SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

SRM Nagar, Kattankulathur – 603203.

(An Autonomous Institution, Affiliated to Anna University, Chennai,
'A' Grade Accredited by NAAC, NBA Accredited,
ISO 9001:2015 Certified)

CURRICULA AND SYLLABI

B.Tech - INFORMATION TECHNOLOGY

REGULATION 2019

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VISION OF THE INSTITUTE

"Educate to excel in Social Transformation"

To accomplish and maintain international eminence and become a model institution for higher learning through dedicated development of minds, advancement of knowledge and professional application of skills to meet the global demands.

MISSION OF THE INSTITUTE

- To contribute to the development of human resources in the form of professional engineers and managers of international excellence and competence with high motivation and dynamism, who besides serving as ideal citizen of our country will contribute substantially to the economic development and advancement in their chosen areas of specialization.
- To build the institution with international repute in education in several areas at several levels with specific emphasis to promote higher education and research through strong institute-industry interaction and consultancy.

VISION OF THE DEPARTMENT

To become a model for higher learning through development to prepare self-disciplined, creative culturally competent and dynamic Information Technocrats while remaining sensitive to ethical, societal and environmental issues.

MISSION OF THE DEPARTMENT

M1: To mould the students as innovative and high quality IT professionals to meet the global challenges and Entrepreneurs of international excellence as global leaders capable of contributing towards technological innovations learning process, participation citizenship in their neighbourhood and economic growth.

M2: To impart value-based IT education to the students and enrich their knowledge and to achieve effective interaction between industry and institution for mutual benefits.

B.TECH.INFORMATION TECHNOLOGY

REGULATIONS – 2019

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

1. To afford the necessary background in the field of Information Technology to deal with engineering problems to excel as engineering professionals in industries.
2. To improve the qualities like creativity, leadership, teamwork and skill thus contributing towards the growth and development of society.
3. To develop ability among students towards innovation and entrepreneurship that caters to the needs of Industry and society.
4. To inculcate and attitude for life-long learning process through the use of information technology sources.
5. To prepare then to be innovative and ethical leaders, both in their chosen profession and in other activities.

2. PROGRAMME OUTCOMES (POs):

After going through the four years of study, Bachelor of Technology in Information Technology Graduates will exhibit ability to:

PO#	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2	Problem analysis	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques,

		resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion Bachelor of Technology in Information Technology program the student will have following Program specific outcomes

1. Design secured database applications involving planning, development and maintenance using state of the art methodologies based on ethical values.
2. Design and develop solutions for modern business environments coherent with the advanced technologies and tools.

3. Design, plan and setting up the network that is helpful for contemporary business environments using latest hardware components.
4. Planning and defining test activities by preparing test cases that can predict and correct errors ensuring a socially transformed product catering all technological needs.

4. PEO / PO Mapping:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES												PROGRAM SPECIFIC OUTCOMES			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
I	✓	✓											✓	✓	✓	
II			✓		✓	✓	✓		✓					✓		
III			✓	✓	✓	✓					✓	✓			✓	✓
IV												✓	✓			
V								✓		✓			✓	✓	✓	✓

MAPPING – UG- INFORMATION TECHNOLOGY ENGINEERING

S. No.	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
I YEAR																			
1	Sem I	1919101	Communicative English	3	3	3	2	3	3	2	-	-	3	-	1	1	1	1	1
2		1918102	Engineering Mathematics - I	3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-
3		1920103	Engineering Physics	3	1	1	1	1	1	1	-	-	-	-	-	1	-	1	-
4		1921104	Engineering Chemistry	3	2	3	1	2	2	2	-	1	1	-	2	1	1	1	2
5		1901006	Programming in C	3	2	2	2	2	1	1	-	2	-	1	1	3	1	2	3
6		1901007	Engineering Graphics	2	-	3	-	-	-	-	-	1	3	-	1	2	1	1	1
7		1901108	Physics and Chemistry Laboratory	3	1	1	1	-	1	2	1	1	-	-	1	2	3	2	1
8		1901010	C Programming Laboratory	3	2	3	2	2	2	-	3	1	1	2	1	2	2	2	2
9	Sem II	1919201	Technical English	3	2	2	2	-	-	-	-	-	3	2	1	1	1	1	2
10		1918202	Engineering Mathematics - II	3	2	1	1	-	-	-	-	-	-	-	1	-	-	-	-
11		1920202	Physics for Information Science	3	2	2	-	1	1	1	-	-	-	-	-	-	-	2	-
12		1921203	Environmental Science and Engineering	1	1	3	-	-	2	3	-	3	-	-	1	1	1	1	1
13		1901005	Problem Solving and Python Programming	3	2	3	2	2	2	1	-	-	2	2	2	2	2	2	3

S. No.		Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
14		1901008	Basic Civil and Mechanical Engineering	3	2	2	1	-	1	1	1	-	-	-	1	2	1	1	2
15		1901009	Problem Solving and Python Programming Laboratory	3	2	2	1	2	2	-	1	-	-	2	3	2	3	2	3
16	**Semester**	1901208	Engineering Practices Laboratory	3	2	2	2	2	1	-	-	1	-	1	1	3	2	2	2
17		1901209	Applied Physics and Environmental Chemistry Laboratory	3	2	2	2	-	2	3	1	1	-	-	2	1	1	1	1
18		1901200	NSS/NCC/YRC /NSO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II YEAR																			
19		1918302	Discrete Mathematics	3	3	2	-	-	-	-	-	1	-	-	-	-	-	-	-
20		1908301	Data Structures and Algorithms	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-	-
21		1908302	Digital Principles and System Design	3	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
22		1904302	Object Oriented Programming	2	3	3	1	3	2	2	1	2	2	1	2	3	2	-	-
23	Sem III	1908303	Analog and Digital Communication	3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
24		1908304	Information Technology Essentials	3	3	2	-	2	-	2	-	-	2	-	-	3	3	2	3
25		1908305	Data Structures Laboratory	3	2	3	-	2	-	-	-	-	-	-	-	3	2	-	-
26		1904306	Object Oriented Programming Laboratory	2	3	3	2	3	2	2	1	2	3	1	2	3	2	-	-
27		1908306	Digital system and communication laboratory	3	3	3	-	2	-	-	-	-	-	-	-	-	3	-	-

S. No.	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
28	Sem IV	1918404	Probability and Statistics	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
29		1908401	Principles of Compiler Design	3	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
30		1908007	Operating Systems Concepts	3	1	3	-	-	-	-	-	-	-	-	-	3	2	2	2
31		1904001	Database Management System	3	2	3	2	2	1	1	-	2	-	2	-	3	-	-	3
32		1915001	Professional Ethics	-	-	-	-		3	3	2	-	-	-	-	1	-	-	1
33		1908402	Principles of Operating Systems Laboratory	3	2	3	-	2	-	-	-	-	-	-	-	2	3	-	2
34		1908403	Compiler Laboratory	2	2	2	2	2	1	2	2	-	2	-	-	-	-	3	-
35		1904002	Database Management System Laboratory	3	2	3	2	2	1	1	2	2	1	2	3	3	-	-	-
36		1919001	Communication Skills Laboratory-Project based	3	3	2	2	3	-	3	-	-	3	-	1	2	1	1	1
III YEAR																			
37	Sem V	1908501	Web Technology	3	1	1	-	3	-	-	-	-		-	-	-	3	-	-
38		1908503	Software Engineering	3	1	2	-	-	-	-	-	-	3	-	-	-	3	-	3
39		1908006	Computer Architecture	3	2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
40		1904003	Computer Networks	3	1	2	-	-	-	-	-	-	-	-	-	-	-	3	-
41		1908510	Web Technology Laboratory	3	1	1	-	3	-	-	-	-	-	-	-	-	3	-	-

S. No.	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
42		1904512	Networks Laboratory	3	1	2	-	2	-	-	-	-	-	-	-	-	-	3	-
43	Sem VI	1908601	Mobile Communication	3	2	3	-	-	-	-	-	-	-	-	-	-	2	2	-
44		1908602	Computational Intelligence	3	2	2	3		-	-	-	-	-	-	-	-	2	3	-
45		1908008	Object Oriented Analysis and Design	3	3	3	3		-	-	-	-	-	-	-	-	2	-	-
46		1908610	Object Oriented Analysis and Design Laboratory	3	3	3	2	3	-	-	-	-	-	-	-	-	2	-	3
47		1908611	Mini Project	3	3	3	1	3	3	3	-	-	-	-	-	2	3	3	3
48		1904610	Mobile Application Development Laboratory	1	-	2	-	3	-	-	-	-	-	-	-	-	2	-	-
49		1919002	Professional Communication	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-	-
IV YEAR																			
50	Sem VII	1908701	Cloud Computing	2	3	3	2	2	2	-	-	-	-	-	-	1	3	2	-
51		1908702	Software Project Management	3	3	3	3		3	-	-	-	-	-	-	-	3	2	-
52		1904005	Cryptography and Network Security	2	3	3	3	2	2	-	-	-	-	-	-	-	3	2	-
53		1908705	FOSS and Cloud Computing Laboratory	2		3	2	3	2	-	-	-	-	-	-	-	2	2	-
54		1908706	Project Work - Phase I	3	3	3	3	3	2	2	1	3	3	3	2	3	3	3	3
55		1908708	Internship	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S. No.	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
56		1904008	Security Laboratory	2	3	2	3	2	2	-	-	-	-	-	-	-	3	2	-
57	Sem VIII	1908808	Project Work - Phase II	3	3	3	3	3	2	2	1	3	3	3	2	3	3	3	3
PROFESSIONAL ELECTIVES																			
58	Sem V PE-I	1908504	Information Theory And Coding Techniques	3	2	3	-	2	-	-	-	-	-	-	-	-	2	-	-
59		1908505	Microprocessors and Microcontrollers	3	2	2	-	2	-	-	-	-	-	-	-	-	2	-	-
60		1908506	System Software	3	3	3	2	3	-	-	-	-	-	-	-	-	2	-	-
61		1908004	C# and .Net Programming	3	2	3	3	3	-	-	-	-	-	-	-	3	3	-	-
62		1908507	Data Warehousing and Data Mining	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-	-
63		1906510	Digital Signal Processing	3	3	3	3	-	2	-	-	-	-	3	1	-	2	-	-
64	Sem VI PE-II	1908603	Formal Languages and Automata Theory	3	3	3	3	2	-	-	-	-	-	-	-	-	3	-	-
65		1908604	Digital Image Processing	3	2	3	-	2	-	-	-	-	-	2	-	-	2	-	-
66		1908606	GPU Architecture	3	-	3	2	2	2	2	-	-	-	2	-	2	3	-	-
67		1904607	Data Science	3	-	3	2	2	2	2	-	-	-	2	-	2		3	-
68		1904606	Intellectual Property Rights	1	2	2	3	2	2	2	-	2	-	2	2	3	2	2	2
69		1915004	Human Rights	-	-	-	-	-	1	1	1	-	-	-	-	-	1	-	1

S. No.	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
70	Sem VI PE-III	1908607	Machine Learning Techniques-I	2	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
71		1908609	Internet of Things and its Applications	2	2	3	3	-	-	-	-	2	3	-	-	-	-	-	3
72		1908009	Information Storage and Management	3	2		2	2	-	-	-	2	-	2	-	3	-	-	-
73		1908010	Computer Graphics and Multimedia	3	-	3	-	2	-	-	-	-	-	-	-	2	3	-	-
74		1908011	Information Retrieval Techniques	2	2	3	-	2	-	-	-	-	-	-	-	-	2	3	-
75		1915002	Principles of Management	-	2	1	-	1	-	1	-	1	2	2	-	-	1	1	-
76	Sem VII PE-IV	1908703	Machine Learning Techniques -II	2	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
77		1908704	Cyber Forensics	3	-	-	2	3	-	-	-	-	-	-	-	-	-	3	-
78		1908012	Social Network Analysis	2	2	2	2	-	-	2	-	-	-	-	-	-	2	3	-
79		1904011	Big Data Analytics	2	2	3	3	2	2	-	-	-	-	-	2	2	2	2	-
80		1906711	Speech Processing	3	3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
81		1915003	Total Quality Management	-	1	1	-	2	-	2	-	-	-	1	-	1	-	-	-
82	Sem VIII PE-V	1908801	Information Security	3	3	3	3		-	-	-	-	-	-	-	-	-	3	-
83		1908802	Advanced Database Technology	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-	-
84		1908803	Service Oriented Architecture	3	3	3	-	-	2	2	-	-	-	-	-	-	3	-	-

S. No.	Semester	Course Code	Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
85		1908804	Fundamentals of Ethical Hacking	2	2	3	-	-	-	-	3	-	-	-	-	2	-	-	-
86		1908005	Virtual Reality	2	2	3	-	2	-	-	-	-	-	-	-	-	3	-	-
87		1908013	Deep Learning and its Applications	2	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
88	Sem VIII PE-VI	1908805	Neural Network and Expert System	2	3	3	3	2	-	-	-	-	-	-	-	-	3	-	-
89		1908807	Blockchain	2	2	3	-	2	-	-	-	-	-	-	2	-	3	-	-
90		1908001	3D Printing and Design	2	2	2	3	2	-	-	-	-	-	2	-	2	3	-	-
91		1908014	Software Testing	2	2	2	3	-	-	-	-	3	3	3	-	-	-	-	3
92		1904803	Green Computing	2	2	3	2	3	2	2	2	-	-	-	3	-	3	2	-
93		1904004	Natural Language Processing	2	3	2	3	2	2	2	-	-	3	-	-	-	3	3	-

Contribution 1 – Reasonable 2 – Significant 3 - Strong

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.TECH INFORMATION TECHNOLOGY
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULA & SYLLABI

SEMESTER - I

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1919101	Communicative English	HS	3	3	0	0	3
2.	1918102	Engineering Mathematics-I	BS	4	3	1	0	4
3.	1920103	Engineering Physics	BS	3	3	0	0	3
4.	1921104	Engineering Chemistry	BS	3	3	0	0	3
5.	1901006	Programming in C	ES	3	3	0	0	3
6.	1901007	Engineering Graphics	ES	6	2	0	4	4
PRACTICALS								
7.	1901108	Physics and Chemistry Laboratory	BS	4	0	0	4	2
8.	1901010	C Programming Laboratory	ES	4	0	0	4	2
TOTAL				**30**	**17**	**1**	**12**	**24**

SEMESTER - II

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1919201	Technical English	HS	3	3	0	0	3
2.	1918202	Engineering Mathematics-II	BS	4	3	1	0	4
3.	1920202	Physics for Information Science	BS	3	3	0	0	3
4.	1921203	Environmental Science and Engineering	BS	3	3	0	0	3
5.	1901005	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	1901008	Basic Civil and Mechanical Engineering	ES	3	3	0	0	3
PRACTICALS								
7.	1901009	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	1901208	Engineering Practices Laboratory	ES	4	0	0	4	2
9.	1901209	Applied Physics and Environmental Chemistry Laboratory	BS	4	0	0	4	2
10.	1901200	NSS/NCC/YRC/NSO	PCD	2*	0	0	2	1
			TOTAL	**31**	**18**	**1**	**14**	**26**

* ***conducted after college hours***

SEMESTER - III

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1918302	Discrete Mathematics	BS	4	3	1	0	4
2.	1908301	Data Structures and Algorithms	PC	3	3	0	0	3
3.	1908302	Digital Principles and System Design	PC	3	3	0	0	3
4.	1904302	Object Oriented Programming	PC	3	3	0	0	3
5.	1908303	Analog and Digital Communication	PC	3	3	0	0	3
6.	1908304	Information Technology Essentials	PC	3	3	0	0	3
PRACTICALS								
7.	1908305	Data Structures Laboratory	PC	4	0	0	4	2
8.	1904306	Object Oriented Programming Laboratory	PC	4	0	0	4	2
9.	1908306	Digital system and communication laboratory	PC	4	0	0	4	2
			TOTAL	**31**	**18**	**1**	**12**	**25**

SEMESTER - IV

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1918404	Probability and Statistics	BS	4	3	1	0	4
2.	1908401	Principles of Compiler Design	PC	3	3	0	0	3
3.	1908007	Operating Systems Concepts	PC	3	3	0	0	3
4.	1904001	Database Management System	PC	3	3	0	0	3
5.	1915001	Professional Ethics	HS	3	3	0	0	3
PRACTICALS								
6.	1908402	Principles of Operating Systems Laboratory	PC	4	0	0	4	2
7.	1908403	Compiler Laboratory	PC	4	0	0	4	2
8.	1904002	Database Management System Laboratory	PC	4	0	0	4	2
9.	1919001	Communication Skills Laboratory – Project based	EEC	2	0	0	2	0
			TOTAL	**30**	**15**	**1**	**14**	**22**

SEMESTER - V

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1908501	Web Technology	PC	3	3	0	0	3
2.	1908503	Software Engineering	PC	3	3	0	0	3
3.	1908006	Computer Architecture	PC	3	3	0	0	3
4.	1904003	Computer Networks	PC	3	3	0	0	3
5.	19XXXXX	Professional Elective - I	PE	3	3	0	0	3
6.	19XXXXX	Open Elective – I	OE	3	3	0	0	3
PRACTICALS								
7.	1908510	Web Technology Laboratory	PC	4	0	0	4	2
8.	1904512	Networks Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER - VI

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1908601	Mobile Communication	PC	3	3	0	0	3
2.	1908602	Computational Intelligence	PC	3	3	0	0	3
3.	1908008	Object Oriented Analysis and Design	PC	3	3	0	0	3
4.	19XXXXX	Professional Elective - II	PE	3	3	0	0	3
5.	19XXXXX	Professional Elective - III	PE	3	3	0	0	3
PRACTICALS								
6.	1908610	Object Oriented Analysis and Design Laboratory	PC	4	0	0	4	2
7.	1908611	Mini Project	EEC	4	0	0	4	2
8.	1904610	Mobile Application Development Laboratory	PC	4	0	0	4	2
9.	1919002	Professional Communication	EEC	2	0	0	2	1
			TOTAL	**29**	**15**	**0**	**14**	**22**

SEMESTER - VII

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	1908701	Cloud Computing	PC	3	3	0	0	3
2.	1908702	Software Project Management	PC	3	3	0	0	3
3.	1904005	Cryptography and Network Security	PC	3	3	0	0	3
4.	19XXXXX	Professional Elective - IV	PE	3	3	0	0	3
5.	19XXXXX	Open Elective – II	OE	3	3	0	0	3
PRACTICALS								
6.	1908705	FOSS and Cloud Computing Laboratory	PC	4	0	0	4	2
7.	1908706	Project Work - Phase I	EEC	4	0	0	4	2
8.	1908708	Internship	EEC	0	0	0	0	1
9.	1904008	Security Laboratory	PC	4	0	0	4	2
			TOTAL	**27**	**15**	**0**	**12**	**22**

SEMESTER - VIII

SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	19XXXXX	Professional Elective - V	PE	3	3	0	0	3
2.	19XXXXX	Professional Elective - VI	PE	3	3	0	0	3
PRACTICALS								
3.	1908808	Project Work - Phase II	EEC	12	0	0	12	6
			TOTAL	**18**	**6**	**0**	**12**	**12**

TOTAL NO. OF CREDITS: 175

PROFESSIONAL ELECTIVES (PE)								
SEMESTER - V PROFESSIONAL ELECTIVE – I								
SL. No	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1908504	Information Theory and Coding Techniques	PE	3	3	0	0	3
2.	1908505	Microprocessors and Microcontrollers	PE	3	3	0	0	3
3.	1908506	System Software	PE	3	3	0	0	3
4.	1908004	C# and .Net Programming	PE	3	3	0	0	3
5.	1908507	Data Warehousing and Data Mining	PE	3	3	0	0	3
6.	1906510	Digital Signal Processing	PE	3	3	0	0	3
SEMESTER - VI PROFESSIONAL ELECTIVE – II								
SL. No	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1908603	Formal Languages and Automata Theory	PE	3	3	0	0	3
2.	1908604	Digital Image Processing	PE	3	3	0	0	3
3.	1908606	GPU Architecture	PE	3	3	0	0	3
4.	1904607	Data Science	PE	3	3	0	0	3
5.	1904606	Intellectual Property Rights	PE	3	3	0	0	3
6.	1915004	Human Rights	PE	3	3	0	0	3
SEMESTER - VI PROFESSIONAL ELECTIVE – III								
SL. No	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1908607	Machine Learning Techniques- I	PE	3	3	0	0	3
2.	1908609	Internet of Things and its Applications	PE	3	3	0	0	3
3.	1908009	Information Storage and Management	PE	3	3	0	0	3
4.	1908010	Computer Graphics and Multimedia	PE	3	3	0	0	3
5.	1908011	Information Retrieval Techniques	PE	3	3	0	0	3
6.	1915002	Principles of Management	PE	3	3	0	0	3

SEMESTER - VII PROFESSIONAL ELECTIVE - IV								
SL. No	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1908703	Machine Learning Techniques -II	PE	3	3	0	0	3
2.	1908704	Cyber Forensics	PE	3	3	0	0	3
3.	1908012	Social Network Analysis	PE	3	3	0	0	3
4.	1904011	Big Data Analytics	PE	3	3	0	0	3
5.	1906711	Speech Processing	PE	3	3	0	0	3
6.	1915003	Total Quality Management	PE	3	3	0	0	3
SEMESTER VIII PROFESSIONAL ELECTIVE - V								
SL. No	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1908801	Information Security	PE	3	3	0	0	3
2.	1908802	Advanced Database Technology	PE	3	3	0	0	3
3.	1908803	Service Oriented Architecture	PE	3	3	0	0	3
4.	1908804	Fundamentals of Ethical Hacking	PE	3	3	0	0	3
5.	1908005	Virtual Reality	PE	3	3	0	0	3
6.	1908013	Deep Learning and its Applications	PE	3	3	0	0	3
SEMESTER - VIII PROFESSIONAL ELECTIVE - VI								
SL. No	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1908805	Neural Network and Expert System	PE	3	3	0	0	3
2.	1908807	Blockchain	PE	3	3	0	0	3
3.	1908001	3D Printing and Design	PE	3	3	0	0	3
4.	1908014	Software Testing	PE	3	3	0	0	3
5.	1904803	Green Computing	PE	3	3	0	0	3
6.	1904004	Natural Language Processing	PE	3	3	0	0	3

OPEN ELECTIVES (OE) – I								
SEMESTER - V OPEN ELECTIVE – I								
SL. No	**COURSE CODE**	**COURSE TITLE**	**COURSE OFFERING DEPARTMENT**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1902512	Environment and Agriculture	AGRI	3	3	0	0	3
2.	1902513	Production Technology of Agricultural Machinery	AGRI	3	3	0	0	3
3.	1903514	Air Pollution and Control Engineering	CIVIL	3	3	0	0	3
4.	1903515	Participatory Water Resources Management	CIVIL	3	3	0	0	3
4.	1904504	Geographic Information System	CSE	3	3	0	0	3
5.	1905001	Energy Conservation and Management	EEE	3	3	0	0	3
6.	1905508	Renewable Energy Sources	EEE	3	3	0	0	3
7.	1905509	SCADA System Management	EEE	3	3	0	0	3
8.	1906507	Entertaintronics	ECE	3	3	0	0	3
9.	1906505	Photonic Networks	ECE	3	3	0	0	3
10.	1906506	Telecommunication Network Management	ECE	3	3	0	0	3
11.	1907503	Sensors and Transducers	EIE	3	3	0	0	3
12.	1907504	Instrumentation in Biomedical Engineering	EIE	3	3	0	0	3
13.	1909510	Product Design and Development	MECH	3	3	0	0	3
14.	1909511	Vibration and Noise Control	MECH	3	3	0	0	3
15.	1909512	Industrial Safety Engineering	MECH	3	3	0	0	3
16.	1910504	Principles of Food Preservation	MEDICAL ELECTRONIC	3	3	0	0	3
17.	1920501	Nanotechnology	PHYSICS	3	3	0	0	3
18.	1920502	Microscopy	PHYSICS	3	3	0	0	3

19.	1921501	Advanced Engineering Chemistry	CHEMISTRY	3	3	0	0	3
20.	1921502	Industrial Nanotechnology	CHEMISTRY	3	3	0	0	3

OPEN ELECTIVES (OE) – II								
SEMESTER - VII **OPEN ELECTIVE – II**								
Sl. No	**COURSE CODE**	**COURSE TITLE**	**COURSE OFFERING DEPARTMENT**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**
1.	1903706	Green Building Design	CIVIL	3	3	0	0	3
2.	1903716	Environmental and social impact assessment	CIVIL	3	3	0	0	3
3.	1904703	Tamil Computing	CSE	3	3	0	0	3
4.	1905711	Electrical Circuits	EEE	3	3	0	0	3
5.	1905712	Renewable Energy systems	EEE	3	3	0	0	3
6.	1905713	Electric Vehicles and Power Management	EEE	3	3	0	0	3
7.	1906705	Acoustics	ECE	3	3	0	0	3
8.	1906706	Visual Communication	ECE	3	3	0	0	3
9.	1906707	MEMS and NEMS	ECE	3	3	0	0	3
10.	1907001	Transducers Engineering	EIE	3	3	0	0	3
11.	1907003	Process Modeling and Simulation	EIE	3	3	0	0	3
12.	1907708	State Variable Analysis and Design	EIE	3	3	0	0	3
13.	1909718	Robotics	MECH	3	3	0	0	3
14.	1909719	Testing of Materials	MECH	3	3	0	0	3
15.	1909720	Design of Electrical Vehicles	MECH	3	3	0	0	3
16.	1910703	Clinical Trials	MEDICAL ELECTRONICS	3	3	0	0	3
17.	1910704	Regulatory requirements in	MEDICAL ELECTRONICS	3	3	0	0	3

		Pharmaceutical Industries						
18.	1910705	Microbiology	MEDICAL ELECTRONICS	3	3	0	0	3
19.	1920701	Analytical Methods and Instrumentation	PHYSICS	3	3	0	0	3
20.	1920702	Medical Physics	PHYSICS	3	3	0	0	3
21.	1920703	Electronic Materials	PHYSICS	3	3	0	0	3
22.	1921701	Waste Water Treatment	CHEMISTRY	3	3	0	0	3

CATEGORY

HUMANITIES AND SOCIAL SCIENCES (HS)

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	1919101	Communicative English	HS	3	3	0	0	3
2	1919201	Technical English	HS	3	3	0	0	3
3	1915001	Professional Ethics	HS	3	3	0	0	3

BASIC SCIENCES (BS)

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	1918102	Engineering Mathematics - I	BS	4	3	1	0	4
2	1920103	Engineering Physics	BS	3	3	0	0	3
3	1921104	Engineering Chemistry	BS	3	3	0	0	3
4	1901108	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5	1918202	Engineering Mathematics - II	BS	4	3	1	0	4
6	1920202	Physics for Information Science	BS	3	3	0	0	3
7	1921203	Environmental Science and Engineering	BS	3	3	0	0	3
8	1901209	Applied Physics and Environmental Chemistry Laboratory	BS	4	0	0	4	2
9	1918302	Discrete Mathematics	BS	4	3	1	0	4
10	1918404	Probability and Statistics	BS	4	3	1	0	4

ENGINEERING SCIENCES (ES)

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	1901006	Programming in C	ES	3	3	0	0	3
2	1901007	Engineering Graphics	ES	6	2	0	4	4
3	1901010	C Programming Laboratory	ES	4	0	0	4	2
4	1901005	Problem Solving and Python Programming	ES	3	3	0	0	3
5	1901008	Basic Civil and Mechanical Engineering	ES	3	3	0	0	3
6	1901009	Problem Solving and Python	ES	4	0	0	4	2

		Programming Laboratory						
7	1901208	Engineering Practices Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC)

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	1908301	Data Structures and Algorithms	PC	3	3	0	0	3
2	1908302	Digital Principles and System Design	PC	3	3	0	0	3
3	1904302	Object Oriented Programming	PC	3	3	0	0	3
4	1908303	Analog and Digital Communication	PC	3	3	0	0	3
5	1908304	Information Technology Essentials	PC	3	3	0	0	3
6	1908305	Data Structures Laboratory	PC	4	0	0	4	2
7	1904306	Object Oriented Programming Laboratory	PC	4	0	0	4	2
8	1908306	Digital system and communication laboratory	PC	4	0	0	4	2
9	1904001	Database Management System	PC	3	3	0	0	3
10	1908401	Principles of Compiler Design	PC	3	3	0	0	3
11	1908007	Operating Systems Concepts	PC	3	3	0	0	3
12	1904002	Database Management System Laboratory	PC	4	0	0	4	2
13	1908402	Principles of Operating Systems Laboratory	PC	4	0	0	4	2
14	1908403	Compiler Laboratory	PC	4	0	0	4	2
15	1908006	Computer Architecture	PC	3	3	0	0	3
16	1904003	Computer Networks	PC	3	3	0	0	3
17	1908501	Web Technology	PC	3	3	0	0	3
18	1908503	Software Engineering	PC	3	3	0	0	3
19	1904512	Networks Laboratory	PC	4	0	0	4	2
20	1908510	Web Technology Laboratory	PC	4	0	0	4	2

21	1908008	Object Oriented Analysis and Design	PC	3	3	0	0	3
22	1908601	Mobile Communication	PC	3	3	0	0	3
23	1908602	Computational Intelligence	PC	3	3	0	0	3
24	1904610	Mobile Application Development Laboratory	PC	4	0	0	4	2
25	1908610	Object Oriented Analysis and Design Laboratory	PC	4	0	0	4	2
26	1904005	Cryptography and Network Security	PC	3	3	0	0	3
27	1908701	Cloud Computing	PC	3	3	0	0	3
28	1908702	Software Project Management	PC	3	3	0	0	3
29	1908705	FOSS and Cloud Computing Laboratory	PC	4	0	0	4	2
30	1904008	Security Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	1919002	Professional Communication	EEC	2	0	0	2	1
2	1908611	Mini Project	EEC	4	0	0	4	2
3	1908706	Project Work - Phase I	EEC	4	0	0	4	2
4	1908708	Internship	EEC	0	0	0	0	1
5	1908808	Project Work - Phase II	EEC	12	0	0	12	6

PERSONALITY AND CHARACTER DEVELOPMENT (PCD)

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	1901200	NSS/NCC/YRC/NSO	PCD	2	0	0	2	1

SUMMARY

SL. NO.	SUBJECT AREA-CATEGORY	CREDITS PER SEMESTER								CREDITS TOTAL	PERCENTAGE
		SEMESTER									
		I	II	III	IV	V	VI	VII	VIII		
1	HS	3	3		3	-	-	-	-	9	5%
2	BS	12	12	4	4	-	-	-	-	32	18%
3	ES	9	10	-	-	-	-	-	-	19	11%
4	PC	-	-	21	15	16	13	13	-	78	45%
5	PCD	-	1	-	-	-	-	-	-	1	1%
6	PE	-	-	-	-	3	6	3	6	18	10%
7	OE	-	-	-	-	3	-	3	-	6	3%
8	EEC	-	-	-	-	-	3	3	6	12	7%
Total		24	26	25	22	22	22	22	12	175	100%
Non Credit/ Mandatory		-	-	-	✓	-	-	-	-	-	

ABBREVIATIONS:

HS - HUMANITIES AND SOCIAL SCIENCES
BS - BASIC SCIENCES
ES - ENGINEERING SCIENCES
PC - PROFESSIONAL CORE
PCD - PERSONALITY CHARACTER DEVELOPMENT
PE - PROFESSIONAL ELECTIVES
OE - OPEN ELECTIVES
EEC - EMPLOYABILITY ENHANCEMENT COURSES

SEMESTER I

1919101	COMMUNICATIVE ENGLISH (Common to all branches of B.E. / B.Tech. Programmes)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- Comprehend content-asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

UNIT–I: SHARING INFORMATION RELATED TO ONESELF/FAMILY & FRIENDS 9

Reading – short comprehension passages, practice in skimming-scanning and predicting –**Writing** – Blog/film review/quora/Twitter/Facebook– developing hints. **Listening** – short texts – short formal and informal conversations. **Speaking** – introducing oneself – exchanging personal information – **Language development** – Wh – Questions – asking and answering – yes or no questions – parts of speech. **Vocabulary development** – prefixes – suffixes – word formation: making sentences of your own.

