.Jain / Allied Publications.
4. Introduction to Manufacturing Processes / John A Schey I Mc Graw Hill.

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ADVANCED COMPUTER ARCHITECTURE

M.Tech I Semester: VLSI System Design

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Tota
21CD04107	Core	4	0	0	4	40	60	100
Contact Classes:64	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 64		

COURSE OBJECTIVES:

- To give an exposure on look ahead pipelining- parallelism, multiprocessor scheduling, multithreading and various memory organizations

COURSE OUTCOMES:

- Apply the basic knowledge of partitioning and scheduling in Multiprocessors.
- Able to analyze and design cache memory, virtual memory and shared memory organizations.
- Able to distinguish and analyze the design properties of Linear and Non – Linear processors.
- Able to analyze the principles of multithreading in hybrid Architectures.
- Able to analyze any parallel programming models for various architectures and applications.

UNIT - I	MULTIPROCESSORS AND MULTI-COMPUTERS	Classes: 13

Multi-vector and SIMD computers. PRAM and VLSI Models. Conditions of parallelism. Program partitioning and scheduling. Program flow mechanisms. Parallel processing applications. Speed up performance law.

UNIT - II	ADVANCED PROCESSOR TECHNOLOGY	Classes: 13

Superscalar and vector processors. Memory hierarchy technology. Virtual memory technology. Cache memory organization. Shared memory organization

UNIT - III	LINEAR PIPELINE PROCESSORS	Classes: 13

Non linear pipeline processors. Instruction pipeline design. Arithmetic design. Superscalar and super pipeline design. Multiprocessor system interconnects. Message passing mechanisms.

UNIT-IV	VECTOR PROCESSING PRINCIPLE	Classes: 12

Multivector multiprocessors. .Compound Vector processing. Principles of multithreading. Fine grain multicomputer. Scalable and multithread architectures. Dataflow and hybrid architectures.

UNIT-V	PARALLEL PROGRAMMING MODELS	Classes: 13

Parallel languages and compilers. Parallel programming environments. Synchronization and multiprocessing modes. Message passing program development. Mapping programs onto multicomputer. Multiprocessor UNIX design goals. MACH/OS kernel architecture. OSF/1 architecture and applications

Text Books:

1. K. Hwang, "Advanced Computer Architecture ", Tata McGraw Hill, 2001.
2. W. Stallings," Computer Organization and Architecture", McMillan, 1990

Reference Books:

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer", McGraw Hill, 1994.
2. Recent literature in Advanced Computer Architecture

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CPLD & FPGA ARCHITECTURES AND APPLICATIONS

M.Tech I Semester: VLSI System Design

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD04109	Core	4	0	0	4	40	60	100
Contact Classes:	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 64		

COURSE OBJECTIVES:

- To give an insight to the students about the significance of CMOS technology and fabrication process.
- To teach the importance and architectural features of programmable logic devices
- To introduce the ASIC construction and design algorithms
- To teach the basic analog VLSI design techniques
- To study the Logic synthesis and simulation of digital system with Verilog HDL

COURSE OUTCOMES:

- Know about different commercially available FPGA and CPLD architectures.
- Design logic blocks using optimization techniques.
- Understand the top down design of digital circuits.
- Know about mentor graphics EDA tool.

UNIT - I	PROGRAMMABLE LOGIC	Classes: 14

ROM, PLA, PAL, PLD, PGA – Features, Programming and Applications using Complex Programmable Logic Devices Altera Series – Max 5000/7000 Series and Altera FLEX Logic – 10000 Series CPLD, AMD"s – CPLD (Mach 1 To 5); Cypres FLASH 370 Device Technology, Lattice Plsi"s Architectures – 3000 Series – Speed Performance and in System Programmability.

UNIT - II	FPGA	Classes: 12

Field Programmable Gate Arrays – Logic Blocks, Routing Architecture, Design Flow, Technology Mapping J for FPGAs.
Case Studies: Xilinx XC4000 & ALTERA"s FLEX 8000/10000 FPGAs: AT & T – ORCA"s (Optimized Reconfigurable Cell Array): ACTEL"s – ACT-1,2,3 and Their Speed Performance

UNIT – III	FINITE STATE MACHINES (FSM)	Classes: 14

Top Down Design – State Transition Table, State Assignments for FPGAs. Problem of Initial State Assignment for One Hot Encoding. Derivations of State Machine Charges.
Realization Of State Machine: Charts with a PAL. Alternative Realization for State Machine Chart using Microprogramming. Linked State Machines. One – Hot State Machine, Petrinetes for State Machines – Basic Concepts, Properties. Extended Petrinetes forParallel Controllers. Finite State Machine – Case Study, Meta Stability, Synchronization

UNIT - IV	FSM ARCHITECTURES AND SYSTEMS LEVEL DESIGN	Classes: 12

Architectures Centered Around Non-Registered PLDs. State Machine Designs Centered Around Shift Registers. One – Hot Design Method. Use of ASMs in One – Hot Design. K Application of One – Hot Method. System Level Design – Controller, Data Path and Functional Partition.

UNIT V	DIGITAL FRONT END DIGITAL DESIGN TOOLS FOR FPGAS & ASICS	Classes: 12

Using Mentor Graphies EDA Tool ("FPGA Advantage") – Design Flow Using FPGAs – Guidelines and Case Studies of Paraller Adder Cell, Paraller Adder Sequential Circuits, Counters, Multiplexers, Parallel Controllers.

Text Books:

1. P.K.Chan& S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall (Pte), 1994.
2. S.Trimberger, Edr., Field Programmable Gate Array Technology, Kluwer Academic Pub,1994.

Reference Books:

EMBEDDED SYSTEM DESIGN

M.Tech II Semester: VLSI SYSTEM DESIGN

Course Code	Category	Hours / Week			Credit	Maximum		
		L	T	P	C	CIA	SEE	Tota
21CD04104	Core	4	0	0	4	40	60	100
Contact Classes:	Tutorial Classes: Nil	Practical Classes:				Total Classes: 64		

COURSE OBJECTIVES:

- To study the the issues relating to hardware and software design concepts.
- To study the the concept of low power microcontrollers.

COURSE OUTCOMES:

- The issues relating to hardware and software design concepts associated with processor in Embedded Systems.
- The concept of low power microcontrollers.
- The hardware software co- design issues pertaining to design of an Embedded System using low power microcontrollers.

UNIT – I	INTRODUCTION TO EMBEDDED ELECTRONIC SYSTEMS AND MICROCONTROLLERS	Classes: 15

An Embedded System-Definition, Embedded System Design and Development Life Cycle, An Introduction to Embedded system Architecture, The Embedded Systems Model, Embedded Hardware: The Embedded Board and the von Neumann Model, Embedded Processors: ISA Architecture Models, Internal Processor Design, Processor Performance, Board Memory: Read-Only Memory (ROM), Random-Access Memory (RAM), Auxiliary Memory, Memory Management of External Memory and Performance, Approaches to Embedded Systems, Small Microcontrollers, Anatomy of a Typical Small Microcontroller, Small Microcontrollers Memory, Embedded Software, Introduction to small microcontroller (MSP430)

UNIT – II	MSP430 – I	Classes: 13

Architecture of the MSP430 Processor: Central Processing Unit, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Examples, Reflections on the CPU and Instruction Set, Resets, Clock System, Memory and Memory Organization.
Functions, Interrupts, and Low-Power Mode: Functions and Subroutines, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C and Assembly Language, Interrupts, Interrupt Service Routines, Issues Associated with Interrupts, Low-Power Modes of Operation

UNIT - III	MSP430 – II	Classes: 12

Digital Input, Output, and Displays:Parallel Ports, Digital Inputs, Switch Debounce, Digital Outputs, Interface between Systems, Driving Heavier Loads, Liquid Crystal Displays, Simple Applications of the LCD.
Timers: Watchdog Timer, Timer_A, Timer_A Modes, Timer_B,Timer_B Modes, Setting the Real-Time Clock, State Machines

UNIT IV	MSP430 COMMUNICATION	Classes: 12

Communication Peripherals in the MSP430, Serial Peripheral Interface, SPI with the USI, SPI with the USCI, A Thermometer Using SPI Modes, Inter-integrated Circuit Bus(I²C) and its operations, State Machines for I²C Communication, A Thermometer Using I²C, Asynchronous Serial Communication, Asynchronous Communication with the USCI_A, A Software UART Using Timer_A, Other Types of Communication

UNIT-V	MSP430 CASE STUDIES	Classes: 12

Introduction to Code Composer studio (CC Studio Ver- 6.1) a tutorial, A Study of blinking LED, Enabling LED using Switches, UART Communication, LCD interfacing, Interrupts, Analog to Digital Conversion, General Purpose input and output ports, I2C.

Text Books:

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING							
I M.Tech (CSE), I- SEMESTER – 2021-22							
COURSE : MACHINE LEARNING							
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD05110	PE-II	4	-	-	4	40	60	100
Classes : 60 Hrs	Tutorial: Nil	Practical Classes: Nil				Total Classes: 60Hrs		

Objectives:

1. To understand the basic theory underlying machine learning.
2. To be able to formulate machine learning problems corresponding to different applications.
3. To understand a range of machine learning algorithms along with their strengths and weaknesses.
4. To be able to apply machine learning algorithms to solve problems of moderate complexity.

Outcomes:

Upon completion of this course, students will be familiar with several

1. Powerful search techniques for automatically solving complex problems.
2. Will have sufficient expertise in both the theory of machine learning and its application to data mining.
3. To use these powerful techniques in a wide range of industrial contexts, for example, bioinformatics, electronic commerce, and finance.

UNIT-I   What is Machine Learning?, Examples of machine learning applications, supervised Learning   **14Hrs**

Learning a class from examples, Vapnik- Chervonenkis dimension, probably approximately correct learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised machine learning algorithm. Decision Tree Learning: Introduction, Decisions Tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, issues in decision tree learning, Artificial Neural Networks: Introduction, Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithm, Remarks on the BACKPROPGRATION Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.

UNIT-II   **Evaluating Hypotheses**

                                             12Hrs

Motivation, Estimating hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, differences in error of two hypothesis, comparing learning algorithms, Bayesian Learning: Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and least squared error hypothesis, Maximum Likelihood hypothesis for predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm , Naïve Bayes Classifier , Bayesian Belief Network, EM Algorithm

UNIT-III **Dimensionality Reduction**

                                             12Hrs

Introduction, Subset selection, principle component analysis, feature embedding, factor analysis, singular value decomposition and matrix factorization, multidimensional scaling, linear discriminant analysis, canonical correlation analysis, Isomap, Locally linear embedding, laplacian eigenmaps, Clustering: Introduction, Mixture densities, K- Means clustering, Expectations- Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchal clustering, Choosing the number of clusters, Nonparametric Methods: Introduction, Non Parametric density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbor, Distance based classification, outlier detection, Nonparametric regression: smoothing models, how to choose the smoothing parameter.

UNIT-IV Linear Discrimination

12Hrs

Introduction, Generalizing the linear model, geometry of the linear discrimination, pair wise separation, parametric discrimination revisited, gradient descent, logistic discrimination, discrimination by regression, learning to rank, Multilayer Perceptrons: Introduction, the perceptron, training a perceptron, learning Boolean functions, multilayer perceptrons, MLP as a universal approximator, Back propagation algorithm, Training procedures, Tuning the network size, Bayesian view of learning, dimensionality reduction, learning time, deep learning

UNIT-V Kernel Machines

10Hrs

Introduction, Optimal separating hyper plane, the non separable case: Soft Margin Hyper plane, v-SVM, kernel Trick, Vectorial kernels, defining kernels, multiple kernel learning, multicast kernel machines, kernel machines for regression, kernel machines for ranking, one-class kernel machines, large margin nearest neighbor classifier, kernel dimensionality reduction, Graphical models: Introduction, Canonical cases for conditional independence, generative models, d separation, belief propagation, undirected Graphs: Markov Random files, Learning the structure of a graphical model, influence diagrams.

Text Books:

1. Machine Learning by Tom M. Mitchell, Mc Graw Hill Education, Indian Edition, 2016.
2. Introduction to Machine learning, Ethem Alpaydin, PHI, 3rd Edition, 2014.

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis, CRC Press Book

Web References:

1. https://www.coursera.org/learn/machine-learning
2. https://www.reddit.com/r/MachineLearning/

E-Text Books:

1. http://www.kdnuggets.com/2016/12/packt-free-ebooks-machine-learning-python-data-analysis.html
2. http://www.e-booksdirectory.com/listing.php?category=284
3. http://web.cs.iastate.edu/~cs573x/texts.html

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD05207	PE-III	4	-	-	4	40	60	100
Classes : 60	Tutorial: Nil	Practical Classes: Nil				Total Classes: 60Hrs		

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
II M.Tech (CSE), II- SEMESTER – 2021-22
COURSE : PATTERN RECOGNITION

Objectives:

The course should enable the students to:
1. Describe various classifiers
2. Apply Markov Chain and Hidden Markov Models
3. Categorize the data objects to recognize the patterns based on template matching
4. Apply unsupervised learning algorithms to data objects

Outcomes:
1. Define various classifiers
2. Apply Markov Chain and Hidden Markov Models
3. Classify the data objects to recognize the patterns based on template matching
4. Apply unsupervised learning algorithms to data objects
5. Classify various Clustering algorithms

UNIT-I   Classifiers Based on Bayes Decision Theory   14Hrs

Classifiers Based on Bayes Decision Theory: Introduction, Bayes Decision Theory, Discriminant Functions and Decision Surfaces, Bayesian classification for Normal Distributions, The Gaussian Probability density function, The Bayesian classifier for normally distributed classes, Estimation of Unknown probability Density functions, Maximum likelihood parameter estimation, Maximum a Posteriori Probability estimation, Bayesian Inference, Maximum entropy estimation, Mixture models, Nonparametric estimation, The Naïve-Bayes Classifier.

UNIT-II   Linear Classifiers   12Hrs

Linear Classifiers: introduction, Linear discriminant functions and Decision hyperplanes, The Perceptron algorithm, Least square methods, Mean square error estimation, Stochastic approximation and the LMS algorithm, Sum of error squares estimation, Mean square estimation revisited, Mean square error regression, MSE estimates posterior class probabilities, The Bias-Variance dilemma, Logistic discrimination, Support Vector machines.

UNIT-III   Feature Selection   14Hrs

Feature Selection: Introduction, Preprocessing, Outlier removal, Data normalization, Missing data, The Peaking Phenomenon, Feature selection based on Statistical hypothesis testing, Hypothesis Testing basics, Application of the t-Test in Feature selection, The Receiver Operating Characteristics (ROC) Curve, Class Seperability Measures, Divergence, Chernoff Bound and Bhattacharyya distance, Scatter matrices, Feature subset selection

UNIT-IV   Feature Generation

8Hrs

Feature Generation: Basis vectors and Images, Singular Value Decomposition, Independent component analysis, Nonlinear Dimensionality Reduction, Discrete Fourier transform

UNIT-V   Template Matching

12HJrs

Template Matching: Measures based on Optimal Path Search, Measures based on correlations, Deformable Template Models, Context based Information Retrieval, Markov Chain and Hidden Markov Model, System Evaluation, Unsupervised Learning and Clustering.

Text Books:

1. S Theodoridis and K Koutroumbas – "Pattern Recognition", 4th Edition, Academic Press, 2009.
2. C Bishop – "Pattern Recognition and Machine Learning" – Springer, 2006

Reference Books:

1. Pattern Recognition: From Classical to Modern Approaches, Sankar K. Pal, Amita Pal – 2001.
2. Pattern Recognition: An Algorithmic Approach, M. Narasimha Murty, V. Susheela Devi – 2011

Web References:

1. https://www.coursera.org/courses?languages=en&query=pattern%20recognition
2. nptel.ac.in/courses/117108048/
3. https://www.mathworks.com/discovery/pattern-recognition.html

E-Text Books:

1. http://users.isr.ist.utl.pt/~wurmd/Livros/school/Bishop –PatternRecognitionAndMachineLearning – Springer2006.pdf
2. www.manalhelal.com/Books/F2014/Pattern%20Recognition_2003.pdf

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Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD05208	PE-III	4	-	-	4	40	60	100
Classes : 60	Tutorial: Nil	Practical Classes: Nil				Total Classes: 60Hrs		

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
II M.Tech (CSE), II- SEMESTER – 2021-22
COURSE : CYBER SECURITY

Objectives:

The course should enable the students to:

1. Understand the core information assurance principles in n-tier web applications.
2. Identify the key components of cyber security network architecture.
3. Study on digital certificates, signatures and digital forensics for cyber crime investigation.
4. Determine the elements of web hacking, cyber crime investigation process and tools.

Outcomes:

1. Identify security tools and hardening techniques
2. Distinguish system and application security threats and vulnerabilities
3. Describe different classes of attacks
4. Define types of incidents including categories, responses and timelines for response
5. Describe new and emerging IT and IS technologies
6. Analyze threats and risks within context of the cyber security architecture
7. Evaluate decision making outcomes of cyber security scenarios

UNIT-I Introduction
10Hrs

A web security forensic lesson, web languages, introduction to different web attacks, overview of n-tier web applications; Web servers: Apache, IIS, database servers.

UNIT-II Review of Computer Security and Cyber Crimes Issues
12Hrs

Public key cryptography, RSA, online shopping, payment gateways, unauthorized access to computers, computer intrusions, white collar crimes, viruses and malicious code, internet hacking and cracking, virus attacks, pornography, software piracy, intellectual property, mail bombs, exploitation, stalking and obscenity in internet, digital laws and legislation, law enforcement roles and responses.

UNIT-III Web Hacking Basics and Investigation
14Hrs

Web hacking basics HTTP and HTTPS URL, web under the cover overview of java security reading the HTML source, applet security, servlets security, symmetric and asymmetric encryptions, network security basics, firewalls and IDS.

Investigation: Introduction to cyber-crime investigation, investigation tools, e-discovery, digital evidence collection, evidence preservation.