UNIT – II : GENERAL READING AND FREE WRITING 9

Reading – Story with questions and answers – **Writing** – paragraph writing- topic sentence – main ideas – free writing, short narrative descriptions using some suggested vocabulary and structures – **Listening** – Listening to a speech – answering questions. **Speaking** –Presentation with PPT - **Language development** – prepositions, **Vocabulary development** – guessing meanings of words in contexts – articles.

UNIT - III : GRAMMAR AND LANGUAGE DEVELOPMENT 9

Reading – short texts (close reading) **Writing** – understanding text structure – use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to stories to answer questions. **Speaking** – asking about routine actions and expressing opinions. **Language development** – Adjectives, degrees of comparison – conjunctions and connectives – **Vocabulary development** – single word substitutes-adverbs.

UNIT – IV : READING AND LANGUAGE DEVELOPMENT 9

Reading – Newspaper articles- answering questions – **Writing** – letter writing, informal or personal letters – congratulating/ thanking/requesting help e-mails – forward a mail to Staff on given topic – **Listening** – listen to different sounds and differentiate the sounds with different words. **Speaking** – speaking about oneself- speaking about one‘s friend – **Language development** – Modals – Tenses – **Vocabulary development** – synonyms –antonyms – phrasal verbs.

UNIT - V: EXTENDED WRITING 9

Reading – longer texts – close reading – **Writing**– brainstorming -writing short essays – developing an outline – identifying main and subordinate ideas – dialogue writing – **Listening** – listening to talks- Note taking – **Speaking** – participating in conversations – short group conversations – **Language development** - correction of errors – **Vocabulary development** – collocations – fixed and semi-fixed expressions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to:

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations.
- Iintroduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

1. Board of Editors. "Using English – A Course book for Under graduate Engineers and Technologists", Orient BlackSwan Limited, Hyderabad, 2015.
2. Richards, C. Jack. "Interchange Students' Book-2", New Delhi, CUP, 2015.

REFERENCE BOOKS:

1. Bailey, Stephen. "Academic Writing: A practical guide for students", New York: Rutledge, 2011.
2. Means, L. Thomas and Elaine Langlois, "English & Communication for Colleges", Cengage Learning, USA, 2007.
3. Redston, Chris & Gillies, Cunningham Face2Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005.
4. Comfort, Jeremy, et al. "Speaking Effectively: Developing Speaking Skills for Business English", Cambridge University Press, Cambridge: Reprint 2011.
5. Dutt P. Kiranmai and Rajeevan Geeta. "Basic Communication Skills, Foundation Books", 2013.
6. Preliminary English Test – Cambridge University Press ESOL
7. Key English Test – Cambridge University Press ESOL.
8. Pronunciation Dictionary – Daniel Jones.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	3	2	3	3	-	-	-	-	3	-	1	1	1	1	1
2	3	2	3	2	2	-	2	-	-	3	-	1	1	1	1	1
3	3	3	-	2	-	-	-	-	-	3	-	1	1	1	1	1
4	3	3	-	-	-	-	3	-	-	3	-	1	1	1	1	1
5	3	3	3	2	3	3	2	-	-	3	-	1	1	1	1	1

1918102	ENGINEERING MATHEMATICS – I	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	3	1	0	4

COURSE OBJECTIVES:

- To understand and apply matrix techniques for engineering applications.
- To familiarize the student with basic calculus and traditions of traditional calculus.
- To solve the problems in single and multivariable calculus and plays an important role in science, economics, engineering.
- To acquaint the student with mathematical tools needed in evaluating integrals.
- To familiarize the student with multiple integrals and their usage in find the area and volume of two and three dimensional objects.

UNIT - I : MATRICES **9L+3T**

System of equations – consistency and inconsistency- Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigen vectors - Statement and Applications of Cayley-Hamilton Theorem - Reduction of a quadratic form into canonical form by orthogonal transformation

UNIT-II: DIFFERENTIAL CALCULUS FOR FUNCTIONS OF ONE VARIABLE

9L+3T

Limit of a function - Continuity – Differentiability - Differentiation rules – Rolle's theorem and Mean Value theorem – Taylor's series- Maxima and Minima of functions of one variable.

UNIT – III: FUNCTIONS OF SEVERAL VARIABLES **9L+3T**

Partial derivatives - Total derivatives - Jacobians and properties - Taylor's series for functions of two variables - Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT – IV : INTEGRAL CALCULUS FOR FUNCTION OF ONE VARIABLE

9L+3T

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration by partial fractions- Improper integrals

UNIT – V : MULTIPLE INTEGRALS 9L+3T

Double integrals in Cartesian and polar coordinates - Change of order of integration - Area enclosed by plane curves - Change of variables in double integrals (Polar coordinates) - Triple integrals - Volume of solids.

TOTAL: 45L+15T PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to:

- To apply the idea of reducing complex problems into simple form using matrix technique.
- Basic application of calculus in Engineering problems and to tackle for different geometries.
- This course equips the students to have basic knowledge and understanding of fundamental statistics to analyze and interpret data.
- To apply Integration byparts, Trigonometric integrals, Trigonometric substitutions, Integration bypartial fractions in Engineering Problems.
- Basic application of Double and Triple integrals used in Engineering real life Problems.

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.
2. Veerarajan. T, “Engineering Mathematics”, McGraw Hill Education (India) Private Limited, 2019.
3. Gupta S.C and Kapoor V.K, “Fundamentals of Mathematical Statistics”, S.Chand Private Ltd., 11th Edition, 2005.

REFERENCE BOOKS:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10thEdition, New Delhi, 2016
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	2	1	-	-	-	-	-	-	-	1	-	-	-	-
2	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
3	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
4	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-
5	3	2	2	1	-	-	-		-	-	-	1	-	-	-	-

1920103 **ENGINEERING PHYSICS** **L T P C 3 0 0 3**

(Common to all branches of B.E. / B.Tech. Programmes)

COURSE OBJECTIVES:

- To understand the stress, strain and the concept of Hooke's law for the modulus of elasticity values .
- To facilitate the knowledge about basics of laser, optical fiber sources and transmission techniques.
- To enrich the idea of transfer and measurement of heat and uses of heat exchangers.
- To explore the basics of quantum theory and atomic and subatomic particles.
- To enhance the fundamental knowledge crystal Physics and its applications

UNIT - I : PROPERTIES OF MATTER 9

Elasticity – Hooke's law-Stress-strain diagram and its uses –Poisson ratio-factors affecting elastic modulus and tensile strength – twisting couple - torsion pendulum: theory and experiment (regular body) - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders.

UNIT – II : LASERS AND FIBER OPTICS 9

Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser-Semiconductor lasers: homojunction and heterojunction – Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication- fibre optic sensors: pressure and displacement- Endoscope.

UNIT – III : THERMAL PHYSICS 9

Transfer of heat energy – thermal conduction, convection and radiation – Newton's law cooling (qualitative) -heat conductions in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media

(series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT – IV : QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation)- deduction of Wien's and Rayleigh jeans law – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional - three dimensional potential box– tunnelling (qualitative) - scanning tunnelling microscope.

UNIT – V : CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances- coordination number and packing factor for SC, BCC, FCC, HCP and diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – growth of single crystals: solution and melt growth techniques - Importance of crystal physics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course,

- The students will gain knowledge on the basics of properties of matter and its applications,
- The students will acquire knowledge on the concepts of optical devices and their applications in fibre optics,
- The students will have adequate knowledge on the concepts of thermal properties of material and their applications in heat exchanger and electrical appliances,
- The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunnelling microscopes, and

- The students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. “Engineering Physics”. Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. “Engineering Physics”. Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. &Chaturvedi, S. “Engineering Physics”. Cengage Learning India, 2012.
4. Brijlal and Subramanyam, “Properties of Matter”, S .Chand publishing, 2002.

REFERENCE BOOKS:

1. Halliday, D., Resnick, R. & Walker, J. “Principles of Physics”. Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. “Physics for Scientists and Engineers”. Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. “Physics for Scientists and Engineers with Modern Physics’. W.H.Freeman, 2007.
4. Shatendra Sharma & Jyotsna Sharma, “Engineering Physics”. Pearson, 2018.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	1	-	-	1	1	-	-	-	-	1	2	-	-	-
2	3	1	1	-	1	1	1	-	-	-	-	1	3	-	-	-
3	3	-	1	-	-	1	-	-	-	-	-	1	3	-	-	-
4	3	1	-	1	-	1	1	-	-	-	-	1	3	-	-	-
5	3	1	-	1	-	-	1	-	-	-	-	1	2	-	-	-

1921104	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to all branches of B.E. / B.Tech Programmes)	3	0	0	3

COURSE OBJECTIVES:

- To make the students acquainted with boiler feed water requirements, related problems and domestic water treatment techniques.
- To understand the basic mechanism of surface phenomenon.
- To acquaint the student with the principles of electrochemical reactions, methods for corrosion prevention and protection of materials.
- To make the student conversant with the basics of polymers, cement and glass.
- To acquaint the students with the basics of nanomaterials, their properties and applications.

UNIT - I: WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units - Boiler feed water-boiler troubles - scale and sludge, priming and foaming, caustic embrittlement, boiler corrosion. Treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning). External treatment – Ion exchange process – domestic water treatment (break point chlorination) – Desalination of brackish water – Reverse Osmosis.

UNIT – II : SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms. Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – Contact theory. Kinetics of surface reactions, unimolecular reactions, Langmuir – applications of adsorption on pollution abatement. Catalysis: Catalyst – types of catalysis – Criteria – Autocatalysis – Catalytic poison and catalytic promoters – Acid base catalysis – Applications (3 way catalytic convertor) – Enzyme catalysis– Michaelis – Menten equation.

UNIT–III:ELECTROCHEMISTRY,CORROSION AND PROTECTIVE COATINGS 9

Electrochemical cell - redox reaction, electrode potential - origin of electrode potential - oxidation potential - reduction potential, measurement and applications - Electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion – causes – factors – types - chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control – material selection and design aspects – Electrochemical protection – sacrificial anode method and impressed current cathodic method. Protective coatings: Metallic coatings – Electroplating of Cu - electroless plating of Ni. Organic coatings: Paints - constituents and function.

UNIT – IV : ENGINEERING MATERIALS 9

Cement: Definition – classification of cement – Portland cement - manufacture and properties - setting and hardening of cement - special cement, water proof, white and sorel cement – properties and uses – Glass: Manufacture, types, properties and uses (laminated, safety and flint glass) - Polymers: Classification - types of polymerization - mechanism - methods of polymerization - Engineering polymers: Nylon-6, Nylon-6,6, Teflon, Kevlar and PEEK - preparation, properties and uses - Plastic and its types - Conducting polymers: Types and applications - Polymers in medicine and surgery (applications).

UNIT – V : NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties (surface to volume ratio, melting point, optical and electrical). Nanoparticles, Nano cluster, Nano rods, Nanotube (CNT: SWNT and MWNT) and Nanowire, Synthesis - precipitation, thermolysis, hydrothermal, electrode position, chemical vapour deposition, laser ablation, sol-gel process and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Gain idea about various methods available for water treatment.
- Explain the materials surface engineering.
- Understand the process of electrochemistry and its application to corrosion.
- Appreciate the nature and novelty of engineering materials.
- Ability to understand the nature and uses of nanomaterials.

TEXT BOOKS:

1. Shikha Agarwal, “Engineering Chemistry - Fundamentals and Applications”, Cambridge University Press, Delhi, 2015.
2. P. C. Jain and Monika Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India PVT, LTD, New Delhi, 2013.

REFERENCE BOOKS:

1. Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.
2. S.S. Dara and S.S. Umare, “A Text Book of Engineering Chemistry”, S. Chand & Company LTD, New Delhi, 2015.
3. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Publishing Company LTD, 2012

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	1	2	1	1	1	1	-	-	-	-	3	1	2	1	1
2	2	1	3	-	1	1	1	-	-	-	-	2	1	1	1	1
3	2	-	1	-	-	1	-	-	-	-	-	1	3	3	3	2
4	1	1	2	1	1	-	1	-	-	-	-	2	2	3	3	1
5	2	-	1	-	1	1	-	-	-	-	-	1	2	3	3	2

1901006	PROGRAMMING IN C	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	3	0	0	3

COURSE OBJECTIVES:

- To develop C Programs using basic programming.
- To develop C programs using arrays
- To develop C programs using strings.
- To develop applications in C using functions
- To develop C program using structures and union

UNIT – I : BASICS OF C PROGRAMMING 9

Introduction to algorithm: Flowchart-Pseudo code- Introduction to programming paradigms – C programming: Data Types – Keywords – Variables and Constants – **Operators and Expressions:** Expressions – precedence – associativity – Input/Output statements – **Decision making and looping:** Branching statements, Iterative statements – Compilation process.

UNIT – II : ARRAYS AND STRINGS 9

Introduction to Arrays: **One dimensional array:** Assigning an array to another array – Equating an array with another array –**Two dimensional Arrays:** Declaration – usage of two dimensional array – reading, storing and accessing elements in two dimensional array –memory representation – **String operations:** String library functions – list of strings-command line arguments.

UNIT – III : FUNCTIONS 9

Introduction to functions: Classification of functions – function definition – function call –function with inputs and outputs – recursive function – library functions-scope of variables.

UNIT – IV : STRUCTURES AND UNIONS 9

Introduction to Structures: Array of structures – Nested structure-functions and Structures **Introduction to union**: Practical applications of union – typedef and structures – enumerated data type.

UNIT – V : STORAGE CLASS AND PREPROCESSOR DIRECTIVE 9

Introduction to storage classes: Types of storage classes – **C preprocessor Directives**: Types of preprocessor directives – Pragma Directive-conditional directive.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Develop simple applications in C using basic constructs.
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions
- Develop applications in C using structures and unions
- Design applications using preprocessor to stimulate functions

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, – "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Reema Thareja, – "Programming in C", Oxford University Press, Second Edition, 2016.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel – "C How to Program", Seventh Edition, Pearson Publication.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	-	3	-	2	-	-	-	-	-	-	1	-	2	-	-
2	3	3	-	-	2	-	1	-	-	-	-	-	3	-	-	-
3	2	1	-	2	3	-	-	-	-	-	-	-	-	-	2	-
4	-	-	2	-	-	-	-	-	2	-	1	-	-	1	-	-
5	-	3	-	-	-	1	-	-	2	-	-	-	-	-	-	3

1901007	ENGINEERING GRAPHICS	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	2	0	4	4

COURSE OBJECTIVES:

- To draw the conics curves and special curves.
- To draw the orthographic projection of lines and plane surfaces.
- To draw the projections and solids and Isometric projection of simple solids.
- To draw projections of Section of Solids and development of surfaces.
- To draw free hand sketching of basic geometrical constructions, multiple views of objects and Perspective Projection of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT – I : PLANE CURVES AND SPECIAL CURVES 10

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid (Rolling Circle rolls on flat surface only). Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT – II : PROJECTION OF POINTS, LINES AND PLANE SURFACES 16

Orthographic projection- Principles-Principal planes - First angle projection-projection of points at First Quadrant only. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) which inclined to both the principal planes by rotating object method.

UNIT – III : PROJECTION OF SOLIDS AND ISOMETRIC PROJECTION 16

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is Inclined to one of the principal planes by rotating object method. Principles of isometric projection – isometric scale – Isometric projections of simple solids - Prisms, pyramids,

cylinders, cones.

UNIT – IV : PROJECTION OF SECTIONED SOLIDS & DEVELOPMENT OF SURFACES 16

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT – V :FREE HAND SKETCHING AND PERSPECTIVE PROJECTIONS 16

Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects. Perspective projection of simple solids-Prisms and pyramids by visual ray method.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

On Completion of the course the student will be able to,

- Draw the conics curves and special curves.
- Do orthographic projection of lines and plane surfaces.
- Draw projections of solids and Isometric Projection
- Draw projections of Section of Solids and development of surfaces.
- Draw free hand sketching of basic geometrical constructions , multiple views of objects and Perspective Projection of simple solids.

TEXT BOOKS:

1. N.D.BHATT, “Engineering Drawing (Plane and Solid Geometry)”, Charotar Publishing House. PVT. LTD. 53rd Edition : 2018 (Reprint)
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2018

REFERENCE BOOKS:

1. T. Jeyapoovan, “Engineering Graphics Using Auto CAD”, Vikas Publishing House Pvt. LTD, seventh Edition, 2015.

2. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2011.
4. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
5. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

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	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	-	3	-	-	-	-	-	1	3	-	1	2	1	1	1
2	2	-	3	-	-	-	-	-	1	3	-	1	2	1	1	1
3	2	-	3	-	-	-	-	-	1	3	-	1	2	1	1	1
4	2	-	3	-	-	-	-	-	1	3	-	1	2	1	1	1
5	2	-	3	-	-	-	-	-	1	3	-	1	2	1	1	1

1901108 PHYSICS AND CHEMISTRY LABORATORY L T P C

(Common to all branches of B.E. / B.Tech. Programmes) **0 0 4 2**

PHYSICS LABORATORY

COURSE OBJECTIVES:

- To study the behaviour of material under shear stress.
- To learn the basics concept understanding the deformation due to linear stress
- To explore the photons to measure the physical parameters.
- To introduce experiments to test thermal conductivity of bad conductor.
- To study the spectrum of white light.

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Determination of rigidity modulus – Torsion pendulum.
2. Determination of Young's modulus by non-uniform bending method.
3. (a) Determination of wavelength and particle size using Laser.
   (b) Determination of acceptance angle and numerical aperture in an optical Fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid and Solid – Ultrasonic Interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Measure the rigidity modulus of the material.
- Calculate the deformation due to linear stress and Young's Modulus
- Use laser to measure the physical parameters.
- Calculate the thermal conductivity of bad conductor by lees disc.
- Measure the wavelength of the mercury the spectrum.

REFERENCE BOOKS:

1. Wilson J.D. and Hernaandez Hall C.A. – “Physics Laboratory Experiments”, Houghton Mifflin Company, New York, 2005.
2. S. Srinivasan, “A Text Book of Practical Physics”, S. Sultan Chand publications. 2005
3. R. Sasikumar, “Practical Physics”, PHI Learning Pvt. Ltd, New Delhi, 2011.

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.
- To make the student conversant with the corrosion defects experimentally.
- To develop and understand the basic concepts of acidic and basic nature using pH.
- To make the student familiar with the properties and nature of alloys experimentally.

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2. Estimation of copper content of the given solution by iodometry.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Determination of strength of acids in a mixture of acids using conductivity meter.
5. Estimation of iron content of the given solution using potentiometer.
6. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
7. Pseudo first order kinetics-ester hydrolysis.
8. Corrosion experiment-weight loss method.
9. Conductometric titration of strong acid Vs strong base.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- Obtain the hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
- Understand the experimental concepts in the mixture of acids and bases.
- Appreciate the need of iodometry in the estimation of metals.
- Explore the drawbacks of corrosion by weight loss method.
- Design and carry out the scientific experiments related to boiler troubles.

TEXT BOOKS:

Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014)

PHYSISCS LABORATORY

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	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
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2	3	1	1	1	-	1	-	1	1	-	-	-	1	-	-	-
3	3	1	1	1	-	2	-	1	1	-	-	-	2	-	-	-
4	3	1	1	1	-	1	-	1	1	-	-	-	2	-	-	-
5	3	1	1	1	-	1	-	1	1	-	-	-	1	-	-	-

CHEMISTRY LABORATORY

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	2	1	2	-	-	2	-	-	-	-	1	-	-	-	-
2	3	2	2	2	-	-	2	-	-	-	-	1	-	-	-	-
3	2	2	1	2	-	1	2	-	-	-	-	1	2	3	2	1
4	3	2	3	2	-	1	2	-	-	-	-	1	2	3	2	1
5	2	2	1	2	-	1	2	-	-	-	-	1	2	3	2	1

	C PROGRAMMING LABORATORY	L	T	P	C
1901010		**0**	**0**	**4**	**2**

(Common to all branches of B.E. / B.Tech. Programmes)

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using arrays and functions.
- To develop applications in C using Strings and Structures.
- To develop various applications using array concepts
- To develop various application using function concept.

LIST OF PROGRAMS:

1. Programs using I/O statements and expressions.
2. Programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Check whether a given number is Armstrong number or not?
6. Check whether a given number is odd or even?
7. Write a program to perform factorial of a number.
8. Write a C program to find out the average of 4 integers.
9. Show how to display array elements using two dimensional array.
10. Write a C program to perform swapping using function.
11. Display all prime numbers between two intervals using functions.
12. Reverse a sentence using recursion.
13. Write a program in C to get the largest element of an array using the function.
14. Write a C program to concatenate two string.
15. Write a C program to find the length of String.
16. Find the frequency of a character in a string.
17. Write a C program to Store Student Information in Structure and Display it.
18. The annual examination is conducted for 10 students for five subjects. Write a

program to read the data and determine the following:

a) Total marks obtained by each student.
b) The highest marks in each subject and the marks of the student who secured it.
c) The student who obtained the highest total marks.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Develop C programs for simple applications.
- Making use of basic constructs, arrays and strings.
- Develop C programs involving functions,
- Develop program using recursion, pointers, and structures.
- Design applications using sequential and random access file processing.

CO	PO												PSO			
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1	3	-	3	-	-	-	-	-	-	-	-	-	2	-	-	-
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3	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	2
4	-	2	-	-	-	2	-	-	-	-	2	-	-	2	-	-
5	-	-	-	-	-	-	-	3	-	-	-	1	2	-	-	-

SEMESTER II

1919201	TECHNICAL ENGLISH	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	3	0	0	3

COURSE OBJECTIVES:

The Course prepares Second semester Engineering & Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations,
- Participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT – I : INTRODUCTION / TECHNICAL ENGLISH 9

Listening – Listening to talks mostly of a scientific/technical nature and completing information – gap exercises- **Speaking** – Asking for and giving directions – **Reading** – reading short technical texts from journals- newspapers – **Writing**– purpose statements – Technical Jargons, homophones – issue – writing instructions – checklists-recommendations-**Vocabulary Development** – technical vocabulary **Language Development** – subject verb agreement – compound words.

UNIT - II : READING AND STUDY SKILLS 9

Listening – Listening to a technical conversation and filling the gaps – **Speaking** – describing a process – **Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing – Writing – interpreting charts, graphs – **Vocabulary Development** – vocabulary used in formal letters/emails and reports **Language Development** – impersonal passive voice, numerical adjectives.

UNIT – III : TECHNICAL WRITING AND GRAMMAR 9

Listening – Listening to classroom lectures/ talks on engineering/technology – **Speaking** – mechanics of presentations – **Reading** – longer texts both general and technical, practice in speed reading; **Writing** – Describing a process, use of sequence words – **Vocabulary Development** – Misspelt words. **Language Development** – homonyms.

UNIT – IV : REPORT WRITING 9

Listening – Listening to documentaries and making notes. **Speaking** – introduction to technical presentations – **Reading** – reading for detailed comprehension – **Writing** – Product description – job application – cover letter – Résumé preparation (via email and hard copy)- Issue based essays and official circulars – **Vocabulary Development** – finding suitable synonyms – paraphrasing – **Language Development** – clauses – if conditionals.

UNIT – V : GROUP DISCUSSION AND JOB APPLICATIONS 9

Listening – TED/INK talks, answering the questions; **Speaking** – participating in a group discussion – **Reading** – reading and understanding technical articles. **Writing** – Writing reports – minutes of a meeting – Letter Writing- Letter to the Editor – Letter seeking permission for an Industrial visit/ Internship – Business Letters, asking for quotation/clarification – seeking orders, thanking for the order given, Complaint letters – **Vocabulary Development** – **verbal analogies Language Development** – reported speech.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to:

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Participate in group discussions.

- Write reports and winning job applications.

TEXT BOOKS:

1. Board of Editors. "Fluency in English – A Course book for Engineering and Technology", Orient BlackSwan Limited, Hyderabad: 2016.
2. Sudharshana. N.P and Saveetha. C. "English for Technical Communication", Cambridge University Press: New Delhi, 2016.

REFERENCE BOOKS:

1. Raman, Meenakshi and Sharma, Sangeetha – "Technical Communication Principles and Practice", Oxford University Press: New Delhi, 2014.
2. Kumar, Suresh. E. "Engineering English". Orient Blackswan: Hyderabad, 2015.
3. Booth-L. Diana, "Project Work", Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, "English for Presentations", Oxford University Press, 2007.
5. Means, L. Thomas and Elaine Langlois, "English & Communication For Colleges".
6. IELTS - Cambridge University Press.
7. BEC - Cambridge University Press.

CO	PO												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	3	2	-	-	-	-	-	-	-	3	-	1	1	1	1	1
2	3	2	2	-	-	-	-	-	-	-	-	2	1	1	1	1
3	3	-	-	-	-	-	-	-	3	3	-	1	1	-	1	1
4	3	2	2	2	-	-	-	-	-	3	-	1	1	1	1	1
5	3	2	-	2	-	-	-	-	-	3	2	1	2	2	1	1

1918202	ENGINEERING MATHEMATICS – II	L	T	P	C
	(Common to all branches of B.E. / B.Tech. Programmes)	3	1	0	4

COURSE OBJECTIVES:

- This course is designed to cover topics such as Ordinary Differential equation, Vector Calculus, Complex Analysis and Laplace Transform.
- ODE is the powerful tools to solve practical problems in the field of engineering.
- Vector calculus can be widely used for modeling the various laws of physics.
- The various methods of complex analysis helps us to evaluate contour integration.
- Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering.

UNIT – I : ORDINARY DIFFERENTIAL EQUATIONS 12

First order linear Differential equations- Exact differential equations- Second order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type.

UNIT – II : VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl– Irrotational and Solenoidal vector fields – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT – III : LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients

UNIT – IV : ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian coordinates – Properties – Harmonic conjugates – Construction of analytic function –

Conformal mapping – Mapping by functions $w = Cz, C + z, \frac{1}{z}, z^2$ Bilinear transformation

UNIT – V : COMPLEX INTEGRATION 12

Complex integration – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to:

- Apply complex variables in finding ,Gradient, divergence,curl of a vector point function.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Analytic functions, conformal mapping and complex integration are evaluated.
- Laplace transform and inverse transform of simple functions, properties, are studied.
- Apply various techniques in solving Ordinary differential equations with constant coefficients

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Veerarajan. T, "Engineering Mathematics", McGraw Hill Education (India) Private Limited, 2019.

REFERENCE BOOKS:

1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt.,

Ltd, New Delhi, 2007.

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4	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-
5	3	1	1	1	-	-	-	-	-	-	-	1	-	-	-	-

1920202	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
	(Common to CSE & IT)	3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of conductivities in the conducting material .
- To facilitate the knowledge about basics of doping, types of semiconductors.
- To enrich the idea of magnetic materials in storage devices.
- To explore the basics of interaction of photon with materials.
- To enhance the fundamental knowledge nano materials and its applications .

UNIT – I : ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity expression - Wiedemann-Franz law – Success and failures – Quantum free electron theory – degenerate states- Fermi- Dirac distribution function – Density of energy states – Electron in periodic potential – Energy bands in solids; conductors, semiconductors and insulators.

UNIT - II : SEMICONDUCTOR PHYSICS 9

Direct and indirect band gap semiconductors - Intrinsic Semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration –Hall effect- Theory and experiment– Applications.

UNIT – III : MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment – origin of magnetic moments- Bohr magneton- magnetic permeability and susceptibility - Magnetic material classification – Ferromagnetism: Domain theory- Energy involved in domains - Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses saturation magnetization and Curie temperature – Magnetic hard disc (GMR sensor).

UNIT – IV : OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) – photo current in a P-N diode – solar cell - LED – Organic LED – Optical data storage techniques.

UNIT – V : NANO MATERIALS AND DEVICES 9

Introduction – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of energy states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterial – Tunnelling: single electron phenomena and single electron transistor – Quantum dot laser – Carbon nanotubes: Properties and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Gain knowledge on classical and quantum free electron theories, and energy band Structures.
- Acquire knowledge on basics of Semiconductor Physics and its applications in various devices,
- Get knowledge on magnetic properties of materials and their applications in data storage.
- Have the necessary understanding on the functioning of optical materials for optoelectronics.
- Understand the basics of quantum structures and their applications.

TEXT BOOKS:

1. Jasprit Singh, “Semiconductor Devices: Basic Principles”, Wiley 2012.
2. Kasap, S.O., “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007.
3. Kittel, C., “Introduction to Solid State Physics”, Wiley, 2005.

REFERENCE BOOKS:

1. Garcia, N. & Damask, A. “Physics for Computer Science Students”, Springer-Verlag, 2012.
2. Hanson, G.W. “Fundamentals of Nano electronics”, Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S. “Nanotechnology: Understanding Small Systems”, CRC Press, 2014.

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1921203 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

(Common to all branches of B.E. / B.Tech. Programmes) **3 0 0 3**

COURSE OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.

UNIT – I : ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the grassland ecosystem, aquatic ecosystems (lakes, oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of an ecosystems.

UNIT – II : ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local

polluted site – Urban / Rural / Industrial /Agricultural.

UNIT – III : NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, soil erosion and desertification, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water– Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity– role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT – IV : SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting and watershed management – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife protection Act – Forest conservation Act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT – V : HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental protection. One will obtain knowledge on the following after completing the course.

- Gain knowledge on ecosystem, environment and biodiversity.
- Understand the process and disadvantages of environmental pollution.
- Analyze the ill effects of over exploitation of natural resources.
- Explain the social issues from unsustainable to sustainable development.
- Outline the need for decrease in population growth and its measures.

TEXT BOOKS:

1. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education, 2004.

REFERENCE BOOKS:

1. Dharmendra S. Sengar, “Environmental law”, Prentice Hall of India PVT LTD, New Delhi, 2007.
2. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press (I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, “Environmental Studies - From Crisis to Cure”, Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India PVT, LTD, Delhi, 2014.

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1901005 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C

(Common to all branches of B.E. / B.Tech. Programmes) **3 0 0 3**

COURSE OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures – lists, tuples, dictionaries.

UNIT – I : ALGORITHMIC PROBLEM SOLVING, DATA TYPES 9

Algorithms: building blocks of algorithms (statements, control flow, functions), notation (pseudo code, flow chart). Python interpreter and interactive mode; **values and types:** int, float, Boolean, string, and list; variables, operators and expressions, statements, tuple assignment, precedence of operators, comments, Illustrative programs: Algorithm for Arithmetic expression (addition and subtraction).

UNIT – II : CONTROL FLOW STATEMENTS AND FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); **Iteration:** state, while, for, break, continue, pass; functions, function definition and use. **Fruitful functions:** return values, parameters, local and global scope, recursion. Illustrative programs: exchange the values of two variables square root, printing n numbers iteratively

UNIT – III : LIST& TUPLES 9

Lists: list operations, list slices, list methods, list loop, mutability, list parameters; **Tuples:** tuple assignment, tuple as return value. Comparison of Lists and tuples. Illustrative programs: selection sort, insertion sort, Quick sort.

UNIT – IV : STRINGS, DICTIONARIES & SET 9

Strings: string slices, immutability, string functions and methods, string module. **Dictionaries:** Operations (create, access, add, remove) and methods. (insert, delete).Set operation (Access, Add, Remove).Comparison of dictionary and set.

UNIT – V : FILES, MODULES & PACKAGES 9

Files and exception: text files, reading and writing files, format operator; errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to:

- Develop algorithmic solutions to simple computational problems.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, Set and dictionaries.
- Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Reema Thareja, “Python Programming using Problem solving Approach” ,Oxford Higher Education,2017
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
3. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python” – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCE BOOKS:

1. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus”, Wiley India Edition, 2013.
2. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

4. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Second edition, Pragmatic Programmers,LLC,2013.

5. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.

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1901008 BASIC CIVIL AND MECHANICAL ENGINEERING L T P C

(Common to CSE, EEE, ECE, EIE, IT & Medical Electronics) **3 0 0 3**

COURSE OBJECTIVES:

- To impart basic knowledge on Civil and Mechanical Engineering.
- To familiarize the materials and measurements used in Civil Engineering.
- To provide the exposure on the fundamental elements of civil engineering structures and construction methods
- To enable the students to distinguish the components and working principle of power plant units, boilers and IC engines.
- To understand the concepts and working principle of refrigeration and air conditioning system

A – OVER VIEW

UNIT – I : SCOPE OF CIVIL AND MECHANICAL ENGINEERING 7

Overview of Civil Engineering: Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering.

Overview of Mechanical Engineering: Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

B – CIVIL ENGINEERING

UNIT – II : SURVEYING AND CIVIL ENGINEERING MATERIALS 7

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber – modern materials.

UNIT – III : BUILDING COMPONENTS AND STRUCTURES 11

Foundations: Types of foundations - Bearing capacity and settlement – Requirement of

good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing– flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and railway.

C – MECHANICAL ENGINEERING

UNIT – IV : INTERNAL COMBUSTION ENGINES AND POWER PLANTS 11

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of steam, Gas, Diesel, Hydro – electric and Nuclear Power plants – working principle of Cochran, La-mont, Benson Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT – V : REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Knowledge of basics in various sub-disciplines of civil and mechanical engineering.
- Use the basics of surveying for calculation of area and volume in basic construction works
- Fundamental elements of civil engineering structures and construction methods.
- Understand the energy sources and working principle of power plants and apply the knowledge of power plants to diagonize and solve the Engineering problem and the working principle of IC Engines

- Understand the function of refrigeration and air conditioning system.

TEXT BOOKS:

1. Shanmugam G and Palanichamy MS, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 2018.
2. Satheesh Gopi, “Basic Civil Engineering”, Pearson publications, 2009.
3. Basant Agrawal and C.M.Agrawal, “Basic Mechanical Engineering”, Wiley Publications Pvt Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2015.
2. Rajput R.K., “Thermal Engineering”, Laxmi Publications (P) Ltd, 10th Edition, 2018.
3. Kothandaraman C.P., Domkundwar S., Dhanpat Rai, “Thermal Engineering”, Publishing Co.(P) Ltd., 6th Edition, 2015.

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4	3	2	2	1	-	1	-	-	-	-	-	1	2	1	1	2
5	3	2	2	1	-	-	-	-	-	-	-	-	1	-	-	1

1901009 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

L T P C

0 0 4 2

(Common to all branches of B.E. / B.Tech. Programmes)

COURSE OBJECTIVES:

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

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. How to create, slice, change, delete and index elements using Tuple.
8. Find First n prime numbers
9. How to create, slice, change,add,delete and index elements using list.
10. Write a program to calculate the length of a string.
11. Write a program to reverse the string
12. How to change, delete, add and remove elements in Dictionary
13. Find the most frequent words in a text read from a file
14. Simulate elliptical orbits in Pygame
15. Simulate bouncing ball using Pygame

TOTAL: 60 PERIODS

PLATFORM NEEDED:

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

At the end of the course, learners will be able to:

- 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.

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3	-	-	-	1	-	-	-	-	-	-	-	-	2	-	-	-
4	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2	-
5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	3

1901208 ENGINEERING PRACTICES LABORATORY L T P C

(Common to all branches of B.E. / B.Tech. Programmes) **0 0 4 2**

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment / tools
- To gain the skills for making fitting joints and assembling air conditioner
- To develop the skills for making simple electrical wiring connections using suitable tools
- To provide hands on experience for soldering and gain knowledge about the behavior of electronics components

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 15

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
d) Hands-on-exercise:
   Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry Works:

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 15

Welding:

a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
b) Gas welding practice

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending
b) Model making – Trays and funnels.
c) Different type of joints.

Fitting:

a) Preparation of square fitting
b) Preparation of V – fitting models.

Machine assembly practice:

a) Assembly of centrifugal pump
b) Assembly of air conditioner

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending.
Example – Exercise – Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step cone pulley.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 15

1. Residential house wiring using Switches, Fuse, Indicator, Lamp and Energy meter.
2. Fluorescent Lamp Wiring.
3. Staircase Wiring.
4. Measurement of Voltage, Current, Power and Power factor in electrical circuit.
5. Measurement of Energy using Analog & Digital Energy meter.
6. Measurement of Earth Resistance.
7. Study of Industrial house wiring.
8. Identification & Study of protective devices: Fuses & Fuse carriers, MCB, ELCB and Isolators with ratings and usage.

IV ELECTRONICS ENGINEERING PRACTICE 15

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, RMS period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Carry out various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering
- Fabricate carpentry components and pipe connections including plumbing works and use welding equipment's to join the structures.
- Carry out the basic machining operations, make the models using sheet metalworks. Illustrate on centrifugal pump, air conditioner, operations of smithy, foundry and fittings
- Carry out basic home electrical works and measure the electrical quantities
- Elaborate on the electronics components, gates and soldering practices

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets
4. Models of industrial trusses, door joints, furniture joints 5 each

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets
7. Moulding table, foundry tools	2 Sets
8. Power Tool: Angle Grinder	2 Nos.
9. Study-purpose items: centrifugal pump, air-conditioner	One each
10. Fitting tools, Hack saw frame, 12' file, hack saw blade	15 Nos.

ELECTRICAL

1.	Assorted electrical components for house wiring	15 Sets
2.	Fluorescent Lamp	15 Sets
3.	Electrical measuring instruments	10 Sets
4.	Analog & Digital energy meter	5 Sets
5.	Megger	2

ELECTRONICS

1.	Soldering guns	10 Nos.
2.	Assorted electronic components for making circuits	50 Nos.
3.	Small PCBs	10 Nos.
4.	Multimeters	10 Nos.
5.	Study purpose items: Telephone, FM radio, low-voltage power supply	

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1901209 APPLIED PHYSICS AND ENVIRONMENTAL CHEMISTRY LABORATORY **L T P C**

0 0 4 2

(Common to all branches of B.E. / B.Tech. Programmes)

(Laboratory classes on alternate weeks for Physics and Environmental Chemistry)

APPLIED PHYSICS LABORATORY

COURSE OBJECTIVES:

- To measure the band gap of given semi conductor.
- To study I-V characteristics of solar cell
- To measure electrical resistivity of metal and alloy
- To calculate the hkl planes
- To measure the paramagnetic susceptibility by Quinke's method

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Determination of band gap of a semiconductor.
2. Study of I-V characteristics of solar cell and determination of its efficiency.
3. Determination of electrical resistivity of metal and alloy –Carey foster Bridge.
4. Calculation of lattice cell parameter – X-ray diffraction method.
5. Measurement of susceptibility of paramagnetic solution by Quinke's method.
6. Study of magnetic Hysteresis-B-H curve.
7. Measurement of Temperature using LM35.

TOTAL: 30 PERIODS

DEMO:

1. Crystal growth- Low temperature solution growth.
2. Absorption and transmittance measurement of materials – UV visible spectrum.
3. Attenuation losses in optical Fiber.

COURSE OUTCOMES:

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

- Measure the band gap of semiconductors
- Measure the efficiency of solar cell
- Compare the resistivity of metals and alloys
- Calculate the lattice parameter and interplanar distance.
- Understand the susceptibility values for any paramagnetic substances

REFERENCE BOOKS

1. Wilson J.D. and Hernaandez Hall C.A. – "Physics Laboratory Experiments", Houghton Mifflin Company, New York, 2005.
2. S. Srinivasan, "A Text Book of Practical Physics", S. Sultan Chand publications. 2005.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd, New Delhi, 2011.

ENVIRONMENTAL CHEMISTRY LABORATORY

COURSE OBJECTIVES:

- To determine the dissolved oxygen and chloride content in water
- To determine calcium and magnesium present in domestic water
- To estimate iron, sodium and chlorine using various techniques
- To determine the chemical oxygen demand in industrial effluent
- To determine the available chlorine in bleaching powder.

LIST OF EXPERIMENTS: (Any 5 Experiments)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of DO content of water sample by Winkler's method.
3. Determination of chloride content of water sample by argentometric method.
4. Estimation of iron content of the water sample using spectrophotometer
5. Determination of COD value of industrial effluents
6. Estimation of sodium by flame photometry
7. Estimation of available chlorine in bleaching powder

TOTAL: 30 PERIODS

DEMO:

1. Pollution abatement by adsorption techniques
2. Scintillation Process

COURSE OUTCOMES:

- Appreciate the basic requirements for potable water.
- Understand the need of dissolved oxygen in water.
- Explore the quantity of bleaching powder to be added in water.
- Analyze the ill effects caused by the industrial effluents.
- Explore new research areas in the treatment of waste water.

TEXT BOOKS:

Vogel's Textbook of Quantitative Chemical Analysis (8th Edition, 2014)

APPLIED PHYSICS LABORATORY

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ENVIRONMENTAL CHEMISTRY LABORATORY

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1901200	NSS/NCC/YRC/NSO	L T P C 0 0 2 1

NATIONAL SERVICE SCHEME (NSS)

COURSE OBJECTIVES :

The main objectives of this course are:

- To help learners know about NSS in the context of youth, community and voluntary service.
- To teach the importance of health, hygiene and sanitation for a healthy Nation.
- To understand the community in which they work.
- To identify the problems of the community and involve them in problem-solving.
- To develop the capacity to meet emergencies and natural disasters.
- To practice the National integration and social harmony.
- To utilize their knowledge in finding practical solutions to individual and community

MODULE - I : INTRODUCTION AND BASIC CONCEPTS OF NSS 8

History – Aim – Objectives of NSS- Emblem – Motto – Badge – Song - Organizational structure - Roles and Responsibilities of NSS-Regular activities - Any approved indoor / outdoor programs approved by the Principal

MODULE - II : YOUTH LEADERSHIP, SOCIAL HARMONY AND NATIONAL INTEGRATION 8

Meaning and types of Leadership - Qualities of good leaders and leadership - Importance and role of youth leadership - Role of youth in peace and Nation building - Any approved indoor / outdoor programs approved by the Principal

MODULE - III : HEALTH, HYGIENE AND SANITATION AND YOUTH HEALTH 8

Definition, Needs and Scope of Health Education - Swachh Bharat Abhiyan - Healthy Lifestyles HIV, AIDS, Drugs abuse - Any approved indoor / outdoor programs approved by the Principal

MODULE - IV :ENVIRONMENT ISSUES, EMERGENCIES AND DISASTER MANAGEMENT 8

Environment conservation, enrichment and sustainability - Waste management - Natural resource management [Rain water harvesting and Energy conservation] -

Introduction to Disaster Management, Classification of Disasters - Any approved indoor / outdoor programs approved by the Principa

MODULE - V SPECIAL CAMPING AND YOUTH DEVELOPMENT PROGRAMMES 8

Aim and objectives of special camping - Organization of special camping - National Youth Policy - Youth Development - Any approved indoor / outdoor programs approved by the Principal

TOTAL PERIODS : 40

COURSE OUTCOMES:

Learners will have the knowledge about NSS and its role in the fields of health, hygiene, emergencies & natural disasters and involve them in problem-solving of the nearest community so as to build a strong country.

REFERENCES :

1. National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
2. National Youth Policy, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
3. https://nss.gov.in/
4. National Service Scheme Handbook, Anna University, Chennai - 25.

1901200 **NSS/NCC/YRC/NSO** **L T P C**
0 0 2 1

NATIONAL CADETS CORPS

OBJECTIVES:

- To develop the students character into comradeship
- To improve the self-responsibilities of the student
- To give the secular outlook
- To perform the adventure activates
- To give the ideas of selfless service among young citizens

MODULE I INTRODUCTION NCC **8**

Moto of NCC- Cardinal principals of Discipline - Aim of NCC – History of NCC – NCC Organization- NCC Song - Opportunities in Indian Army

MODULE II BASIC DRILL PRACTICE **8**

Foot Drill – Arms Drill – Ceremonial Drill – Attention – Right Face – Salute – Present Arms and Orders – Forward March.

MODULE III NCC ARMY **8**

Armed Forces – Military History – Badges and Ranks- Setting a Map, Finding Own Position and North– General Awareness – Border & Coastal Areas

MODULE IV NCC NAVY **8**

History of Indian Navy – Types of Warship and Roles – Navy Ranks – Role of INDO PAK war – 1971 & Kargil war – Naval Communications

MODULE V NCC SAFETY AND RESCUE OPERATIONS **8**

First Aid – Firefighting – Flooding – Damage Control - Health and Hygiene – Swimming - Trekking

Total Periods: 40

OUTCOMES:

- The NCC cadets learnt several Valuable things Selfness, Honesty Hard work and discipline
- NCC develops their personalities in different angles
- NCC army grows the turnout cadets in Army
- NCC Navy intensification the technical information about the coastal

areas
- NCC generally improve the personal and social impact
- NCC is foot path to join in an Indian defense

Text books:

1. R Gupta's "NCC Navy wing" it covers both Common and Special Subjects
2. R Gupta's "Handbook of National Cadets Corps for 'A', 'B' and 'C' certificate examination"
3. NCC Army Hand book https://nccorissa.org/old/Doc/cadet%20Hand%20Book%20SPL%20SUBJECT%20Army.pdf
4. NCC Navy Hand Book https://dokumen.tips/documents/ncc-cadet-handbook-navy-specialised-subject-sd-swpdf-ncc-cadet-handbook.html

1901200 **NSS/NCC/YRC/NSO** **L T P C**
0 0 2 1

YOUTH RED CROSS

OBJECTIVES: To inculcate the following in the youth of our college

- Health awareness
- Civic responsibilities with humanitarian concern
- Spirit of service
- Sense of duty
- Friendly relationship without discrimination

MODULE I :INTRODUCTION **8**

Origin-Fundamental Principles-Huanity,Impartiality,Neutrality,Independence,Voluntary service, Unity, Universality based activities like First Aid etc.

MODULE II :MOTTO

8

Health-Protection of health and life , Service- Serving the sick and suffering, Friendship-Promoting it through program like Financial Literacy etc.

MODULE III :FEATURES OF YRC

8

Organizing Committee-Structure-How to start a Unit- Core focus areas-Strategic Goals and Objectives through programs like Eye, Dental, General Health checkup etc.

MODULE IV :REGULAR ACTIVITIES

8

Disaster Relief- Health and Medical Service-Training Courses-Human resource development through programs on the above areas

MODULE V :HUMANITARIAN PRINCIPLES **8**

Principle of Humanity-Principle of Distinction-Principle of Military Necessity-Principle of prevention of unnecessary suffering-Principle of Proportionality - programs on the above

Total Periods: 40

OUTCOMES: The students would have got their **personality developed** through

- Health awareness
- Civic responsibilities with humanitarian concern
- Spirit of service

- Sense of duty
- Friendly relationship without discrimination

References:

1. IRCS/YRC Handbook
2. https://www.indianredcross.org/youth/Guidelines-for-JYRC-LR.pdf

1901200	NSS/NCC/YRC/NSO	L T P C 0 0 2 1

NATIONAL *SPORTS ORGANISATION* (NSO)

Objective:

- To create awareness about basic fitness and mental strength
- To promote the development of physical fitness
- To develop the sporting activities of the youth
- To create the social responsibility and social interaction through participation

Module 1 - **8 hours**

Introduction of Physical Education - History - Origin - Physical Fitness Test - Major games Skills Test.

Module 2 - **8 hours**

Importance of Basic Physical Fitness - BMI Calculation - Identification of deformities - Nutrition & Diet for fitness - Major games practice.

Module 3 - 8 hours

Health Education - Physical Fitness Activities (Speed - Strength - Endurance - Agility) minor games practice.

Module 4 - 8 hours

Major games introduction (Athletics - Badminton - Ball Badminton - Basketball - Chess - Cricket - Football - Kabaddi - Kho-Kho - Table Tennis - Volleyball) and tournament.

Module 5 - 8 hours

Major games skills training - Physical Fitness Activities (50mtr dash - 800mtr run - sit ups/pushups - shuttle run) Assessments.

Total - 40 hours

Outcomes:

- Get basic knowledge about physical and mental fitness and gain physical fitness and mental fitness
- NSO create-esteem and self confidence
- NSO provide opportunity get social interaction
- Development of character and personality through participation

III SEMESTER

1918302 DISCRETE MATHEMATICS L T P C

3 1 0 4

OBJECTIVES:

- To extend student‘s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of Combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT – I: LOGIC AND PROOFS 9+3

Propositional logic – Propositional equivalences – Normal forms - Predicates and quantifiers – Nested quantifiers – Rules of inference

UNIT - II: COMBINATORICS 9+3

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT - III: GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths

UNIT - IV: ALGEBRAIC STRUCTURES 9+3

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem – Definitions and examples of Rings and Fields.

UNIT - V: LATTICS AND BOOLEAN ALGEBRA 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special

lattices – Boolean algebra.

TOTAL: 45+15 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXT BOOKS:

1. Rosen, K.H., “Discrete Mathematics and its Applications”, 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCE BOOKS:

1. Grimaldi, R.P. “Discrete and Combinatorial Mathematics: An Applied Introduction”, 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., “Discrete Mathematics”, Schaum‘s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. “Discrete Mathematics with Applications”, Elsevier Publications, 2006.

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1908301 DATA STRUCTURES AND ALGORITHMS L T P C

3 0 0 3

OBJECTIVES:

- To understand the concepts of ADTs
- To Learn linear data structures – lists, stacks, and queues
- To Learn non- linear data structures
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT – I: LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT - II: LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue – De Queue – applications of queues

UNIT - III: NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree **-** Heap – Applications of heap

UNIT - IV: NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT - V: SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Implement abstract data types for linear data structures.
- Apply the various linear data structures to problem solutions.
- Apply the different non-linear data structures to problem solutions.
- Critically analyze the various sorting, searching algorithms.
- Select appropriate data structures and hashing function as applied to specific problem definition.

TEXT BOOKS:

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 1997.
2. Reema Thareja, —Data Structures Using C, Second Edition, Oxford University Press, 2011

REFERENCE BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, — “Introduction to Algorithms”, Second Edition, McGraw Hill, 2002.
2. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
3. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.

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1908302 DIGITAL PRINCIPLES AND SYSTEM DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous sequential logic
- To analyze and design asynchronous sequential logic
- To understand Programmable Logic Devices and to write HDL code for combinational and sequential circuits.

UNIT – I: BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map and Tabulation method - NAND and NOR Implementations.

UNIT - II: COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Sub tractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers.

UNIT - III: SYNCHRONOUS SEQUENTIAL LOGIC 9

Storage Elements- Latches - Flip-Flops- Registers - Analysis and Design Procedure of Sequential Circuits - State Reduction and Assignment - Shift register - Sequence generator/detector- Counters.

UNIT - IV: ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT - V: HDL & MEMORY AND PROGRAMMABLE LOGIC 9

Introduction to HDL – HDL Models of Combinational circuits and Sequential Circuits- RAM – Memory Decoding - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Simplify Boolean functions using KMap
- Design and Analyze Combinational Circuits
- Implement design using synchronous and asynchronous sequential logic Circuits
- Implement designs using Programmable Logic Devices
- Write HDL code for combinational and Sequential Circuits

TEXT BOOKS:

1. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2017.

REFERENCE BOOKS:

1. G. K. Kharate, “Digital Electronics”, Oxford University Press, 2010.
2. John F. Wakerly, “Digital Design Principles and Practices”, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, “Fundamentals of Logic Design”, Sixth Edition, CENGAGE Learning, 2013.
4. Donald D. Givone, “Digital Principles and Design”, Tata McGraw Hill, 2003.

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1904302 OBJECT ORIENTED PROGRAMMING L T P C

3 0 0 3

OBJECTIVES:

- To understand Object Oriented Programming concepts using Java.
- To know the principles of packages, inheritance and interfaces.
- To handle exceptions and use I/O streams.
- To develop a java application with threads.
- To design and build simple Graphical User Interfaces.

UNIT – I: INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9

Object Oriented Programming - Abstraction – Encapsulation- Inheritance -Polymorphism- Characteristics of Java – The Java Environment **-** Java Source File Structure – Compilation. Fundamental Programming Structures in Java – Data Types, Variables, Operators, Control Flow, Arrays.

UNIT - II: CLASSES AND CONSTRUCTORS 9

Defining classes in java -Inheritance – super classes- sub classes –protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.

UNIT - III: STRINGS AND EXCEPTION HANDLING 9

String Operations - Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, packages.

UNIT - IV: I/O AND MULTITHREADING 9

Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files, Multi-threading, thread life cycle, creating threads, synchronizing threads, Inter-thread communication.

UNIT - V: EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color and fonts, - Basics of event handling - event handlers - adapter classes - actions - AWT event hierarchy

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop Java programs using Object Oriented Programming principles.
- Develop Java programs with the concepts inheritance and interfaces.
- Build Java applications using exceptions and I/O streams.
- Develop Java applications with threads and Files.
- Develop interactive Java programs using graphics.

TEXT BOOKS:

1. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013

REFERENCE BOOKS:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
3. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
4. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

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1908303 ANALOG AND DIGITAL COMMUNICATION L T P C

3 0 0 3

OBJECTIVES:

- To understand the all basic analog communication Concepts
- To understand foundation of Pulse modulation techniques
- To understand the basic concepts of Digital communication techniques
- To learn data communication techniques.
- To be familiarized with source, Error control coding and Cellular concepts**.**

UNIT – I: ANALOG COMMUNICATION 9

Introduction to Communication Systems - Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Theory of Frequency and Phase Modulation – Comparison of Analog Communication Systems (AM – FM – PM).

UNIT - II: PULSE COMMUNICATION 9

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

UNIT – III: DIGITAL COMMUNICATION 9

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)–Phase Shift Keying (PSK) – BPSK – QPSK - 8PSK.Comparison of various Digital Communication System (ASK – FSK – PSK).

UNIT - IV: DATA COMMUNICATION 9

Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Data communication Hardware - serial and parallel interfaces.

UNIT - V: SOURCE AND ERROR CONTROL CODING 9

Entropy - Source encoding theorem - Shannon fano coding - Huffman coding - mutual information - channel capacity - Error Control Coding - linear block codes. case study - Cellular Concept-1G,2G,3G,4G

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply analog modulation techniques.
- Learn and compare different Digital communication and the concepts of Cmmunication technology
- Use pulse communication techniques.
- Utilize Data communication techniques.
- Analyze Source and Error control coding.

TEXT BOOKS:

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2009.

REFERENCE BOOKS:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3. H.Taub, D L Schilling and G Saha,”Principles of Communication”, 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2007.
5. Blake, “Electronic Communication Systems”, Thomson Delmar Publications, 2002.
6. Martin S.Roden, “Analog and Digital Communication System”, 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, “Digital Communication Fundamentals and Applications”, 2nd Edition Pearson Education 2007.

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1908304 INFORMATION TECHNOLOGY ESSENTIALS L T P C

3 0 0 3

OBJECTIVES:

- To introduce the concept of Internet, Networks and its working principles.
- To know scripting languages.
- To know basic concept of Information technology
- To understand the simple concept of mobile communication with networking
- To understand various applications related to Information Technology.

UNIT – I: WEB ESSENTIALS 9

Creating a Website – Working principle of a Website – Browser fundamentals – Authoring tools – Types of servers: Application Server – Web Server – Database Server

UNIT - II: SCRIPTING ESSENTIALS 9

Need for Scripting languages – Types of scripting languages – Client side scripting – Server side scripting – PHP – Working principle of PHP – PHP Variables – Constants – Operators – Flow Control and Looping – Arrays – Strings – Functions – File Handling – PHP and MySQL – PHP and HTML – Cookies – Simple PHP scripts.

UNIT - III: NETWORKING ESSENTIALS 9

Fundamental computer network concepts – Types of computer networks – Network layers – TCP/IP model – Wireless Local Area Network – Ethernet – WiFi – Network Routing – Switching – Network components.

UNIT - IV: MOBILE COMMUNICATION ESSENTIALS 9

Cell phone working fundamentals – Cell phone frequencies & channels – Digital cell phone components – Generations of cellular networks – Cell phone network technologies / architecture – Voice calls & SMS

UNIT - V: APPLICATION ESSENTIALS 9

Creation of simple interactive applications – Simple database applications – Multimedia applications – Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design and deploy web-sites
- Design and deploy simple web-applications
- Create simple database applications
- Develop information system concepts
- Describe the basics of networking, mobile communications and the basic essential of Information Technology

TEXT BOOKS:

1. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5” Third Edition, O’REILLY, 2014.
2. James F. Kurose, “Computer Networking”: A Top-Down Approach, Sixth Edition, Pearson, 2012.

REFERENCE BOOKS:

1. Gottapu Sasibhushana Rao, “Mobile Cellular Communication”, Pearson, 2012.
2. R. Kelly Rainer, Casey G. Cegielski , Brad Prince,” Introduction to Information Systems”, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org.