UNIT-IV Digital Certificates and Digital Forensics
12Hrs

Digital certificates, hashing, message digest, and digital signatures; Digital forensics: Introduction to digital forensics, forensic software and hardware, analysis and advanced tools, forensic technology and practices.

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UNIT-V   **Securing Databases, Laws and Acts**   **12Hrs**

Basics, secure JDBC, securing large applications, cyber graffiti; Laws and acts: Laws and ethics, digital evidence controls, evidence handling procedures; Basics of Indian Evidence Act IPC and CRPC: Electronic communication privacy act, legal policies.

Text Books:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, "Guide to Computer Forensics and Investigations", Information Security Professionals, 4th Edition, 2009.
2. Stuart McClure, Saumil Shah, Shreeraj Shah, "Web Hacking: Attacks and Defense", Addison-Wesley Professional, 1st Edition, 2002.

Reference Books:

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata Mc Graw Hill, 1st Edition, 2006.
2. Garms, Jess, Daniel Somerfield, "Professional Java Security", Wrox Press, Illustrated Edition, 2001.
3. Robert M Slade, "Software Forensics", Tata Mc Graw Hill, New Delhi, 1st Edition, 2005.

Web References:

1. http://www.mail.nih.gov/user/faq/tlsssl.htm
2. http://www.openssl.org/
3. http://www.ntsecurity.net/

E-Text Books:

1. https://www.mitre.org/sites/.../pr-13-1028-mitre-10-strategies-cyber-ops-center.pdf
2. https://www.coursera.org/specializations/cyber-security
3. https://www.ccdcoe.org/publications/books/NationalCyberSecurityFrameworkManual.pdf

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING							
II M.Tech (CSE), II- SEMESTER – 2021-22							
COURSE : R PROGRAMMING							
Course Code	Category	Hours / Week			Credits	Maximum Marks		
21CD05209	PE-IV	L	T	P	C	CIA	SEE	Total
		4	-	-	4	40	60	100
Classes : 60	Tutorial: Nil	Practical Classes: Nil				Total Classes: 60Hrs		

Objectives:

1. Understand the fundamentals of 'R' programming.
2. Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.
3. Explore data-sets to create testable hypotheses and identify appropriate statistical tests.

Outcomes:

1. Ability to Work on a real life Project, implementing R Analytics to create Business Insights.
2. Ability to analyze the data and results using R, a flexible and completely cross-platform.
3. Ability to use a wide range of analytical methods and produce presentation quality graphics.

Unit-I   Introducing R

12Hrs

Introducing R: Getting the Hand of R, Running the R Program, Finding Your Way with R, Command Packages. Becoming Familiar With R: Reading and Getting Data into R, Viewing Named Objects, Types of Data Items, The Structure of Data Items, Examining Data Structure Working with History Commands, Saving your Work in R. Working With Objects: Manipulating Objects, Viewing Objects within Objects, Constructing Data Objects, Forms of Data Objects: Testing and Converting.

UNIT-II   Data, Distribution, Simple Hypothesis Testing

13Hrs

Data: Descriptive statistics and tabulation. **Distribution:** Looking at the Distribution of Data **Simple Hypothesis Testing:** Using the Student,s t-test, The Wilcoxon U-Test (Mann-Whitney), Paired t- and U- Tests, Correlation and Covariance, Tests for Association.

UNIT-III   Introduction to Graphical Analysis

12Hrs

Introduction To Graphical Analysis: Box-whisker Plots, Scatter Plots, Pairs Plots(Multiple Correlation Plots) Line Charts, Pie Charts, Cleveland Dot Charts, Bar Charts, Copy Graphics to Other Applications. Formula Notation And Complex Statistics: Examples of Using Formula Syntax for Basic tests, Formula Notation in Graphics, Analysis of Variance (ANOVA).

UNIT-IV   Manipulating Data And Extracting Components

11Hrs

Manipulating Data And Extracting Components: Creating Data for Complex Analysis, Summarizing Data. Regression (Linear Modeling): Simple Linear Regression, Multiple Regression, Curvilinear Regression, Plotting Linear Models and Curve Fitting, Summarizing Regression Models.

UNIT-V   Writing Your Own Scripts

12Hrs

Adding elements to existing plots, Matrix plots, multiple plots in one window, exporting Graphs Writing your own scripts: Beginning to Program: Copy and Paste Scripts, Creating Simple Functions, Making Source Code.

Text Books:

1. "Beginning R the statistical programming language" Dr. Mark Gardener, Wiley Publications, 2015.

Reference Books:

1. Hands-On Programming with R Paperback by Grolemund (Author), Garrett (Author), SPD,2014. The R Book, Michael J. Crawley, WILEY, 2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
II M.Tech (CSE), II- SEMESTER – 2021-22
COURSE : COMPUTER VISION

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD05210	PE-IV	4	-	-	4	40	60	100
Classes : 60	Tutorial: Nil	Practical Classes: Nil				Total Classes: 60Hrs		

Objectives:

1. To review image processing techniques for computer vision
2. To understand shape and region analysis
3. To understand Hough Transform and its applications to detect lines, circles, ellipses
4. To understand three-dimensional image analysis techniques
5. To understand motion analysis
6. To study some applications of computer vision algorithms

Outcomes:

Upon completion of the course, the students will be able to:

1. Implement fundamental image processing techniques required for computer vision
2. Perform shape analysis
3. Implement boundary tracking techniques
4. Apply chain codes and other region descriptors
5. Apply Hough Transform for line, circle, and ellipse detections
6. Apply 3D vision techniques
7. Implement motion related techniques
8. Develop applications using computer vision techniques

UNIT-I   Image Processing Foundations

10Hrs

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT-II   Shapes and Regions

12Hrs

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT-III   Hough Transform

13Hrs

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

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UNIT-IV   3D Vision and Motion

12Hrs

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion

UNIT-V   Applications

13Hrs

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

Text Books:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

Reference Books:

1. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
2. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
3. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING								
II M.Tech (CSE), II- SEMESTER – 2021-22								
COURSE : ADVANCED DATABASES								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
21CD05212	PE-IV	4	-	-	4	40	60	100
Classes : 60	Tutorial: Nil	Practical Classes: Nil				Total Classes: 60Hrs		

Objectives:

1. To learn the modeling and design of databases.
2. To acquire knowledge on parallel and distributed databases and its applications.
3. To study the usage and applications of Object Oriented database
4. To understand the principles of intelligent databases.
5. To understand the usage of advanced data models.
6. To learn emerging databases such as XML, Cloud and Big Data.
7. To acquire inquisitive attitude towards research topics in databases.

Outcomes:

1. Select the appropriate high performance database like parallel and distributed database
2. Model and represent the real world data using object oriented database
3. Design a semantic based database to meaningful data access
4. Embed the rule set in the database to implement intelligent databases
5. Represent the data using XML database for better interoperability
6. Handle Big data and store in a transparent manner in the cloud
7. To solve the issues related to the data storage and retrieval

UNIT-I Parallel and Distributed Databases

13Hrs

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies

UNIT-II Object and Object Relational Databases

12Hrs

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT-III Intelligent Databases

12Hrs

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules- Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

UNIT-IV   Advanced Data Models
11Hrs

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

UNIT-V   Emerging Technologies
12Hrs

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases- XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

Text Books:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/ Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007

Reference Books:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill, 2006.
2. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2004.

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Generation and Transmission Systems

IV Semester: EEE

Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
19CA02402	Core	3	-	-	3	30	70	100
Contact Classes:48	Tutorial Classes: NIL	Practical Classes: NIL				Total Classes:48		

OBJECTIVES:

The course should enable the students to:

I. Demonstrate various conventional power generation systems including major subsystem.
II. Apply knowledge of non conventional power generating systems in design and implementation to obtain clean energy.
III. Calculation of different transmission line parameters and their use.
IV. Modelling of transmission line and evaluation of constants.

UNIT-I	CONVENTIONAL POWER GENERATING SYSTEMS	Classes: 10

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of TPS Components.

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.

Nuclear Power: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors.

UNIT-II	NON CONVENTIONAL POWER GENERATING SYSTEMS	Classes: 10

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.

UNIT-III	TRANSMISSION LINE PARAMETERS	Classes: 10

Types of Conductors - Calculation of Resistance for Solid Conductors - Calculation of Inductance for Single Phase and Three Phase, Single and Double Circuit Lines, Concept of GMR & GMD, Symmetrical and Asymmetrical Conductor Configurations with and without transposition. Calculation of Capacitance for 2 wire and 3 wire systems, Effect of Ground on Capacitance, Capacitance Calculations for Symmetrical and Asymmetrical Single and Three phase, Single and Double Circuit Lines, Numerical Problems.

UNIT-IV	MODELING OF TRANSMISSION LINES	Classes: 09

Classification of Transmission Lines - Short, Medium and Long Lines and their Models - Representations - Nominal-T, Nominal-π and A, B, C, D Constants. Mathematical Solutions to estimate Regulation and Efficiency of All Types of Lines- Long Transmission Line-Rigorous Solution, Evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π, Numerical Problems. – Surge Impedance and Surge Impedance Loading - Ferranti Effect, Charging Current, Need of Shunt Compensation.

UNIT-V	MECHANICAL DESIGN OF TRANSMISSION LINES	Classes: 09

Overhead Line Insulators: Types of Insulators, String Efficiency and Methods for Improvement, Capacitance Grading and Static Shielding.

Corona: Corona Phenomenon, Factors Affecting Corona Critical Voltages and Power Loss, Radio

CODE: 17CA02503

TRANSMISSION AND DISTRIBUTION SYSTEMS

V Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA02503	Core	2	2	-	3	30	70	100
Contact Classes: 34	Tutorial Classes:34	Practical Classes: Nil				Total Classes: 68		

OBJECTIVES:

The course should enable the students to:

I. Know Transmission line parameters and calculation of GMD and GMR for different types of transmission systems.

II. Estimate the voltage regulation and efficiency of different transmissions lines.

III. Demonstrate the mechanical design of overhead lines, cables and insulators.

IV. Illustrate the performance of different types of distribution systems.

V. Outline the comparisons of Ac and DC distribution, design features of distribution system and concept of corona.

UNIT-I	TRANSMISSION LINE PARAMETERS	Classes:14

Transmission line parameters: Types of conductors, Skin effect, calculation of resistance for solid conductors, calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR and GMD, symmetrical and asymmetrical conductor configuration with and without transposition, numerical problems, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, numerical problems, effect of ground on capacitance, numerical problems.

UNIT - II	MODELLING AND PERFORMANCE OF TRANSMISSION LINES	Classes:14

Classification of transmission lines: Short, medium and long line and their model representations, nominal T, nominal π and A, B, C, D constants for symmetrical and asymmetrical networks, numerical problems, mathematical solutions to estimate regulation and efficiency of all types of lines, numerical problems; Long transmission line: Rigorous solution, evaluation of A, B, C, D constants, numerical problems, Ferranti effect, surge impedance and surge impedance loading of long lines. Incident, reflected and refracted waves, wave length and velocity of propagation of waves.

UNIT -III	OVER HEAD INSULATORS AND UNDER GROUND CABLES	Classes: 13

Overhead insulators: Types of insulators, voltage distribution, calculation of string efficiency, Methods for improving string efficiency: capacitance grading and static shielding, numerical problems.

Underground cables: Types of cables, construction, types of insulating materials, calculations of
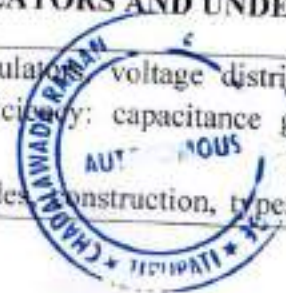
insulation resistance and stress in insulation, numerical problems, capacitance of single and 3 core belted cables, numerical problems, grading of cables, capacitance grading, numerical problems, description of inter sheath grading, numerical problems.

UNIT -IV	MECHANICAL DESIGN OF TRANSMISSION LINES AND SUBSTATIONS	Classes: 14

Sag and tension calculations: Sag and tension calculations with equal and unequal heights of towers, effect of wind and ice on weight of conductor, numerical problems, stringing chart and sag template and its applications; .

Corona: critical disruptive voltages, factors affecting corona, methods for reducing corona power loss.

Substation: Classification of substations, substation equipments, bus bar arrangement and bus-bar schemes.

UNIT - V	GENERAL ASPECTS OF AC DISTRIBUTION SYSTEMS	Classes: 13

Distribution systems: Types of distribution systems: Radial and ring main system, current and voltage calculation in distributors with concentrated and distributed load, comparison of DC Vs AC and underground Vs over head distribution systems, requirements and design features of distribution system; Voltage drop calculations in AC distributors for the following cases: Power factors referred to receiving end voltage and with respect to respective load voltages, numerical problems.

Text Books:

1. C L Wadhwa, "Electric Power Systems", New age publications, New Delhi, 9th Edition, 2007.
2. Singh S N, "Electric Power Generation, Transmission and Distribution", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition, 2002.
3. Turan Gonen, "Electrical Power Distribution System Engineering", CRC Press, 3rd Edition, 2014.
4. V Kamaraju, "Electrical Power Distribution Systems", TMH, Publication, Edition 2009=

Reference Books:

1. J B Gupta, "A Course in Power Systems",S K Kataria and Sons, 2013 Edition, 2013
2. D Kothari and I J Nagrath, "Power System Engineering", McGraw Hill Education; 2nd Edition, 2007.
3. V K Mehta and Rohit Mehta, "Principles of Power System", S Chand, 3rd revised Edition, 2015.
4. M L Soni, P V Gupta, U S Bhatnagar and A Chakrabarthy, "A Text Book on Power System Engineering", Dhanpat Rai and Co Pvt. Ltd., revised Edition, 2009.

Web References:

1. https://www.en.wikipedia.org/wiki/Electric_power_transmission
2. https://www.iec.ch/about/brochures/pdf/technology/transmission.pdf
3. https://www.teriin.org/upfiles/pub/papers/ft33.pdf
4. https://www.energy.gov/sites/prod/files/20_____/f26/QTR2015-3F-Transmission-and-Distribution_1.pdf

E-Text Books:

1. https://www.jfgieras.com/Grigsby_Chapter___EM.pdf

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DIGITAL CIRCUITS AND SYSTEMS

V Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA04511	Foundation	3	1	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES: This course should enable the student to:

1. Understand Basics, Different Binary Codes In Digital Electronic Circuits And Conversion Between Different Codes.
2. Implement Minimization Techniques And State Machines Using Flip-Flops.
3. Understand the Concept Of Sequential Circuits And Analyze Sequential Systems.
4. Design Finite State Machine and Algorithmic State Machines Charts And Memories.

UNIT-I	NUMBER SYSTEM AND BOOLEAN ALGEBRA	Classes: 10

Number system: Digital Systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes.
Boolean Algebra: Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.

UNIT-II	GATE LEVEL MINIMIZATION	Classes: 10

The map method, four variable & Five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Ex-or Function, Tabular Method.

UNIT-III	COMBINATIONAL LOGIC CIRCUITS	Classes: 12

Combinational circuits, Analysis & Design procedure, Arithmetic circuits, comparator, Multiplexers, Hazards and hazards free relations

UNIT-IV	SEQUENTIAL LOGIC CIRCUITS	Classes: 14

Sequential Circuits: Introduction, Difference Between Combinational And Sequential Circuits, State Diagram, State Table, State Reduction & Assignment, Excitation Table And Maps Circuit Implementation, Asynchronous Sequential Circuits - Introduction, Analysis and Design Procedure, Reduction of State Flow Tables, Race-Free State Assignment.

UNIT-V	MEMORY DEVICES	Classes: 14

Classification of memories – ROM – ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) - Field Programmable
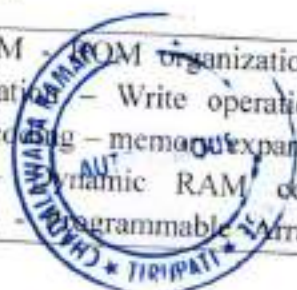
POWER QUALITY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA02508	Elective	2	2	-	3	30	70	100
Contact Classes: 34	Tutorial Classes: 34	Practical Classes: Nil				Total Classes: 68		

OBJECTIVES:

The course should enable the students to:
I. Understand the terminology used to describe power quality.
II. The sources of power quality disturbances and power transients that occur in power systems.
III. The sources of harmonics, harmonic indices, Devices for controlling harmonic distortion.
IV. The principle of operation of DVR and UPQC.

UNIT-I	INTRODUCTION	Classes:14

Introduction of the power quality (PQ) problem, terms used in PQ: Voltage, sag, swell, surges, harmonics, over voltages, spikes, voltage fluctuations, transients, interruption, overview of power quality phenomenon, remedies to improve power quality, power quality monitoring.

UNIT - II	TRANSIENTS, SHORT DURATION AND LONG DURATION VARIATIONS	Classes:14

Categories and Characteristics of Electromagnetic Phenomena in Power Systems- Impulsive and Oscillatory Transients-Interruption - Sag-Swell-Sustained Interruption - Under Voltage – Over Voltage- Outage. Sources of Different Power Quality Disturbances- Principles of Regulating the Voltage- Conventional Devices for Voltage Regulation.

UNIT - III	FUNDAMENTALS OF HARMONICS & APPLIED HARMONICS	Classes:13

Harmonic Distortion, Voltage Versus Current Distortion, Harmonics Versus Transients, Power System Quality Under Non Sinusoidal Conditions, Harmonic Indices, Harmonic Sources from Commercial Loads, Harmonic Sources from Industrial Loads. Applied Harmonics: Effects Of Harmonics, Harmonic Distortion Evaluations, Principles of Controlling Harmonics, Devices for Controlling Harmonic Distortion.

UNIT - IV	POWER QUALITY MONITORING	Classes:13

Power Quality Benchmarking-Monitoring Considerations- Choosing Monitoring Locations- Permanent Power Quality Monitoring Equipment-Historical Perspective of Power Quality Measuring Instruments- Power Quality Measurement Equipment-Types of Instruments- Assessment of Power Quality Measurement Data- Power Quality Monitoring Standards.