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4	3	3	2	-	-	-	-	-	-	2	-	-	-	3	-	3
5	2	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-

1908305 **DATA STRUCTURES LABORATORY** **L T P C**

0 0 4 2

OBJECTIVES:

- To implement linear data structures
- To implement non-linear data structures
- To understand the different operations of search trees
- To implement graph traversal algorithms
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS:

1. Array and Linked list implementation of List ADT
2. Array and Linked list implementation of Stack ADT
3. Array and Linked list implementation of Queue ADT
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms
12. Hashing – any two collision techniques

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Write functions to implement linear and non-linear data structure operations.
- Suggest appropriate linear data structure operations for solving a given problem.
- Appropriately use the linear / non-linear data structure operations for a given problem.
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

- Apply the searching and sorting algorithms for problem solving.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Systems with Linux Operating System with gnu compiler, Systems with Turbo C compiler

HARDWARE:

Standalone desktops - 30 Nos.

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1904306 OBJECT ORIENTED PROGRAMMING LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To apply the concepts of classes.
- To understand and implement packages and interfaces.
- To handle I/O and exception handling.
- To understand file processing operations.
- To develop applications using event handling.

LIST OF EXPERIMENTS:

1. Write a java program to illustrate the concept of class and object creation.
2. Write a java program to implement constructors.
3. Write a java program to implement abstract class and abstract method.
4. Write a java program to implement Inheritance.
5. Write a java program to implement I/O, Throwing and Catching exceptions.
6. Write a java program to implement Designing Packages.
7. Write a java program to implement Interfaces in Java.
8. Write a java program to manipulate file operations.
9. Write a java program to create multithreads in Java applications.
10. Write a java program to implement Graphics classes
11. Write a java program to implement Event driven programming.

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

C++, Java

HARDWARE:

Standalone desktops - 30 Nos.

OUTCOMES:

At the end of the course, the student should be able to:

- Build software development skills using java programming for real-world applications

- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java programs using Inheritance and Interfaces.
- Develop and implement Java programs using array list, exception handling and multithreading.
- Design applications using file processing, generic programming and event handling.

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1908306 DIGITAL SYSTEM AND COMMUNICATION LABORATORY **L T P C 0 0 4 2**

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous sequential logic
- To analyze and design asynchronous sequential logic
- To understand Programmable Logic Devices and to write HDL code for combinational and sequential circuits

LIST OF EXPERIMENTS:

1. Verification of Boolean Theorems using basic gates.
2. Design and implement Half/Full Adder and Subtractor.
3. Design and implement combinational circuits using MSI devices- Parity generator / checker
4. Design and implement shift-registers.
5. Design and implement synchronous counters.
6. Implement a Amplitude modulation and demodulation
7. Implement a Frequency modulation and demodulation
8. Implement a Pulse code modulation Techniques
9. Write a code for FSK, PSK and DPSK schemes (Simulation)
10. Write a program for Coding combinational circuits using HDL.
11. Write a program for Coding sequential circuits using HDL.

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE:

1. Digital trainer kits – 30 Nos.
2. Kits for AM, FM and PCM
3. Software Defined Radio platform for link simulation studies
    i) Signal generator / Function generators / Power Supply / CRO / Bread Board each -15 Nos.

ii) Digital ICs required for the experiments in sufficient numbers.

SOFTWARE:

HDL simulator.

MATLAB / SCILAB for simulation experiments PCs - 10 Nos.

OUTCOMES:

At the end of the course, the student should be able to:

- Design a basic combinational circuit applications.
- Design a basic analog modulation circuits AM,FM.
- Simukate a FSK,PSK circuits in HDL.
- Construct a pulse code modulation circuits.
- Code and Simulate a combinational circuits and sequental circuits.

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IV SEMESTER

1918404	PROBABILITY AND STATISTICS	L T P C
		3 1 0 4

OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables and concepts of two dimensional random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples this plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments this plays very important

UNIT – I: RANDOM VARIABLES 9+3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT - II: TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables-Central Limit Theorem.

UNIT - III: TESTING OF HYPOTHESIS 9+3

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT - IV: DESIGN OF EXPERIMENTS 9+3

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT - V: STATISTICAL QUALITY CONTROL 9+3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 45+15 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Students will be able to understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS:

1. T. Veerarajan, “Probability, Statistics Random Processes with Queueing Theory and Queueing Networks (Third Edition)”, Tata McGraw-Hill Publishers, 2008.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCE BOOKS:

1. P.Sivaramakrishna Das, C.Vijayakumari, "Probability and Statistics", Second Edition, 2020 Pearson India Education Services Pvt. Ltd.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, New Delhi, 8th Edition, 2014.
3. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
4. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists",

3rd Edition, Elsevier, 2004.

5. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum‘s Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

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1908401 PRINCIPLES OF COMPILER DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT – I: INTRODUCTION TO COMPILERS 9

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing

UNIT - II: SYNTAX ANALYSIS 9

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing – General Strategies Recursive Descent Parser Predictive Parser - LL(1) Parser -Shift Reduce Parser-LR Parser - LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT - III: INTERMEDIATE CODE GENERATION 9

Syntax Directed Definitions - Evaluation Orders for Syntax Directed Definitions - Intermediate Languages - Syntax Tree - Three Address Code - Types and Declarations - Translation of Expressions - Type Checking.

UNIT - IV: RUN-TIME ENVIRONMENT AND CODE GENERATION 9

Storage Organization - Stack Allocation Space - Access to Non-local Data on the Stack – Heap Management – Issues in Code Generation – Design of a simple Code Generator.

UNIT - V: CODE OPTIMIZATION 9

Principal Sources of Optimization – Peep-hole optimization – DAG - Optimization of Basic Blocks - Global Data Flow Analysis – Efficient Data Flow Algorithm.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the different phases of compiler.
- Design a lexical analyzer for a sample language and implement a scanner and a parser using LEX and YACC tools
- Apply different parsing algorithms to develop the parsers for a given grammar.
- Understand syntax-directed translation and run-time environment.
- Learn to implement code optimization techniques and a simple code generator.

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education, 2009.

REFERENCE BOOKS:

1. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence based Approach”, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers – Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004
4. V. Raghavan, “Principles of Compiler Design”, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, “Compiler Design in C”, Prentice-Hall Software Series, 1993.

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5	-	3	-	3	-	-	-	-	-	-	-	-	-	-	3	-

1908007 OPERATING SYSTEMS CONCEPTS L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.

UNIT – I: PROCESSES AND THREADS 9

Introduction to operating systems – Objectives and functions, Evolution of Operating System - operating system-structures – system calls – system programs – System Generation and system boot Processes: Process concept – Process scheduling – Operations on processes –Inter process communication – Communication in client-server systems. Threads: Multi-threading models – Threading issues. Case study: IPC in Linux, Pthreads library

UNIT - II: PROCESS SCHEDULING AND SYNCHRONIZATION 9

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multilevel Queue scheduling - Multilevel feedback Queue Scheduling-Process Synchronization: The critical-section problem – Semaphores – Classic problems of synchronization –critical regions. Deadlock: System model – Deadlock characterization –Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance –Deadlock detection – Recovery from deadlock. Case study: Process scheduling in Linux

UNIT - III: STORAGE MANAGEMENT 9

Main Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing. Case Study: Memory management in Linux

UNIT - IV: FILE SYSTEMS 9

File-System Interface: File concept – Access methods – Directory structure – File system mounting – File Sharing- Protection. File-System Implementation: File System Structure-Allocation methods – Free-space management – efficiency and performance – recovery – log-structured file systems. Case studies: File system in Linux

UNIT - V: I/O SYSTEMS 9

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem - streams – performance. Mass-Storage Structure: Disk scheduling – Disk management – Swap-space management – disk attachment. Case study: I/O in Linux

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems and I/O management
- Perform administrative tasks on Linux Servers.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004.
2. Gary Nutt, “Operating Systems”, Third Edition, Pearson Education, 2004.
3. Harvey M. Deitel, “Operating Systems”, Third Edition, Pearson Education, 2004.
4. RamezElmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
5. Achyut S. Godbole, AtulKahate, “Operating Systems”, McGraw Hill Education, 2016.
6. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O‘Reilly

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3	3	1	-	-	-	-	-	-	-	-	-	-	-	2	-	2
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1904001 DATABASE MANAGEMENT SYSTEM L T P C

3 0 0 3

OBJECTIVES:

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques recovery procedures
- To have an introductory knowledge about Query Processing.
- To analyze the different DB storage like XML,ODMG etc. in distributed environment

UNIT – I: INTRODUCTION TO DATABASES 9

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping.

UNIT - II: SQL FUNDAMENTALS 9

Relational Algebra – SQL fundamentals – Advanced SQL features–Triggers–Nested Queries-Joins-Inner Join-Outer join-Functions.

UNIT - III: NORMALIZATION 9

Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT - IV: TRANSACTION PROCESSING AND CONCURRENCY CONTROL 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT - V: IMPLEMENTATION TECHNIQUES 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Query optimization using Heuristics and Cost

Estimation Distributed Databases.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Classify the modern and futuristic database applications based on size and complexity
- Map ER model to Relational model to perform database design effectively
- Write queries using normalization criteria and optimize queries.
- Compare and contrast various indexing strategies in different database systems
- Appraise how advanced databases differ from traditional databases.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, Tata McGraw Hill, 2016
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson, 2016

REFERENCE BOOKS:

1. C. J. Date, A.Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, ”Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta, "Database Management Systems”, Tata McGraw Hill, 2011.

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3	2	1	-	2	3	-	-	-	-	-	-	-	3	-	-	2
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1915001 **PROFESSIONAL ETHICS** **L T P C**

3 0 0 3

OBJECTIVES:

- To introduce and educate the students on the concept of Human Values
- To enable the students to have awareness on Engineering Ethics theories and models.
- To make students understand the code of ethics and fundamental principles in social experiments in engineering.
- To educate on safety and risk aspects in engineering and to appreciate the rights of others.
- To create awareness about international issues related to ethics.

UNIT – I: HUMAN VALUES **9**

Moral values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Introduction to Yoga and Meditation for professional excellence and stress management - Simple Living and High Thinking, Science and Spirituality.

UNIT - II: ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of Professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT - III: ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters - Engineer's Responsibilities to Economically Deprived People and Environment, Corruption – Codes of Ethics- Fundamental Principles – A Balanced Outlook on Law – Challenger Case Study

UNIT - IV: SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk –Government Regulator's approach to risks - The Three Mile Island, Chernobyl & Bhopal Case Studies, Greenery Effects - Collegiality and Loyalty - Respect for Authority –

Collective Bargaining – Confidentiality – Conflicts of Interest – Unethical Behaviour at Work Place – Reporting Unethical Behaviour- Professional Rights – Employee Rights – Intellectual Property Rights (IPR).

UNIT - V: INTERNATIONAL ISSUES 9

Multinational corporations - Business ethics - Environmental ethics - Internet ethics - Role in Technological Development - Weapons development-engineers as managers - Consulting Engineers - Engineers as expert witnesses and advisors - Honesty - leadership - Sample code of conduct ethics - ASME, ASCE, IEEE, Institution of Engineers (India),Indian Institute of Materials Management Institution of electronics and telecommunication engineers (IETE), India – Corporate Social Responsibility, Indian and Western Culture – Cyber Crime.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand human values and apply ethics in societal issues.
- Understanding on nuances of engineering ethics.
- Understanding of engineer's responsibility to society and code of ethics
- Understand risk and safety issues related to engineering.
- Advocate on applying ethical principles in international context.

TEXT BOOKS:

1. World Community Service Centre, "Value Education", Vethathiri publications, Erode, 2011.
2. R. Subramanian, 'Professional Ethics' Oxford University Press, 2nd Edition 2017
3. R. S. Nagarazan, 'A Textbook on Professional Ethics and Human Values' New Age International Publishers, 2015
4. Sekhar, R.C., Ethical Choices in Business Response Books, New Delhi, Sage Publications,1997.

REFERENCE BOOKS:

1. Langford, Duncan (EDT): Internet Ethics, London, Macmillan Press Ltd., 2000.
2. Erwann, M. David, Michele S. Shauf, Computers, Ethics and Society, Oxford

University Press,2003

3. Alan Kitson and Robert Campbell:" The Ethical Organisation", Red Globe Press, 2008.
4. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Professional Ethics and Human Values", Prentice Hall of India, New Delhi, 2013.
5. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 3rd edition (2017).

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1908402 PRINCIPLES OF OPERATING SYSTEMS LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To learn Unix commands and shell programming
- To implement various CPU Scheduling Algorithms
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms, File Organization and File Allocation Strategies

LIST OF EXPERIMENTS:

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, opendir,
3. Write programs to implement the UNIX Commands like ls, grep, cp
4. Shell Programming
5. Write C programs to implement the FCFS and SJF(Preemptive and Non preemptive) CPU Scheduling Algorithms
6. Write C programs to implement the Priority(Preemptive) and Round Robin CPU Scheduling Algorithms
7. Implementation of Semaphores
8. Implementation of Shared memory and IPC
9. Bankers Algorithm for Deadlock Avoidance
10. Implementation of Paging Technique of Memory Management
11. Implementation of the following Page Replacement Algorithms

    a) FIFO b) LRU c) LFU
12. Implementation of the following File Allocation Strategies

    a) Sequential b) Indexed c) Linked

TOTAL: 60 PERIODS

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Standalone desktops with C / C++ / Java / Equivalent complier 30 Nos. (or) Server with C / C++ / Java / Equivalent complier supporting 30 terminals or more.

HARDWARE:

Standalone Desktops: 30 Nos.

OUTCOMES:

At the end of the course, the student should be able to:

- Compare the performance of various CPU Scheduling Algorithms
- Implement Deadlock avoidance and Detection Algorithms
- Implement Semaphores and File Allocation Strategies
- Create processes and implement IPC
- Analyze the performance of the various Page Replacement Algorithms

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5	3	2	-	-	2	-	-	-	-	-	-	-	2	3	-	2

1908403	COMPILER LABORATORY	L T P C
		0 0 4 2

OBJECTIVES:

- Deepen the understanding of compiler design.
- To implement Lexical Analyzer using Lex tool &Syntax Analyzer or parser using YACC Tool.
- To implement NFA and DFA from a given regular expression.
- To implement front end of the compiler by means of generating Intermediate codes
- To implement code optimization techniques

LIST OF EXPERIMENTS:

1. Implementation of Symbol Table
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using Lex Tool
4. Generate YACC specification for a few syntactic categories.
    a) Program to recognize a valid arithmetic expression that uses operator +, - , * and /.
    b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
    c) Implementation of Calculator using LEX and YACC
5. Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
6. Implement type checking
7. Implement control flow analysis and Data flow Analysis
8. Implement any one storage allocation strategies (Heap, Stack)
9. Construction of DAG
10. Implementation of Simple Code Optimization Techniques.

TOTAL: 60 PERIODS

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

C/C++ compiler and Compiler writing tools

LEX and YACC

HARDWARE:

Standalone Desktops: 30 Nos.

OUTCOMES:

At the end of the course, the student should be able to:

- Acquire the generic skills to design
- Implement a compiler along with analysis of practical aspects
- Design Lexical analyzer for given language using C and LEX tools.
- Design and convert BNF rules into YACC form to generate various parsers.
- Generate machine code from the intermediate code forms , Implement simple optimization techniques and compiler writing tools.

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1904002 DATABASE MANAGEMENT SYSTEM LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- Learn to create and use a database
- Be familiarized with a query language
- Have hands on experience on DDL Commands
- Have a good understanding of DML Commands and DCL commands
- Be Exposed to different applications

LIST OF EXPERIMENTS:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creating an Employee database to set various constraints and Creation of Views Indexes, Save point.
4. Joins and Nested Queries.
5. Study of PL/SQL block.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures.
9. Creation of database triggers and functions
10. Creation of Database in Ms Access.
11. Database connectivity using Front End Tools (Application Development using Oracle/ Mysql)

Mini Project

a) Inventory Control System.
b) Material Requirement Processing.
c) Hospital Management System.
d) Railway Reservation System.
e) Personal Information System

TOTAL: 60 PERIODS

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Systems with MySql, Visual Studio, Systems with Oracle 11g Client

HARDWARE:

Standalone Desktops: 30 Nos.

OUTCOMES:

At the end of the course, the student should be able to:

- Use typical data definition and manipulation commands.
- Design application to test nested and join queries.
- Implement simple application that use views.
- Implement application that requires front end tools.
- Critically analyze the use of tables and functions.

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1919001 COMMUNICATION SKILLS LABORATORY – PROJECT BASED **L T P C 0 0 2 0**

OBJECTIVES:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities and make effective presentations.
- Improve general and academic listening skills and technical writing skills.
- Strengthen the reading skills of students of engineering.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT – I: Informal Communication – An Introduction **6**

Listening - Listening as a key skill- its importance- **Speaking** - give personal information - ask for personal information - express ability - enquire about ability – rephrase for clarification or emphasis - Improving pronunciation – Articulation of speaking –vowel sounds. **Reading** – Strategies for effective reading- Read and recognize different text types in a newspaper - **Writing**-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence.

UNIT - II: Mechanics of Basic Communication **6**

Listening - Listen to a process information- **Speaking** - asking for details formal/informal – give views, opinions and justification of a news- consonant sounds –diphthongs - .**Reading**-Read for vocabulary through scientific invention summarise the same into a paragraph- . **Writing**-compare and contrast ideas using adjectives from multiple sources stating reasons and examples to support ideas. Write a paragraph with reasons and examples- Write a Rejoint to a newspaper expressing opinions on particular news.

UNIT - III: Nuances of LSRW **6**

Listening - Lexical chunking for accuracy and fluency- factors that influence fluency- listen for and follow the gist- listen for detail **Speaking** - deliver a five-minute informal talk - invite and offer - accept - decline - take leave - word stress – stress rules-ability to recognize RP sound- . **Reading**– Skimming / Scanning a text to apply both the concepts –

to search – to analyze. **Writing**–Use of dictionary and usage of synonyms- editing and proof reading.

UNIT - IV: Technical Communication – Basic presentation Skills 6

Listening - Being an active listener: giving verbal and non-verbal feedback- listening to a podcast of a native speaker and reciprocating **Speaking** - participating in a group discussion - conversational speech listening to and participating in conversations - persuade.– Sentence stress – intonations types-features of connected speech **Reading**– Genre and Organization of Ideas- note taking and summarizing **Writing–**Email writing- Job application- Blog writing.

UNIT - V: Communication Skills for Formal Occasion 6

Listening Listening to documentaries and make notes (TED talks) **Speaking** -Power point presentation - strategies for presentations and interactive communication - group/pair presentations –use stress and intonation to convey meaning and nuances of meaning clearly- **Reading**– Technical passages for comprehension- understanding how the text positions the reader- **Writing**– Statement of Purpose - analyse the situation in a picture / photo and write a suitable description with a proper title

The lab course is offered as an **Employability Enhancement Course**

The Course will have an Internal End semester exam includes a **project work**. The Students need to have **75% attendance** for the completion of the course.

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Read and evaluate texts critically.
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal
- Write winning job applications.
- Display critical thinking in various professional contexts.

REFERENCE BOOKS:

1. Gramer F.Margot and Colin S.Ward ‘Reading and Writing’ (Level 3) Oxford University Press: Oxford, 2011.

2. Debra Daise, CharlNorloff, and Paul ‘Reading and Writing’ (Level 4) Oxford University Press: Oxford, 2011
3. Brooks, Margret. ‘Skills for Success. Listening and Speaking.’ (Level 4)Oxford University Press, Oxford: 2011.
4. Richards,C. Jack. & David Bholke. ‘Speak Now’(Level 3.) Oxford University Press, Oxford: 2010
5. Davis,Jason and Rhonda LIss. ‘Effective Academic Writing’ (Level 3) Oxford University Press: Oxford, 2006
6. E.Suresh Kumar. ‘Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
7. Petelin, Roslyn and Marsh Durham. ‘The Professional Writing Guide: Knowing Well and Knowing Why’. Business & Professional Publishing: Australia, 2004.
8. Bhatnagar, Nitin and Mamta Bhatnagar. ‘Communicative English for Engineers and Professionals’. Pearson: New Delhi, 2010.
9. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
10. Vargo, Mari. Speak Now (Level 4). Oxford University Press: Oxford, 2013.
11. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
12. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
13. IELTS, TOFEL testing series
14. Jack c. Richards. Tactics for Listening: Developing. Oxford University Press: Oxford,.2004
15. New Oxford Dictionary for writers and editors: The essential A-Z Guide to the Written Word 2005.

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V SEMESTER

1908501 WEB TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To understand about client-server communication and protocols used during communication.
- To design interactive web pages using Scripting languages.
- To learn server side programming using servlets and JSP.
- To develop web pages using XML/XSLT.
- To develop the web applications using web development framework.

UNIT – I: WEB SITE BASICS AND HTML 9

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-Forms-HTML 5.0.

UNIT - II: CSS AND CLIENT SIDE SCRIPTING 9

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. Client-Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-inObjects-JavaScript Debuggers.

UNIT - III: CLIENT SIDE TECHNOLOGIES 9

Model-View-Controller Paradigm, Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers.

UNIT - IV: SERVER SIDE TECHNOLOGIES 9

Server-Side Programming: Java Servlets-Architecture -Overview-A Servlet-Generating

Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies-URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Databases and Java Servlets.
Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Databases and JSP.

UNIT - V: APPLICATION DEVELOPMENT ENVIRONMENT 9

Overview of MVC architecture – Java Server Faces: Features – Components – Tags – Struts: Working principle of Struts – Building model components – View components – Controller components – Forms with Struts – Presentation tags – Developing Web applications – Hibernate: Configuration Settings – Mapping persistent classes – Working with persistent objects – Concurrency – Transactions – Caching – Queries for retrieval of objects – Spring: Framework – Controllers – Developing simple applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design simple web pages using markup languages like HTML and XHTML.
- Design web pages using CSS.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Program server side webpages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.

TEXT BOOKS:

1. Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2006.
2. Deitel, Deitel, Goldberg, “Internet & World Wide Web How to Program”, Third Edition, Pearson Education, 2006.

REFERENCE BOOKS:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
2. Marty Hall and Larry Brown, “Core Web Programming Second Edition”, Volume I and II, Pearson Education, 2001.
3. Bates, “Developing Web Applications”, Wiley, 2006

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1908503 SOFTWARE ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To understand the phases in a software project.
- To understand fundamental concepts of requirements engineering.
- To Understand Analysis Modeling.
- To understand the various software design methodologies.
- To learn various testing and maintenance measures.

UNIT – I: SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering- Software Process- Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process-Quality management-SQA-SQA plan.

UNIT - II: REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional- User requirements- System requirements- Software Requirements Document – Requirement Engineering Process: Feasibility Studies,- Requirements elicitation and analysis- requirements validation-requirements management-Classical analysis: Structured system Analysis, Petri Nets-Data Dictionary.

UNIT - III: SOFTWARE DESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT - IV: TESTING AND MAINTENANCE 9

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNIT - V: PROJECT MANAGEMENT **9**

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Identify the key activities in managing a software project, project schedule, estimate project cost and effort required.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.

TEXT BOOKS:

1. Roger S. Pressman,-Software Engineering– A Practitioner's Approach, Seventh Edition, McGraw-Hill International Edition,2010.
2. Ian Sommerville, Software Engineering, 9th Edition, Pearson Education Asia, 2011.

REFERENCE BOOKS:

1. RajibMall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Pvt. Limited, 2009.
2. PankajJalote, "Software Engineering, A Precise Approach", Wiley India, 2010
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited,2007
5. https://nptel.ac.in/courses/106/105/106105182/

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1908006 COMPUTER ARCHITECTURE L T P C

3 0 0 3

OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit
- To learn the basics of pipelined execution.
- To understand the parallelism and multi-core processors
- To understand the memory hierarchies, cache memories and virtual memories and to learn the different ways of communication with I/O devices.

UNIT – I: BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing– Bus structure – Bus operation

UNIT - II: ARITHMETIC FOR COMPUTERS 9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Sub word Parallelism

UNIT - III: PROCESSOR AND CONTROL UNIT 9

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined data path and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT - IV: PARALLELISIM 9

Parallel processing challenges – Flynn’s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT - V: MEMORY & I/O SYSTEMS 9

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB’s – Accessing I/O Devices – Interrupts – Direct Memory Access – Arbitration – Interface circuits - USB.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basics structure of computers, operations and instructions
- Design arithmetic and logic unit
- Understand pipelined execution and design control unit
- Understand parallel processing architectures
- Understand the various memory systems and I/O communication

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

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1904003 COMPUTER NETWORKS L T P C

3 0 0 3

OBJECTIVES:

- To understand the protocol layering and physical level communication
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.
- To understand and analyze the performance of network applications

UNIT – I: INTRODUCTION AND PHYSICAL LAYER 9

Networks – Network Types – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT - II: DATA-LINK LAYER & MEDIA ACCESS 9

Introduction – DLC Services – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs: IEEE 802.11, Bluetooth – Connecting Devices: Hubs, Switches- Routers.

UNIT - III: NETWORK LAYER 9

Network Layer Services – Packet switching – IPV4 Addresses: Classful addressing- classless addressing – Network Layer Protocol: Internet Protocol (IP) – Routing Algorithms: Distance vector routing- Link State routing- Unicast routing algorithm: OSPF– Multicasting Basics – IPV6 Addressing – IPV6 Protocol

UNIT - IV: TRANSPORT LAYER 9

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – SCTP.

UNIT - V: APPLICATION LAYER 9

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basic layers and its functions in computer networks.
- Understand the basics of how data flows from one node to another.
- Analyze and design routing algorithms.
- Design protocols for various functions in the network.
- Understand the working of various application layer protocols.

TEXT BOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

REFERENCE BOOKS:

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, “Computer and Communication Networks”, Second Edition, Prentice Hall, 2014.

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1908510 WEB TECHNOLOGY LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To design interactive web pages using HTML.
- To apply CSS style rules for dynamic web pages.
- To design interactive web pages using Scripting languages.
- To learn server side programming using servlets and JSP.
- To develop web pages using XML/XSLT.

LIST OF EXPERIMENTS:

1. HTML
   - I. Simple HTML using
     - Heading elements
     - Text Elements
     - Logical Styles
     - Physical Styles
     - Ordered , Unordered and Definition list
   - II. Hyper Links
     - Image Link - Link to page containing Images and Videos
     - File Link - Time table
     - Single Page Link
   - III. Using Frames
     - Navigation Frame
     - Floating Frame
     - Inline Frame
   - IV. Registration Form with Table
2. CSS - Inline Style , Internal Style and External Style Sheets
3. DHTML
   - I. Use user defined function to get array of values and sort them in ascending order
   - II. Demonstrate String and Math Object's predefined methods
   - III. Demonstrate Array Objects and Date Object's predefined methods

IV. Exception Handling

V. Calendar Creation: Display all month

Validation of registration form

Open a Window from the current window

Change color of background at each click of button or refresh of a page

Display calendar for the month and year selected from combo box

On Mouse over event

4. JSP

I. Create a welcome Cookie (Hit for a page) and display different image and text on tent each time when the user hit the page

II. List a table of content and navigate within the pages

III. Demonstrate Request and Response object using HTML Form

IV. Database Connection to display all the values in the table

5. Java Servlets

I. Simple Servlets

II. Servlets with HTML form

III. Cookie creation and retrieval using servlet

6. XML

I. Create any catalog

II. Display the catalog created using CSS or XSL

7. Programs using XML –Schema –XSLT/XSL.

8. Programs using DOM and SAX

9. Programs using AJAX

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP

HARDWARE:

Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more.

OUTCOMES:

At the end of the course, the student should be able to:

- Design simple web pages using markup languages like HTML and XHTML.
- Develop web pages using CSS.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Program server side web pages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.

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4	-	-	1	-	-	-	-	-	-	-	-	-	-	3	-	-
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1904512 **NETWORKS LABORATORY** **L T P C**

0 0 4 2

OBJECTIVES:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS:

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup, ping and traceroute.
2. Write a code simulating Socket Programming and Client – Server model
3. Write a code simulating Stop and Wait protocol.
4. Write a code simulating ARP /RARP protocols.
5. Develop a TCP daytime server and client.
6. Applications using TCP sockets like:
    - Echo client and echo server
    - Chat
    - File Transfer
7. Write a HTTP web client program to download a web page using TCP sockets.
8. Simulation of DNS using UDP sockets.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Study of TCP/UDP performance using Simulation tool.

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

C /C++ / Java / Equivalent Compiler, Network simulator likeNS2 / Equivalent

HARDWARE:

Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more

OUTCOMES:

At the end of the course, the student should be able to:

- Implement various network commands.
- Develop applications using socket programming.
- Implement applications using TCP and UDP protocols.
- Use simulation tools to analyze the performance of various network protocols.
- Analyze various routing algorithms.

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VI SEMESTER

1908601	MOBILE COMMUNICATION	L T P C
		3 0 0 3

OBJECTIVES:

- Understand the basic concepts of mobile computing.
- Learn the basics of mobile telecommunication system.
- Understand Wireless LAN, Bluetooth and Wi-Fi Technologies.
- Be familiar with the network protocol stack.
- Be exposed to Ad-Hoc networks.

UNIT – I: INTRODUCTION **9**

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies-MAC Protocols – SDMA- TDMA- FDMA- CDMA

UNIT - II: MOBILE TELECOMMUNICATION SYSTEM **9**

GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS- UMTS- Architecture

UNIT - III: WIRELESS NETWORKS **9**

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services – Blue Tooth- Wi-Fi – Wi MAX

UNIT - IV: MOBILE NETWORK LAYER **9**

Mobile IP – DHCP – AdHoc– Proactive and Reactive Routing Protocols – Multicast Routing- Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security

UNIT - V: MOBILE TRANSPORT AND APPLICATION LAYER **9**

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the basics of mobile telecommunication system.
- Illustrate the generations of telecommunication systems in wireless network.

- Understand the architecture of Wireless LAN technologies.
- Determine the functionality of network layer.
- Understand the concepts of routing protocol for the Ad hoc networks , functionality of Transport and Application layer.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012.