UNIT - V	POWER QUALITY ENHANCEMENT USING CUSTOM POWER	Classes:14

CODE: 17CA02508

	DEVICES	

Introduction to Custom Power Devices-Network Reconfiguring Type: Solid State Current Limiter (SSCL)-Solid State Breaker (SSB) -Solid State Transfer Switch (SSTS) Compensating Type: Dynamic Voltage Restorer (DVR)-Unified Power Quality Conditioner (UPQC)-Principle of Operation Only.

Text Books:

Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H.Wayne Beaty, Mc Graw Hill Education (India) Pvt. Ltd., 3rd Edition, 2012.
2. Power quality, C. Sankaran, CRC Press, 2001.

Reference Books:

1. Understanding Power quality problems – Voltage Sags and Interruptions, Math H. J. Bollen IEEE Press Series on Power Engineering, WILEY, 2007.

2. Power quality – VAR Compensation in Power Systems, R. Sastry Vedam, Mulukutla S. Sarma, CRC Press, 2009, First Indian Reprint 2013.
3. Fundamentals of Electric Power Quality, Surya Santoso, Create Space, 2012.

Web References:

1. https://www.researchgate.net
2. https://www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. https://www.electrical4u.com
5. https://www.crectirupati.com

E-Text Books:

1. https://www.jntubook.com/
2. https://www.freeengineeringbooks.com

Course Outcome:

At the end of the course, a student will be able to:

- Address power quality issues to ensure meeting of standards
- Apply the concepts of compensation for sags and swells using voltage regulating devices
- Assess harmonic distortion and its mitigation.
- Explain the power measurement data according to standards

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SOFT SKILLS - II

III B. Tech – II Semester: Common for All Branches

Course Code	Category	Hours/Week				Credits	Maximum Marks		
	Foundation	L	T	P	C		CIA	SEE	Total
		3	1	-	3		30	70	100
Contact Classes:45	Tutorial Classes:15	Practical Classes: Nil				Total Classes:60			

Objectives:

* To enhance employability skills through Group discussions and Mock Interviews.
* To enable the students collectively in organizational skills.
* To train the students to meet communicative competence.

UNIT - I	VERBAL ABILITY & COMMUNICATION SKILLS	Classes:09

Communication: Verbal and Non-Verbal Communication, Barriers to effective Communication, Types of Communication - Oral, Aural, Writing and Reading

Grammar:- usage of Articles, Preposition, Verb, Tenses, Adverbs, If-Conditionals, Adjectives, Degrees of Comparison, Conjunction, Simple, Compound & Complex, Active & Passive voice, Reported Speech and Common Errors in English.

Word Power: - Synonyms, Antonyms, Affixes, One word substitutions and Idioms & Phrases.

UNIT- II	EMPLOYABILITY SKILLS	Classes:09

COMPREHENSIONS:-Listening Comprehension, Reading Comprehension, Technical Reports, Resume Writing, E-mail Writing and Essay Writing

SVAR (Accent): Phonetics, Inflections, Stress and Intonation.

GROUP ACTIVITIES: Just-A-Minute (JAM), Debate, Group Discussion and Interview Skills

UNIT - III	Arithmetic III	Classes:09

Number System, Averages, Percentages, Simple Interest & Compound Interest, Problems on Ages, Profit & Loss, Probability, Permutation & Combinations, Logarithms

UNIT - IV	Arithmetic IV	Classes:10

Time & work, Time and Distance, Allegation and Mixtures, Mesuration2D, Mensuration3D, Data Interpretation.

UNIT –V	Reasoning II	Classes:08

Analogy, Classification, Number series, Coding Decoding, Direction & Distance, Blood Relation.

Critical Reasoning – Syllogism, Statements & Assumptions, Statements & Arguments, Data sufficiency, Seating Arrangment, Puzzles.

Text Books:

1. Rizvi M. Ashraf Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, 2006.
2. Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chand Limited 2011

References:

1. Bovee Courtland and Throill John, Business Communication Essentials: A skills-Based Approach to Vital Business English. Pearson Education Inc., 2011. 106 CS-Engg&Tech-SRM-2013
2. Dhanavel, S.P., English & Communication Skills for Students of Science and Engineering. Orient Black Swan, 2009,
3. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 3rd Edition, 2011
4. Rakesh Yadav Latest Edition
5. Arihant Latest Edition
6. "Other material related to quantitative aptitude"

Web References

https://www.englishclub.com/

https://www.onestopenglish.com/

https://www.englishgrammar.org/

E-Text Books:

* Campus Recruitment Complete Reference by Praxis groups

Outcomes:

At the end of the course, the learners will be able to
1. Enrich the employbility skills
2. Enhance logical thinking ability
3. Apply grammatical structures to formulate sentences and correct word forms
4. Analyze discourse markers to speak clearly on a specific topic in informal and formal discussions
5. Create a coherent paragraph wri...

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DESIGN THINKING

I B. Tech - I Semester:

Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
19CA53303	Foundation	3	-	-	3	30	70	100
Contact Classes:	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:51		

UNIT-I	INTRODUCTION TO DESIGN THINKING	Classes:09

Introduction to Design thinking: Concept and its role within new product development and Innovation, Frame work of design thinking, Non linear process, principles and mindset. Inspirational Design Briefing: Nine Criteria, Writing, Research findings, pitfalls to avoid, Keys to success.

UNIT-II	CUSTOMER EXPERIENCE MAPPING	Classes:11

Customer Experience Mapping: Inputs to experience mapping, Experience mapping process. Experience map as spring board to innovative solutions.

UNIT-III	BRIDGE RESEARCH AND CONCEPT DESIGN	Classes:10

Bridge research and concept design: Challenges in idea generation, Need for systematic method to connect to the user, The Visualize, Empathize and Ideate method, applying the method.

UNIT-IV	CREATIVITY IN IDEA GENERATION	Classes:10

Boosting creativity in idea generation using Design heuristics: Design Heuristics, The evidence base, Design heuristics for idea generation, Using Design heuristics to generate design concepts, Evidence of the value of design heuristics tools.

The role of design in early stage ventures: An emerging start up culture, Basics, Process, and Troubleshooting common mistakes.

UNIT-V	CORPORATE CULTURE OF DESIGN THINKING	Classes:11

Leading for Corporate culture of design thinking: What is corporate culture, Impact of corporate culture, Corporate forces that undermine the design thinking, Four pillars of innovation for enabling design thinking, Four stages of transforming to a culture of design thinking.

Text Books:

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, "Exploring Engineering: An Introduction to Engineering and Design", 4th edition, Elsevier, 2016.
2. David Ralzman, "History of Modern Design", 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, "Design Thinking", AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006.

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CATIA V5 SYLLABUS

Module	Session	Contents
Introduction	1	**CATIA as a CAD software:-** Concept of Parametric Modeling, Feature Based Modeling, User Interface, Mouse operations, File types and Management, drawing profiles. Major user industries of Catia. Why Catia is preferred?
Sketcher	2	**Sketcher:** Profile toolbar, operation (corner, chamfer, delimitations, transformations, project 3D element), constriants, types of constraints, workbench.
	3	**Sketcher:-** sketch tools, tools(Sketch sloving status, sketch analysis, output feature), visulization toolbar, user selection filter.
Modelling of Machined Component (Part Modelling)	4	**Modeling of Machined component,** Material Addition and Removal (Pad, Pocket, Shaft, Groove), Sketch and Positioned Sketch, Types of Fillets, Types of Chamfer, Types of Hole.
	5	**Modeling of Machined component - 2. Pattern** (Rectangular, Circular, User) , **Thread/Tap, Datum Features** (Plane, Axes, Points),Simple Draft. Frequently used commands for Machined components in Catia / Creo
	6	**Advance Design features :-** Axis System, Types of draft, Shell, Stiffener, rib slot, **Multi section solid, Removed multi sectionsolid**, Apply Material, Measure, Render.
	7	**Introduction To Multi body concept:-** Copy Paste, Paste special, Insert body, Boolean Operations (Add, remove, Intersect), **Transformation** (Translation, Mirror, Scaling, Affinity).
	8	**Multi body concept:- Standared example** , Negative body concept (Boolean Operations)
	9	**Advance Features:-** Parameters, Formula, Relations, Design Table.
	10	**Introduction To Drafting & Detailing Theory:-** (types Generative – Interactive), Initial Drafting setting, Sheet Background, Views (ortho, ISO), Dimensions (Types- Generate Dimension & Create Dimension).
	11	**Views:-** (ABV, Section, Details, Clipping, Broken), View properties, DATUMS & Tolerance.
	12	**Annotations,** GD & T Symbols, Note, Leaders, Table, Symbol (Mamual), Roughness, Welding, Custom), Dress-upToolbar.

Drafting	13	**Surfacing Modeling based Plastic Component:-** Environment, Tool bars, Surface Creation (Extrude, Revolve, Sphere, Cylinder), Surface Modification, Surface Editing (Trim, Split, Shape Fillet, Close Surface, Thickness).
	14	**Surfacing:-** Offset(All 3 types), Fill, Blend, Join, healing, Project-Combine.
	15	**Advanced Surfacing:-** Adaptive Sweep, Sweep(ALL), Multi section Surface.
Wire-frame Modeling	16	**Wire-frame Modeling:-** Point, Line, Planes, Curves, Circle-Conic, STANDARD EXAMPLES. Use of wire frame modeling.
BIW Templates	17	**BIW Templates:-** What is BIW, Junction, Diabolo, Hole, Mating Flange, Bead, BlendCorner.
Assembly & Mechanism	18	**Introduction to Assembly:-** Types of assembly approach, Types of Constrains and DOF, placement of components in the Assembly, Manipulating Components, **BOTTOM UP Approach**
	19	**TOP DOWN Approach:-** Part, Product, Component, Space Analysis, Reuse Pattern, Save management.
	20	**Assembly Drafting:-** Scene(Exploded View), Bill of material, Ballon creation, Graph Tree Reordering.

COMPUTER AIDED MACHINE DRAWING

II- B.Tech II Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA03404	Core	-	-	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 51				Total Classes: 51		

OBJECTIVES:

The course should enable the students to:

1. During the term of the course, students will learn to work within virtual 3-D space.
2. Build volumetric objects including: vertices, splines, polygons, primitive shapes and Sub Patch geometry.
3. Students will use these tools to build complex objects then learn the basic 3-D rendering tools and techniques.
4. The student will able to produce 2D drawing from the 3D part geometry to assure the proper dimensioning of the parts.
5. To make the students to understand and draw assemblies of machine parts and to draw their sectional views.

List of Experiments

1. Introduction to 3D modeling

2. Modelling of screw threads, keys and Fasteners

3. Assembly of Sleeve and Cotter Joint

4. Assembly of Socket and Spigot Joint

5. Assembly of Shaft Coupling

6. Assembly of Gib & Cotter Joint

7. Assembly of Knuckle Joint

8. Assembly of Universal Joint

9. Assembly of Screw Jack

10. Assembly of Plummer Block

11. Assembly of Simple Eccentric

12. Assembly of Machine Vice

Reference Books:

1. Gopalakrishnan K.R, "Machine Drawing", Subhas Stores, 2007
SOFTWARE REQUIREMENTS:
Any of the standard Software Packages like – AUTO CAD, Pro-E, Uni – Graphics, CATIA .... Etc may be used.

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AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

II B.Tech I Semester: ME

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05406	Core	_	_	4	2	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes:45

Objectives:

The course should enable the students to:
- Implement the basic knowledge of Study of Prolog.
- Construct Problem solving Techniques.
- Apply Different Search Techniques.
- Practice various Traversal Problems.

Week-1	PROLOG

1. Study of PROLOG. Write the following programs using PROLOG.
2. Program to show how integer variable is used in prolog program.

Week-2	8-Queens Problem

1. Write a program to solve 8 queens problem.
2. Program to add two numbers.
3. Program to delete an integer from the list .

Week-3	DFS Search

1. Solve any problem using depth first search.
2. Program to categorize animal characteristics.
3. Program to show concept of list.

Week-4	BFS Search

1. Solve any problem using best first search.
2. Program to read address of a person using compound variable
3. Program to demonstrate family relationship

Week-5	Problem solving

1. Solve 8-puzzle problem using best first search
2. Program of fun to show concept of cut operator .

Week-6	Traversal

1. Solve Robot (traversal) problem using means End Analysis.
2. Program to count number of elements in a list .

Week-7	Salesman and Integer

1. Solve traveling salesman problem.
2. Program to reverse the list.

Week-8	List

1. Program to append an integer into the list.
2. Program to replace an integer from the list.

Reference Books:

1. Artificial Intelligence: A Modern Approach,. Russell & Norvig. 1995, Prentice Hall.
2. Artificial Intelligence, Elain Rich and Kevin Knight, 1991,TMH.
3. Artificial Intelligence-A modern approach, Start Russel and peter norvig, 1998, PHI.
4. Artificial intelligence, Patrick Henry Winston, 1992, Addition Wesley 3 Ed.,
5. Introduction to prolog

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ADVANCED PYTHON PROGRAMMING

VI Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA05603	Core	3	1	-	3	30	70	100
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 60**		

Objectives:

The course should enable the students to:

- To know the basics of Python Fundamentals.
- To read and write the Python Programs.
- To develop Python programs with conditional and loops.
- To define Python functions and call them.
- To use Python Data Structures-List,Tuples,Dictionaries.
- To do input/output files in the Python

UNIT-I	PYTHON FUNDAMENTALS	Classes: 10

Introduction: What is program, running python, The first program, arithmetic operators, values and types, Formal and natural languages.

Variables, Expressions and Statements: Assignment statements, variable names, Expressions and Statements, Script mode, Order of operators, String operations,comments,Debugging.

UNIT-II	CONTROL FLOW, FUNCTIONS AND STRINGS	Classes: 09

Conditionals: Boolean values and operators, conditions(if),alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass;

Fruitful functions: return values, parameters, local and global scope, function composition, recursion; **Strings:** string slices, immutability, string functions and methods, string module;

UNIT-III	LISTS, TUPLES, DICTIONARIES	Classes: 08

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; **Tuples:** tuple assignment, tuple as return value; **Dictionaries:** operations and methods.

UNIT-IV	FILES, MODULES, PACKAGES	Classes: 08

Files and exception: text files, reading and writing files, format operator; errors and exceptions, handling exceptions, modules, packages;

UNIT-V	OBJECT ORIENTED PROGRAMMING AND GUI PROGRAMMING	Classes: 10

Object Oriented Programming: Encapsulation, Inheritance, and Polymorphism

GUI PROGRAMMING Tkinter Overview - tkinter pragmatics, Documentation, Extensions, structure; tkinter coding alternatives, adding buttons and callbacks-lambda, bound method, callable class object,

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VI- Semester : CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA05612	Core	-	-	3	2	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Objectives:

The course should enable the students to:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.
- Use GUI programming, To implement Python programs with package.

LIST OF EXPERIMENTS

Week -1	BASICS

- Write a python script to display a simple message
- Write a python script to perform basic arithmetic operations on two values which are accepted from the user.
- Exponentiation (power of a number)
- Find the maximum of a list of numbers

Week-2	CONTROL FLOW

- Write a python script to calculate the factorial of a given number.
- Write a python script to calculate sum of individual digits of a given number.
- Write a python script to display the prime number series up to the given N Value.

Week-3	CONTROL FLOW

- Write a python script to find the largest number among three numbers and display them in ascending order using if-else construct.
- Write a python script to display Fibonacci sequence of numbers using while loop, for loop and do-while loop constructs.

Week-4	FUNCTIONS

- Write a python script to find GCD of two numbers using recursive and non recursive Functions.
- Write a python script to convert the following using functions: (i) Fahrenheit to Celsius Temperature. (ii) Celsius to Fahrenheit temperature.

Week -5	STRINGS
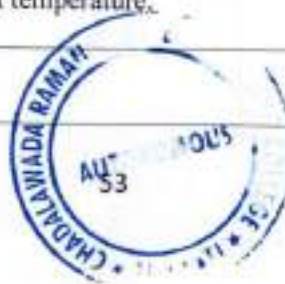
HARDWARE DESCRIPTION LANGUAGES

I Semester: VLSI SYSTEM DESIGN

Course Code	Category	Hours / Week			Credit	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Tota**
17CD04104	Core	4	0	-	4	40	60	100
Contact Classes:	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 60**		

OBJECTIVES:

- To understand various modeling in HDL.
- To design digital circuits using verilog HDL.
- To understand verilog data types , operators in verilog HDL.
- To understand synthesis in verilog HDL.

OUTCOMES:

- Analyze the various design methodologies in HDL.
- Program in verilog HDL for digital circuits.
- Analyze the synthesis of digital circuits.
- Design the digital circuits in verilog HDL.

UNIT - I	HARDWARE MODELING WITH THE VERILOG HDL	Classes: 15

Verilog Module, Hardware Modeling Verilog Primitives, Descriptive Styles, Structural Connections, Behavioral Description In Verilog, Hierarchical Descriptions of Hardware, Structured (Top Down) Design Methodology, Arrays of Instances, Using Verilog for Synthesis, Language Conventions, Representation of Numbers.

Logic System, Data Types And Operators For Modeling In VERILOG HDL:

User-Defined Primitives, User Defined Primitives – Combinational Behavior User-Defined Primitives –Sequential Behavior, Initialization of Sequential Primitives. Verilog Variables, Logic Value Set, Data Types, Strings. Constants, Operators, Expressions and Operands, Operator Precedence Models Of Propagation Delay; Built-In Constructs for Delay, Signal Transitions, Verilog Models for Gate Propagation Delay (Inertial Delay), Time Scales for Simulation, Verilog Models for Net Delay (Transport Delay), Module Paths and Delays, Path Delays and Simulation,

Inertial Delay Effects and Pulse Rejection

UNIT - II	BEHAVIORAL DESCRIPTIONS IN VERILOG HDL	Classes: 15

Verilog Behaviors, Behavioral Statements, Procedural Assignment, Procedural Continuous Assignments, Procedural Timing Controls and Synchronization, Intra-Assignment, Delay-Blocked Assignments, Non-Blocking Assignment, Intra-Assignment Delay: Non-Blocking Assignment, Simulation of Simultaneous Procedural Assignments, Repeated Intra Assignment Delay, Indeterminate Assignments and Ambiguity, Constructs for Activity Flow Control, Tasks and Functions, Summary of Delay Constructs in Verilog, System Tasks for Timing Checks, Variable Scope Revisited, Module Contents, Behavioral Models of Finite State Machines

UNIT - III	SYNTHESIS OF COMBINATIONAL LOGIC	Classes: 10

HDL-Based Synthesis, Technology- Independent Design, Benefits of Synthesis, Synthesis Methodology, Vendor Support, Styles for Synthesis of Combinational Logic, Technology Mapping and Shared Resources, Three State Buffers, Three State Outputs and Don"t Cares, Synthesis of Sequential Logic Synthesis of Sequential Udps, Synthesis of Latches, Synthesis of Edge-Triggered Flip Flops, Registered Combinational Logic, Shift Registers and Counters, Synthesis of Finite State Machines, Resets, Synthesis of Gated Clocks, Design Partitions and Hierarchical Structures.

Synthesis Of Language Constructs:

Synthesis of Nets, Synthesis of Register Variables, Restrictions on Synthesis of "X" and "Z", Synthesis of Expressions and Operators, Synthesis of Assignments, Synthesis of Case and Conditional Statement, Synthesis of Resets, Timing Controls in Synthesis, Synthesis of

DATA MINING AND KNOWLEDGE DISCOVERY

I-Semester: Professional Elective-II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CD05109	Elective	4	-	-	4	40	60	100
Contact Classes: 60	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:60		

Objectives:

- Describe the logical and mathematical foundations, and study abstract models of computation.
- Illustrate the limitations of predicate logic.
- Define modern algebra for constructing and writing mathematical proofs.
- Solve the practical examples of sets, functions, relations and recurrence relations.

Outcomes:

After completing this course, the student will be able to:

- Apply data mining techniques and methods to large data sets.
- Use data mining tools
- Compare and contrast the various classifiers.

UNIT-I	Introduction To Data Mining	Classes: 14

Introduction to data mining: Motivation, importance, definition of data mining ,Types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity
Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi dimensional data Analysis

UNIT-II	Classification	Classes: 14

Basic Concepts, Decision Trees, and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: Due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier.
Classification-Alternative techniques:
Nearest Neighborhood classifier, Bayesian Classifier, Support Vector Machines: Linear SVM, Separable and Non Separable case.

UNIT-III	Association Analysis	Classes: 10

Problem Definition, Frequent Item-set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithms, Handling categorical, continuous attributes, concept hierarchy, sequential, sub-graph patterns

UNIT-IV	Clustering	Classes: 10

Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN
Cluster Evaluation: Overview, Unsupervised Cluster evaluation using cohesion and separation, using the proximity matrix, Scalable clustering algorithms.

UNIT-V	Web Data Mining	Classes: 12

Introduction, Web terminology and characteristics, web content mining, web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of web pages, Enterprise search

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BIG DATA ANALYTICS

II-Semester										
Course Code		**Category**	Hours / Week			**Credits**	**Maximum Marks**			
			L	T	P	C	CIA	SEE	Total	
17CD05202		Core	4	-	-	4	40	60	100	
Contact Classes: 60		Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 60			

Objectives:

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop echo system.

Outcomes:

- Understand what Big Data is and why classical data analysis techniques are no longer adequate.
- Understand the benefits that Big Data can offer to businesses and organizations.
- Understand conceptually how Big Data is stored.
- Understand how Big Data can be analyzed to extract knowledge.

UNIT-I	Big Data	Classes: 10

What is Big Data , Characteristics of Big data, Introduction to Hadoop, Brief History ,Why Hadoop,Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) .

UNIT-II	HDFS	Classes: 14

The Design of HDFS,HDFS Concepts, Blocks, Name nodes and Data nodes HDFS Federation HDFS High-Availability, The Command-Line Interface ,Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API ,Writing Data, Directories, Querying the File System, Deleting Data Data Flow, Anatomy of a File Read ,Anatomy of a File Write ,Coherency Model.

UNIT-III	MapReduce	Classes: 12

Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework, Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

UNIT-IV	HIVE	Classes: 12

The Hive Shell, Running Hive, Configuring Hive, Hive Services, The Metastore, Comparison with Traditional Databases, Schema on Read Versus Schema on Write, HBasics, Implementation, Java and MapReduce clients, Loading data, web queries.

UNIT-V	PIG	Classes: 12

Installing and Running Pig, Execution Types, Running Pig Programs, Grunt, Pig Latin Editors An Example, Generating Examples, Comparison with Databases, Pig Latin, Structure, Statements Expressions, Types, Schemas, Functions, Macros, User-Defined Functions, A Filter UDF, An Eval UDF,A Load UDF

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INTERNET OF THINGS

II-Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CD05203	Core	4	-	-	4	40	60	100
Contact Classes: 60	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 60		

Objectives:

The course should enable the students to:

- Understand the architecture of Internet of Things and connected world.
- Explore on use of various hardware and sensing technologies to build IoT applications.
- Illustrate the real time IoT applications to make smart world.

Outcomes:

- Interpret the vision of IoT from a global context.
- Determine the Market perspective of IoT.
- Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
- Implement state of the art architecture in IoT.
- Illustrate the application of IoT in Industrial Automation and identify Real World Design

UNIT-I	Introduction to Internet of Things(IoT)	Classes: 12

Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT enabling technologies, IoT levels and deployment, domain specific IoTs.

UNIT-II	IoTand M2M	Classes: 12

Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.

UNIT-III	IoT Architecture and Python	Classes: 12

IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model.

Logical design using Python: Installing Python, Python data types and data structures, control flow, functions, modules, packages, file handling.

UNIT-IV	IoT Physical Devices and Endpoints	Classes: 12

Introduction to Raspberry Pi interfaces (Serial, SPI, I2C), programming Raspberry PI with Python, other IoT devices.

UNIT-V	IoT Physical Servers and Cloud Offerings	Classes: 12

Introduction to cloud storage models and communication APIs; WAMP: AutoBahn for IoT, Xively cloud for IoT; Case studies illustrating IoT design: Home automation, smart cities, smart environment.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014.
2. Matt Richardson, Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 3rd Edition, 2014.

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MAP REDUCE PROGRAMMING LAB

II Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	T	P	C	CIA	SEE	Total
17CD05213	Core	-	-	4	2	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 48				Total Classes:48		

Objectives:

- Introduce students the concept and challenge of big data (3 V's: volume, velocity, and variety).
- Teach students in applying skills and tools to manage and analyze the big data

Outcomes:

- Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data;
- Collect, manage, store, query, and analyze various form of big data; and
- Gain hands-on experience on large-scale analytics tools to solve some open big data problems;
- Understand the impact of big data for business decisions and strategy.

Week-1	**Getting Started with MapReduce and Hadoop**

Loading an existing Eclipse project,

Week-2	**Examining a simple MapReduce Class: Word Counting**

During operation, multiple instances of the Map and Reduce classes will be made, where each can be run on different machines are to be created.

Week-3	**Compiling the Word Counting Example and running it Locally**

The word counting example translates into a map and reduce tasks, we will now compile the Word Counting example and run it on your local machine.

Week-4	**Running Word Counting on a Remote Cluster**

Running a MapReduce job on Amazon.

Week-5	**Top Hashtag Identification**

To modify a MapReduce job and how to use the configure and close methods to make use of stateful tasks. In particular, you will take the code of the word counting example from the previous task and modify it to find the top 10 hashtags from the input corpus.

Week-6	**Indexing English Tweets**

You will learn how to use external .jar files with a project, use additional resources and change the output format of a MapReduce job. In particular, this exercise is focused on using a MapReduce job to build an index of English tweets from a generic tweet sample. You will create a map task that will classify incoming tweets as English or not and create a new output format for Hadoop that will write the classified documents in a format that a search engine(the Terrier IR Platform) can understand.

References:

- http://wireless.ictp.it/school_2015/labs/Lab1.pdf
- https://cs.calvin.edu/courses/cs/374/exercises/12/lab/
- http://cecs.wright.edu/~pmateti/Courses/7380/Lectures/Hadoop/hadoop-lab.html

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APPLIED PHYSICS

I B.Tech - II Semester: EEE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA55103	Foundation	3	0	-	3	30	70	100
Contact Classes:51	Tutorial Classes: 0				Practical Classes: Nil	Total Classes: 51		

OBJECTIVES:

Applied Physics for undergraduate program is designed
> To develop students with sufficient knowledge in interference and diffraction and also to know the importance of the optical phenomenon in real time applications.
> To develop basic concepts of electromagnetic waves and its propagation through optical fibers along with its engineering applications.
> To know the importance of dielectric and magnetic materials by learning the concepts which lead to design and develop novel materials.
> To develop students with sufficient knowledge in semiconductors in the functioning of electronic devices.
> To know the importance of superconductors and nanomaterials by learning the basic concepts this could be useful to design novel materials in relevant engineering branches.

UNIT – I	WAVE OPTICS	Classes: 8

Interference: Principle of superposition – Interference of light – Conditions for sustained interference – Interference in thin films (in reflected light) – Newton's Rings – Determination of wavelength – Engineering applications of interference.

Diffraction: Principle – Types of diffraction – Difference between interference and diffraction – Fraunhofer diffraction - Single slit and double slit diffraction – Diffraction grating – Grating spectrum – Engineering applications of diffraction.

UNIT – II	ELECTROMAGNETIC WAVES AND FIBER OPTICS	Classes:11

Electromagnetic waves: Divergence and curl of electric and magnetic fields – Gauss theorem for divergence and Stoke's theorem for curl – Maxwell's equations (quantitative) – Electromagnetic wave propagation (non conducting medium) – Poynting theorem.

Fiber optics: Optical fibers – Total internal reflection – Acceptance angle and numerical aperture –Classification of fibers based on refractive index and material – Modes of propagation of through optical fiber – attenuation and losses of fibers – Block diagram of fiber optic communication system – Optical fibers as sensors – Applications of optical fibers.

UNIT – III	DIELECTRIC AND MAGNETIC MATERIALS	Classes:11

Dielectrics: Dielectric polarization – Dielectric polarizability – Susceptibility and Dielectric constant – Types of polarizations: Electronic and Ionic (quantitative), Orientation polarizations (qualitative) – Frequency dependence of polarization – Lorentz (internal) field – Claussius - Mosotti equation – Applications of Dielectrics.

Magnetic materials: Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of magnetic materials – Hysteresis – soft and hard magnetic materials – Magnetic materials and their applications.

UNIT – IV	SEMICONDUCTOR PHYSICS	Classes:11

Classification of solids based on energy bands – Intrinsic semiconductors – density of charge carriers – Fermi energy – Electrical conductivity – extrinsic semiconductors – P - type & N - type – Density of charge carriers – Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's relation – Hall effect – Direct and Indirect band gap semiconductors – Formation of PN junction – Forward bias and reverse
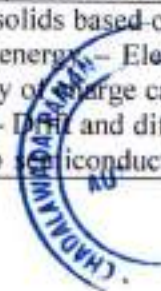
PROBLEM SOLVING AND PROGRAMMING

I Semester: Common for All Branches								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	T	P	C	CIA	SEE	Total
19CA05101	Foundation	3	1	-	4	30	70	100
Contact Classes:51	**Tutorial Classes:17**	**Practical Classes: Nil**				**Total Classes:68**		

Objectives:

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

UNIT - I	INTRODUCTION TO COMPUTERS AND C LANGUAGE	Classes:11

Introduction to Computers, Introduction to Programming, Algorithms, Flowcharts, Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems– Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers.Example problems-Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

Introduction to C Language, C Language Elements, Variables, Data Types, Operators and Expressions, Constants, Declarations, Operators, Type Conversions, Precedence and Order of Evaluation.

UNIT - II	CONTROL STATEMENTS, LOOPS AND ARRAYS	Classes:10

Statements: Selection Statements, Iteration Statements, Jump statements: Break, Continue, goto, Arrays: Accessing Array Elements, Single & Multi Dimensional Arrays.

UNIT - III	STRINGS AND FUNCTIONS	Classes:10

Strings: Declaring, Initialization of a String, Reading and Writing Strings, String manipulation functions from the standard Library, String I/O Functions: gets(), puts().
Functions: Definition, Function Call- Call by Value, Storage Class Specifiers, Understanding the scope of Functions with its Types, the Return Statement, Recursion, Command Line Arguments.

UNIT - IV	POINTERS, STRUCTURES AND UNIONS	Classes:10

Pointers: Pointer Variables, Pointer Expressions, Pointers And Arrays, Pointers to Strings, Call by Reference, C's Dynamic Allocation Functions, Problems with Pointers.
Structures and Unions: Accessing structure members, Array of structures, Passing Structures to Functions, Structure Pointers, Structures within Structures, Bit Fields, Enumerations, Typedef.

UNIT –V	FILE I/O	Classes:10

Streams and File, File System Basics: File pointer, opening a file using fopen(), closing a file, getc(), putc(), fclose(), feof(), fputs, fgets(), ferror(), fread(), fwrite(), fseek(), Formatted Console I/O: fprintf, fscanf, the Preprocessor Directives: #define and #include.

Text Books:

1. The Complete Reference C, Fourth Edition, Herbert Schildt, McGraw-Hill Education.
2. The C Programming Language" Second Edition, Brain W. Kernighan, Dennis M. Ritchie, Prentice Hall, India.

References:

- Programming with C Second Edition, Byron Gottfried, Schaum's outline, McGraw-Hill Education.
- Computer Fundamentals and C programming, B. L Juneja, A Seth, Cengage Learning India.
- Programming in C and data Structures", Hanly, Koffman, Kamthane, Ananda Rao, Pearson.
- A BOOK ON C, Kelly and Pohl, Pearson Education.

APPLIED PHYSICS LAB

I B. Tech - I Semester: CSE/EEE					I B. Tech - II Semester: ECE			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
19CA55104	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil				Practical Classes: 51	Total Classes: 51		

OBJECTIVES:

- ➤ To understand the basic principles of interference, diffraction.
- ➤ To understand the role of optical fiber parameters in communication.
- ➤ Recognize the importance of energy gap in the study of conductivity and Hall effect in a semiconductor.
- ➤ Illustrates the magnetic and dielectric materials applications.
- ➤ To apply the principles of semiconductors in various electronic devices.

Out comes:

- **Operate** various optical experiments like microscope and spectroscope (L2).
- **Determine** thickness of a hair/paper using the concept of interference (L2).
- **Estimate** the wavelength of different colors using diffraction grating and resolving power.
- **Plot** the intensity of the magnetic field of circular coil carrying current with distance (L3).
- **Evaluate** the acceptance angle and numerical aperture of an optical fiber (L3).
- **Determine** magnetic susceptibility of the material and its losses by B-H curve (L3).
- **Determine** the resistivity of the given semiconductor using four probe method (L3).
- **Identity** the type of semiconductor i.e n-type or p-type using Hall effect (L3).
- **Calculate** the band gap of a given semiconductor (L3).

Expt. 1	Determination of thin object using wedge method
Expt. 2	Determination of radius of curvature of plano-convex lens - Newton's rings
Expt. 3	Determination of wavelength of different colors using grating
Expt. 4	Determination of dispersive power a diffraction grating.
Expt. 5	Determination of resolving power of a grating.
Expt. 6	Determination of dielectric constant by charging and discharging method
Expt. 7	Determination of magnetic field along the axis of a circular coil carrying current.
Expt. 8	Determination of self inductance of the coil (L) using Anderson's bridge.
Expt. 9	Study the variation of B versus H by magnetizing the magnetic material using B-H curve method.
Expt. 10	Determination of numerical aperture and acceptance angle of given optical fiber.
Expt. 11	Measurement of magnetic susceptibility by Gouy's method.
Expt. 12	Determination of Charge density and Hall coefficient or magnetic flux density – Hall effect.
Expt. 13	Determination of resistivity of semiconductor by four probe method
Expt. 14	Determination of Band gap of semiconductor
Expt. 15	Measurement of resistance with varying temperature
References 1.	A Text book of practical physics – S. Balasubramanian, M. N. Srinivasan, S. Chand Publishers.
2.	http://vlab.amrita.edu/index/php Virtual labs, Amrita University.

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PROBLEM SOLVING AND PROGRAMMING LAB

I B.Tech - II Semester: Common for All Branches

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05102	Foundation	–	–	3	1.5	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 51	Total Classes:51

Objectives:
- Learn C Programming language.
- To make the student solve problems, implement algorithms using C language.
- To write diversified solutions using C language.

Design an algorithm and construct a flow chart using Raptor tool and then write programs for the following problems.

LIST OF PROGRAMS

Week -1	**BASIC C PROGRAMS**

Write C program to
1. Find the Sum of three numbers.
2. Exchange (swap) of two numbers by using third variable.
3. Exchange (swap) of two numbers without using third variable.
4. Print the size of all data types.

Week - 2	**BASIC C PROGRAMS**

a). Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.

b). Write a C program to find the Priority and associativity of operators using expressions. Take the expressions with different operators.

c). Write a C program to swap two numbers using bitwise operators.

Week - 3	**CONTROL STATEMENTS**

a) Write a C program to find whether the given number is odd or even.
b) Write a C program to find the Maximum and minimum of N numbers.
c) Write a C program to find the Maximum of three numbers.
d) Write a C program to print 'hello world' without using semicolon.
e) Write a C program to find whether the given number is odd or even using bitwise operator.
f) Write a C program to find the maximum of two numbers using Conditional operator.
g) Write a program which takes two integers and one arithmetic operator from the user, and

performs the operation and then prints the result by using **switch-case**.(Operators : +, -, *, /, %)

Week -4	**ITERATION STATEMENTS**

a) Write a C program to generate the required multiplication table.
b) Write a C program to find the Factorial of a given number.
c) Write a C program to check whether the given number is prime or not.
d) Write a C program to find GCD

Week - 5	**ITERATION STATEMENTS**

PYTHON PROGRAMMING LABORATORY

II- Semester : CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05202	Foundation	-	-	3	1.5	40	60	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Objectives:

The course should enable the students to:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.
- To implement Python programs with Turtle graphics.