REFERENCE BOOKS:

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. William.C.Y.Lee, “Mobile Cellular Telecommunications- Analog and Digital Systems”, Second Edition, TataMcGraw Hill Edition ,2006.
4. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

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1908602 COMPUTATIONAL INTELLIGENCE L T P C

3 0 0 3

OBJECTIVES:

- To provide a strong foundation on fundamental concepts in Computational Intelligence.
- To understand knowledge representation and reasoning.
- To get knowledge on fuzzy logic
- To know about various learning techniques
- To understand the applications of machine learning techniques

UNIT – I: INTRODUCTION 9

Introduction to Artificial Intelligence- Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions Search-A* algorithm-Game Playing- Alpha-Beta Pruning-Expert systems-Inference-Rules-Forward Chaining and Backward Chaining- Genetic Algorithms.

UNIT - II: KNOWLEDGE REPRESENTATION AND REASONING 9

Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining - Backward Chaining - Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming

UNIT - III: FUZZY LOGIC 9

Non monotonic reasoning-Fuzzy Logic-Fuzzy rules-fuzzy inference-Temporal Logic-Temporal Reasoning-Neural Networks-Neuro-fuzzy Inference.

UNIT - IV: LEARNING 9

Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

UNIT - V: INTELLIGENCE AND APPLICATIONS 9

Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis-AI applications – Language Models - Information Retrieval – Information Extraction - Machine Translation - Symbol-Based Machine Learning: Connectionist Machine Learning.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Provide a basic exposition to the goals and methods of Computational Intelligence.
- Get the knowledge on knowledge representation and reasoning.
- Understand the Intelligence system with Fuzzy logics methodologies.
- Implement the decision make system with Neural networks and National Language Programing.
- Apply the Intelligent techniques for problem solving

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, —Artificial Intelligence: A Modern Approach, Third Edition, Pearson Education / Prentice Hall of India, 2010.
2. Elaine Rich and Kevin Knight, —Artificial Intelligence, Third Edition, Tata McGraw-Hill, 2010

REFERENCE BOOKS:

1. Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.
2. Dan W.Patterson, —Introduction to Artificial Intelligence and Expert Systems, PHI, 2006.
3. Nils J. Nilsson, —Artificial Intelligence: A new Synthesis, Harcourt Asia Pvt. Ltd., 2000

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1908008 OBJECT ORIENTED ANALYSIS AND DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To understand the fundamentals of object modeling and differentiate Unified Process from other approaches.
- To design with static UML diagrams.
- To design with the UML dynamic and implementation diagrams.
- To improve the software design with design patterns.
- To test the software against its requirements specification

UNIT – I: UNIFIED PROCESS AND USE CASE DIAGRAMS 9

Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case – Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – When to use Use-cases

UNIT - II: DESIGN PATTERNS AND METHODOLOGY 9

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioural – Strategy – observer –Applying GoF design patterns – Mapping design to code – methodology – Survey – Rumbaugh, Booch, Jacobson Methods.

UNIT - III: STATIC UML DIAGRAMS 9

Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams

UNIT - IV: DYNAMIC AND IMPLEMENTATION UML DIAGRAMS 9

Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modeling –When to use State Diagrams - Activity diagram – When to use activity diagrams **Implementation Diagrams** - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams

UNIT - V: TESTING **9**

Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans CASE STUDY: Health care, Student Marks Analysing system, CASE studies Tools: Star UML/ UML

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Express software design with UML diagrams
- Design software applications using OO concepts.
- Identify various scenarios based on software requirements
- Transform UML based software design into pattern based design using design patterns
- Create code from design

TEXT BOOKS:

1. Craig Larman, —Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999

REFERENCE BOOKS:

1. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, —Design patterns: Elements of Reusable Object-Oriented Softwareǁ, Addison-Wesley, 1995.
2. Martin Fowler, —UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third edition, Addison Wesley, 2003.

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1908610	OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY	L T P C 0 0 4 2

OBJECTIVES:

- To capture the requirements specification for an intended software system.
- To draw the UML diagrams for the given specification.
- To map the design properly to code.
- To test the software system thoroughly for all scenarios.
- To improve the design by applying appropriate design patterns.

LIST OF EXPERIMENTS:

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the use case diagram
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank

   Or any other domain

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

HARDWARE:

Standard PC desktops - 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE:

1. Windows 7 or higher
2. ArgoUML that supports UML 1.4 and higher/Rational Suite
3. Selenium, JUnit or Apache JMeter

OUTCOMES:

At the end of the course, the student should be able to:

- Perform OO analysis and design for a given problem specification.
- Identify and map basic software requirements in UML mapping.
- Use the UML analysis and design diagrams.
- Improve the software quality using design patterns and to explain the rationale behind applying specific design patterns
- Create code from design.

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3	-	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
4	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	3
5	3	-	3	2	3	-	-	-	-	-	-	-	-	1	-	-

1908611	MINI PROJECT	L T P C
		0 0 4 2

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.
- To develop the ability to perform testing in the developed work.
- To understand the project management in an efficient way.
- To improve effective team building and good coordination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

1. Analyze the literature survey in a specific domain as a team / individual in an ethical way.
2. Plan an experimental design to solve engineering / societal problems using modern tools
3. Develop lifelong learning to keep abreast of latest technologies.
4. Analyze and implement the design to provide sustainable solutions
5. Evaluate and interpret the experimental results and analyze the impact on society and environment.

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1904610 MOBILE APPLICATION DEVELOPMENT LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts and issues of development of mobile applications.
- Understand the capabilities and limitations of mobile devices
- To use engineering, physics & mathematical concepts critical to mobile application development

LIST OF EXPERIMENTS:

1. Develop an android application to work on GUI components
2. Write an android application to develop dice roller
3. Write an android application to develop Native Calculator
4. Write an android application to develop a Reminder App.
5. Develop an android application to implement Multithreading
6. Write an android application to implement all the UI design (Widgets, Layouts, UI Events and Event Listeners).
7. Develop an android application to make use of Database Concepts
8. Implement an android application to use 2D graphics
9. Develop an android application to implement multimedia (Audio playback and Media Player).
10. Develop an android application to make use of Networking Concept.
    - I. Making Phone call.
    - II. Sending Emails.
    - III. Sending SMS

TOTAL: 60 PERIODS

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Eclipse, Android Studio

HARDWARE:

Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more.

OUTCOMES:

At the end of the course, the student should be able to:

- Design and Implement various mobile applications using emulators
- Deploy applications to hand-held devices
- Transfer current knowledge to learning of new technologies
- Have Skills to software development, computer programming & graphic
- Design using appropriate and accessible digital tools for research and learning.

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1919002 PROFESSIONAL COMMUNICATION L T P C

0 0 2 1

OBJECTIVES:

- Enhance the Employability and Career Skills of students.
- Orient the students towards grooming as a professional.
- To learn how to speak in group discussions.
- Make them employable Graduates and help them attend interviews successfully.
- Develop their confidence and help them express views clearly.

UNIT – I: General English for competitive Exams 6

English for competitive exams —General awareness of Current Affairs – multiple choice – Cloze – Vocabulary Structure

UNIT - II: Mechanics of Interpersonal Communication 6

Introduction to soft skills - Interpersonal communication - Introducing oneself to the audience — answering questions – writing a message – memo –mail – asking for comments – giving information – agreeing to requests – apologizing – Complaining – Business proposal – short report – summarizing.

UNIT - III: Basics of Group Discussion 6

Introduction to Group Discussion— participating in group discussions – questioning and clarifying –GD strategies –monologues – dialogues – discussions.

UNIT - IV: Fundamentals of Interview Skills 6

Interview etiquette –Portfolio development- attending job interviews–FAQs related to job interviews- Interview types –expressing opinions – present circumstances - past experiences – future plans

UNIT - V: Specific skills for Career advancement 6

Recognizing differences between groups and teams - networking professionally- respecting social protocols- understanding career management- developing a long- term career plan- making career changes. – organizing a larger unit of discourse – expressing and justifying opinions – negotiating – collaborating – disagreeing – speculating – decision taking.

TOTAL: 30 PERIODS

The lab course is offered as an **Employability Enhancement Course**

The course is offered as a **one credit** paper with an End Semester Examination

OUTCOMES:

At the end of the course, the student should be able to:

- Make effective presentations
- Participate confidently in Group Discussions
- Attend job interviews and interacting in different situations.
- Write business reports, proposals and related correspondence.
- Develop adequate Soft Skills required for the workplace

REFERENCE BOOKS:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students, Orient Black swan: Hyderabad, 2016.
3. E. Suresh Kumar et al. Communication for Professional Success. Orient Black swan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanl. Soft Skills. MJP Publishers: Chennai, 2010.
6. Successful Presentations: DVD and Student's Book. A video series teaching business communication skills for adult professionals by John Huges and Andrew Mallett- OUP 2012
7. Good heart-Will cox, "Professional Communication", First Edition , 2017. Online test book
8. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6 edition, 2015
9. English for success in Competitive exams. Philip Sunil Solomon – OUP 2009

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VII SEMESTER

1908701 CLOUD COMPUTING L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT – I: INTRODUCTION 9

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT - II: CLOUD ENABLING TECHNOLOGIES 9

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT - III: CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT - IV: RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT - V: CLOUD TECHNOLOGIES AND ADVANCEMENTS 9

Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine –– Open Stack – Federation in the Cloud – Four Levels of Federation –

Federated Services and Applications – Future of Federation.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Install and use current cloud technologies.

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017

REFERENCE BOOKS:

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure

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1908702 SOFTWARE PROJECT MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the Software Project Planning and Evaluation technique.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management and to deliver successful software projects that support organization‘s strategic goals.

UNIT – I: PROJECT EVALUATION AND PROJECT PLANNING 9

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting Objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT - II: PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

UNIT - III: ACTIVITY PLANNING AND RISK MANAGEMENT 9

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT - IV: PROJECT MANAGEMENT AND CONTROL 9

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT - V: STAFFING IN SOFTWARE PROJECTS 9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall: “Software Project Management” – Fifth Edition, Tata McGraw Hill, New Delhi, 2012

REFERENCE BOOKS:

1. Robert K. Wysocki —”Effective Software Project Management” – Wiley Publication, 2011.
2. Walker Royce:- “Software Project Management ”-Addison-Wesley,1998.
3. Gopalaswamy Ramesh,-“Managing Global Software Projects ”- McGraw Hill Education (India), Fourteenth Reprint 2013.

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3	-	-	2	-	-	-	-	-	-	3	3	-	-	-	-	3
4	-	2	2	-	-	-	-	-	3	3	3	-	-	-	-	-
5	-	-	-	3	-	-	-	-	3	-	2	-	-	-	-	3

1904005 CRYPTOGRAPHY AND NETWORK SECURITY L T P C

3 0 0 3

OBJECTIVES:

- To understand basics of Cryptography and Network Security
- To understand the number theory used for network security
- To understand Cryptography Theories, Algorithms and Systems.
- To understand the design concept of cryptography and authentication
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

UNIT – I: INTRODUCTION & NUMBER THEORY 9

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography). FINITE FIELDS AND NUMBER THEORY: Modular arithmetic- Euclid's algorithm- Prime numbers-Fermat's and Euler's theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms

UNIT – II: SYMMETRIC KEY CRYPTOGRAPHY 9

SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard – RC4 – Key distribution.

UNIT - III: PUBLIC KEY CRYPTOGRAPHY 9

ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT - IV: MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS-Authentication applications – Kerberos, X.509

UNIT - V: SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security – SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
- Apply the different cryptographic operations of symmetric cryptographic algorithms
- Apply the different cryptographic operations of public key cryptography
- Apply the various Authentication and hash algorithms to simulate different applications.
- Understand various Security practices and System security standards.

TEXT BOOKS:

William Stallings, Cryptography and Network Security: Principles and Practice, PHI 4th Edition, 2006.

REFERENCE BOOKS:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007.
2. Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication in Public World”, PHI 2002.

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3	2	3	3	3	-	2	-	-	-	-	-	-	-	2	-	-
4	2	3	2	3	2	-	-	-	-	-	-	-	-	3	-	-
5	2	2	-	-	2	2	-	-	-	-	-	-	-	3	2	-

1908705 FOSS AND CLOUD COMPUTING LABORATORY L T P C

0 0 4 2

OBJECTIVES:

- To learn and use version control systems
- To develop web applications in cloud
- To learn and work with virtual machine
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

LIST OF EXPERIMENTS:

1. Use gcc to compile c-programs. Split the programs to different modules and create an application using make command.
2. Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories.
3. Install Virtual box/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
4. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
5. Install Google App Engine. Create hello world app and other simple web applications using python/java.
6. Use GAE launcher to launch the web applications.
7. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.
8. Find a procedure to transfer the files from one virtual machine to another virtual machine.
9. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
10. Install Hadoop single node cluster and run simple applications like

TOTAL : 60 PERIODS

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

C Compiler

Eucalyptus or Open Nebula or equivalent

HARDWARE:

Standalone desktops 30 Nos

OUTCOMES:

At the end of the course, the student should be able to:

- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Install and use Hadoop

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3	1	-	-	2	-	2	-	-	-	-	-	-	-	-	2	-
4	-	-	3	-	3	-	-	-	-	-	-	-	-	2	2	-
5	1	-	-	-	2	2	-	-	-	-	-	-	-	2		-

1908706 **PROJECT WORK - PHASE I** **L T P C**

0 0 4 2

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.
- To develop the ability to perform testing in the developed work.
- To understand the project management in an efficient way.
- To improve effective team building and good coordination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Prepare a literature survey in a specific domain as a team / individual to motivate lifelong learning.
- Identify the problem which needs to be provided a sustainable solution using modern tools.
- Analyze the problem definition and its impact on the society and environment.
- Analyze the design information to provide environment friendly solutions
- Document the literature , findings and results.

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1904008 **SECURITY LABORATORY** **L T P C**

0 0 4 2

OBJECTIVES:

- To learn different cipher techniques.
- To implement the algorithms DES.
- To implement the RSA Algorithm.
- To implement the MD5, Digital Signature Algorithms.
- To use network security tools and vulnerability assessment tools

LIST OF EXPERIMENTS:

1. Perform encryption, decryption using the following substitution techniques
   (i) Ceaser cipher
   (ii) playfair cipher
   (iii) Hill Cipher
   (iv) Vigenere cipher
2. Perform encryption and decryption using following transposition techniques
   i) Rail fence
   ii) row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Implement RSA Algorithm using HTML and JavaScript
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME - Digital Signature Standard.
9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools
11. Exploring N-Stalker, a Vulnerability Assessment Tool
12. Defeating Malware
    i) Building Trojans
    ii) Rootkit Hunter

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE:

C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent

HARDWARE:

Standalone desktops -30 Nos. (or) Server supporting 30 terminals or more.

OUTCOMES:

At the end of the course, the student should be able to:

- Develop code for classical Encryption Techniques to solve the problems.
- Build cryptosystems by applying symmetric and public key encryption algorithms.
- Construct code for authentication algorithms.
- Develop a signature scheme using Digital signature standard.
- Demonstrate the network security system using open source tools

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VIII SEMESTER

1908808 **PROJECT WORK - PHASE II** **L T P C**

0 0 12 6

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.
- To develop the ability to perform testing in the developed work.
- To understand the project management in an efficient way.
- To improve effective team building and good coordination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the literature survey in a specific domain as a team / individual in an ethical way.
- Plan an experimental design to solve engineering / societal problems using modern tools
- Develop lifelong learning to keep abreast of latest technologies.
- Analyze and implement the design to provide sustainable solutions
- Evaluate and interpret the experimental results and analyze the impact on society and environment

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PROFESSIONAL ELECTIVES

1908504 INFORMATION THEORY AND CODING TECHNIQUES L T P C

3 0 0 3

OBJECTIVES:

- To understand source coding and channel coding theorems
- To know about data and voice coding techniques.
- To be familiar with the methods of error control coding techniques.
- To be aware of compression and decompression techniques.
- To be learn the concepts of multimedia communication audio and video techniques.

UNIT – I: INFORMATION ENTROPY FUNDAMENTALS 9

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem

UNIT - II: DATA AND VOICE CODING 9

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive sub band coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT - III: ERROR CONTROL CODING 9

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

UNIT - IV: COMPRESSION TECHNIQUES 9

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

UNIT - V: AUDIO AND VIDEO CODING 9

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

TOTAL: 45 PERIODS

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Understand the information entropy fundamentals.
- Understand the data and voice coding technique.
- Design an application with error–control
- Use compression and decompression techniques.
- Gather knowledge on audio and video coding.

TEXT BOOKS:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.
2. Fred Halsall, “Multimedia Communications, Applications Networks Protocols and Standards”, Pearson Education, Asia 2002.

REFERENCE BOOKS:

1. Mark Nelson, “Data Compression Book”, BPB Publication 1992.
2. Watkinson J, “Compression in Video and Audio”, Focal Press, London, 1995.

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1908505 MICROPROCESSORS AND MICROCONTROLLERS L T P C

3 0 0 3

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

UNIT – I: 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT - II: 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT - III: I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT - IV: MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT - V: INTERFACING MICROCONTROLLER 9

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface- Stepper Motor and Waveform generation – Comparison of Microprocessor,

Microcontroller, PIC and ARM processors

TOTAL: 45 PERIODS

At the end of the course, the student should be able to:

- Understand the Basic knowledge of internal architecture of Microprocessor and execute programs based on 8086 microprocessor.
- Develop bus structure and communication of microprocessor
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.
- Design Memory Interfacing circuits.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, RolinMcKinlay, —The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson education, 2011.

REFERENCE BOOKS:

1. DoughlasV.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH,2012.
2. A.K.Ray,K.M.Bhurchandi, Advanced Microprocessors and Peripherals —3rd edition, Tata McGrawHill,2012.

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1908506 **SYSTEM SOFTWARE** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers.
- To know the design and implementation of linkers and loaders.
- To have an understanding of macro processors.
- To have an understanding of system software tools.

UNIT – I: INTRODUCTION **9**

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

UNIT - II: ASSEMBLERS **9**

Basic assembler functions **-** A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features **-** Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

UNIT - III: LOADERS AND LINKERS **9**

Basic loader functions **-** Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features **–** Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

UNIT - IV: MACRO PROCESSORS **9**

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language

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UNIT - V: SYSTEM SOFTWARE TOOLS 9

Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems **-** Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Have good knowledge about Machine architecture and Instructions.
- Gain knowledge about working of assemblers.
- Understand about Program loading & Program linking.
- Learn about implementation of Macro and functions of macro processor
- Have knowledge and idea about various system software tools.

TEXT BOOKS:

Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2000.

REFERENCE BOOKS:

1. D. M. Dhamdhere, “Systems Programming and Operating Systems”, Second Revised Edition, Tata McGraw-Hill, 1999.
2. John J. Donovan “Systems Programming”, Tata McGraw-Hill Edition, 1972.
3. John R. Levine, “Linkers & Loaders”, Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000

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3	2	3	-	-	2	-	-	-	-	-	-	-	-	2	-	-
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1908004 **C# and .NET PROGRAMMING** **L T P C**

3 0 0 3

OBJECTIVES:

- To learn basic programming in C# and the object oriented programming concepts.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET.
- To study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
- To implement mobile applications using .Net compact framework.
- To understand the working of base class libraries, their operations and manipulation of data using XML.

UNIT - I: C# LANGUAGE BASICS 9

.Net Architecture – Core C# – Variables – Data Types – Flow control – Objects and Types- Classes and Structs – Inheritance- Generics – Arrays and Tuples – Operators and Casts – Indexers

UNIT - II: C# ADVANCED FEATURES 9

Delegates – Lambdas – Lambda Expressions – Events – Event Publisher – Event Listener – Strings and Regular Expressions – Generics – Collections – Memory Management and Pointers – Errors and Exceptions – Reflection.

UNIT - III: BASE CLASS LIBRARIES AND DATA MANIPULATION 9

Diagnostics -Tasks, Threads and Synchronization – .Net Security – Localization – Manipulating XML- SAX and DOM – Manipulating files and the Registry- Transactions – ADO.NET- Peer-to-Peer Networking – PNRP – Building P2P Applications – Windows Presentation Foundation (WPF).

UNIT - IV: WINDOW BASED APPLICATIONS, WCF AND WWF 9

Window based applications – Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)- Introduction to Web Services – .Net Remoting – Windows Service – Windows Workflow Foundation (WWF) – Activities – Workflows

UNIT - V: .NET FRAMEWORK AND COMPACT FRAMEWORK 9

Assemblies – Shared assemblies – Custom Hosting with CLR Objects – App domains –

Core XAML – Bubbling and Tunneling Events- Reading and Writing XAML – .Net Compact Framework – Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Write various applications using C# Language in the .NET Framework.
- Develop programs using advanced C# concepts on .NET.
- Analyse the base class libraries, operations and manipulation of data using XML.
- Develop distributed applications using .NET Framework.
- Create mobile applications using .NET compact Framework.

TEXT BOOKS:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner,- Professional C# 2012 and .NET 4.5, Wiley, 2012
2. Harsh Bhasin, —Programming in C#, Oxford University Press, 2014.

REFERENCE BOOKS:

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, —Programming C# 4.0, OReilly, Fourth Edition, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, A press publication, 2012.
3. Andy Wigley, Daniel Moth, Peter Foot, —Mobile Development Handbook, Microsoft Press, 2011.

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1908507 DATA WAREHOUSING AND DATA MINING L T P C

3 0 0 3

OBJECTIVES:

- Be familiar with the concepts of data warehouse.
- Be familiar with techniques of data mining.
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
- Be familiar with data mining functionalities.
- To understand the applications of data mining.

UNIT – I: DATA WAREHOUSING 9

Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

UNIT - II: BUSINESS ANALYSIS 9

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi relational OLAP – Categories of Tools – OLAP Tools and the Internet.

UNIT - III: DATA MINING 9

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

UNIT - IV: ASSOCIATION RULE MINING AND CLASSIFICATION 9

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 – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction

UNIT - V: CLUSTERING AND TRENDS IN DATA MINING 9

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 – Data Mining Applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basic concepts of Data Warehouse.
- Apply the data warehouse concepts in business analysis.
- Apply data mining techniques and methods to large data sets.
- Understand the concepts of Association and Prediction.
- Use data mining tools.

TEXT BOOKS:

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and MichelineKamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.

REFERENCE BOOKS:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007.
2. K.P. Soman, ShyamDiwakar and V. Aja, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, “Data Mining Methods and Models”, Wiley-Interscience, 2006.

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1906510 DIGITAL SIGNAL PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- To understand the concepts of discrete time signals and systems.
- To learn Discrete Fourier Transform, properties of DFT and its application to linear filtering
- To explore the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- To Analyze the effects of finite world length effects on digital filters
- To understand the fundamental concepts of multi rate signal processing, adaptive filters and its applications

UNIT – I: REVIEW OF SIGNALS AND SYSTEMS 9

Basic Elements of DSP —– Sampling Theorem – Discrete Time Signals, Systems – Analysis of Discrete Time LTI Systems – Z Transform – Convolution – Correlation.

UNIT - II: FREQUENCY TRANSFORMATIONS 9

Introduction to DFT – Properties of DFT – Circular Convolution – FFT Algorithms – Decimation in Time Algorithms, Decimation in Frequency Algorithms – Use of FFT in Linear Filtering ..

UNIT - III: IIR FILTER DESIGN 9

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Filter design using frequency translation..

UNIT - IV: FIR FILTER DESIGN 9

Structures of FIR – Linear phase FIR filter – Fourier Series – Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques.

UNIT - V: FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS & APPLICATIONS 9

Finite word length effects in Digital Filters - ADC - Quantization - Truncation and Rounding - Quantization noise - Product Quantization error - overflow error - Limit Cycle Oscillations and

scaling. Multi rate signal Processing-Decimation, Interpolation- Adaptive filters and its application

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply DFT for the analysis of digital signals and systems.
- Design and analyse the IIR filters and its applications.
- Explore and analyse the FIR filters and its applications.
- Analyze the effects of finite word effect on digital filters.
- Design Multirate filters and apply adaptive filters appropriately in communication systems.

TEXT BOOKS:

1. John G. Proakis & DimitrisG.Manolakis, —Digital Signal Processing – Principles, Algorithms & Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, Eight Indian Reprint, Pearson, 2004.

REFERENCE BOOKS:

1. Emmanuel C. Ifeachor& Barrie. W. Jervis, —Digital Signal Processing, Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, —Digital Signal Processing – A Computer Based Approach, Tata McGraw Hill, 2007.
3. Andreas Antoniou, —Digital Signal Processing, Tata McGraw Hill, 2006.

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1908603 FORMAL LANGUAGES AND AUTOMATA THEORY L T P C

3 0 0 3

OBJECTIVES:

- To understand a finite automata for a given language.
- To understand the relation between grammar and language.
- To understand the basic principles of working of a compiler.
- To study about the type checking procedure during the compilation.
- To understand the storage structure of the running program.

UNIT – I: AUTOMATA 9

Introduction to formal proof –Additional forms of proof –Inductive proofs –Finite Automata (FA) –Deterministic Finite Automata (DFA) –Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions-Equivalence and minimization of Automata.

UNIT - II: CONTEXT FREE GRAMMARS AND LANGUAGES 9

Context-Free Grammar (CFG) –Parse Trees –Ambiguity in grammars and languages – Definition of the Pushdown automata –Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG–Deterministic Pushdown Automata-Normal forms for CFG –Pumping Lemma for CFL –Closure Properties of CFL –Turing Machines – Programming Techniques for TM.

UNIT - III: BASICS OF COMPILATION 9

Compilers –Analysis of source program –Phases of a compiler –Grouping of phases – Compiler construction tools –Lexical Analyzer : Token Specification –Token Recognition – A language for Specifying lexical analyzer –Top down parser : Table implementation of Predictive Parser –Bottom up Parser : SLR(1) Parser –Parser generators.

UNIT - IV: TYPE CHECKING AND RUNTIME ENVIRONMENTS 9

Syntax directed definitions –Construction of syntax trees –Type systems –Specification of a simple type checker-Equivalence of type expressions –Type conversions –Attribute grammar for a simple type checking system –Runtime Environments: Source language issues –Storage organization –Storage allocation strategies –Parameter passing.

UNIT - V: CODE GENERATION AND OPTIMIZATION 9

Issues in the design of a code generator -The target machine -Run-time storage management -Basic blocks and flow graphs -Next-use information -A simple code

generator -Register allocation and assignment -The dag representation of basic blocks -Generating code from DAG –Dynamic programming code generation algorithm –Code generator generators -Code optimization.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design a finite automaton for a specific language.
- Design a Turing machine.
- Select appropriate grammar for the implementation of compiler phases.
- Design a lexical analyser and a simple parser.
- Design and implement techniques used for optimization by a compiler.

TEXT BOOKS:

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2007.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education, 2008.

REFERENCE BOOKS:

1. J. Martin, “Introduction to Languages and the Theory of computation”, Third Edition, Tata McGraw Hill, 2007.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers -Elsevier Science, India, Indian Reprint 2003.

   Muneeswaran. K, “Compiler Design”, Oxford University Press, 2012.

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1908604 DIGITAL IMAGE PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- Learn digital image fundamentals
- Be exposed to simple image processing techniques
- Understand enhancement techniques in spatial and Frequency domain
- Be familiar with image compression and segmentation techniques
- Analyze patterns and recognition process

UNIT – I: DIGITAL IMAGE FUNDAMENTALS 9

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models, Two-dimensional mathematical preliminaries, 2D transforms – DFT.

UNIT - II: IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters

UNIT - III: IMAGE RESTORATION AND SEGMENTATION 9

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation Morphological processing- erosion and dilation

UNIT - IV: WAVELETS AND IMAGE COMPRESSION 9

Wavelets – Sub band coding - Multi resolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards

UNIT - V: IMAGE REPRESENTATION AND RECOGNITION 9

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand simple image processing techniques
- Understand digital image fundamentals
- Apply image enhancement techniques
- Apply image restoration techniques, Use image compression , segmentation Techniques and represent features in images
- Apply pattern and recognition process

TEXT BOOKS:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010

REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. Willliam K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt.Ltd., 2011.

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1908606 **GPU ARCHITECTURE** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the basics of GPU architectures
- To write programs for massively parallel processors
- To understand about memory and thread
- To understand the issues in mapping algorithms for GPUs
- To introduce different GPU programming models

UNIT – I: GPU ARCHITECTURE **9**

Evolution of GPU architectures - Understanding Parallelism with GPU –Typical GPU Architecture - CUDA Hardware Overview - Threads, Blocks, Grids, Warps, Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT - II: CUDA PROGRAMMING **9**

Using CUDA - Multi GPU - Multi GPU Solutions - Optimizing CUDA Applications: Problem Decomposition.

UNIT-III: MEMORY AND THREAD in CUDA **9**

Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT - IV: PROGRAMMING ISSUES **9**

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.

UNIT - V: ALGORITHMS ON GPU **9**

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication - Programming Heterogeneous Cluster.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Describe GPU Architecture
- Write programs using CUDA, identify issues and debug them

- Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
- Identify efficient parallel programming patterns to solve problems
- Implement programs for massively parallel processors

TEXT BOOKS:

1. Shane Cook, CUDA Programming: —A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), First Edition, Morgan Kaufmann, 2012.

REFERENCE BOOKS:

1. Nicholas Wilt, —CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison - Wesley, 2013.
2. Jason Sanders, Edward Kandrot, —CUDA by Example: An Introduction to General Purpose GPU programming, Addison - Wesley, 2010.
3. David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors - A Hands-on Approach, Third Edition, Morgan Kaufmann, 2016.
4. http://www.nvidia.com/object/cuda_home_new.htm

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1904607 **DATA SCIENCE** **L T P C**

3 0 0 3

OBJECTIVES:

- Be exposed to basic introduction of big data
- To impart necessary knowledge of the mathematical foundations
- Be familiar with basic concepts on Machine Learning
- Learn the different classification algorithm for appropriate decision making.
- To learn the tools to implement Data science and its application.