LIST OF EXPERIMENTS

Week -1	**BASIC PROGRAMS**

Write a program :

a) To print 'HELLO CREC'
b) To Compute All Arithmetic Operators.
c) To Swap Two Variables with third variable.
d) To swap two variables without third variable.

Week -2	**BASIC PROGRAMS**

Write a program
a) To Generate A Random Number
b) To Find The Area Of A Triangle.
c) To Calculate Quadratic equation.

Week-3	**CONTROL STATEMENTS**

a) Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
b) Write a program to compute the GCD of two numbers.
c) Design a Python script to determine if a given string is a Palindrome using recursion

Week-4	**CONTROL STATEMENTS**

a) Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
b) Write a program to find the sum of the digits of a number.
c) Write a program to find given number is strong number or not

Week-5	**CONTROL STATEMENTS**

STATISTICS & R

II B. Tech II Semester: CSE									
Course code	**Category**	head			**Credits**	head			
		Hours/week			**Credits**	**Maximum Marks**			
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**	
17CA05404	Core	2	2	-	3	30	70	100	
Contact Classes:34	**Tutorial Classes :34**	**Practical Classes: NIL**				**Total Classes:68**			

Objectives:

The course should enable the students to :

- Use R for statistical programming, computation, graphics, and modeling,
- Write functions and use R in an efficient way,
- To determine the quality control and its real life applications.

Unit-I	Introduction to R Programming	Classes:08

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

Unit-II	R Programming Structures and Loops	Classes:13

R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quick sort Implementation.

Unit-III	Math Simulation in R Programming	Classes:13

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.

Unit-IV	Graphics	Classes:12

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

Unit-V	Probability Functions Through R Programming	Classes:12

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

Text Books:

1. "The Art of R Programming", A K Verma, Cengage Learning.
2. "R for Everyone", Lander, Pearson
3. "The Art of R Programming", Norman Matloff, No starch Press.

Reference Books:

1. R Cookbook, Paul Teetor, Oreilly.
2. R in Action, Rob Kabacoff, Manning

Outcomes:

At the end of this course, students will be able to:

1. Learn fundamentals of R Programming.
2. Access online resources for R and import new function packages into the R workspace
3. Import, review, manipulate and summarize data-sets in R
4. Explore data-sets to create testable hypotheses and identify appropriate statistical tests

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STATISTICS & R LABORATORY

II B.Tech II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA05407	Core	-	-	4	2	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45	Total Classes: 45

Objectives:

The course should enable the students to :

- Use R for statistical programming, computation, graphics, and modeling,
- Write functions and use R in an efficient way,
- To determine the quality control and its real life applications.

Week-1	**Basic Programs**

i. R Program to Generate Random Number from Standard Distributions
ii. R Program to Find Minimum and Maximum
iii. R Program to Sort a Vector
iv. R Program to Check if a Number is Positive, Negative or Zero

Week-2	**Control statements and Loops**

i. R Program to Find the Factorial of a Number
ii. R Multiplication Table
iii. R Program to check Armstrong Number
iv. R Program to Check Prime Number

Week-3	**Vectors**

i. R Program to Add Two Vectors
ii. R Program to Find Sum, Mean and Product of Vector in R Programming
iii. R Program to Sort a Vector

Week-4	**Functions and Recursions**

i. Convert Decimal into Binary using Recursion in R
ii. R program to Find the Factorial of a Number Using Recursion.
iii. Fibonacci Sequence Using Recursion in R

Week-5	**Simple Mathematical Functions**

i. R Program to Find H.C.F. or G.C.D.
ii. R Program to Find L.C.M.
iii. Sum of Natural Numbers Using Recursion

Week-6	**Introduction to statistics**

i. R Program to perform various Linear Algebra Operation on Vectors X and Y.
ii. R Program to perform various arithmetic operations Matrices.
iii. R Program to Generate Random Number from Standard Distributions

Week-7	**Vector data and Sampling**

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B. Tech IV-I Sem. (CSE)

L	T	P	C
0	0	4	2

15A05710   GRID AND CLOUD COMPUTING LABORATORY

Course Objectives:

- The student should be made to:
- Be familiar with developing web services/Applications in grid framework.
- Be exposed to tool kits for grid and cloud environment.
- Learn to use Hadoop
- Learn to run virtual machines of different configuration.

Course Outcomes:

The student should be able to
Design and Implement applications on the Cloud.
Design and implement applications on the Grid.
Use the grid and cloud tool kits.

GRID COMPUTING PROGRAMS USING GRIDSIM

1. Program to creates one Grid resource with three machines
2. Program to to create one or more Grid users. A Grid user contains one or more Gridlets
3. Program to shows how two GridSim entities interact with each other ; main(ie example3) class creates Gridlets and sends them to the other GridSim entities, i.e. Test class
4. Program shows how a grid user submits its Gridlets or tasks to one grid resource entity
5. Program to show how a grid user submits its Gridlets or task to many grid resource entities
6. Program to show how to create one or more grid users and submits its Gridlets or task to many grid resource entities
7. Program to creates one Grid resource with three machines

Grid computing programs using Use Globus Toolkit or equivalent:

1. Develop a new Web Service for Calculator.
2. Develop new OGSA-compliant Web Service.
3. Using Apache Axis develop a Grid Service.
4. Develop applications using Java or C/C++ Grid APIs
5. Develop secured applications using basic security mechanisms available in Globus Toolkit.
6. Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

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CLOUD COMPUTING
Programs on SaaS

1 Create an word document of your class time table and store locally and on the cloud with doc,and pdf format . (use www.zoho.com and *docs.google.com)*

2 Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula
DA=10% OF BASIC
HRA=30% OF BASIC
PF=10% OF BASIC IF BASIC<=3000
12% OF BASIC IF BASIC>3000
TAX=10% OF BASIC IF BASIC<=1500
=11% OF BASIC IF BASIC>1500 AND BASIC<=2500
=12% OF BASIC IF BASIC>2500
(use www.zoho.com and *docs.google.com)*
NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX

3 Prepare a ppt on cloud computing –introduction , models, services ,and architecture
Ppt should contain explanations, images and at least 20 pages
(use www.zoho.com and *docs.google.com)*

4 Create your resume in a neat format using google and zoho cloud

Programs on PaaS

1 Write a Google app engine program to generate n even numbers and deploy it
to google cloud

2 Google app engine program multiply two matrices

3 Google app engine program to validate user ; create a database login(username, password) in mysql and deploy to cloud

4 Write a Google app engine program to display nth largest no from the given list
of numbers and deploy it into google cloud

5 Google app engine program to validate the user
Use mysql to store user info and deploy on to the cloud

6 Implement Prog 1-5 using Microsoft Azure

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B. Tech IV-I Sem. (CSE)

L	T	P	C
3	1	0	3

15A05703   MOBILE APPLICATION DEVELOPMENT

Course Objectives:

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications
- To understand fundamentals of android programming.

Course Outcomes:

- Create data sharing with different applications and sending and intercepting SMS.
- Develop applications using services and publishing android applications.
- To demonstrate their skills of using Android software development tools

Unit 1: Introduction to Android:

The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset.

Unit 2: Basic Widgets:

Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons

Unit 3: Building Blocks for Android Application Design:

Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen orientation.

Utilizing Resources and Media Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, playing Audio, Playing Video, Displaying Progress with Progress Bar, Using Assets.

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Unit 4: Using Selection widgets and Debugging:

Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service(DDMS), Debugging Application, Using the Debug Perspective.

Displaying And Fetching Information Using Dialogs and Fragments: What Are Dialogs?, Selecting the Date and Time in One Application, Fragments, Creating Fragments with java Code, Creating Special Fragments

Unit 5: Building Menus and Storing Data:

Creating Interface Menus and Action Bars, Menus and Their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the Action Bar, Replacing a Menu with the Action Bar, Creating a Tabbed Action Bar, Creating a Drop-Down List Action Bar

Using Databases:

Using the SQLiteOpenHelperclasss, Accessing Databases with the ADB, Creating a Data Entry Form,

Communicating with SMS and Emails:

Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working With Telephony Manager.

Text Books

1. Android Programming by B.M Harwani, Pearson Education, 2013.

References Text Books:

1. Android application Development for Java Programmers, James C Sheusi, Cengage Learning
2. Android In Action by w.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.
3. Professional Android 4 applications development, Reto Meier, Wiley India, 2012.
4. Beginning Android 4 applications development, Wei- Meng Lee, Wiley India,2013

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	L	T	P	C
B. Tech IV-I Sem. (CSE)	3	1	0	3

15A05701   GRID AND CLOUD COMPUTING

Course Objectives:

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing. Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

Course Outcomes:

The student should be able to

- Apply the security models in the grid and the cloud environment.
- Use the grid and cloud tool kits.
- Apply the concept of virtualization.
- Apply grid computing techniques to solve large scale scientific problems

UNIT I   INTRODUCTION

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers - Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

UNIT II   GRID SERVICES

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

UNIT III   VIRTUALIZATION

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

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UNIT IV   PROGRAMMING MODEL

Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model - Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.

UNIT V   SECURITY

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

TEXT BOOK:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

REFERENCES:

1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", A Press, 2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009.
3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005
4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann.
5. Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press, 2009.
6. Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005.
7. Barry Wilkinson, "Grid Computing: Techniques and Applications", Chapman and Hall, CRC, Taylor and Francis Group, 2010.

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	L	T	P	C
B. Tech IV-I Sem. (CSE)	0	0	4	2

15A05711   MOBILE APPLICATION DEVELOPMENT LABORATORY

Course Objectives:
- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications
- To understand fundamentals of android programming.

Course Outcomes:
- Create data sharing with different applications and sending and intercepting SMS.
- Develop applications using services and publishing android applications.
- To demonstrate their skills of using Android software development tools

1. Setting Up the Development Environment
    1.1 Download/Install the SDK
For in-depth instructions, visit Android Installation Documentation. Otherwise perform the following steps.
- Go to http://developer.android.com/sdk/index.html.
- Unpack to a convenient location - Remember the full path to this location, we will refer to it as <android_sdk_dir> for the rest of the lab.
    o <android_sdk_dir> would then be
       /home/<username>/android_dir.
- Add the path to the <android_sdk_dir>/tools directory to your system PATH
    o Windows:
    1. Right-click My Computer.
    2. Click Properties.
    3. Click Advanced tab.
    4. Click Environment Variables button.
    5. Double Click Path under System Variables.
    6. Add ; <android_sdk_dir>/tools;<android_sdk_dir>/platform-tools to the end of the Variable Values text field.
- Navigate to your <android_sdk_dir>/tools directory and type android. Add the appropriate components. See step 4 in http://developer.android.com/sdk/installing.html.
- Test your installation by running adb from the command line. If you did everything right, you should get a long list of help instructions.

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1.2 Download/Install the Eclipse Plugin
- It is recommended that you use Eclipse 3.4 or later
  - Lab Machines - Fedora Eclipse based on 3.4.2
    The version of Eclipse used by the lab machines is missing a vital component and requires adding an additional Eclipse plugin in order to use the Android plugin:
    1. Click the menu Help -> Software Updates.
    2. Click the tab Available Software -> Add Site button.
    3. Enter http:// download.eclipse.org/releases/ganymede into the Location field.
    4. Click OK button.
    5. Enter WST Common UI into the search/text box at the top of the window (give it a second, it tries to search as you type and its kind of slow).
    6. Click the checkbox next to WST Common UI.
    7. Click the Install button.
    8. Click the Next button.
    9. Accept the terms, click Finish.
    10. Restart Eclipse.
    11. Follow the steps in the next bullet 3.4 Ganymede.

  - Eclipse 3.4 Ganymede:
    1. Click the menu Help -> Software Updates.
    2. Click Available Software tab -> Add Site button.
    3. Enter https://dl-ssl.google.com/andriod/eclipse into the "Location" field.
    4. Click OK button.
    5. Click the checkbox next to Developer Tools.
    6. Click the Install button.
    7. Click the Next button.
    8. Accept the terms, click Finish.
    9. Restart Eclipse.
  - Eclipse 3.5 Galileo:
    1. Click Help -> Install New Software .
    2. Click Add... button.
    3. Enter a name for the site into the Name field.
    4. Enter htpps://dl-ssl/google.com/android/eclipse/ into the Location field.
    5. Click OK button.
    6. Click the checkbox next to Developer Tools.
    7. Click the Next button.
    8. Accept the terms, click Finish.
    9. Restart Eclipse.

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- Point Eclipse to <android_sdk_dir>:
    1. Click the menu Window -> Preferences.
    2. Click Android from the Hierarchy view on the left hand side.
    3. Enter <android_sdk_dir> into the SDK Location field.
    4. Click the Apply button.
    5. Click the OK button.

1.3 Download/Install the SDK Platform Components

At the time of writing this lab there are are eight different versions of the Android Platform available, ranging from 1.1 to 2.2. It is best practice to develop for the oldest platform available that still provides the functionality you need. This way you can be assured that your application will be supported by as many devices as possible. However, you will still want to download newer versions of the platforms so that you can test your applications against these as well. Due to the size of each platform component you will only be required to download and develop on one platform for the whole class. We will target the highest platform that the G1 phones support, Android 1.6 (API 4). Before we can begin developing we must download and install this platform:

- Select the menu Window -> "Android SDK and AVD Manager", or click on the black phone shaped icon in the toolbar.
- Select Available Packages on the left hand side.
- Expand the Google Android site in the "Site, Packages, and Archives" Tree.
- Check the following items:
    - SDK Plaform Android 1.6, API 4 Revision 3
    - Google APIs by Google Inc., Android API 4, Revision 2
    - NOTE: Those of you developing on Lab Machines should follow these instructions: http://sites.google.com/site/androidhowto/how-to-1/set-up-the-sdk-on-lab-machines-linux.
- Click Install Selected.
- Accept the Terms for all packages and click Install Accepted.

We're now ready to develop our application.
2. Create "Hello World" Application
    2.1 Create a new Android Project
    2.2 Run "Hello World" on the Emulator
    2.3 On a Physical Device
    2.4 Greeting the User
3. Create Application by Using Widgets
    3.1 Creating the Application by using the Activity class
      (i)   onCreate()
      (ii)   onStart()
      (iii) onResume()

    (iv)   onPause()
    (v)   onStop()
    (vi)   onDestroy()
    (vii)   onRestart()
3.2 Creating the Application by using Text Edit control.
3.3 Creating the Application Choosing Options
    (i) CheckBox
    (ii) RadioButton
    (iii) RadioGroup
    (iv) Spinner

4. Create Application by Using Building Blocks for Android Application Design
    4.1 Design the Application by using
        (i) Linear Layout
        (ii) Relative Layout
        (iii) Absolute Layout
    4.2 Create the Application to play the Audio and Video clips.

5. Create Application by Using Building Menus and Storing Data
    5.1 Design the Application for Menus and Action Bar
        5.2 Design the application to display the Drop-Down List Action Bar

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B. Tech IV-II Sem. (CSE)

L	T	P	C
3	1	0	3

15A05802   MOBILE COMPUTING
(MOOCS-II)

Course Objectives:

- Understand mobile ad hoc networks, design and implementation issues, and available solutions.
- Acquire knowledge of sensor networks and their characteristics.

Course Outcomes:

- Students able to use mobile computing more effectively
- Students gain understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
- Acquire skills to design and implement a basic mobile ad hoc or wireless sensor network via simulations.

UNIT-I:

Wireless LANS and PANS: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.
Wireless Internet:
Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web over Wireless.

UNIT-II:

AD HOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, AD Hoc Wireless Internet.
MAC Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT -III:

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand
Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

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Transport Layer and Security Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

UNIT –IV:

Quality of Service: Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks.
Energy Management: Introduction, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Ad Hoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.

UNIT –V:

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, PHI, 2004.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press

REFERENCE BOOKS:

1. Ad hoc Mobile Wireless Networks – Subir Kumar sarkar, T G Basvaraju, C Puttamadappa, Auerbach Publications,2012.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , Pearson Education.

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INFORMATION SECURITY

IV- Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
17CF00405	Elective -1	3	-	-	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Course Objectives:

The course should enable the students to:

- Learn the basic categories of threats to computers and networks.
- Understand various cryptographic algorithms and be familiar with public-key cryptography.
- Apply authentication functions for providing effective security.
- Analyze the application protocols to provide web security.
- Discuss the place of ethics in the Information Security Area.

Course Outcomes:

- Identify a range of security and privacy issues and threats that drive the need for security
- Understand the three security principles Confidentiality, Integrity and Availability (C,I,A) and how they relate to security threats and technologies
- Identify a range of security paradigms and models and understand how they can be deployed in a security strategy to protect information and preserve privacy
- Understand cryptographic technologies and how they can be deployed to protect information and preserve privacy

Unit-I	Attacks on Computers and Computer Security	Classes: 08

Attacks on computers and computer security: Introduction, the need for security, security approaches, principles of security, types of security attacks, security services, security mechanism, a model for network security; Cryptography concepts and techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

Unit-II	Symmetric Key Ciphers	Classes: 10

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES, Blowfish), differential and linear cryptanalysis, block cipher modes of operation, stream ciphers,RC4 location, and placement of encryption function, key distribution; Asymmetric key ciphers: Principles of public key cryptosystems, algorithms (RSA Diffie- Helman, ECC) key distribution.

Unit-III	Message Authentication Algorithm and Hash Functions	Classes: 08

Message authentication algorithm and hash functions: Authentication requirements, functions, message, authentication codes, hash functions, secure hash algorithm, whirlpool, HMAC, CMAC, digital signatures, knapsack algorithm.

Authentication application: Kerberos, X.509 authentication service, public – key infrastructure, biometric authentication.

Unit-IV	E-Mail Security	Classes: 10

E-mail security: Pretty good privacy; S/MIMI IP Security: IP security overview, IP security architecture, authentication header, encapsulating security payload, combines security associations, key management.

Unit-V	Web Security	Classes: 09

Web security: Web security considerations, secure socket layer and transport layer security, secure electronic transaction intruders; Virus and firewalls: Intruders, intrusion detection password management, virus and related threats, countermeasures, firewall design principles; Types of firewalls case studies on cryptography and security: Secure inter-branch payment transactions, cross site scripting vulnerability, virtual electronics.

Text Books:

1. William Stallings, "Cryptography and Network Security", Pearson Education, 4th Edition, 2005.
2. AtulKahate, "Cryptography and Network Security", McGraw Hill, 2nd Edition, 2009.

Reference Books:

1. C K Shymala, N Harini, Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India, 1st Edition, 2016.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay , "Cryptography and Network Security", McGraw Hill, 2nd Edition, 2010.

Web References:

1. http://bookboon.com/en/search?q=INFORMATION+SECURITY
2. https://books.google.co.in/books/about/Cryptography_Network_Security_Sie_2E.html?id=Kokjwdf0E7QC
3. https://books.google.co.in/books/about/Information_Security.html?id=Bh45pU0_E_4C

E-Text Books:

1. https://books.google.co.in/books/about/Information_Security.html
2. http://www.amazon.in/Cryptography-Network-Security-Behrouz-Forouzan/dp/007070208X

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DISTRIBUTED SYSTEMS

IV- Semester								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
17CF00408	Elective – 2	-	4	-	4	40	60	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

Course Objectives:

- To learn the different Principles of Networking

- To learn about the Distributed Systems

- To understand concurrency control and transactions

Course Outcomes:

- Demonstrate knowledge of the basic elements and concepts related to distributed system technologies

- Demonstrate knowledge of the core architectural aspects of distributed systems

- Design and implement distributed applications

- Demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems)

- Uuse and apply important methods in distributed systems to support scalability and fault tolerance

- Demonstrate experience in building large-scale distributed applications.

Unit-I		Classes: 12

Introduction, Networking and Internetworking – Types of network, Network principles, Internet protocols, Case studies.
Inter Process Communication- The API for Internet protocols, External data representation and marshalling, Client-Server Communication, Group Communication, IPC in UNIX.

Unit-II		Classes: 12

Distributed Objects and Remote Invocation -Communication between distributed objects, Remote Procedure Call, Events and notifications, Case study – Java RMI
Operating System Support- The operating system layer, Protection, Process and threads, Communication and invocation, Operating system architecture.

Unit-III		Classes: 12

Distributed File Systems – File service architecture, Sun Network File System, The Andrew File System.
Name Services - Name services and the Domain Name System, Directory services
Time and Global States and Coordination and Agreement Introduction, Clocks Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Distributed Debugging.

Unit-IV		Classes: 12

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control.

Unit-V		Classes: 12

Distributed Transactions - Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, distributed Deadlocks, Transactions with replicated data, Transaction recovery, Fault-tolerant services, Hierarchical and group masking of faults. **Distributed shared memory** -Design and Implementation issues, Sequential consistency and ivy, Release consistency and Munin, Overview of Distributed Operating systems Mach, Chorus.

Text Books:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Operating Systems, Pradeep K.Sinha, PHI

Reference Books:

1. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
2. Distributed Systems, S.Ghosh, Chapman &Hall/CRC, Taylor & Francis Group, 2010.
3. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, PearsonEducation.
4. Distributed Algorithms, N.A.Lynch, Elsevier.

Web References:

https://www.abebooks.com/first-edition/Advanced-Concepts-Operating-Systems-Mukesh-Singhal/5056007082/bd

E-Text Books:

https://www.scribd.com/doc/166936614/Advanced-Concepts-in-Operating-Systems

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PYTHON PROGRAMMING & ENGINEERING CHEMISTRY LAB
PYTHON PROGRAMMINGLABORATORY

I B. Tech - II Semester: CSE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CLA	SEE	Total
17CA05202	Foundation	-	-	4	2	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 68	Total Classes:68

OBJECTIVES:
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

OUTCOMES:
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

Any 12 of the following programs has to be executed during the I year II Sem.

Week-1	Basic Programs

1. Write a program to compute the GCD of two numbers.
2. Write a program to find the factorial of given number.

Week-2	Basic Programs

1. Write a program to find the sum of positive and negative numbers in a given set of numbers.
2. Write a program to find the whether the given number is prime or not.

Week-3	Basic Programs

1. Write a program to find the sum of the digits of a number.
2. Write a program to find the maximum of a list of numbers.

Week-4	Searching

1. Write a program to implement Linear search.
2. Write a program to implement Binary search.

Week-5	Sorting

1. Write a program to implement Selection sort.
2. Write a program to implement Merge sort.

Week-6	Functions

1. Write a program to display Fibonacci numbers using functions.
2. Write a program to multiply two matrices.

Week-7	Files

1. Write a program to create a file and write some text data on the file. Then display the contents of the file.
2. Find the most frequent words in a text read from a file.

| i. | Given two vectors of data, superpose their CDFs and show the results of the two-sample Kolmogorov-Smirnoff test. |
| ii. | R Program to demonstrate Standard computations with well-studied distributions with sample data. |

Week-8	**Keyboard and Monitor**

| i. | R program to Accessing the Keyboard and Monitor, Reading and writer Files. |
| ii. | R program to implement Joint distributions, marginal distributions, useful tables with sample data |

Week-9	**Graphs**

| i. | R program to display of a macroeconomic time-series, with a filled colour bar showing a recession with sample data. |
| ii. | Display two series on one plot, one with a left y axis and another with a right y axis |

Week-10	**Regression Techniques**

R program to implement nonlinear regression, in the following ways

- a. By just supplying the function to be fit,
- b. By also supplying the analytical derivatives, and
- c. By having him analytically differentiate the function to be fit.

Week-11	**Probability Distributions Functions**

- a. R program to implement Probability Distributions for any sample data.
- b. R program to implement Binomial Distributions for any sample data.

Week-12	**Correlation and Covariance**

- a. R program to implement Correlation and Covariance with sample data.
- b. R program to implement various types of T-Test with sample data.

Note : Sample data may be considered as student details are employee data

Reference Books:

1. The Art of R Programming, A K Verma, Cengage Learning.
2. R for Everyone, Lander, Pearson

Web References:

1. http://www.mayin.org/ajayshah/KB/R/
2. https://www.datamentor.io/r-programming/examples

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		L	T	P	C
B. Tech III-ISem. (ECE)		3	1	0	3

15A04506   MEMS & MICRO SYSTEMS
(MOOCS-I)

UNIT I
Introduction: Introduction to MEMS & Microsystems, Introduction to Microsensors, Evaluation of MEMS, Microsensors, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties.

UNIT II
Microelectronic Technology for MEMS: Microelectronic Technology for MEMS,Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micromachined Microstructure, Microstereolithography.

UNIT III
Micro Sensors: MEMS Microsensors, ThermalMicrosensors, Mechanical MicromachinedMicrosensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micromachined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor

UNIT IV
MEMS Accelerometers: Micromachined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezoresistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application.

UNIT V
MEMS Applications: Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Interface Electronics for MEMS, Introduction to BioMEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS)

Text Books:
1. NadimMalufKirt Williams "An Introduction to Microelectromechanical Systems Engineering", Second Edition, Artech House, Inc. Boston London, International Standard Book Number: 1-58053-590-9.
2. Varadan, V KandVaradan "Microsensors, actuators, MEMS, and electronics for smart structures" Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Microfabrication, SPIE OpticalEngineeringPress

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15A04605   MATLAB PROGRAMMING
(CBCC-I)

Objectives:

- Understand the MATLAB Desktop, Command window and the Graph Window
- Be able to do simple and complex calculation using MATLAB
- Be able to carry out numerical computations and analyses
- Understand the mathematical concepts upon which numerical methods rely
- Ensure you can competently use the MATLAB programming environment
- Understand the tools that are essential in solving engineering problems

1. **UNIT-I:Introduction to MATLAB**
   MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB.

2. **UNIT-II:Arrays**
   Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

3. **UNIT-III:Functions & Files**
   Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

4. **UNIT-IV:Programming Techniques**
   Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the Switch Structure, Debugging Mat Lab Programs.
   Plotting :XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

5. **UNIT-V:Linear Algebraic Equations**
   Elementary Solution Methods, Matrix Methods for (Linear Equations), Cramer's Method, Undet- ermined Systems, Order Systems.

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B. Tech III-I Sem. (CSE)	L	T	P	C
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15A05507 R-PROGRAMMING
(MOOCS-I)

Course Objectives:

- Understand the fundamentals of 'R' programming
- Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests.

Course Outcomes:

- Ability to Work on a real life Project, implementing R Analytics to create Business Insights.
- Ability to analyze the data and results using R, a flexible and completely cross-platform.
- Ability to use a wide range of analytical methods and produce presentation quality graphics.

UNIT-I

INTRODUCING R: Getting the Hand of R, Running the R Program, Finding Your Way with R, Command Packages.

BECOMING FAMILIAR WITH R: Reading and Getting Data into R, Viewing Named Objects, Types of Data Items, The Structure of Data Items, Examining Data Structure Working with History Commands, Saving your Work in R.

WORKING WITH OBJECTS: Manipulating Objects, Viewing Objects within Objects, Constructing Data Objects, Forms of Data Objects: Testing and Converting.

UNIT II

Data: Descriptive statistics and tabulation.

DISTRIBUTION: Looking at the Distribution of Data

SIMPLE HYPOTHESIS TESTING: Using the Student's t-test, The Wilcoxon U-Test (Mann-Whitney), Paired t- and U-Tests, Correlation and Covariance, Tests for Association.

UNIT-III

INTRODUCTION TO GRAPHICAL ANALYSIS: Box-whisker Plots, Scatter Plots, Pairs Plots(Multiple Correlation Plots) Line Charts, Pie Charts, Cleveland Dot Charts, Bar Charts, Copy Graphics to Other Applications.

FORMULA NOTATION AND COMPLEX STATISTICS: Examples of Using Formula Syntax for Basic tests, Formula Notation in Graphics, Analysis of Variance (ANOVA).

UNIT-IV

MANIPULATING DATA AND EXTRACTING COMPONENTS: Creating Data for Complex Analysis, Summarizing Data.

REGRESSION (LINEAR MODELING): Simple Linear Regression, Multiple Regression, Curvilinear Regression, Plotting Linear Models and Curve Fitting, Summarizing Regression Models.

UNIT-V

Adding elements to existing plots, Matrix plots, multiple plots in one window, exporting graphs

WRITING YOUR OWN SCRIPTS:

BEGINNING TO PROGRAM: Copy and Paste Scripts, Creating Simple Functions, Making Source Code.

Text Books:

1) "Beginning R the statistical programming language" Dr. Mark Gardener, Wiley Publications, 2015.

References Books:

1) Hands-On Programming with R Paperback by Grolemund (Author), Garrett (Author), SPD,2014.
2) The R Book, Michael J. Crawley, WILEY, 2012.

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	L	T	P	C
B. Tech III-II Sem. (CSE)	0	0	2	4

15A05610   DATA WAREHOUSING & MINING LABORATORY

Course Objectives:
Learn how to build a data warehouse and query it (using open source tools like Pentaho Data Integration and Pentaho Business Analytics). Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA), Understand the data sets and data preprocessing, Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression, Exercise the data mining techniques with varied input values for different parameters.

Course Outcomes:
- Ability to build Data Warehouse and Explore WEKA
- Ability to perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
- Ability to perform classification, clustering and regression on data sets
- Ability to design data mining algorithms

Data Warehousing

Experiments:
Build Data Warehouse and Explore WEKA

A. Build a Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration tool, Pentoaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects, etc.).
  (i). Identify source tables and populate sample data
  (ii). Design multi-dimensional data models namely Star, snowflake and Fact constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, Manufacturing, Automobile, etc.).
  (iii). Write ETL scripts and implement using data warehouse tools
  (iv). Perform various OLAP operations such slice, dice, roll up, drill up and pivot
  (v). Explore visualization features of the tool for analysis like identifying trends etc.

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B. Explore WEKA Data Mining/Machine Learning Toolkit
(i). Downloading and/or installation of WEKA data mining toolkit,
(ii). Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
(iii). Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
(iv). Study the arff file format
(v). Explore the available data sets in WEKA.
(vi). Load a data set (ex. Weather dataset, Iris dataset, etc.)
(vii). Load each dataset and observe the following:
    i. List the attribute names and they types
    ii. Number of records in each dataset
    iii. Identify the class attribute (if any)
    iv. Plot Histogram
    v. Determine the number of records for each class.
    vi. Visualize the data in various dimensions

Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets

A. Explore various options available in Weka for preprocessing data and apply (like Discretization Filters, Resample filter, etc.) on each dataset
B. Load each dataset into Weka and run Aprori algorithm with different support and confidence values. Study the rules generated.
C. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated. Derive interesting insights and observe the effect of discretization in the rule generation process.

Demonstrate performing classification on data sets

A. Load each dataset into Weka and run Id3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
B. Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix and derive Accuracy, F-measure, TPrate, FPrate, Precision and Recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.
C. Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
D. Plot RoC Curves

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E. Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

Demonstrate performing clustering on data sets

A. Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters). Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
B. Explore other clustering techniques available in Weka.
C. Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

Demonstrate performing Regression on data sets

A. Load each dataset into Weka and build Linear Regression model. Study the clusters formed. Use Training set option. Interpret the regression model and derive patterns and conclusions from the regression results.
B. Use options cross-validation and percentage split and repeat running the Linear Regression Model. Observe the results and derive meaningful results.
C. Explore Simple linear regression technique that only looks at one variable

Resource Sites:
1. http://www.pentaho.com/
2. http://www.cs.waikato.ac.nz/ml/weka/

Data Mining

Task 1: Credit Risk Assessment

Description:
The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.
To do the assignment, you first and foremost need is some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spreadsheet version of the German credit data. In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !) A few notes on the German dataset

- DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter).
- Owns_telephone. German phone rates are much higher. So fewer people own telephones.
- Foreign_worker. There are millions of these in Germany (many from Turrkey). It is very hard to get German citizenship if you were not born of German parents.
- There are 20 attributes used in judging a loan applicant. The goal is to classify the applicant into one of two categories, good or bad.

Subtasks: (Turn in your answers to the following tasks)
1. List all the categorical (or nominal) attributes and the real-valued attributes separately.

2. What attributes do you think might be crucial in making the credit assessment ? Come up with some simple rules in plain English using your selected attributes.

3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you

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classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?

5. Is testing on the training set as you did above a good idea? Why or Why not ?

6. One approach for solving the problem encountered in the previous question is using cross-validation? Describe what is cross-validation briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?

7. Check to see if the data shows a bias against "foreign workers" (attribute 20), or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect?

8. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)

9. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifcations equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)?

10. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model?

11. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?

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12.(Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR.

Task Resources:

- Andrew Moore's Data Mining Tutorials (See tutorials on Decision Trees and Cross Validation)
- Decision Trees (Source: Tan, MSU)
- Tom Mitchell's book slides (See slides on Concept Learning and Decision Trees)
- Weka resources:
  - o Introduction to Weka (html version) (download ppt version)
  - o Download Weka
  - o Weka Tutorial
  - o ARFF format
  - o Using Weka from command line

Task 2: Hospital Management System
Data Warehouse consists Dimension Table and Fact Table.
REMEMBER The following
Dimension
The dimension object (Dimension):
_ Name
_ Attributes (Levels) , with one primary key
_ Hierarchies
One time dimension is must.
About Levels and Hierarchies

Dimension objects (dimension) consist of a set of levels and a set of hierarchies defined over those levels. The levels represent levels of aggregation. Hierarchies describe parent-child relationships among a set of levels.
For example, a typical calendar dimension could contain five levels. Two hierarchies can be defined on these levels:
H1: YearL > QuarterL > MonthL > WeekL > DayL
H2: YearL > WeekL > DayL

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The hierarchies are described from parent to child, so that Year is the parent of Quarter, Quarter the parent of Month, and so forth.

About Unique Key Constraints

When you create a definition for a hierarchy, Warehouse Builder creates an identifier key for each level of the hierarchy and a unique key constraint on the lowest level (Base Level)

Design a Hospital Management system data warehouse (TARGET) consistig of Dimensions Patient, Medicine, Supplier, Time. Where measures are ' NO UNITS', UNIT PRICE.

Assume the Relational database (SOURCE) table schemas as follows

TIME (day, month, year),

PATIENT (patient_name, Age, Address, etc.,)

MEDICINE (Medicine_Brand_name, Drug_name, Supplier, no_units, Uinit_Price, etc.,)

SUPPLIER :(Supplier_name, Medicine_Brand_name, Address, etc.,)

If each Dimension has 6 levels, decide the levels and hierarchies, Assume the level names suitably.

Design the Hospital Management system data warehouse using all schemas. Give the example 4-D cube with assumption names.

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15A05603   DESIGN PATTERNS

Course Objectives:
- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

Course Outcomes:
- Know the underlying object oriented principles of design patterns.
- Understand the context in which the pattern can be applied.
- Understand how the application of a pattern affects the system quality and its tradeoffs.

UNIT-I

Introduction to Design Patterns

Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, Use of Design Patterns.

UNIT-II

Designing A Document Editor: A Case Study

Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT-III

Structural Patterns-1: Adapter, Bridge, Composite.
Structural Patterns-2: Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns.

UNIT-IV

Behavioral Patterns-1: Chain of Responsibility, Command, Interpreter, Iterator.
Behavioral Patterns-2: Mediator, Memento, Observer.