UNIT – I: INTRODUCTION TO DATA SCIENCE 9

Introduction to Data Science-Concept of Data Science-Traits of Big data-Web Scraping-Analysis vs Reporting.

UNIT - II: MATHEMATICAL FOUNDATIONS 9

Linear Algebra: Vectors, Matrices- Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox-Correlation and Causation- Probability: Dependence and Independence, Conditional Probability, Bayes's-Theorem, Random Variables-Continuous Distributions- The Normal Distribution-The Central Limit Theorem.

UNIT - III: MACHINE LEARNING 9

Overview of Machine learning concepts –Types of Machine learning - Linear Regression-model assumptions-Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression- support vector machines (SVM), decision trees, and random forest.

UNIT - IV: PROGRAMMING TOOLS FOR DATA SCIENCE 9

Introduction to Programming Tools for Data Science-Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK-Visualizing Data: Bar Charts, Line Charts and Scatterplots-Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs).

UNIT - V: Case Studies of Data Science Application 9

Weather forecasting-Stock market prediction-Object recognition- Real Time Sentiment Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Basic foundations of Big data.
- Demonstrate understanding of the mathematical foundations needed for data science.
- Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees.
- Build data science applications using Python based toolkits.
- Familiar in Data science applications and implementation.

TEXT BOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media First edition (April 30, 2015)
2. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, 2017, O'Reilly Media.

REFERENCE BOOKS:

1. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, Second Edition, 2009.
2. G. Strang (2016). Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA.
3. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press, First Edition(November 18, 2016)
4. Montgomery, D. C. and G. C. Runger (2011). Applied Statistics and Probability for Engineers. 5th Edition. John Wiley & Sons, Inc., NY, USA

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1904606 INTELLECTUAL PROPERTY RIGHTS L T P C

3 0 0 3

OBJECTIVES:

- To give an idea about IPR, registration and its enforcement.
- To acquaint the students with basics of intellectual property rights with special reference to Indian Laws and its practices.
- To provide an overview of the statutory, procedural, and case law underlining these processes and their interplay with litigation.
- To encourage and protect innovation in the form of intellectual property rights.
- To encourage research, scholarship, and a spirit of inquiry, thereby generating new knowledge.

UNIT – I: INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property – Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT - II: REGISTRATION OF IPRs 9

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.

UNIT - III: AGREEMENTS AND REGISTRATION 9

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT - IV: DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT - V: ENFORCEMENT OF IPRs 9

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Skill to understand the concept of intellectual property rights.
- Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
- Skill to pursue the professional programs in Company Secretary ship, Law. Business (MBA), International Affairs, Public Administration and Other fields.
- Employability as the Compliance Officer, Public Relation Officer and Liaison Officer.
- Establishment of Legal Consultancy and service provider.

TEXT BOOKS:

1. V. ScopleVinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, —Intellectual Property Rights and Copy Rights, EssEss Publications, New Delhi, 2002.

REFERENCE BOOKS:

1. Deborah E. Bouchoux, —Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
2. PrabuddhaGanguli, Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

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1915004	HUMAN RIGHTS	L T P C
		3 0 0 3

OBJECTIVES:

- To sensitize the Engineering students to various aspects of Human Rights.
- To educate on the evolution of human rights movement.
- To create awareness and understanding on the international deliberations towards human rights.
- To educate on constitutional rights and provisions related to human rights in India.
- Create awareness on support organisations in Human Rights in India.

UNIT – I: INTRODUCTION 9

Human Rights - Meaning, Origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil, Political Rights, Economic, Social and Cultural Rights, Educational Rights, Collective and Solidarity Rights - Societal problems and human rights

UNIT - II: EVOLUTION OF HUMAN RIGHTS MOVEMENT 9

Evolution of the concept of Human Rights Magana carta – Geneva Convention1864. Universal Declaration of Human Rights, 1948. Principles of Human Rights - Theories of Human Rights – Feminist Perspectives of Human Rights – Human Rights Problems - Violence against Women and Children, Communal Violence

UNIT - III: INTERNATIONAL PRESPECTIVES 9

Theories and Perspectives of United Nation Laws – United Nations Agencies to monitor and compliance – United National Commission of Human Rights (UNCHR) – United Nations Children Fund (UNICEF) – United Nations Commission for Refugee (UNHCR) – United Nations Education, scientific and cultural Organisation (UNESCO) – International Labour Organisation and Labour Rights

UNIT - IV: HUMAN RIGHTS IN INDIA 9

Human Rights in India – Constitutional Provisions / Guarantees. – Fundamental rights, Directive Principles of State, Policies, Fundamental Duties - International Human Rights and the Indian Constitution – Human Rights violation in Private and Public Domain - Within

the Family, by Dominant Castes and Religious Groups, Riots and Violence

UNIT - V: HUMAN RIGHTS SUPPORT ORGANISATION 9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Engineering students will acquire the basic knowledge of human rights.
- Students will have an understanding on the evolution of human rights movement.
- Students will be able to show an understanding on UN laws and agencies related to human rights.
- Students will be able to advocate on constitutional provisions related to human rights in India.
- Students will have understanding on the various organisations involved in support of human rights in India.

REFERENCE BOOKS:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad,7th edition 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, 'The Future of Human Rights', Oxford University Press, NewDelhi, 3rd edition 2012.

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1908607 MACHINE LEARNING TECHNIQUES-I L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic concepts and techniques of Machine Learning.
- To learn the linear models concepts.
- To understand the theoretical and practical aspects of tree and Probabilistic Models.
- To know about the genetic algorithms and graphics models.
- To get the knowledge on the concept of advanced learning theory.

UNIT – I: INTRODUCTION 9

Learning – Machine Learning Foundations –Overview – Design of a Learning system - Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants –Linear Separability – Linear Regression.

UNIT - II: LINEAR MODELS 9

Linear model for classification - Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT - III: TREE AND PROBABILISTIC MODELS 9

Decision trees – learning decision trees – Constructing Decision Trees -ranking and probability estimation trees – Regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first -order rule learning- Gaussian Mixture Models- Nearest Neighbor Methods –K means Algorithms- Vector Quantization – Self Organizing Feature Map.

UNIT - IV: EVOLUTIONARY AND GRAPHICAL MODELS 9

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators –

Using Genetic Algorithms –Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Directed graphical models- Undirected graphical models- Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

UNIT - V: ADVANCED LEARNING 9

Sampling –Basic sampling methods- Monte Carlo- Reinforcement Learning- Model-Based Learning- Temporal Difference Learning Exploration Strategies- Deterministic and Non-deterministic Rewards Actions Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, applications in game playing – applications in robot control.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the basic concepts and techniques of Machine Learning
- Learn the linear models and supervised learning techniques.
- Understand the theoretical and practical aspects of tree and Probabilistic Models
- know about the genetic algorithms and graphics models.
- Get the knowledge on the concept of advanced learning theory.

TEXT BOOKS:

1. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Press, Machine Learning and Pattern Recognition Series, 2014.
2. Tom M.Mitchell, "Machine Learning", First Edition, McGraw-Hill, 2013.

REFERENCE BOOKS:

1. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
2. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
3. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
4. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical

Learning", Springer, Second Edition, 2011.

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1908609 INTERNET OF THINGS AND ITS APPLICATIONS L T P C

3 0 0 3

OBJECTIVES:

- Understand Smart Objects and IoT Architectures.
- Learn about various IOT-related protocols.
- Build simple IoT Systems using Arduino and Raspberry Pi.
- Understand data analytics and cloud in the context of IoT.
- Develop IoT infrastructure for popular applications.

UNIT – I: FUNDAMENTALS OF IoT 9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT - II: IoT PROTOCOLS 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT - III: DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT - IV: DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT - V: CASE STUDIES **9**

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plant wide Ethernet Model (CPwE) – Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand all basic foundation of IoT,the functional block of IoT.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Raspberry Pi/Arduino.
- Apply data analytics and use cloud offerings related to IoT.
- Implement IoT infrastructure for popular applications

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012 .

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015
2. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
4. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

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1908009 INFORMATION STORAGE AND MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic components of Storage System Environment.
- To understand the Storage Area Network Characteristics and Components.
- To examine emerging technologies including IP-SAN.
- To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- To understand the local and remote replication technologies.

UNIT – I: STORAGE SYSTEMS 9

Introduction to Information Storage and Management: Information Storage - Evolution of Storage Technology and Architecture - Data Center Infrastructure - Key Challenges in Managing Information -Information Lifecycle. Storage System Environment - Components of the Host. RAID - Implementation of RAID -RAID Array Components - RAID Levels - RAID Comparison - RAID Impact on Disk Performance - Hot Spares.

UNIT - II: STORAGE NETWORKING TECHNOLOGIES 9

Direct-Attached Storage and Introduction to SCSI: Types of DAS, DAS Benefits and Limitations- Disk Drive Interfaces - Introduction to Parallel SCSI -SCSI Command Model.- Storage Area Networks - Fiber Channel - SAN Evolution - SAN Components - Fiber Channel Connectivity - Fiber Channel Ports - Fiber Channel Architecture – Zoning - Fiber Channel Login Types - Fiber Channel Topologies.

UNIT - III: ADVANCED STORAGE NETWORKING AND VIRTUALIZATION 9

IP SAN – iSCSI – FCIP - Content-Addressed Storage - Fixed Content and Archives - Types of Archives - Features and Benefits of CAS -CAS Architecture - Object Storage and Retrieval in CAS -CAS Examples - Storage Virtualization - Forms of Virtualization - NIA Storage Virtualization Taxonomy - Storage Virtualization Configurations - Storage Virtualization Challenges - Types of Storage Virtualization.

UNIT - IV: BUSINESS CONTINUITY 9

Introduction to Business Continuity - Information Availability - BC Terminology - BC Planning Lifecycle - Failure Analysis - Business Impact Analysis - BC Technology Solutions - Backup and Recovery - Backup Purpose – Considerations – Granularity - Recovery Considerations - Backup Methods and Process.

UNIT - V: REPLICATION 9

Local Replication - Source and Target - Uses of Local Replicas - Data Consistency - Local Replication Technologies - Restore and Restart Considerations - Creating Multiple Replicas - Management Interface.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the logical and physical components of a Storage infrastructure.
- Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.
- Understand the various forms and types of Storage Virtualization.
- Understand the business continuity capabilities.
- Distinguish different remote replication technologies.

TEXT BOOKS:

1. EMC Corporation, Information Storage and Management, Wiley, India, 2012

REFERENCE BOOKS:

1. Robert Spalding, —Storage Networks: The Complete Reference Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, —Building Storage Networks, Tata McGraw Hill, Osborne, 2001.
3. Meeta Gupta, Storage Area Networks Fundamentals, Pearson Education Limited, 2002.

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1908010 COMPUTER GRAPHICS AND MULTIMEDIA L T P C

3 0 0 3

OBJECTIVES:

- To understand the two-dimensional graphics and their transformations.
- To understand the three-dimensional graphics and their transformations.
- To appreciate illumination and color models,familiar with understand clipping .techniques.
- To understand multimedia system design and file handling.
- To become familiar with Blender Graphics.

UNIT – I: OUTPUT PRIMITIVES AND COLOR MODELS 9

Introduction to computer graphics and applications- Output primitives – points and lines line drawing algorithms - circle and ellipse generating algorithms - filled area primitives - Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection.

UNIT - II: TWO-DIMENSIONAL GRAPHICS 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline - viewing coordinate reference frame; window-to-viewport coordinate transformation - Two dimensional viewing functions - clipping operations – point, line - and polygon clipping algorithms.

UNIT - III: THREE-DIMENSIONAL GRAPHICS 9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT - IV: MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING **9**

Multimedia basics − Multimedia applications − Multimedia system architecture − Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards − Multimedia databases. Compression and decompression − Data and file format standards − Multimedia I/O technologies − Digital voice and audio − Video image and animation − Full motion video − Storage and retrieval technologies

UNIT - V: HYPERMEDIA **9**

Multimedia authoring and user interface - Hypermedia messaging -Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems.

CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modeling – Shading & Textures

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply Illumination and color models
- Design two dimensional graphics and apply two dimensional transformations
- Design three dimensional graphics, apply three dimensional transformations and clipping techniques to graphics
- Design multimedia system and file handling
- Understood Different types of Multimedia File Format and design Basic 3D Scenes using Blender

TEXT BOOKS:

1. Donald Hearn and Pauline Baker M, —Computer Graphics", Prentice Hall, New Delhi, 2007
2. Andleigh, P. K and KiranThakrar, —Multimedia Systems and Design, PHI, 2003.

REFERENCE BOOKS:

1. Judith Jeffcoate, —Multimedia in practice: Technology and Applications, PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, —Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnel, —Computer Graphics: Theory into Practice, Jones and Bartlett Publishers,2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan, 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, —Fundamentals of Computer Graphics, CRC Press, 2010.
6. William M. Newman and Robert F.Sproull, —Principles of Interactive Computer Graphics McGraw Hill 1978.
7. https://www.blender.org/support/tutorials/

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1908011 INFORMATION RETRIEVAL TECHNIQUES L T P C

3 0 0 3

OBJECTIVES:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations.
- To understand the different components of an Information retrieval system
- To learn different techniques of recommender system.

UNIT - I: INTRODUCTION 9

Information Retrieval –Early Developments –The IR Problem –The Users Task – Information versus Data Retrieval -The IR System –The Software Architecture of the IR System –The Retrieval and Ranking Processes -The Web –The e-Publishing Era –How the web changed Search –Practical Issues on the Web –How People Search –Search Interfaces Today –Visualization in Search Interfaces.

UNIT - II: MODELING AND RETRIEVAL EVALUATION 9

Basic IR Models -Boolean Model -TF-IDF (Term Frequency/Inverse Document Frequency) Weighting -Vector Model –Probabilistic Model –Latent Semantic Indexing Model –Neural Network Model –Retrieval Evaluation –Retrieval Metrics –Precision and Recall –Reference Collection –User-based Evaluation –Relevance Feedback and Query Expansion –Explicit Relevance Feedback.

UNIT - III: TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification –Unsupervised Algorithms: Clustering –Naïve Text Classification –Supervised Algorithms –Decision Tree –k-NN Classifier –SVM Classifier –Feature Selection or Dimensionality Reduction –Evaluation metrics –Accuracy and Error –Organizing the classes –Indexing and Searching –Inverted Indexes –Sequential Searching –Multi-dimensional Indexing

UNIT - IV: WEB RETRIEVAL AND WEB CRAWLING 9

The Web –Search Engine Architectures –Cluster based Architecture –Distributed Architectures –Search Engine Ranking –Link based Ranking –Simple Ranking Functions –Learning to Rank –Evaluations --Search Engine Ranking –Search Engine User Interaction –

Browsing –Applications of a Web Crawler –Taxonomy –Architecture and Implementation – Scheduling Algorithms –Evaluation

UNIT - V: RECOMMENDER SYSTEM 9

Recommender Systems Functions –Data and Knowledge Sources –Recommendation Techniques –Basics of Content-based Recommender Systems –High Level Architecture – Advantages and Drawbacks of Content-based Filtering –Collaborative Filtering –Matrix factorization models –Neighborhood models

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Implement the basics of web search
- Use an open source search engine framework and explore its capabilities
- Apply appropriate method of classification or clustering.
- Design and implement innovative features in a search engine.
- Design and implement a recommender system.

TEXT BOOKS:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, —Recommender Systems Handbook, First Edition, 2011.

REFERENCE BOOKS:

1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

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1915002 PRINCIPLES OF MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To study the principles of management, functions and its application an organization.
- To educate the students on the concept of planning and decision making.
- To understand the dynamics of human relations in organizations.
- To learn about motivation, communication and leadership aspects.
- To study the process controlling and the various techniques involved in controlling

UNIT – I: INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers managerial roles and skills –Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment –Multinational Corporations - Current trends and issues in Management.

UNIT - II: PLANNING 9

Nature and purpose of planning – planning process – types of planning – OBJECTIVES: – setting OBJECTIVES: – policies – Planning premises – Strategic Management –types of strategies – Planning Tools and Techniques – Decision making steps and process.

UNIT - III: ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Talent Acquisition, Training and Development, Performance Management, Career planning and management.

UNIT - IV: DIRECTING 9

Motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –

communication and IT.

UNIT - V: CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Quality control and Inventory Control - Productivity problems and management – control and performance – direct and preventive control – Maintenance control and purchase control– reporting.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Students will be able to have a clear understanding of managerial functions.
- Students would have knowledge to apply planning techniques and decision making.
- Understand concept of Human Resource Management.
- Students would be able to understand motivation, leadership and communication principles.
- Students would be able to apply control techniques in the organization.

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, “Management”, 14th Edition, Pearson, 2017
2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.

REFERENCE BOOKS:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” 10th Edition, Pearson Education, 2016.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata Mc Graw Hill, 2006.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 6th edition 2017.

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1908703 MACHINE LEARNING TECHNIQUES-II L T P C

3 0 0 3

OBJECTIVES:

- To understand the machine learning techniques in various problem
- To study the concept of neural networks and genetic algorithms
- To understand the latest trends in machine learning
- To know about instant learning techniques
- To understand the concepts of Reinforcement learning and set of rules for machine learning

UNIT – I: INTRODUCTION 9

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT - II: NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT - III: BAYESIAN AND COMPUTATIONAL LEARNING 9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT - IV: INSTANT BASED LEARNING 9

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT - V: ADVANCED LEARNING 9

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm– Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the machine learning techniques in various problem
- Study the concept of neural networks and genetic algorithms
- Understand the latest trends in machine learning
- Know about instant learning techniques
- Understand the concepts of Reinforcement learning and set of rules for machine learning

TEXT BOOKS:

Tom M. Mitche, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2017.

REFERENCE BOOKS:

1. EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning),The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009

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1908704 **CYBER FORENSICS** **L T P C**

3 0 0 3

OBJECTIVES:

- To learn the security issues in network layer and transport layer.
- To understand the e-mail security and fire walls.
- To learn about basics of computer forensics.
- To know the evidence collection and forensics tools.
- To analyze and validate forensics data.

UNIT – I: NETWORK LAYER SECURITY &TRANSPORT LAYER SECURITY **9**

IP Sec Protocol – IP Authentication Header – IP ESP – Key Management Protocol For IP Sec. Transport Layer Security: SSL Protocol, Cryptographic Computations – TLS Protocol.

UNIT - II: E-MAIL SECURITY & FIREWALLS **9**

PGP – S/MIME – Internet Firewalls For Trusted System: Roles Of Firewalls – Firewall Related Terminology- Types of Firewalls – Firewall Designs – SET For E-Commerce Transactions.

UNIT - III: INTRODUCTION TO COMPUTER FORENSICS **9**

Introduction To Traditional Computer Crime, Traditional Problems Associated With Computer Crime- Introduction To Identity Theft & Identity Fraud. Types Of CF Techniques – Incident And Incident Response Methodology – Forensic Duplication And Investigation. Preparation For IR: Creating Response Tool Kit And IR Team. – Forensics Technology And Systems – Understanding Computer Investigation – Data Acquisition.

UNIT - IV: EVIDENCE COLLECTION AND FORENSICS TOOLS **9**

Processing Crime And Incident Scenes – Working With Windows And DOS Systems.

Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT - V: ANALYSIS AND VALIDATION **9**

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone And Mobile Devices Forensics.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the security issues in network layer and transport layer.
- Apply Security protocols in transport layer and network layer.
- Understand the e-mail security, firewalls and its types.
- Able to understand computer forensics and its types.
- Use forensics tools , evidence collection to analyse and validate forensics data.

TEXT BOOKS:

1. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.

REFERENCE BOOKS:

1. John R.Vacca, “Computer Forensics”, Cengage Learning, 2005.
2. Richard E.Smith, “Internet Cryptography”, 3rd Edition Pearson Education, 2008.
3. MarjieT.Britz, “Computer Forensics And Cyber Crime”: An Introduction”, 3rd Edition, Prentice Hall, 2013.

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1908012 SOCIAL NETWORK ANALYSIS L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behavior in social web and related communities.
- To understand privacy issues in online social networks.
- To learn visualization of social networks.

UNIT – I: INTRODUCTION 9

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks

UNIT - II: MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data

UNIT - III: EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks

UNIT - IV: PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 9

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality

mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT - V: VISUALIZATION AND APPLICATIONS OF SOCIALNETWORKS **9**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behavior in social web and related communities.
- Learn Visualize social networks.
- Understand privacy issues in online social networks, the knowledge representation and applications of social networks.

TEXT BOOKS:

1. Peter Mika, -Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, -Handbook of Social Network Technologies andApplications,1st Edition, Springer,2010

REFERENCE BOOKS:

1. Guandong Xu, Yanchun Zhangand Lin Li,-Web Mining and Social Networking– Techniques and applications, First Edition, Springer, 2011.
2. Dion Gohand Schubert Foo, -Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé - Dupuy, -Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI

Global Snippet, 2009.

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1904011	BIG DATA ANALYTICS	L T P C
		3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data
- To Be familiar with the visualization

UNIT – I: INTRODUCTION TO BIG DATA 9

Introduction to Big Data Platform -Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value - Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT - II: CLUSTERING AND CLASSIFICATION 9

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes‘ Theorem - Naïve Bayes Classifier

UNIT - III: ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches

UNIT - IV: STREAM MEMORY 9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment

Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT - V: NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION **9**

A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model. NoSQL Databases : Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Know about Big Data fundamentals, Characteristics and its challenges
- Work with big data tools and its analysis techniques
- Analyze data by utilizing clustering and classification algorithms
- Learn and apply different mining algorithms and recommendation systems for large volumes of data
- Perform analytics on data streams and Learn NoSQL databases and management

TEXT BOOKS:

1. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013

REFERENCE BOOKS:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. DietmarJannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.

4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010

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1906711 **SPEECH PROCESSING** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the fundamentals of the speech processing
- To explore the various speech models
- To gather knowledge about the phonetics and pronunciation processing
- To perform mathematical analysis of speech for identification
- To understand the concepts of speech recognition

UNIT - I: INTRODUCTION **9**

Introduction – knowledge in speech and language processing – ambiguity – models and algorithms – language – thought – understanding – regular expression and automata – words & transducers – N grams

UNIT - II: SPEECH MODELLING **9**

Word classes and part of speech tagging – hidden markov model – computing likelihood: the forward algorithm – training hidden markov model – maximum entropy model – transformation-based tagging – evaluation and error analysis – issues in part of speech tagging – noisy channel model for spelling

UNIT - III: SPEECH PRONUNCIATION AND SIGNAL PROCESSING **9**

Phonetics – speech sounds and phonetic transcription – articulatory phonetics – phonological categories and pronunciation variation – acoustic phonetics and signals – phonetic resources – articulatory and gestural phonology

UNIT - IV: SPEECH IDENTIFICATION **9**

Speech synthesis – text normalization – phonetic analysis – prosodic analysis – diphone waveform synthesis – unit selection waveform synthesis – evaluation

UNIT - V: SPEECH RECOGNITION **9**

Automatic speech recognition – architecture – applying hidden markov model – feature extraction: MFCC vectors – computing acoustic likelihoods – search and decoding – embedded training – multi pass decoding: n-best lists and lattices- a* (‗stack‘) decoding – context-dependent acoustic models: triphones – discriminative training – speech recognition by humans.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze new algorithms with speech processing.
- Derive new speech models.
- Perform various language phonetic analysis.
- Create a new speech identification system.
- Generate a new speech recognition system.

TEXT BOOKS:

1. Daniel Jurafsky and James H. Martin, — Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Person education,2013.
2. Claudio Becchetti, Klucio Prina Ricotti, —"Speech Recognition: Theory and C++ implementation", Wiley publications 2008.

REFERENCE BOOKS:

1. Kai-Fu Lee, —"Automatic Speech Recognition", The Springer International Series in Engineering and Computer Science, 1999.
2. Himanshu Chaurasiya, —"Soft Computing Implementation of Automatic Speech Recognition", LAP Lambert Academic Publishing, 2010.
3. Ikrami Eldirawy, Wesam Ashour, —"Visual Speech Recognition", Wiley publications, 2011

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1915003 TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the need and evolution of quality concepts, contribution of quality gurus.
- To understand the TQM Principles and Models.
- To learn and apply the traditional tools and techniques of TQM.
- To educate students to apply the modern tools and techniques in TQM.
- To understand and apply QMS and EMS in any organization.

UNIT - I: INTRODUCTION 9

Introduction - Definition of quality - Need for quality - Evolution of quality - Dimensions of product and service quality - Definition of TQM - Basic concepts of TQM – Principles of TQM - TQM Framework- Barriers to TQM – Benefits of TQM – Cost of Quality.

UNIT - II: TQM PRINCIPLES 9

Leadership--The Deming Philosophy, Quality council, Quality statements and Strategic planning- Hoshin Planning - Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward - Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Sourcing, Supplier selection, Supplier Rating and Relationship development

UNIT - III: TQM TOOLS &TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma Process Capability–Bench marking – Reasons to bench mark, Bench marking process, Criticisms of Bench Marking – FMEA –FMEA Documentation, Stages.

UNIT - IV: TQM TOOLS & TECHNIQUES II 9

Quality Circles – Quality Function Deployment (QFD) – House of Quality – QFD Process, Benefits – Total Productive Maintenance – Concepts, Benefits – Business Process Reengineering – Concepts, Process and Applications – Business Process Improvement.

UNIT - V: QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific

Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--Environmental Management System: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001 -Requirements of ISO 14001—Benefits of EMS – National and International Awards.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course:

- Students would understand the basic concepts, contribution of quality guru's and TQM framework.
- Students would become acquainted with TQM Principles.
- Student would be able to apply the tools and techniques of quality management.
- Students will be able to apply Quality philosophy to facilitate business processes and understand customer requirements.
- Students can apply QMS and EMS in any organisation.

TEXT BOOKS:

1. Dale Besterfield, Carol B. Michna, Glen H. Besterfield, Mary B. Sacre, Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal.R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,7 th Print 2011.
4. Itay Abuhav, ISO 9001: 2015 - A Complete Guide to Quality Management Systems, CRC Press; 1st edition(2017)ISO 9001-2015 standard

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1908801 **INFORMATION SECURITY** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT – I: INTRODUCTION **9**

History, What is Information Security?, Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing the Components - Balancing Security and Access - The SDLC - The Security SDLC.

UNIT - II: SECURITY INVESTIGATION **9**

Need for Security - Business Needs - Threats, Attacks – Legal - Ethical and Professional Issues -An Overview of Computer Security -Access Control Matrix - Policy-Security policies - Confidentiality policies - Integrity policies and Hybrid policies.

UNIT - III: SECURITY ANALYSIS **9**

Risk Management - Identifying and Assessing Risk - Assessing and Controlling Risk - Systems - Access Control Mechanisms - Information Flow and Confinement Problem.

UNIT - IV: LOGICAL DESIGN **9**

Blueprint for Security - Information Security Policy - Standards and Practices - ISO 17799/BS 7799 - NIST Models - VISA International Security Model - Design of Security Architecture -Planning for Continuity.

UNIT - V: PHYSICAL DESIGN **9**

Security Technology - IDS, Scanning and Analysis Tools – Cryptography - Access Control Devices - Physical Security -Security and Personnel.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Discuss the basics of information security
- Illustrate the legal, ethical and professional issues in information security
- Demonstrate the aspects of risk management.
- Become aware of various standards in the Information Security System
- Design the Security Techniques.

TEXT BOOKS:

Michael E Whitman and Herbert J Mattord, —Principles of Information Security— Vikas Publishing House, New Delhi, 2003

REFERENCE BOOKS:

1. Micki Krause, Harold F. Tipton, — Handbook of Information Security Management, Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposed, Tata McGraw-Hill, 2003.
3. Matt Bishop, —Computer Security Art and Science, Pearson/PHI, 2002.

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1908802 ADVANCED DATABASE TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To acquire knowledge on parallel and distributed databases and their applications
- To study the usage and applications of Object Oriented and Intelligent databases
- To understand the usage of advanced data models
- To learn emerging databases such as XML, Cloud and Big Data
- To acquire inquisitive attitude towards research topics in databases

UNIT – I: PARALLEL AND DISTRIBUTED DATABASES 9

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 – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies**.**

UNIT - II: OBJECT AND OBJECT RELATIONAL DATABASES 9

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 9

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 – Data log- Recursive Rules-Syntax and Semantics of Data log 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 9

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 9

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.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop in-depth understanding of relational databases and skills to optimize database performance in practice.
- Understand and critique on each type of databases.
- Design faster algorithms in solving practical database problems.
- Implement intelligent databases and various data models.
- Design information Retrieval Techniques, Gain knowledge about databases such as XML, Cloud and Big Data

TEXT BOOKS:

1. RamezElmasri, Shamkant B. Navathe, —Fundamentals of Database Systems, Sixth Edition, Pearson, 2011.
2. Thomas Cannolly and Carolyn Begg, —Database Systems, A Practical Approach to Design, Implementation and Management, Fourth Edition, Pearson Education, 2008

REFERENCE BOOKS:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, —Database System Concepts, Sixth Edition, McGraw Hill, 2011.

2. C.J.Date, A.Kannan, S.Swamynathan, —An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.
3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, —Advanced Database Systems‖, Morgan Kaufmann publishers,2006.

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1908803 SERVICE ORIENTED ARCHITECTURE L T P C

3 0 0 3

OBJECTIVES:

- Learn XML fundamentals.
- Be exposed to build applications based on XML.
- Understand the key principles behind SOA.
- Be familiar with the web services technology elements for realizing SOA.
- Learn the various web service standards.

UNIT – I: INTRODUCTION TO XML 9

XML document structure – Well formed and valid documents – Namespaces – DTD – XML Schema – X-Files.