UNIT-V

Behavioral Patterns-2(cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

TEXT BOOK :

1. Design Patterns By Erich Gamma, Pearson Education

REFERENCE BOOKS:

1. Pattern's in JAVA Vol-I By Mark Grand, Wiley DreamTech.
2. Pattern's in JAVA Vol-II By Mark Grand, Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III By Mark Grand, Wiley DreamTech.
4. Head First Design Patterns By Eric Freeman-Oreilly-spd
5. Design Patterns Explained By Alan Shalloway,Pearson Education.
6. Pattern Oriented Software Architecture, F.Buschmann &others, John Wiley & Sons.

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15F05303 Design and Analysis Of Algorithms

Course Objectives:
- To know the importance of the complexity of a given algorithm.
- To study various algorithmic design techniques.
- To utilize data structures and/or algorithmic design techniques in solving new problems.
- To know and understand basic computability concepts and the complexity classes P, NP, and NP-Complete.
- To study some techniques for solving hard problems

Course Outcomes
- Analyze the complexity of the algorithms
- Use techniques divide and conquer, greedy, dynamic programming, backtracking, branch and bound to solve the problems.
- Identify and analyze criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution.
- Describe the classes P, NP, and NP-Complete and be able to prove that a certain problem is NP-Complete

Unit - I :
Algorithms, Pseudo code for expressing algorithms, performance analysis:- space complexity and time complexity, Asymptotic notations:- Big Oh notation, Omega Notation, Theta notation, amortized complexity

Unit – II:
Divide and Conquer: General method, applications: Defective Chessboard, Binary Search, Quick Sort and its time complexity, Merge Sort and Stressen's matrix multiplication.
Greedy Method: General method, applications: job sequencing with deadlines, knapsack problem, single source shortest path, Minimum cost Spanning Trees

Unit – III :
Dynamic programming: General Method, applications: Single Source Shortest path, 0/1 knapsack, All Pairs shortest path, travelling sales person problem and reliability design

Unit – IV :
Back tracking: General Method, applications: 8 – queens problem, sum of subsets problem, graph coloring and hamiltonian cycles, Knapsack Problem.
Branch and Bound: General method, applications: travelling sales person, 0/1 knapsack problem, LC Branch and Bound and FIFO Branch and Bound

Unit – V :
NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

Text Books :
1. "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Satraj Sahani and Rajasekhran, University Press.
2. "Design and Analysis of Algorithms", Parag Himanshu Dave, Himanshu Bhalchandra Dave, Second Edition, Pearson Education

Reference Books :
1. "Introduction to Algorithms", secondedition,T.H.Cormen,C.E.Leiserson, R.L.Rivest,and C.Stein,PHI Pvt. Ltd./ Pearson Education
2. "Introduction to Design and Analysis of Algorithms A strategic approach", R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc Graw Hill.
3. "Data structures and Algorithm Analysis in C++", Allen Weiss, Second edition, Pearson education.
4. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft,Pearson education.
5. "Algorithms" – Richard Johnson baugh and Marcus Schaefer, Pearson Education

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15F05306   ALGORITHMS ANALYSIS LAB.
Course Objectives

- Implement the various algorithms that are being studied in Design and Analysis of Algorithms subject in C++/Java.

Note:You may develop programs using java or C++

1. Write a program that implements Prim's algorithm to generate minimum cost spanning tree.
2. Write a program that implements Kruskal's algorithm to generate minimum cost spanning tree.
3. Write a program to implement Huffman's algorithm for text compression.
4. Write a program to implement Dijkstra's algorithm for Single source shortest path problem.
5. Write a program to implement Floyd's algorithm for the All pairs shortest path problem.
6. Write a program to implement greedy algorithm for job sequencing with deadlines.
7. Write programs for the implementation of bfs and dfs for a given graph.
8. Write a program to find Minimum Cost Binary Search Tree.
9. Write a program to implement Dynamic Programming algorithm for 0/1 Knapsack problem.
10. Write a program to implement the Backtracking algorithm for the sum of subsets problem.
11. Write programs to implement backtracking algorithms for
    a) N-queens problem
    b) The Hamiltaonian cycles problem
    c) The m-colourings graph problem

TEXT BOOKS

1. Data structures and Algorithms in java,3rd edition,A.Drozdek,Cengage Learning.
2. Data structures with Java,J.R.Hubbard,2nd edition,Schaum's Outlines,TMH.
3. Data structures and algorithms in Java, 2nd Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Data structures, Algorithms and Applications in C++, 2nd Edition, S.Sahani, Universities Press.
7. Data structures and Algorithm Analysis in C++,2nd Edition,M.A.Weiss,Pearson education.
8. Design and Analysis of Algorithms,H.Dave and H.B.Dave, Pearson education.
9. Data structures and java collections frame work,W.J.Collins,Mc Graw Hill.

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15F05307 Operating Systems Lab

Course Objectives:

- To implement CPU scheduling algorithms, file allocation methods and page replacement algorithms in C.

1. Simulate the following CPU scheduling algorithms
   a) Round Robin   b) SJF   c) FCFS   d) Priority

2. Simulate all file allocation strategies
   a) Sequential   b) Indexed   c) Linked

3. Simulate MVT and MFT

4. Simulate all File Organization Techniques

   a) Single level directory   b) Two level   c) Hierarchical   d) DAG

5. Simulate Bankers Algorithm for Dead Lock Avoidance

6. Write a C program to create a child process and allow the parent to display "Hello" and the child to display "Welcome" on the screen.

7. Simulate all page replacement algorithms

   a) FIFO   b) LRU   c) LFU   Etc...

8. Simulate Paging Technique of memory management.

9. Write C programs that make a copy of a file using i) standard I/O and ii) system calls.

10. Write C programs that count the number of blanks in a text file using i) standard

TEXT BOOKS:
1. An Introduction to Operating Systems, P.C.P Bhatt, 2nd edition, PHI.

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RANDOM SIGNALS & SYSTEMS

B.Tech II Year I Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CA04302	Core	3	0	0	3	30	70	100

Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 48

COURSE OBJECTIVES:

1. To gain basic concepts about signals and systems.
2. To understand the behavior of signals and systems in both time and frequency domain.
3. To understand the stability of systems through the concept of ROC.
4. To get an in-depth knowledge about signals, systems and analysis of the same using various transforms.

UNIT - I	INTRODUCTION TO SIGNALS & SYSTEMS	Classes: 10

Analogy between vectors and signals – Orthogonality - Mean Square Error, Definition and classification of signal and systems (Continuous time and Discrete time), Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals. Fourier Series Representation of Periodic Signals: Representation of Fourier series, Dirichlet's conditions, Trigonometric & Exponential Fourier series.

UNIT - II	FOURIER TRANSFORM	Classes: 10

CONTINUOUS TIME FOURIER TRANSFORM: Deriving Fourier transform from Fourier series, Definition, Computation and properties of Fourier Transform for different types of signals. Statement and proof of sampling theorem of low pass signals and systems.
DISCRETE TIME FOURIER TRANSFORM: Definition, Computation and properties of Fourier Transform for different types of signals.

UNIT - III	SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS	Classes: 10

Linear system, impulse response, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer functions of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power Spectral Densities.

UNIT - IV	LAPLACE TRANSFORM	Classes: 10

Definition, ROC, ROC-Properties, Inverse Laplace transforms: S-plane, BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Relation between Laplace transforms and Fourier transform of a signal.

UNIT - V	Z–TRANSFORM	Classes: 08

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform.
Z-Transform Properties: Linearity, time shifting, change of scale, Z-domain differentiation, differencing, accumulation, convolution in discrete time, initial and final value theorems. Poles and Zeros in Z –plane, inverse Z-Transform.
System analysis: Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2009, BS Publications.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn.
3. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition

Reference Books:

1. Signals and Systems – A. Ramakrishna Rao - 2008, TMH.

ANALOG ELECTRONIC CIRCUITS

B.Tech II Year II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
20CA04401	Core	3	0	0	3	30	70	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 48		

COURSE OBJECTIVES:

The course should enable the students to :

1. To perform analysis of FET and BJT amplifiers at low & high frequencies, cascade and Darlington amplifiers.
2. To familiarize with the feedback concept in amplifiers and stability issues.
3. To perform analysis of Oscillators, Power and Tuned amplifiers.
4. To familiarize with the operation and characteristics of multivibrators, time base generators and sweep circuits.

UNIT-I	SINGLE STAGE AND MULTISTAGE AMPLIFIERS	Classes: 10

Classification of amplifiers, Various types of distortions in amplifiers, Analysis of CB, CE and CC transistor amplifiers circuit using simplified h-parameter model, Millers theorem and its dual, Design of Single stage RC coupled amplifier using BJT, Low frequency response of BJT amplifier, Effect of coupling and bypass capacitor.

Multistage amplifiers: Different coupling schemes used in amplifiers, RC coupled amplifiers, Transformer coupled amplifiers and Direct coupled amplifiers, Cascode amplifier, Analysis of Cascaded RC coupled amplifiers, Darlington pair amplifier, Analysis of Multi-stage CS and CD amplifiers using FET.

UNIT-II	HIGH FREQUENCY RESPONSE OF TRANSISTOR	Classes: 08

The hybrid-π Common Emitter transistor model, Hybrid-π conductance and Hybrid-π capacitances, Common Emitter short circuit current gain, Current gain with resistive load, α and β cut-off frequencies, Gain Bandwidth product, Emitter follower at high frequencies, Analysis of CS and CD amplifiers at high frequencies.

UNIT-III	FEEDBACK AMPLIFIERS AND OSCILLATORS	Classes: 10

Feedback amplifiers: Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Analysis of voltage series, voltage shunt, current series and current shunt feedback configurations.

Oscillators: Classification of Oscillators, Conditions for oscillations, Generalized analysis of LC oscillators, Hartley and Colpitt's oscillators, RC phase shift oscillator, Wien bridge and Crystal oscillators, Frequency and Amplitude stability of oscillators.

UNIT-IV	LARGE SIGNAL AND TUNED AMPLIFIERS	Classes: 09

LARGE SIGNAL AMPLIFIERS: Class A large signal amplifier, Transformer coupled Class A audio power amplifiers, Efficiency of Class A amplifier, Class B amplifier, Class B push-pull amplifier, Complementary symmetry Class B push-pull amplifier, Efficiency of Class B amplifier, Phase inverters, Thermal stability and Heat sinks.

TUNED AMPLIFIERS: Series and Parallel resonant circuits, Q - factor, Small Signal Tuned amplifiers, Effect of cascading Single and Double Tuned amplifiers on bandwidth, Staggered Tuned amplifiers, and Stability of Tuned amplifiers.

UNIT-V	MULTIVIBRATORS AND TIME BASE GENERATORS	Classes: 08

MULTIVIBRATORS: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

TIME BASE GENERATORS: General features of a Time base Signal, Methods of Generating Time Base Waveform, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, UJT Sawtooth generator.

Text Books:

1. Jacob Millman, Christor C Halkias, "Integrated Electronics", Tata McGraw Hill, 1st Edition, 2008.
2. Sedra A.S., K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 6th Edition, 2013.
3. Donald A Neamen, "Electronic Circuits Analysis and Design", Tata McGraw Hill, 3rd Edition, 2007.

Reference Books:

ANALOG AND DIGITAL COMMUNICATIONS

B.Tech III Year I Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA04502	Core	3	0	0	3	30	70	100

Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 48

COURSE OBJECTIVES:

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of pulse shaping in baseband transmissions.

UNIT-I	AMPLITUDE MODULATION	Classes: 10

Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, SSB modulation - time and frequency domain description, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT-II	ANGLE MODULATION	Classes: 10

Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal-Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM, Concept of Pre-emphasis and de-emphasis.

UNIT-III	TRANSMITTERS AND RECEIVERS	Classes: 10

Transmitters: Classification of Transmitters AM Transmitters, FM Transmitters.
Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super hetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, Automatic Gain Control, Amplitude limiting, FM Receiver.

UNIT-IV	PULSE MODULATION & PULSE CODE MODULATION	Classes: 09

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM.
Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT-V	PULSE SHAPING AND DIGITAL MODULATION TECHNIQUES	Classes: 09

Pulse Shaping: Base-band Transmission, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, Ideal Nyquist channel, Raised cosine filter & its spectrum, Eye diagrams.
Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK and Differential PSK.

Text Books:

1. S. S. Haykin, "Communication Systems", Wiley Eastern, 2nd Edition, 2006.
2. Taub, Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 4th Edition, 2013.
3. B.P. Lathi, "Signals, Systems and Communications", BS Publications, 5th Edition, 2009.
4. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.

ANALOG & DIGITAL COMMUNICATIONS LABORATORY

B.Tech III Year I Semester								
Course Code	**Category**	Hours / Week			**Credits**	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
19CA04509	**Core**	0	0	3	1.5	30	70	100

Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 48	Total Classes: 48

Course OBJECTIVES:

1. Implement various Modulation techniques in Analog communication.
2. Understand the importance of Automatic Gain Control.
3. Understand the importance of Time Division of Multiplexing.
4. Experience real time behavior of different Digital Modulation schemes.

LIST OF EXPERIMENTS

Experiments on Analog Communication   (ANY FIVE EXPERIMENTS)

1	AMPLITUDE MODULATION AND DEMODULATION

Generation of amplitude modulation and demodulation using hardware.

2	BALANCED MODULATOR AND SYNCHRONOUS DETECTOR

Generation of Double side band suppressed carrier modulation and demodulation using hardware.

3	SINGLE SIDE BAND MODULATION AND DEMODULATION

Generation of Single Side Band suppressed carrier modulation and demodulation using hardware.

4	FREQUENCY MODULATION AND DEMODULATION

Generation of frequency modulation and demodulation using hardware.

5	PRE-EMPHASIS AND DE-EMPHASIS

Verification of pre-emphasis and de-emphasis to boost high frequency modulating signal using hardware.

6	CHARACTERISTICS OF AUTOMATIC GAIN CONTROL

Verification of automatic gain control characteristics using hardware.

Experiments on Digital Communication (ANY FIVE EXPERIMENTS)

7	TIME DIVISION MULTIPLEXING.

To design Time Division Multiplexing using hard ware.

8	PULSE CODE MODULATION.

To design Pulse Code Modulation using hard ware.

9	DIFFERENTIAL PULSE CODE MODULATION.

To design Differential Pulse Code Modulation using hard ware.

10	DELTA MODULATION.

To design Delta Modulation using hard ware.

11	FREQUENCY SHIFT KEYING.

To design Frequency Shift Keying using hard ware.

12	DIFFERENTIAL PHASE SHIFT KEYING.

To design Differential Phase Shift keying using hard ware.

Reference Books:

1. John Proakis, "Digital Communications", TMH, 2nd Edition 1983.
2. B.P.Lathi, "Modern Analog and Digital Communication", Oxford reprint, 3rd Edition, 2004.
3. Singh, Sapre, "Communication Systems Analog and Digital", TMH, 2nd Edition
4. S.S.Haykin, "Communication Systems", Wiley Eastern, 2nd Edition, 2006.
5. Taub, Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 4th edition, 2013.

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

CO1: Demonstrate knowledge on analog and Digital Communication systems.

MICROWAVE & OPTICAL COMMUNICATION

B.Tech III Year II Semester

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA04601	Core	2	1	0	3	30	70	100

Contact Classes: 32	Tutorial Classes:16	Practical Classes: Nil	Total Classes:48

COURSE OBJECTIVES:

1. To develop the knowledge on transmission lines for microwaves, waveguide components and applications.
2. To understand the scattering matrix parameters and its use.
3. The course gives an account of optical Communication starting with the basic of fiber optics.
4. To give clear understanding of various components such as Optical fibers, Photo detectors, connectors, coupling devices and optical amplifiers Knowledge of various components used in optical networks.

UNIT-I	MICROWAVE TRANSMISSION LINES	Classes: 10

MICROWAVE TRANSMISSION LINES: Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides-Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, Characteristic equation and cutoff frequencies, dominant and degenerate modes, sketches of TE and TM mode fields in the cross-section. Mode characteristics- Phase and Group velocities, wavelengths and impedance relations.

UNIT-II	WAVEGUIDE COMPONENTS AND APPLICATIONS	Classes: 10

Coupling mechanisms: Probe, loop, waveguide discontinuities, Waveguide attenuators; Waveguide phase shifters; waveguide multiport junctions: Properties and s-matrix calculations of E plane Tee, H plane Tee, Magic Tee, Directional Coupler.
Ferrites: Faraday rotation principle, gyrator, isolator, circulator.

UNIT-III	MICROWAVE TUBES & INTRODUCTION TO OPTICAL FIBERS	Classes: 09

Microwave linear beam tubes: Limitations of conventional tubes at microwave frequencies; Two Cavity klystron Amplifier, Single cavity Klystron Oscillator..
Introduction To Optical Fibers: Evolution of fiber optic system, Element of an Optical Fiber Transmission link, Ray Optics, OpticalFiber Modes and Configurations, Mode theory of Circular Wave guides, Key Modal concepts, Linearly Polarized Modes.

UNIT-IV	SIGNAL DEGRADATION OPTICAL FIBERS	Classes: 10

Attenuation, Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides, Information Capacity determination, Group Delay, Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers, Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers, Mode Coupling.

UNIT-V	FIBER OPTICAL SOURCES AND COUPLING	Classes: 09

Direct and indirect Band gap materials, LED structures, Light source materials, Quantum efficiency and LED power, Modulation of a LED, lasers Diodes, Modes and Threshold condition, Rate equations,
External Quantum efficiency, Resonant frequencies, Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fiber–to- Fiber joints, Fiber splicing.

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson, 3rd Edition, 2003.
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, "Microwave Principles", CBSPublishers and Distributors, New Delhi, 1st Edition, 2004.
3. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd edition, 2000.

INTERNET OF THINGS (IOT)

B.Tech III Year II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05604	Core	3	0	0	3	30	70	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		

COURSE OBJECTIVES:

The course should enable the students to:
1. Introduce the fundamental concepts of IoT and physical computing.
2. Expose the student to a variety of embedded boards and IoT Platforms.
3. Create a basic understanding of the communication protocols in IoT communications.
4. Familiarize the student with application program interfaces for IoT.
5. Enable students to create simple IoT applications.

UNIT-I	Classes: 09

Overview of IoT: The Internet of Things: An Overview, The Flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances. Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.

UNIT-II	Classes: 10

Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things.

UNIT-III	Classes: 10

Communication in the IoT: Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol.

UNIT-IV	Classes: 10

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups. Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

UNIT- V	Classes: 09

Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software. Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

Text Books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547 R16 B.TECH ECM.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

Web References:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to
- CO1: Choose the sensors and actuators for an IoT application.
- CO2: Select protocols for a specific IoT application.
- CO3: Utilize the cloud platform and APIs for IoT applications.
- CO4: Experiment with embedded boards for creating IoT prototypes.
- CO5: Design a solution for a given IoT application.

AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

B.Tech III Year II Semester

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA05511	Core	0	0	3	1.5	30	70	100
Contact Classes:Nil	Tutorial Classes:Nil	Practical Classes: 48				Total Classes: 48		

COURSE OBJECTIVES:

The course should enable the students to:

1. Implement the basic knowledge of Study of Prolog.
2. Construct Problem solving Techniques.
3. Apply Different Search Techniques.
4. Practice various Traversal Problems.

LISTOF EXPERIMENTS

Exp. 1	Study of PROLOG. Write the following programs using PROLOG.
Exp. 2	Program to show how integer variable is used in prolog program.
Exp. 3	Write a program to solve 8 queens problem
Exp. 4	Program to add two numbers
Exp. 5	Program to delete an integer from the list .
Exp. 6	Solve any problem using depth first search.
Exp. 7	Program to categorize animal characteristics.
Exp. 8	Program to show concept of list.
Exp. 9	Solve any problem using best first search.
Exp. 10	Program to read address of a person using compound variable
Exp. 11	Program to demonstrate family relationship
Exp. 12	Solve 8-puzzle problem using best first search
Exp. 13	Program of fun to show concept of cut operator .
Exp. 14	Solve Robot (traversal) problem using means End Analysis.
Exp. 15	Program to count number of elements in a list .
Exp. 16	Solve traveling salesman problem.
Exp. 17	Program to reverse the list.
Exp. 18	Program to append an integer into the list.
Exp. 19	Program to replace an integer from the list.

Equipment/Software required for Laboratories: PROLOG

Reference Books:

1. Artificial Intelligence: A Modern Approach,. Russell & Norvig. 1995, Prentice Hall.
2. Artificial Intelligence, Elain Rich and Kevin Knight, 1991, TMH.
3. Artificial Intelligence-A modern approach, Staurt Russel and peter norvig, 1998, PHI.
4. Artificial intelligence, Patrick Henry Winston:, 1992, Addition Wesley 3 Ed.,

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

CO1: Demonstrate the knowledge on prolog Programming and Analyze the PROLOG programming through SWI

CO2: Analyze the various problem solving techniques

CO3: Design and develop prolog program to add variables

CO4:Conduct investigation and test the functionality on implementation of prolog programming

CO5: Select appropriate techniques or algorithm tool kit to analyze and implement DFS,BFS

CO6: Follow **ethical** principles in designing and programming AI problems.

CO7: Do experiments effectively as an **individual** and as a member in a **group**.

CO8:**Communicate** verbally and in written form, the understandings about the programming.

CO9: Continue updating their skill related to implementation for various applications during

ADVANCED 3G & 4G WIRELESS COMMUNICATIONS
(MOOC COURSE-II)

B. Tech IV Year I Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA04711	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Course Objectives:

The course should enable the students to:

1. Build an understanding of the fundamental concepts of communications
2. Familiarize the student with the basic taxonomy and terminology of the Mobile communications.
3. Introduce the student to advanced wireless communication concepts, preparing the student for entry Advanced courses in wireless communications.
4. Allow the student to gain expertise in some specific areas of communications such as 3G & 4G.

UNIT-I	WIRELESS COMMUNICATIONS AND DIVERSITY	Classes: 8

Introduction to 3G/4G Standards, Wireless Channel and Fading, Rayleigh Fading and BER of Wired Communication, BER for Wireless Communication, Introduction to Diversity, Multi-antenna Maximal Ratio Combiner, BER with Diversity, Spatial Diversity and Diversity Order

UNIT-II	BROADBAND WIRELESS CHANNEL MODELLING AND CELLULAR COMMUNICATION	Classes: 10

Wireless Channel and Delay Spread, Coherence Bandwidth of the Wireless Channel, ISI and Doppler in Wireless Communications, Doppler Spectrum and Jakes Model, Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes - Call Setup, Handover etc., Teletraffic Theory.

UNIT-III	CDMA AND OFDM	Classes: 8

Introduction to CDMA, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization. Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues.

UNIT-IV	MIMO AND UWB (ULTRA WIDE BAND)	Classes: 10

Introduction to MIMO, MIMO Channel Capacity, SVD and Eigenmodes of the, MIMO Channel , MIMO Spatial Multiplexing – BLAST, MIMO Diversity – Alamouti, OSTBC, MRT, MIMO - OFDM. UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train, Bit-Error Rate Performance of UWB.

UNIT-V	3G AND 4G WIRELESS STANDARDS	Classes: 9

GSM, GPRS, WCDMA, WiFi, UMTS, LTE, LTE-A, WiMAX.

TEXT BOOKS:

1. Principles of Modern Wireless Communication Systems-Aditya K. Jagannatham, Publisher-McGraw Hill,2015.
2. Fundamentals of Wireless Communications – David Tse and PramodViswanath, Publisher - Cambridge University Press,2005.

ELECTROMAGNETIC THEORY

B.Tech II Year II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
19CA04401	Core	2	1	0	3	30	70	100

Contact Classes: 32	Tutorial Classes: 16	Practical Classes: Nil	Total Classes: 48

COURSE OBJECTIVES:

The course should enable the students to:

1. Provide the foundational education in static electromagnetic fields, and time varying electromagnetic waves.
2. Introduce the concepts of Electrostatics and Magneto statics.
3. Develop an understanding of Electromagnetic Waves and their Propagation.

UNIT-I	ELECTROSTATICS-I	Classes: 10

Review of Vector algebra, Co-ordinate systems & transformation, Vector calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Illustrative Problems.

UNIT-II	ELECTROSTATICS-II	Classes: 10

Maxwell's Two Equations for Electrostatic Fields, Electric dipole, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT-III	MAGNETOSTATICS	Classes: 10

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic torque and moment, Magnetic dipole, Inductances and Magnetic Energy, Illustrative Problems.

UNIT-IV	MAXWELL'S EQUATIONS (FOR TIME VARYING FIELDS)	Classes: 09

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary ConditionsofElectromagneticfields:Dielectric-DielectricandDielectric-ConductorInterfaces, Illustrative Problems.

UNIT-V	EM WAVE CHARACTERISTICS	Classes: 09

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetic", Oxford University Press, 4th edition,2009.
2. E.C. Jordan, K.G. Balmain, "Electromagnetic waves and Radiating Systems", PHI learning, 2nd Edition,2000.
3. Umesh Sinha, Satya Prakashan, "Transmission lines and Networks", Tech India Publications, 1st edition, 2010.

Reference Books:

1. Nathan Ida, "Engineering Electromagnetic", Springer (India) Pvt. Ltd, 2nd Edition, 2005
2. William H. Hayt Jr., John A. Buck, "Engineering electromagnetic", Tata McGraw Hill, 7th Edition, 2006.

LINEAR & DIGITAL IC APPLICATIONS LABORATORY

B. Tech III Year I Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
17CA04509	Core	-	-	3	2	30	70	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**		

Course Objectives:
1. To implement different circuits and verify circuit concepts.
2. To Study the concepts of multivibrators and filters.
3. To verify the operations of the timers and PLLs and their applications.
4. To design and verify combinational and sequential circuits

LIST OF EXPERIMENTS

MINIMUM OF TEN EXPERIMENTS TO BE CONDUCTED (FIVE FROM EACH PART)

EXP-1	INVERTING, NON-INVERTING AND DIFFERENTIAL AMPLIFIERS

To construct and test the performance of an Inverting, Non-inverting amplifier and Differential amplifier.

EXP-2	INTEGRATOR AND DIFFERENTIATOR

To construct and test the performance of an Integrator and Differentiator.

EXP-3	FIRST ORDER ACTIVE BANDPASS FILTERS

To design and verify the operation of the Active Band Pass filter.

EXP-4	ASTABLE MULTIVIBRATOR

To design and construct an Astable multivibrator

EXP-5	PHASE LOCKED LOOP (PLL)

To verify characteristics of PLL

EXP-6	INSTRUMENTATION AMPLIFIER

To design and verify the operation of instrumentation amplifier

EXPERIMENTS CAN BE PERFORMED USING HARDWARE OR SOFTWARE TOOLS.

EXP-7	MULTIPLEXER AND DEMULTIPLEXER

To verify functionality of Multiplexer (1:4) and Demultiplexer (4:1)

EXP-8	ENCODER AND DECODER

To Verify Functionality of Encoder (4:2) and Decoder (2:4)

EXP-9	REALISATION OF DIFFERENT FLIP-FLOPS USING LOGIC GATES

To Verify functionality of Flip-flops using Universal Logic Gates.

EXP-10	4 BIT COUNTERS (Asynchronous or Synchronous)

To verify functionality of counters using JK Flip Flops.

EXP-11	REALISATION OF SHIFT REGISTERS

To verify functionality of 4 bit Shift Registers in SISO,SIPO,PISO,PIPO modes using D Flip-Flop

EXP-12	DECADE COUNTER

To verify functionality of decade counter using J-K/T Flip-Flop

Reference Books:

1. D. Roy Chowdhury, "Linear Integrated Circuits", New age international (p) Ltd, 2nd Edition, 2003.
2. Ramakanth A. Gayakwad, "Op-Amps & linear ICs", PHI, 3rd Edition, 2003.
3. John F. Wakerly, "Digital Design Principles and Practices", Prentice Hall, 3rd Edition, 2005.

HARDWARE DESCRIPTION LANGUAGES

M.Tech I Semester: VLSI SYSTEM DESIGN

Course Code	Category	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CIA	SEE	Tota
17CD04104	Core	4	0	-	4	40	60	100
Contact Classes:	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 60**		

OBJECTIVES:

- To understand various modeling in HDL.
- To design digital circuits using verilog HDL.
- To understand verilog data types , operators in verilog HDL.
- To understand synthesis in verilog HDL.

OUTCOMES:

- Analyze the various design methodologies in HDL.
- Program in verilog HDL for digital circuits.
- Analyze the synthesis of digital circuits.
- Design the digital circuits in verilog HDL.

UNIT - I	**HARDWARE MODELING WITH THE VERILOG HDL**	**Classes: 15**

Verilog Module, Hardware Modeling Verilog Primitives, Descriptive Styles, Structural Connections, Behavioral Description In Verilog, Hierarchical Descriptions of Hardware, Structured (Top Down) Design Methodology, Arrays of Instances, Using Verilog for Synthesis, Language Conventions, Representation of Numbers.

Logic System, Data Types And Operators For Modeling In VERILOG HDL:

User-Defined Primitives, User Defined Primitives – Combinational Behavior User-Defined Primitives –Sequential Behavior, Initialization of Sequential Primitives. Verilog Variables, Logic Value Set, Data Types, Strings. Constants, Operators, Expressions and Operands, Operator Precedence Models Of Propagation Delay; Built-In Constructs for Delay, Signal Transitions, Verilog Models for Gate Propagation Delay (Inertial Delay), Time Scales for Simulation, Verilog Models for Net Delay (Transport Delay), Module Paths and Delays, Path Delays and Simulation,

Inertial Delay Effects and Pulse Rejection

UNIT - II	**BEHAVIORAL DESCRIPTIONS IN VERILOG HDL**	**Classes: 15**

Verilog Behaviors, Behavioral Statements, Procedural Assignment, Procedural Continuous Assignments, Procedural Timing Controls and Synchronization, Intra-Assignment, Delay-Blocked Assignments, Non-Blocking Assignment, Intra-Assignment Delay: Non-Blocking Assignment, Simulation of Simultaneous Procedural Assignments, Repeated Intra Assignment Delay, Indeterminate Assignments and Ambiguity, Constructs for Activity Flow Control, Tasks and Functions, Summary of Delay Constructs in Verilog, System Tasks for Timing Checks, Variable Scope Revisited, Module Contents, Behavioral Models of Finite State Machines

UNIT - III	**SYNTHESIS OF COMBINATIONAL LOGIC**	**Classes: 10**

HDL-Based Synthesis, Technology- Independent Design, Benefits of Synthesis, Synthesis Methodology, Vendor Support, Styles for Synthesis of Combinational Logic, Technology Mapping and Shared Resources, Three State Buffers, Three State Outputs and Don"t Cares, Synthesis of Sequential Logic Synthesis of Sequential Udps, Synthesis of Latches, Synthesis of Edge-Triggered Flip Flops, Registered Combinational Logic, Shift Registers and Counters, Synthesis of Finite State Machines, Resets, Synthesis of Gated Clocks, Design Partitions and Hierarchical Structures.

Synthesis Of Language Constructs:

Synthesis of Nets, Synthesis of Register Variables, Restrictions on Synthesis of "X" and "Z", Synthesis of Expressions and Operators, Synthesis of Assignments, Synthesis of Case and Conditional Statement, Synthesis of Resets, Timings Controls in Synthesis, Synthesis of Multi-Cycle Operations, Synthesis of Loops, Synthesis if Fork Join Blocks, Synthesis of The Disable Statement Synthesis of User-Defined Tasks, Synthesis of User-Defined Functions,

Synthesis of Specify Blocks, Synthesis of Compiler Directives.

UNIT - IV	SWITCH-LEVEL MODELS IN VERILOG	Classes: 10

MOS Transistor Technology, Switch Level Models of MOS Transistors, Switch Level Models of Static CMOS Circuits, Alternative Loads and Pull Gates, CMOS Transmission Gates. Bio-Directional Gates (Switches), Signal Strengths, Ambiguous Signals, Strength Reduction By Primitives, Combination and Resolution of Signal Strengths, Signal Strengths and Wired Logic. Design Examples in Verilog.

UNIT - V	INTRODUCTION TO VHDL	Classes: 10

An Overview of Design Procedures used for System Design using CAD Tools. Design Entry. Synthesis, Simulation, Optimization, Place and Route. Design Verification Tools. Examples using Commercial PC Based on VHDL Elements of VHDL Top Down Design with VHDL Subprograms. Controller Description VHDL Operators.

Process Statement Assertion Statements, Sequential Wait Statements Formatted ASCII I/O Operators, MSI-Based Design. Differences between VHDL and Verilog.

Text Books:

1. M.D.CILETTI, "Modeling, Synthesis and Rapid Prototyping with the Verilog HDL", Prentice-
Hall, 1999.
2. Z.NAWABI, "VHDL Analysis and Modeling of Digital Systems", (2/E), McGraw Hill, 1998.

Reference Books:

1. M.G.ARNOLD, "Verilog Digital – Computer Design", Prentice-Hall (PTR), 1999.
2. PERRY, "VHDL", (3/E), McGraw Hill.

PRINCIPLES OF ELECTRICAL ENGINEERING

B.Tech I Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
19CA02203	Foundation	3	1	0	3	30	70	100
Contact Classes:48	Tutorial Classes: 16	Practical Classes: Nil				Total Classes: 64		

Course Objectives:

The course should enable the students:

1. To introduce basics of electric & magnetic circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and electrical machines.
4. To impart knowledge on low voltage electrical installations

UNIT – I	DC CIRCUITS	Classes: 12

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems, Maximum power transfer theorem & Reciprocity theorem - Time-domain analysis of first-order RL and RC circuits.

UNIT – II	AC CIRCUITS	Classes: 12

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Concept of Resonance in series & parallel circuits, bandwidth and quality factor, Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT – III	TRANSFORMERS	Classes: 15

Magnetic materials, BH characteristics, Mutual coupled circuits, Dot Convention in coupled circuits, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto-transformer and three –phase transformers connections.

UNIT – IV	ELECTRICAL MACHINES	Classes: 15

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor, Single-phase induction motor, construction, working, torque- speed characteristic and speed control of separately excited dc motor, construction and working of synchronous generators.

UNIT – V	ELECTRICAL INSTALLATIONS	Classes: 14

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Important Characteristics for Batteries, Elementary calculations for energy consumption, power factor improvement and battery backup.

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

References

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Web References:

1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

E-Text Books:

PRINCIPLES OF ELECTRICAL ENGINEERING LAB

B.Tech I Year II Semester

Course Code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
19CA02204	Foundation	0	0	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes :NIL	Practical Classes: 48				Total Classes:48		

Course Objectives:
The course should enable the students to:
1. Verify the fundamental concepts with experiments

EXP.1	Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
EXP.2	Verification of Thevenin's and Norton Theorems.
EXP.3	Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
EXP.4	Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
EXP.5	Verification of Superposition theorem for DC and AC Networks.
EXP.6	Verification of Maximum power transfer theorem for DC and AC Networks.
EXP.7	Verification of Reciprocity theorem.
EXP.8	To determine the performance characteristics of a Shunt Motor.
EXP.9	To determine the performance characteristics of a Compound Motor.
EXP.10	To determine speed control of DC Shunt Motor.
EXP.11	To determine the load characteristics of a Shunt Generator.
EXP.12	Demonstration of components of LT switchgear.
EXP.13	3 – Phase Power Measurements for balanced loads

References

1.	Laboratory Manual on Principles of Electrical Engineering ,by Dr.Sudha Rani , Dhanpat Rai publishing house 2009

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

CO1: Demonstrate the knowledge on different network theorems and electrical machines

CO2: Analyze the basic the principles of different network theorems and electrical machines

CO3: Apply the basic knowledge on different network theorems and calculate characteristics of electrical machines

CO4: Follow ethical values during conducting of Experiments.

CO5: Work individually or in a team effectively.

CO6: Communicate verbally and in written form pertaining to results of the Experiments.

CO7: Perform experiments involving electrical circuits in future years.