UNIT - II: BUILDING XML- BASED APPLICATIONS 9

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML

UNIT - III: SERVICE ORIENTED ARCHITECTURE 9

Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA -- Principles of Service orientation – Service layers.

UNIT - IV: WEB SERVICES 9

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography –WS Transactions.

UNIT - V: BUILDING SOA-BASED APPLICATIONS 9

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines -- Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand XML technologies and service orientation
- Understand web services and WS standards

- Use web services extensions to develop solutions
- Understand and apply service modeling and service oriented analysis
- Design SOA based application development

TEXT BOOKS:

1. Ron Schmelzer et al. " XML and Web Services", Pearson Education, 2002
2. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

REFERENCE BOOKS:

1. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 20044.
4. James McGovern, SameerTyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture", Morgan Kaufmann Publishers, 2003.

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1908804 FUNDAMENTALS OF ETHICAL HACKING L T P C

3 0 0 3

OBJECTIVES:

- To understand and analyze Information security threats & counter measures
- To perform security auditing & testing To understand issues relating to ethical hacking
- To study & employ network defense measures To understand penetration and security testing issues
- To understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks
- To perform penetration & security testing

UNIT – I: ETHICAL HACKING OVERVIEW & VULNERABILITIES 9

Understanding the importance of security, Concept of ethical hacking and essential Terminologies Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

UNIT - II: FOOTPRINTING & PORT SCANNING 9

Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS.

UNIT - III: SYSTEM HACKING 9

Aspect of remote password guessing, Role of eavesdropping - Various methods of password cracking - Keystroke Loggers - Understanding Sniffers -Comprehending Active and Passive Sniffing - ARP Spoofing and Redirection.

UNIT - IV: HACKING WEB SERVICES & SESSION HIJACKING 9

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass - web services and related flaws - protective http headers Understanding Session Hijacking - Phases involved in Session Hijacking - Types of Session Hijacking.

UNIT - V: HACKING WIRELESS NETWORKS 9

Introduction to 802.11,Role of WEP, Cracking WEP Keys - Sniffing Traffic - Wireless DOS attacks - WLAN Scanners - WLAN Sniffers - Hacking Tools - Securing Wireless Networks.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand and analyze Information security threats & Router measures
- Perform security auditing & testing To understand issues relating to ethical hacking
- Employ network defense measures.
- Understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks
- Perform penetration & security testing

TEXT BOOKS:

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010

REFERENCE BOOKS:

1. RajatKhare, "Network Seuciryt and Ethical Hacking", Luniver Press, 2006
2. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.). Packt Publishing, 2011
3. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

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1908005 **VIRTUAL REALITY** **L T P C**

3 0 0 3

OBJECTIVES:

- To study about basic concepts of Virtual reality
- To understand Virtual environment
- To understand geometric modeling
- To study about Virtual Hardware and Software
- To develop Virtual Reality applications

UNIT – I: INTRODUCTION TO VIRTUAL REALITY **9**

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics–Flight Simulation –Virtual environments–requirement – benefits of virtual reality- Historical development of VR : Introduction – Scientific Landmark -3D Computer Graphics :Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modeling- illumination models – Reflection models – Shading algorithms- Radiosity – Hidden Surface Removal – Realism-Stereographic image.

UNIT - II: GEOMETRIC MODELLING **9**

Geometric Modeling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances –Picking – Flying – Scaling the VE – Collision detection - A Generic VR system: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction-VR Systems.

UNIT - III: VIRTUAL ENVIRONMENT **9**

Animating the Virtual Environment: Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – linear and non- linear translation - shape & object in between ing – free from deformation – particle system- Physical Simulation - Introduction – Objects falling in a gravitational field-Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft.

UNIT - IV: VR HARDWARES & SOFTWARES 9

Human factors: Introduction – the eye-the ear-the somatic senses-VR Hardware : Introduction – sensor hardware – Head-coupled displays –Acoustic hardware – Integrated VR systems-VR Software: Introduction –Modeling virtual world –Physical simulation- VR toolkits – Introduction to VRML.

UNIT - V: VR APPLICATION 9

Virtual Reality Applications: Introduction – Engineering – Entertainment – Science Training – The Future: Introduction – Virtual environments – modes of interaction.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understood the basic concept of virtual reality
- Understood 3D computer Graphics System
- Design object objects using geometric modelling
- Develop Virtual environment and Virtual Reality applications
- Apply study about Virtual Hardware and Software.

TEXT BOOK:

1. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007.
2. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.

REFERENCE BOOKS:

1. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology”, Wiley Inter science, 2nd Edition, 2006.
2. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 2008.
3. www.vrac.iastate.edu.

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1908013 DEEP LEARNING AND ITS APPLICATIONS L T P C

3 0 0 3

OBJECTIVES:

- To Gain in-depth knowledge of tensor flow along with its functions, operations, and the execution pipeline.
- To Implement linear regression and gradient descent in tensor flow.
- To Understand the concept of artificial neural networks, convolutional neural networks, and recurrent neural networks.
- To Discuss how to speed up neural networks along with regularization techniques to reduce over fitting.
- To Understand the use cases of implementing artificial intelligence such as image processing, natural language processing, speech recognition, deep face - facial recognition system, etc.

UNIT – I: INTRODUCTION TO MACHINE LEARNING BASICS 9

Scalars – Vectors – Matrices – Tensors – Identity and Inverse Matrices – Linear Dependence and Span – Eigen Decomposition – Probability – Random Variables – Conditional Probability – Expectation – Variance – Covariance –Bayes' Rule – Supervised Learning Algorithm – Unsupervised Learning Algorithm –Stochastic Gradient Descent.

UNIT - II: DEEP NETWORKS 9

Deep Feed Forward Network: Learning XOR – Gradient Based Learning- Hidden Units – Architecture Design – Back Propagation Algorithms. Regularization for Deep Learning: Parameter Norm Penalties – Regularization and unconstrained Problems – Dataset Augmentation – Noise Robustness – Semi supervised Learning – Challenges in Neural Network Optimization.

UNIT - III: CONVOLUTIONAL NETWORKS 9

The Convolution Operation – Motivation – Pooling – Variants of the Basic Convolution Function – Structured Outputs – Data types – Efficient Convolution Algorithm – Random or Unsupervised Features.

UNIT - IV: SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS **9**

Unfolding Computational Graphs – Recurrent Neural Networks – Bidirectional RNNs – Encoder Decoder Sequence to Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – The Challenge of Long- Term Dependencies – Echo State Networks – The Long-tem memory and other Gated RNNs – Optimization for Long Term Dependencies – Explicit Memory.

UNIT - V: DEEP LEARNING RESEARCH and ITS APPLICATIONS **9**

Linear Factor Models – Auto Encoders - Representation Learning – Structured Probabilistic Models for Deep Learning - Monte Carlo Methods. Applications of deep learning in various technologies like Big Data, Medical Imaging, Neural network, vision, natural language processing, arbitrary object recognition, driverless cars, semantic image segmentation, deep visual residual abstraction and brain–computer interfaces

.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.
- Understand the theory behind deep learning methods such as Convolutional Neural Networks, Auto encoders and Boltzmann Machines,
- Grasp of the open issues and trends in deep learning research,
- Feel when to use or avoid deep learning methods

TEXT BOOKS:

1. Ian Good Fellow, Yoshua Bengio, Aaron Courville, “Deep Learning” MIT Press, Cambridge Massachusetts, London England 2016.
2. Valentina Emilia Balas , Sanjiban Sekhar Roy , Dharmendra Sharma , Pijush Samui Handbook of Deep Learning Applications (Smart Innovation, Systems and Technologies) 2019.

REFERENCE BOOKS:

1. www.deeplearningbook.org
2. Adam Gibson and Josh Patterson’s Deep Learning: A Practitioners Approach Paperback – 1 January 2017 by Josh Patterson (Author), Adam Gibson.
3. https://github.com/janishar/mit-deep-learning-book-pdf
4. https://www.guru99.com/deep-learning-tutorial.html
5. Francois Chollet, Google AI researcher and creator of the popular Keras deep learning library, published his book, Deep Learning with Python in October 2017.

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1908805 NEURAL NETWORK AND EXPERT SYSTEM L T P C

3 0 0 3

OBJECTIVES:

- To learn the basic concepts of neural networks
- To become familiar with various multilayer networks like neural BPN, HNN, RNN
- To provide a strong foundations of fundamental concepts in Pattern Recognition
- To provide knowledge on concepts in Expert System programming
- To understand the Expert Systems, Architecture

UNIT – I: INTRODUCTION TO NEURAL NETWORKS 9

Introduction-Artificial Intelligence- Neural Network Representation - Classification of ANNs- McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta-Perception Network-Adaline Network-Madaline Network

UNIT - II: MULTI LAYER NETWORKS 9

Multilayer Networks and Back propagation Neural Networks - Kohonen Neural Network - Learning -Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models

UNIT - III: INTRODUCTION TO PATTERN RECOGNITION AND CLASSIFICATION 9

Introduction to Statistical Pattern Recognition- Overview of Pattern Classifiers- The Bayes Classifier for minimizing Risk- Estimating Bayes Error; Minimax and Neymann- Pearson classifiers

UNIT - IV: INTRODUCTION TO EXPERT SYSTEM PROGRAMMING 9

Defining Expert Systems –- Tools For Building Expert Systems - High Level Programming Languages – Logic Programming For Expert Systems

UNIT - V: EXPERT SYSTEM ARCHITECTURE 9

Expert system architecture-Robot Architectures - Case Based Reasoning – Semantic of Expert Systems – Modeling of Uncertain Reasoning – Applications Of Semiotic Theory; Designing For Explanation.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the concept of neural networks
- Design multilayer network for machine learning
- Know the pattern recognition and classification
- Provide programing knowledge on expert system.
- Understand the expert system architecture

TEXT BOOKS:

1. S.Rajasekaran, G.A.VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.
2. James A. Freeman and David M. Skapura, —Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

REFERENCE BOOKS:

1. Tom M. Mitchell, —Machine Learning‖, McGraw-Hill Education (India) Private Limited, 2013.
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2002.
3. C.M.Bishop, Neural Networks and Pattern Recognition, Oxford University Press (Indian Edition), 2003.
4. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education 2007.
5. Robert I. Levine, Diane E. Drang, Barry Edelson: “AI and Expert Systems: a comprehensive guide, C language”, 2nd edition, McGraw-Hill 1990.
6. Jean-Louis Ermine: “Expert Systems: Theory and Practice”, 4th printing, Prentice-Hall of India, 2001.

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1908807 **BLOCKCHAIN** **L T P C**

3 0 0 3

OBJECTIVES:

- The objective of this course is to provide conceptual understanding of how blockchain technology can be used to innovate and improve business processes.
- The course covers the technological underpinning of blockchain operations.
- To learn the practical implementation of solutions using blockchain technology.
- To understand the critical evaluation of existing “smart contract” capabilities and platforms, and examines their future directions, opportunities, risks and challenges.
- To develop familiarity of current technologies, tools, and implementation strategies.

UNIT – I: INTRODUCTION 9

Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain, Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT - II: UNDERSTANDING BLOCKCHAIN WITH CRYPTO CURRENCY 9

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin**:** Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hash cash PoW, Bit coin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool

UNIT - III: UNDERSTANDING BLOCKCHAIN FOR ENTERPRISES 9

Permissioned Blockchain: Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned blockchain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems

UNIT - IV: ENTERPRISE APPLICATION OF BLOCK 9

Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain

UNIT - V: BLOCKCHAIN APPLICATION DEVELOPMENT 9

Hyper ledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyper ledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand block chain technology.
- Develop block chain based solutions and write smart contract using Hyper ledger Fabric and Ethereum frameworks.
- Build and deploy block chain application for on premise and cloud based architecture.
- Integrate ideas from various domains and implement them using block chain technology in different perspectives.
- Analyze the incentive structure in a block chain based system and critically assess its functions, benefits and vulnerabilities

TEXT BOOKS:

1. Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015.
2. Josh Thompsons, “Blockchain: The Blockchain for Beginners- Guide to BlockchainTechnology and Leveraging Blockchain Programming”, 2017

REFERENCE BOOKS:

1. Daniel Drescher, “Blockchain Basics”, Apress; 1stedition, 2017.
2. AnshulKaushik, “Blockchain and Crypto Currencies”, Khanna Publishing House, Delhi, 2018
3. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing, 2018
4. RiteshModi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing, 2018.
5. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O’Dowd, Venkatraman Ramakrishna, “Hands-On Blockchain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer”, Import, 2018.

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1908001 **3D PRINTING AND DESIGN** **L T P C**

3 0 0 3

OBJECTIVES:

- To impart knowledge and skills related to 3D printing technologies.
- To Select the material and equipment and develop a product using this technique.
- To understand Industry 4.0 environment.
- To understand CAD and Additive manufacturing
- To understand Additive Equipment.

UNIT – I: 3D PRINTING AND ADDITIVE MANUFACTURING 9

Introduction, Process, Classification, Advantages, Additive V/s Conventional Manufacturing processes, Applications.

UNIT - II: CAD AND ADDITIVE MANUFACTURING 9

CAD for Additive Manufacturing-CAD Data formats, Data translation, Data loss, STL format. Additive Manufacturing Techniques - Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology.

UNIT - III: PROCESS 9

Process, Process parameter, Process Selection for various applications. Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools.

UNIT - IV: MATERIALS 9

Polymers, Metals, Non-Metals, Ceramics, Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties. Support Materials.

UNIT - V: ADDITIVE MANUFACTURING EQUIPMENT 9

Process Equipment- Design and process parameters-Governing Bonding Mechanism-Common faults and troubleshooting - Process Design- Post Processing: Requirement and Techniques- Product Quality.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop CAD models for 3D printing.
- Import and Export CAD data and generate .stl file.
- Select a specific material for the given application.
- Select a 3D printing process for an application.
- Produce a product using 3D Printing or Additive Manufacturing (AM).

TEXTBOOKS

1. Khanna Editorial, “3D Printing and Design”, Khanna Publishing House, Delhi.2020
2. CK Chua, Kah Fai Leong, “3D Printing and Rapid Prototyping- Principles and Applications”, World Scientific, 2017.

REFERENCE BOOKS:

1. Lan Gibson, David W. Rosen and Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010.
2. Andreas Gebhardt, “Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing”, Hanser Publisher, 2011.
3. J.D. Majumdar and I. Manna, “Laser-Assisted Fabrication of Materials”, Springer Series in Material Science, 2013.
4. L. Lu, J. Fuh and Y.S. Wong, “Laser-Induced Materials and Processes for Rapid Prototyping”, Kulwer Academic Press, 2001.
5. Zhiqiang Fan And Frank Liou, “Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy”, InTech, 2012.

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1908014 **SOFTWARE TESTING** **L T P C**

3 0 0 3

OBJECTIVES:

- To learn the criteria for test cases.
- To learn the design of test cases.
- To understand test management.
- To understand test automation techniques.
- To apply test metrics and measurements.

UNIT – I: INTRODUCTION **9**

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester‘s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design –Defect Examples- Developer/Tester Support of Developing a Defect Repository.

UNIT - II: TEST CASE DESIGN STRATEGIES **9**

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing – Requirements based testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing.

UNIT - III: LEVELS OF TESTING **9**

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing –Compatibility testing –

Testing the documentation – Website testing.

UNIT - IV: TEST MANAGEMENT 9

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group

UNIT - V: TEST AUTOMATION 9

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design test cases suitable for a software development for different domains.
- Prepare test planning based on the document.
- Document test plans and test cases designed.
- Use automatic testing tools.
- Develop and validate a test plan.

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, ―Software Testing – Principles and Practices, Pearson Education, 2006.
2. Ron Patton, ―Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCE BOOKS:

1. Ilene Burnstein, ―Practical Software Testing, Springer International Edition, 2003.
2. Edward Kit, Software Testing in the Real World – Improving the Process, Pearson Education, 1995.
3. Boris Beizer, Software Testing Techniques‖ – 2nd Edition, Van Nostrand Reinhold, New York, 1990.

4. Aditya P. Mathur, —Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

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1904803 **GREEN COMPUTING** **L T P C**

3 0 0 3

OBJECTIVES:

- To gain basic knowledge about fundamentals of green computing.
- To know about green assets and models.
- To minimize the inclusion of harmful materials.
- To use as many biodegradable materials as possible.
- To explore green frame work and compliance

UNIT – I: FUNDAMENTALS **9**

Green IT Fundamentals: Business, IT, and the Environment –Green computing: carbon foot print, scoop on power –Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics

UNIT - II: GREEN ASSETS AND MODELING **9**

Green Assets: Buildings - Data Centers - Networks, and Devices - Green Business Process Management: Modeling, Optimization, and Collaboration –Green Enterprise Architecture –Environmental Intelligence Green Supply Chains –Green Information Systems: Design and Development Models.

UNIT - III: GREEN FRAMEWORK **9**

Virtualizing of IT systems –Role of electric utilities – Telecommuting - teleconferencing and teleporting –Materials recycling –Best ways for Green PC –Green Data center – Green Grid framework.

UNIT - IV: GREEN COMPLIANCE **9**

Socio-cultural aspects of Green IT –Green Enterprise Transformation Roadmap –Green Compliance: Protocols - Standards - and Audits –Emergent Carbon Issues: Technologies and Future.

UNIT - V: CASE STUDIES **9**

The Environmentally Responsible Business Strategies (ERBS) –Case Study Scenarios for Trial Runs – calculating the carbon footprint – greening mobile devices - CASE STUDIES –Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Gain basic knowledge about fundamentals of green computing.
- Minimize the inclusion of harmful materials.
- Apply changing government policy to encourage recycling.
- Preserve resources which use less energy to produce use and dispose of product.
- Understand save resources and environment.

TEXT BOOKS:

1. BhuvanUnhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, Green Home computing for dummies, August 2009.

REFERENCE BOOKS:

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff / IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT-Best Practices on regulations & industry”, Lulu.com, 2008.
4. Carl Speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012

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1904004 NATURAL LANGUAGE PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To understand approaches to discourse, generation, dialogue and summarization within NLP
- To apply the NLP techniques to IR applications

UNIT – I: INTRODUCTION 9

Origins and challenges of NLP –Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata –English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT - II: WORD LEVEL ANALYSIS 9

Unsmoothed N-grams -Evaluating N-grams – Smoothing - Interpolation and Back off – Word Classes - Part-of-Speech Tagging - Rule-based - Stochastic and Transformation-based tagging - Issues in PoS tagging –Hidden Markov and Maximum Entropy models

UNIT - III: SYNTACTIC ANALYSIS 9

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar –Dependency Grammar –Syntactic Parsing – Ambiguity - Dynamic Programming parsing –Shallow parsing –Probabilistic CFG - Probabilistic CYK - Probabilistic Lexicalized CFGs -Feature structures - Unification of feature structures

UNIT - IV: SEMANTICS AND PRAGMATICS 9

Requirements for representation, First-Order Logic, Description Logics –Syntax-Driven Semantic analysis, Semantic attachments –Word Senses, Relations between Senses - Thematic Roles - selectional restrictions –Word Sense Disambiguation - WSD using Supervised - Dictionary & Thesaurus - Bootstrapping methods –Word Similarity using Thesaurus and Distributional methods

UNIT - V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES 9

Discourse segmentation - Coherence –Reference Phenomena - Anaphora Resolution using Hobbs and Centering Algorithm –Co reference Resolution –Resources: Porter Stemmer - Lemmatizer, Penn Treebank, Brill's Tagger, Word Net, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).Programming in Python **-** NLTK (Natural Language Toolkit)

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Tag a given text with basic Language features
- Design an innovative application using NLP components
- Implement a rule based system to tackle morphology/syntax of a language
- Design a tag set to be used for statistical processing for real-time applications
- Compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXT BOOKS:

1. DanielJurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O Reilly Media, 2009.

REFERENCE BOOKS:

1. Breck Baldwin, —Language processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Java, O Reilly Media, 2015.
3. NitinIndurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

5. http://nltk.sourceforge.net/lite/doc/en/programming.html

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OPEN ELECTIVE I

1902512 ENVIRONMENT AND AGRICULTURE L T P C

3 0 0 3

OBJECTIVES:

- To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.
- To understand the ecological context of agriculture and its concerns.
- To study the context of climate change and emerging global issues.
- To gain knowledge on water balance.
- To understand the importance of virtual water

UNIT – I: ENVIRONMENTAL CONCERNS 9

Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT - II: ENVIRONMENTAL IMPACTS 9

Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT - III: CLIMATE CHANGE 9

Global warming and changing environment – Ecosystem changes – Changing blue green-grey water cycles – Water scarcity and water shortages – Desertification.

UNIT - IV: ECOLOGICAL DIVERSITY AND AGRICULTURE 9

Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

UNIT - V: EMERGING ISSUES 9

Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Students may be able to know how the environment and agriculture are related and the changes in the environmental due to agriculture.
- Students will be able to gather idea on about how the mechanization helps and impacts of soil erosion due to agricultural activities.
- Students will have a wide knowledge of changing environment due to global warming and climate change and its impact on water.
- Students are exposed to the ecological diversity in agriculture and different technologies used in farming activities.
- Students are able to understand the global governance system and agricultural policies involved in the sustainable agricultural systems**.**

TEXT BOOKS:

1. M.Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
2. Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005

REFERENCE BOOKS:

1. T.C. Byerly, Environment and Agriculture, United States Dept. of Agriculture, Economic Research Service, 2006.
2. Robert D. Havener, Steven A. Breth, Environment and agriculture: rethinking development issues for the 21st century: proceedings of a symposium, Winrock International Institute for Agricultural Development, 1994.
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	2	-	-	-	1	1	-	-	1	-	-
2	2	3	1	-	2	3	-	-	1	-	1	1
3	1	3	-	-	-	1	2	-	-	-	-	2
4	3	3	3	2	3	-	3	2	1	-	2	3
5	-	3	2	2	3	-	3	3	-	-	2	3

1902513 PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the mechanical properties of engineering materials and their classifications
- To understand the basic principles of lathe and the corresponding machines.
- To gain knowledge on various welding techniques available.
- To understand the importance of advanced manufacturing process.
- To emphasize on the importance of accuracy on machine operation.

UNIT- I: ENGINEERING MATERIALS **9**

Engineering materials - their classification - Mechanical properties of materials, strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability, weldability. Steels and cast irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron, cast iron. Alloy steels: Stainless steel, tool steel.

UNIT- II: MACHINING **9**

Basic principles of lathe - machine and operations performed on it. Basic description of machines and operations of Shaper-Planner, Drilling, Milling & Grinding.

UNIT- III: WELDING **9**

Introduction, classification of welding processes. Gas welding, types of flames and their applications. Electric Arc welding. Resistance welding, Soldering & Brazing processes and their uses.

UNIT-IV: ADVANCED MANUFACTURING PROCESS **9**

Abrasive flow machining - abrasive jet machining - water jet machining - Electro Discharge Machining (EDM) - Wire cut EDM - Electro Chemical Machining (ECM) - Ultrasonic Machining / Drilling (USM / USD) - Electron Beam Machining (EBM) - Laser Beam Machining (LBM).

UNIT- V: CNC MACHINE 9

Numerical control (NC) machine tools - CNC: types, constitutional details, special features - design considerations of CNC machines for improving machining accuracy - structural members - slide ways - linear bearings - ball screws - spindle drives and feed drives. Part programming fundamentals - manual programming.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course,

- Students can able to apply the different manufacturing process and use this in industry for component production.
- Students will be able to understand the working principle of lathe and various operations done on it.
- Students will be able to gather idea on welding and soldering process.
- Students will gain wide knowledge on various advance manufacturing process.
- Students will gain knowledge in CNC machine and improving the machining accuracy.

TEXTBOOKS:

1. “Manufacturing Engineering and Technology”, Kalpakjian and Schmid, Pearson, 2010.
2. Hajra Choudry, “Elements of workshop technology - Vol II”, Media promoters, 2002.

REFERENCE BOOKS:

1. Gupta. K.N., and Kaushik, J.P., 1998, Workshop Technology Vol I and II, New Heights, Daryaganj, New Delhi.
2. Arthur. D., et. al. 1998, General Engineering Workshop Practice, Asia Publishing House, Bombay.
3. Chapman W.A.J., Workshop Technology, 1992, Part I, II, III, E.L.B.S. and Edward Amold Publishers Ltd, London.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	2	1	1	3	-	2	-	-	-	2
2	2	2	-	-	1	2	-	-	2	-	1	-
3	3	2	-	2	2	-	-	2	-	-	-	-
4	2	-	2	3	3	-	2	-	2	1	1	2
5	-	2	-	2	3	-	2	-	3	1	-	-

1903514 AIR POLLUTION AND CONTROL ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.
- To gain knowledge of characteristics of air pollution and noise pollution.
- To create awareness among the sources and effects of air pollution.
- To gain knowledge on air pollution control equipments.
- To develop a knowledge on air quality standards.

UNIT – I: INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards – Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT - II: METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT – III: CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT - IV: CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

UNIT - V: INDOOR AIR QUALITY MANAGEMENT 9

Air quality standards - Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness - Town planning regulations of industries-Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management.
- Ability to identify, formulate and solve air and noise pollution problems.
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to control effects of noise pollution and indoor air pollution.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science , science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

REFERENCE BOOKS:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited,2007.

CO	PO											
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3	-	-	2	-	-	-	2	2	-	-	-	-
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5	-	-	-		3	-	-	-	2	1	2	2

1903515 PARTICIPATORY WATER RESOURCES MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To gain an insight on local and global perceptions and approaches on participatory water resource management
- To know the role of farmers in socio economic issues and challenges.
- To bring the knowledge of water conservation.
- To gain knowledge on issues of water management.
- To develop knowledge on global challenges and solutions.

UNIT – I: FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH **9**

Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Needs for participatory -Objectives of participatory approach.

UNIT - II: UNDERSTANDING FARMERS PARTICIPATION **9**

Farmers participation - Need and Benefits - Comparisons of cost and benefit -Sustained system performance - Kinds of participation - Context of participation, factors in the environment - WUA - Constraints in organizing FA - Role of Community Organizer – socio economic - Case Studies.

UNIT - III: ISSUES IN WATER MANAGEMENT **9**

Multiple use of water – Issues in Inter-sectoral Water Allocation - domestic, irrigation, industrial sectors - Modernization techniques and its challenges – Command Area Development - Water delivery systems – Advantages and disadvantages.

UNIT - IV: PARTICIPATORY WATER CONSERVATION **9**

Global Challenges -Social – Economic – Environmental - Solutions –Political - Water Marketing –Water Rights -Consumer education – Success Stories Case Studies.

UNIT - V: PARTICIPATORY WATERSHED DEVELOPMENT **9**

Concept and significance of watershed - Basic factors influencing watershed development – Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes –- People’s participation – Entry point activities - Evaluation of watershed management measures.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Gain knowledge on various processes involved in participatory water resource management.
- Understand farmer's participation in water resources management.
- Aware of the issues related to water conservation and watershed Development.
- Get knowledge in participatory water conservation.
- Understand concept, principle and approach of watershed management.

TEXT BOOKS:

1. Sivasubramaniyan, K. “Water Management”, SIMRES Publication, Chennai, 2011.
2. Uphoff.N, “Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and Management”, No.11, West view press, Boulder, CO, 1986.
3. Tideman E.M., “Watershed Management”, Omega Scientific Publishers, New Delhi, 1996.

REFERENCE BOOKS:

1. Chambers Robert, “Managing canal irrigation”, Cambridge University Press, 1989.

CO	PO											
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2	-	2	-	-	-	2	2	1	3	-	-	-
3	-	-	2	3	3	-	-	-	-	-	-	2
4	2	-	-	1	-	-	-	-	3	-	2	-
5	1	-	-	-	2	-	-	-	-	-	-	2

1904504 GEOGRAPHIC INFORMATION SYSTEM L T P C

3 0 0 3

OBJECTIVES:

- To introduce the fundamentals and components of Geographic Information System.
- To provide details of spatial data structures and input, management and output processes.
- To provide details about raster input data structures.
- To be familiar with network topologies.
- To Analyze data analytics and various applications of GIS.

UNIT – I: FUNDAMENTALS OF GIS 9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - geographical data types - Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT - II: SPATIAL DATA MODELS 9

Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector ModelsTIN and GRID data models - OGC standards - Data Quality.

UNIT - III: DATA INPUT AND TOPOLOGY 9

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser – Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT - IV: DATA ANALYSIS 9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT – V: APPLICATIONS 9

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output.

TEXT BOOKS:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction Geographical Information Systems, Pearson Education, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.

CO	PO											
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3	-	-	-	-	-	-	2	-	-	3	-	1
4	-	-	-	-	-	-	1	-	-	-	3	-
5	-	-	-	-	-	-	1	-	-	-	-	2

1905001 ENERGY CONSERVATION AND MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- Understand and analyse the energy data of industries.
- Carryout energy accounting and balancing.
- Conduct energy audit and suggest methodologies for energy savings.
- Utilise the available resources in optimal ways
- Understand and analyse of Energy Economics.

UNIT – I: INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT - II: ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT - III: THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT - IV: ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets.

UNIT - V: ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Can able to analyse the energy data.
- Can carryout energy accounting and balancing.
- Can suggest methodologies for energy savings.
- Can carry out Energy Conservation in Major Utilities.
- Can suggest methodologies for Energy Economics.

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004

REFERENCE BOOKS:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford,1981.
3. Dryden. I.G.C., “The Efficient Use of Energy” Butterworths, London, 1982.
4. Turner. W.C., “Energy Management Hand book”, Wiley, New York, 1982.
5. Murphy. W.R. and G. Mc KAY, “Energy Management”, Butterworths, London 1987.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1	1	-	1	-	3	-	-	-	2	-	-
2	-	-	2	-	1	-	-	-	2	-	-	1
3	-	1	-	3	-	2	-	-	-	-	-	-
4	3	-	-	-	-	3	-	2	-	-	2	-
5	-	2	-	3	2	-	1	2	-	-	-	2

1905508 RENEWABLE ENERGY SOURCES L T P C

3 0 0 3

OBJECTIVES:

- To get exposure on solar radiation and its environmental impact to power.
- To know about the various collectors used for storing solar energy.
- To know about the various applications in solar energy.
- To learn about the wind energy and biomass and its economic aspects.
- To know about geothermal energy with other energy sources.

UNIT – I: PRINCIPLES OF SOLAR RADIATION 10

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT - II: SOLAR ENERGY COLLECTION 8

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - III: SOLAR ENERGY STORAGE AND APPLICATIONS 8

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT - IV: WIND ENERGY 10

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT - V: GEOTHERMAL ENERGY 9

Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC-Magneto Hydro Dynamic power generation.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

TEXT BOOKS:

1. Rai G.D., “Non-Conventional Energy Sources”, Khanna Publishers, 2011.
2. Twidell & Wier, “Renewable Energy Resources”, CRC Press (Taylor & Francis), 2011.

REFERENCE BOOKS:

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007.
2. Ramesh R & Kumar K.U, “Renewable Energy Technologies”, Narosa Publishing House, 2004.
3. Mittal K M, “Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi, 2003.

CO	PO											
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1	1	-	-	-	-	2	2	1	1	-	-	2
2	1	-	-	-	2	1	3	1	-	-	-	1
3	1	-	-	-	-	2	3	1	2	-	-	2
4	2	-	-	-	3	2	3	2	-	-	1	2
5	2	-	-	-	-	1	2	2	1	-	2	1

1905509 SCADA SYSTEM MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To provide knowledge about the SCADA system and its architecture
- To provide knowledge about SCADA system components
- To provide knowledge about SCADA communication protocols
- To provide knowledge about SCADA monitoring and control in power system
- To provide knowledge about SCADA applications in power system

UNIT – I: INTRODUCTION 9

Evolution of SCADA, SCADA definitions, SCADA Functional requirements and Components, SCADA Hierarchical concept, SCADA architecture, General features, SCADA Applications, Benefits

UNIT - II: SCADA SYSTEM COMPONENTS 9

Remote Terminal Unit (RTU), Interface units, Human- Machine Interface Units (HMI), Display Monitors/Data Logger Systems, Intelligent Electronic Devices (IED), Communication Network, SCADA Server, SCADA Control systems and Control panels

UNIT - III: COMMUNICATION 9

SCADA Communication requirements, Communication protocols: Past, Present and Future, Structure of a SCADA Communications Protocol, Comparison of various communication protocols, IEC61850 based communication architecture, Communication media like Fiber optic, PLCC etc. Interface provisions and communication extensions, synchronization with NCC, DCC.

UNIT - IV: MONITORING AND CONTROL 9

Online monitoring the event and alarm system, trends and reports, Blocking list, Event disturbance recording. Control function: Station control, bay control, breaker control and disconnector control.

UNIT - V: APPLICATIONS IN POWER SYSTEM 9

Applications in Generation, Transmission and Distribution sector, Substation SCADA system Functional description, System specification, System selection such as Substation configuration, IEC61850 ring configuration, SAS cubicle concepts, gateway interoperability list, signal naming concept. System Installation, Testing and Commissioning.

TOTAL: 45 PERIODS

OUTCOMES:

- This course gives knowledge about SCADA SYSTEM and its architecture
- This course gives knowledge about various system components of SCADA System
- This course gives knowledge about various communication protocols of SCADA System
- This course gives knowledge about SCADA monitoring and control in power System
- This course gives knowledge about SCADA system applications

TEXT BOOKS:

1. Stuart A. Boyer: SCADA-Supervisory Control and Data Acquisition, Instrument Society of America Publications,USA,2004
2. Gordon Clarke, Deon Reynders: Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems, Newnes Publications, Oxford, UK,2004
3. William T. Shaw, Cyber security for SCADA systems, PennWell Books, 2006

REFERENCE BOOKS:

1. David Bailey, Edwin Wright, Practical SCADA for industry, Newnes3 William T. Shaw, Cybersecurity for SCADA systems, PennWell Books, 2006, 2003
2. Michael Wiebe, A guide to utility automation: AMR, SCADA, and IT systems for electric Power, PennWell 1999
3. Dieter K. Hammer, Lonnie R. Welch, Dieter K. Hammer, “Engineering of Distributed Control Systems”, Nova Science Publishers, USA, 1st Edition, 2001

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	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
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3	2	-	-	3	3	2	1	-		3	-	1
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1906507 **ENTERTAINTRONICS** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the basics of display devices.
- To enhance the student knowledge in Audio broadcasting systems.
- To enable the student to learn about Television systems.
- To develop the student knowledge in Interactive Gaming Applications.
- To apply the knowledge of Consumer Electronic Applications.

UNIT – I: DISPLAY DEVICES 9

Introduction – Underlying technologies of displays -Types of Electronic displays – Segment displays –Two dimensional displays: Liquid Crystal display, Light emitting diode display – Three dimensional displays: Laser display, Holographic display – Applications.

UNIT - II: AUDIO BROADCASTING SYSTEMS 9

Loud Speakers: construction, working principles and applications of crystal, condenser and dynamic loudspeakers – Tweeters, Squawkers & Woofers - Public address system - Requirements of Public Addressing system -Microphones: construction, working principles and applications of Carbon, Moving coil and Crystal microphones. Headphones: Principle of operation of crystal and dynamic and Bluetooth based headphones.

UNIT - III: TELEVISION SYSTEMS 9

Basics of Television: Television standards, frequency bands, Scanning method, interlacing and synchronization, bandwidth, Advanced TV systems: LCD, LED, HDTV,3DTV, Smart TV. Color concepts, concepts of luminance, Hue and Saturation, Color TV (PAL Systems). Cable TV concepts, Closed Circuit Television.

UNIT - IV: INTERACTIVE GAMING APPLICATIONS 9

Fundamental of game design - Gaming scenarios – Interfaces- Multi player interactive gaming – Programming concepts – educational games – Privacy and security in games – Introduction to Android games and its development – Online games.

UNIT - V: CONSUMER ELECTRONIC APPLICATIONS 9

Principle of operation of digital clocks, electronic calculator, cellular phones- smart phones microwave ovens, washing machines, air conditioners, ATMs and set-top-boxes – Compact Ultrafast Fiber lasers for Consumer electronics – Virtual reality applications,

Alexa.

TOTAL: 45 PERIODS

At the end of the course, the student should be able to:

- Understand the basic applications of display devices.
- Analyze the operation of Audio devices and its applications.
- Know the basic TV Standards and the basics of Television.
- Design the Gaming scenarios and knowing programming concepts.
- Apply the Knowledge of applications of Consumer electronics.

TEXT BOOKS:

1. Shoichi Matsumoto, “Electronic display devices”, Wiley, 1990.
2. Ajay Sharma, “Audio video and TV Engineering-Consumer Electronics”, Dhanpat Rai and co, 2003.
3. R.G. Gupta, “Audio and Video systems”, Tata Mc Graw Hill Publishing Co.Ltd, 2010

REFERENCE BOOKS:

1. R. Gulati, “Monochrome and Color Television”, New Age International (P) Ltd, New Delhi, 2014
2. S P Bali, “Consumer Electronics”, Pearson,.2007

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1906505 **PHOTONIC NETWORKS** **L T P C**

3 0 0 3

OBJECTIVES:

- To enable the students to manifest the components used is the optical system, propagation of signals and their impairments in optical fiber.
- To enable the student to understand the importance of the backbone infrastructure for our present and future communication needs.
- To familiarize the students about the optical network architectures and the protocol stack in use.
- To enable the student to understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods in vogue.
- To expose the student to the advances in networking and switching domains and the future trends.

UNIT – I: OPTICAL SYSTEM COMPONENTS 9

Light Propagation in optical fibers – Loss & bandwidth, System limitations, Nonlinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT - II: OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; Wavelength Division Multiplexing, optical add/drop multiplexer, SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture.

UNIT - III: WAVELENGTH ROUTING NETWORKS 9

The optical layer, Optical Network Nodes, Routing and wavelength assignment, Traffic Grooming in Optical Networks, Architectural variations- Linear Light wave networks, Logically Routed Networks.

UNIT - IV: WAVELENGTH ROUTING NETWORKS 9

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks, Contention Resolution Access Networks – Network Architecture overview, Optical Access Network Architectures and

OTDM networks, OTDR.

UNIT - V: NETWORK DESIGN AND MANAGEMENT 9

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion, Wavelength stabilization, Overall design considerations, Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Elucidate the components in an optical system.
- Use the backbone infrastructure for our present and future communication needs.
- Analyze the architectures and the protocol stack,
- Compare the differences in the design of data plane, control plane, routing, switching, resource allocation methods.
- Annotate the network management and protection methods in vogue.

TEXT BOOKS:

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective”, Second Edition, Harcourt Asia Pte Ltd., 2004.
2. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks: Concept, Design and Algorithms”, 1st Edition, Prentice Hall of India, 2002.

REFERENCE BOOKS:

1. John M. Senior ,“Optical Fiber Communication”,3rd edition, Prentice Hall,2009.
2. Uyless N. Black, “Optical Networks, Third Generation Transport Systems”,1st Edition, Prentice hall of India, 2002.
3. Biswanath Mukherjee, “Optical WDM Networks”, Springer Series, 2006.
4. Govind P. Agrawal, “Fiber Optic Communication Systems”, 3rd Edition, Wiley India (P) Ltd, 2002.
5. Gerd Keiser , “Optical Fiber Communication” , 5th Edition , McGraw Hill Education (India) Pvt. Ltd. , 2013.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	-	-	2	1	-	1	-	-	-	-	2	-
2	2	-	2	-	1	1	-	-	-	-	-	-
3	2	2	-	1	-	-	-	-	-	-	-	2
4	2	2	-	2	1	-	-	-	-	-	-	-
5	2	2	2	-	-	-	-	-	-	-	-	-

1906506 TELECOMMUNICATION NETWORK MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept of network management standards.
- To design the common management information service element model.
- To understand the various concept of information modelling.
- To analyze the concept of SNMPv1 and SNMPv2 protocol.
- To explore the concept of examples of network management

UNIT – I: BASIC FOUNDATIONS AND NETWORK MANAGEMENT APPLICATIONS 9

Network management standards–Network management model– Organization model– Information model - Abstract syntax notation One (ASN.1) – Encoding structure– Macros –Functional model. Network management applications functional requirements: Configuration management– Fault management–Performance management–Error correlation technology– Security management–Accounting management– Common management–report management– Policy based management – Service level management– Management service– Community definitions– capturing the requirements– simple and formal approaches–semi formal and formal notations.

UNIT - II: COMMON MANAGEMENT INFORMATION SERVICE ELEMENT 9

CMISE model–service definitions–errors–scooping and filtering features– synchronization–functional units– association services– common management information protocol specification

UNIT - III: INFORMATION MODELING FOR TMN 9

Rationale for information modeling–management information model–object oriented modeling paradigm– structure of management information–managed object class definition–management information base.

UNIT - IV: SIMPLE NETWORK MANAGEMENT PROTOCOL 9

SNMPv1: Managed networks–SNMP models– organization model– Information model– SNMPv1 communication model–functional model. SNMPv2-major changes in SNMPv2–

structure of management information, MIB–SNMPv2 protocol– compatibility with SNMPv1. SNMPv3– architecture–applications–MIB- security, SNMP Management: remote monitoring–SMI and MIB– RMON1 and RMON2.

UNIT - V: NETWORK MANAGEMENT EXAMPLES 9

ATM integrated local management interface–ATM MIB–M1– M2–M3–M4–interfaces–ATM digital exchange interface management–digita1 subscriber loop and asymmetric DSL technologies–ADSL configuration management–performance management Network management tools: Network statistics management–network management system–management platform case studies: OPENVIEW–ALMAP.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design and analyze of fault management.
- Analyze the common management information protocol specifications.
- Recognize the management information model.
- Realize the simple network management protocol.
- Apply various types of network management tools

TEXT BOOKS:

1. Mani Subramanian, “Network Management: Principles and Practice” Pearson Education, Second edition, 2010.
2. Lakshmi G Raman, “Fundamentals of Telecommunications Network Management”, Wiley, 1999.

REFERENCE BOOKS:

1. Henry Haojin Wang, “Telecommunication Network Management”, Mc- Graw Hill, 1999.
2. Salah Aidarous & Thomas Plevyak, “Telecommunication Network Management: Technologies and Implementations”, Wiley, 1997.
3. Singh B, “Network Security and Management”, Eastern Economy Edition, 2012.

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2	3	3	3	1	-	-	2	2	-	-	-	2
3	3	3	3	2	-	-	-	-	-	-	-	2
4	3	3	2	3	-		2	2		-	-	2
5	2	2	1	1	-	2	2	2	2	-	-	2

1907503 SENSORS AND TRANSDUCERS L T P C

3 0 0 3

OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the applications and working of motion and ranging sensors.
- To explore the latest sensor technologies like MEMS & nano sensors, smart sensors
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT – I: INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT - II: MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT - III: FORCE, MAGNETIC AND HEADING SENSORS 9

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT - IV: OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT - V: SIGNAL CONDITIONING and DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain various calibration techniques and signal types for sensors.
- Understand the basic principles of various smart sensors.
- Illustrate the basic principles of various smart sensors.
- Apply the various sensors in the Automotive and Mechatronics applications
- Implement the DAQ systems with different sensors for real time applications

TEXT BOOKS:

1. Ernest O Doebelin, Dhanesh N.Manik “Measurement Systems – Applications and Design”, seventh Edition McGraw-Hill, 2019.
2. Sawney A K and Puneet Sawney, “A Course in Mechanical Measurements and Instrumentation and Control”, 12th edition, Dhanpat Rai & Co, New Delhi, 2013.

REFERENCE BOOKS:

1. Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.
2. John Turner and Martyn Hill, “Instrumentation for Engineers and Scientists”, Oxford Science Publications, 1999.
3. Richard Zurawski, “Industrial Communication Technology Handbook” 2nd edition, CRC Press, 2015.

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3	-	-	3	-	-	3	2	-	-	-	-	1
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5	3	2	2	2	2	-	-	-	-	-	-	1

1907504 INSTRUMENTATION IN BIOMEDICAL ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To study about the different bio potential and its propagation
- To understand the different types of electrodes and its placement for various recording
- To study the design of bio amplifier for various physiological recording
- To learn the different measurement techniques for non-physiological parameters.
- To familiarize the different biochemical measurements.

UNIT – I: BIO POTENTIAL GENERATION AND ELECTRODES TYPES 9

Origin of bio potential and its propagation. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes

UNIT - II: BIOSIGNAL CHARACTERISTICS AND ELECTRODE CONFIGURATIONS 9

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.

UNIT - III: SIGNAL CONDITIONING CIRCUITS 9

Need for bio-amplifier - differential bio-amplifier, Impedance matching circuit, isolation amplifiers, Power line interference, Right leg driven ECG amplifier, Band pass filtering

UNIT - IV: MEASUREMENT OF NON-ELECTRICALPARAMETERS 9

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - Auscultatory method, direct methods: electronic manometer, Systolic, diastolic pressure, Blood flow and cardiac output measurement: Indicator dilution, and dye dilution method, ultrasound blood flow measurement

UNIT - V: BIO-CHEMICAL MEASUREMENT 9

Blood gas analyzers and Non-Invasive monitoring, colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the different bio potential and its propagation.
- Explain the different electrode placement for various physiological recording
- Design bio amplifier for various physiological recording
- Understand various technique of non electrical physiological measurements
- Understand the different biochemical measurements

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 2007.
2. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 2004.

REFERENCE BOOKS:

1. Myer Kutz, “Standard Handbook of Biomedical Engineering and Design”, McGraw Hill Publisher, 2003.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 2003.(Units II & IV)
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education, 2004.

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3	3	1	2	1	1	1	-	-	-	-	-	-
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5	-	-	2	1	1	1	-	-	-	-	-	-

1909510 PRODUCT DESIGN AND DEVELOPMENT L T P C

3 0 0 3

OBJECTIVES:

- product design and development
- Apply the concept of prototyping in a real life problem.
- Reduce the waste by using product architecture**.**
- Understand the concepts of industrial design.
- Understand the concepts of DFM

UNIT – I: INTRODUCTION 9

Need for IPPD – Strategic importance of Product development – integration of customer, designer, material supplier and process planner, Competitor and customer – Behaviour analysis. Understanding customer – prompting customer understanding – involve customer in development and managing requirements.

UNIT - II: CONCEPT GENERATION AND SELECTION 9

Task – Structured approaches – clarification – search – externally and internally – explore systematically – reflect on the solutions and processes – concept selection – methodology – benefits.

UNIT - III: PRODUCT ARCHITECTURE 9

Implications – Product change – variety – component standardization – product performance – manufacturability – product development management – establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions.

UNIT - IV: INDUSTRIAL DESIGN 9

Need for industrial design – impact – design process – investigation of for industrial design – impact – design process – investigation of customer needs – conceptualization – refinement – management of the industrial design process – technology driven products – user – driven products – assessing the quality of industrial design.

UNIT - V: DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 9

Definition – Estimation of Manufacturing cost – reducing the component costs and

assembly costs – Minimize system complexity – Prototype basics – principles of prototyping – planning for prototypes – Economic Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the product design and concepts.
- Apply the concept of prototyping in a real life problem.
- Reduce the waste by using product architecture**.**
- Understand the concepts of industrial design.
- Understand the concepts of DFM.

TEXT BOOKS:

1. Kari T.Ulrich and Steven D.Eppinger, ”Product Design and Development”, McGraw-Hill International Edn.2017.

REFERENCE BOOKS:

1. Kemnneth Crow, “Concurrent Engg./Integrated Product Development”, DRM Associates,
   26/3, Via Olivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book.
2. Stephen Rosenthal, “Effective Product Design and Development”, Business One Orwin, Homewood, 1992, ISBN 1-55623-603-4.

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2	1	1	1	1	1	-	1	1	-	1	-	-
3	1	-	-	-	1	1	1	1	1	1	-	1
4	1	1	1	-	-	-	1	1	-	1	-	-
5	2	2	-	-	-	-	1	-	-	1	-	-

1909511 VIBRATION AND NOISE CONTROL L T P C

3 0 0 3

OBJECTIVES:

- Apply the fundamental concepts of vibration.
- Apply the fundamentals of noise.
- Describe the various sources of noise for automotive applications.
- Determine the natural frequencies and mode shapes of the two degree freedom systems.
- Describe the different types of noise and its control measures

UNIT – I: BASICS OF VIBRATION 9

Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT - II: BASICS OF NOISE 9

Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT - III: AUTOMOTIVE NOISE SOURCES 9

Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine necessary contributed noise, transmission noise, aerodynamic noise, tire noise, brake noise.

UNIT - IV: CONTROLTECHNIQUES 9

Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT - V: SOURCE OF NOISE AND CONTROL 9

Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound

in enclosures, sound energy absorption, sound transmission through barriers.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply the fundamental concepts of vibration.
- Apply the fundamentals of noise.
- Describe the various sources of noise for automotive applications.
- Determine the natural frequencies and mode shapes of the two degree freedom systems.
- Describe the different types of noise and its control measures

TEXT BOOKS:

1. Singiresu S.Rao, “Mechanical Vibrations”, 6th Edition, Pearson Education, 2016.

REFERENCE BOOKS:

1. Balakumar Balachandran and Edward B. Magrab, “Fundamentals of Vibrations”,1st Editon,Cengage Learning, 2009
2. Benson H. Tongue, “Principles of Vibrations”, 2nd Edition, Oxford University, 2007

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1	3	2	2	2	-	-	1	-	-	-	-	1
2	3	2	2	2	-	-	1	-	-	-	-	1
3	3	2	2	2	-	-	1	-	-	-	-	1
4	3	2	2	2	-	-	1	-	-	-	-	1
5	3	2	2	2	-	-	1	-	-	-	-	1

1909512 INDUSTRIAL SAFETY ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- Identify unsafe conditions and recognize unsafe alerts.
- Interpret the rules and regulations for safety operations.
- Capable of solving problem of accidents.
- Capable of solving the present for criticizing the present for improved safety.
- Collaborate and modify processes / procedures for safety.

UNIT – I: INTRODUCTION 9

Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT - II: CHEMICAL HAZARDS 9

Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT - III: ENVIRONMENTAL CONTROL 9

Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT - IV: HAZARD ANALYSIS 9

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT - V: SAFETY REGULATIONS 9

Explosions – Disaster management – catastrophe control, hazard control , Factories Act, Safety regulations Product safety – case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- **At the end of the course, the student should be able to:**
- Identify and prevent chemical, environmental mechanical, fire hazard.
- Collect, analyze and interpret the accidents data based on various safety techniques.
- Apply proper safety techniques on safety engineering and management.

- Able to perform hazard analysis.
- Aid to design the system with environmental consciousness by implementing safety regulation.

TEXT BOOKS:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCE BOOKS:

1. David L.Goetsch, “Occupational Safety and Health for Technologists”, Engineers and Managers, Pearson Education Ltd. 5th Edition, 2005.
2. Deshmukh L M, “Industrial Safety Management”, Tata McGraw-Hill Publishing Company Ltd.,2005
3. Safety Manual, “EDEL Engineering Consultancy”, 2000.

CO	PO											
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1	2	1	2	-	-	2	1	-	-	-	-	1
2	2	1	2	-	-	2	1	-	-	-	-	1
3	2	1	2	-	-	2	1	-	-	-	-	1
4	2	1	2	-	-	2	1	-	-	-	-	1
5	2	1	2	-	-	2	1	-	-	-	-	1

1910504 PRINCIPLES OF FOOD PRESERVATION L T P C

3 0 0 3

OBJECTIVES:

- To learn about the shelf life of food products.
- To gain knowledge on the storage of food products.
- To know about the thermal processing methods of food products.
- To design different types of Dryers.
- To understand the non thermal methods of food preservation.

UNIT – I: FOOD PRESERVATION AND ITS IMPORTANCE 9

Introduction to food preservation. Wastage of processed foods; Shelf life of food products; Types of food based on its perishability. Traditional methods of preservation.

UNIT - II: METHODS OF FOOD HANDLING AND STORAGE 9

Nature of harvested crop, plant and animal; storage of raw materials and products using low temperature, refrigerated gas storage of foods, gas packed refrigerated foods, sub atmospheric storage, Gas atmospheric storage of meat, grains, seeds and flour, roots and tubers; freezing of raw and processed foods.retort pouch packing, Aseptic packaging.

UNIT - III: THERMAL METHODS 9

Newer methods of thermal processing; batch and continuous; In container sterilization-canning; application of infra-red microwaves; ohmic heating; control of water activity; preservation by concentration and dehydration; osmotic methods.

UNIT - IV: DRYING PROCESS FOR TYPICAL FOODS 9

Rate of drying for food products; design parameters of different type of dryers; properties of air-water mixtures. Psychrometric chart, freezing and cold storage. freeze concentration, dehydro-freezing, freeze drying, IQF; calculation of refrigeration load, design of freezers and cold storages.

UNIT - V: NON-THERMAL METHODS 9

Super Critical Technology for Preservation - Chemical preservatives, preservation by ionizing radiations, ultrasonics, high pressure, fermentation, curing, pickling, smoking, membrane technology. Hurdle technology

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Be aware of the different thermal processing methods of food products.
- Understand the concept of food storage.
- Be familiarize with shelf life of food products.
- Recognize the different types of dryers.
- Acquire knowledge on non thermal methods of food preservation.

TEXT BOOKS:

1. Karnal, Marcus and D.B. Lund “Physical Principles of Food Preservation”. Rutledge, 2003.
2. VanGarde, S.J. and Woodburn. M “Food Preservation and Safety Principles and Practice”.Surbhi Publications, 2001.
3. Sivasankar, B. “Food Processing & Preservation”, Prentice Hall of India, 2002.
4. Khetarpaul, Neelam, “Food Processing and Preservation”, Daya Publications, 2005.

REFERENCE BOOKS:

1. Rahman, M. Shafiur. “Handbook of Food Preservation”. Marcel & Dekker, 2006.
2. Zeuthen, Peter and Bogh-Sarensen, Leif. “Food Preservation Techniques”. CRC / Wood Head Publishing, 2003.
3. Ranganna, S. “Handbook of Canning and Aseptic Packaging”. Tata McGraw-Hill, 2000.

CO	PO											
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3	3	2	1	2	-	1	1	-	-	-	-	2
4	3	2	1	2	-	1	1	-	-	-	-	2
5	3	1	2	-	-	1	1	-	-	-	-	2

1920501 **NANOTECHNOLOGY** **L T P C**

3 0 0 3

OBJECTIVES:

- Make the students to understand the fundamentals of nanomaterials.
- To acquire the knowledge on different classifications in nano materials.
- To educate the different synthesis techniques.
- To provide information on different fabrication and characterization techniques.
- Make the students to understand and apply the techniques to different systems.

UNIT – I: BASICS OF NANOTECHNOLOGY 9

Introduction –Scientific revolutions –Time and length scale in structures –Definition of a nanosystem –Dimensionality and size dependent phenomena –Surface to volume ratio - Fraction of surface atoms-Properties at nanoscale (optical, mechanical, electronic and magnetic).

UNIT - II: DIFFERENT CLASSES OF NANOMATERIALS 9

Classification based on dimensionality-Quantum Dots, Wells and Wires-Carbon-based nano materials (buckyballs, nanotubes, graphene)–Metal based nano materials (nanogold, nanosilver and metal oxides) –Nanocomposites-Nanopolymers –Nanoglasses –Nano ceramics.

UNIT - III: SYNTHESIS OF NANOMATERIALS 9

Classification of synthesis: Top down and bottom up nanofabrication. Chemical Methods: Solvothermal Synthesis-Photochemical Synthesis –Sonochemical Routes-Chemical Vapor Deposition (CVD) –Metal Oxide -Chemical Vapor Deposition (MOCVD). Physical Methods: Ball Milling –Electrodeposition -Spray Pyrolysis -Flame Pyrolysis - DC/RF Magnetron Sputtering -Molecular Beam Epitaxy (MBE).

UNIT - IV: FABRICATION AND CHARACTERIZATION OF NANOSTRUCTURES 9

Nanofabrication: Photolithography and its limitation-Electron-beam lithography (EBL)-Nanoimprint –Softlithography patterning. Characterization: Environmental Scanning Electron Microscopy (ESEM) High Resolution Transmission Electron Microscope (HRTEM) –Scanning Tunneling Microscope (STM)-Surface enhanced Raman spectroscopy (SERS)-

X-ray Photoelectron Spectroscopy (XPS) -Auger electron spectroscopy (AES).

UNIT - V: APPLICATIONS 9

Solar energy conversion and catalysis -Molecular electronics and printed electronics – Nanoelectronics -Polymers with a special architecture -Liquid crystalline systems -optical properties, Applications in displays and other devices -Photonics, Plasmonics-Chemical and biosensors –Nanomedicine and Nanobiotechnology –Nanotoxicology challenges.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Able to understand the basics of nanoscience.
- Able to differentiate the materials based on their structures.
- Ability to understand the different synthesis techniques of nanomaterials.
- Ability to identify various fabrication techniques and characterization of nanostructures.
- Able to apply them for suitable applications.

TEXT BOOKS:

1. Bhusan, Bharat (Ed), “Springer Handbook of Nanotechnology”, 2nd Edition, 2007.
2. Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press, 2002.
3. Pradeep T., “A Textbook of Nanoscience and Nanotechnology”, Tata McGraw Hill Education Pvt. Ltd., 2012.

REFERENCE BOOKS:

1. Charles P. Poole Jr., Frank J. Ownes, ‘Introduction to Nanotechnology”, Wiley Interscience, 2003.
2. Dupas C., Houdy P., Lahmani M., “Nanoscience: Nanotechnologies and Nanophysics”,Springer-Verlag Berlin Heidelberg, 2007.
3. Mark Ratner and Daniel Ratner, “Nano Technology”, Pearson Education, New Delhi, 2003.
4. Nabok A., “Organic and Inorganic Nanostructures”, Artech House, 2005.

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5	3	-	3	3	3	1	1	-	-	-	-	1

1920502 **MICROSCOPY** **L T P C**

3 0 0 3

OBJECTIVES:

- To introduce the basic principles of optical and electron microscopy.
- To elucidate the different microscopic techniques.
- To explore the knowledge on electron microscopy
- Make the students to learn the sample preparation techniques for the microstructural analysis.
- To investigate on different chemical analysis techniques.

UNIT – I: INTRODUCTION **9**

History of Microscopy, Overview of current microscopy techniques. Light as particles and waves, Fundamental of optics: Diffraction and interference in image formation, real and virtual images, Resolution, Depth of field and focus, Magnification, Numerical aperture, Aberration of lenses. Components of Light Microscopy, Compound light microscopy and its variations**.**

UNIT - II: MICROSCOPY **9**

Phase contrast microscopy: optical design, theory, image interpretation, Dark-field microscopy: optical design, theory, image interpretation, Polarization Microscopy: Polarized light, optical design, theory, image interpretation, Differential Interference Contrast (DIC): equipment and optics, image interpretation, Modulation contrast microscopy: contrast methods using oblique illumination.

UNIT - III: ELECTRON MICROSCOPY **9**

Interaction of electrons with matter, elastic and inelastic scattering, secondary effects, Components of electron microscopy: Electron sources, pumps and holders, lenses, apertures, and resolution. Scanning Electron and Transmission Electron Microscopy: Principle, construction, applications and limitations.

UNIT - IV: SAMPLE PREPARATION FOR MICROSTRUCTURAL ANALYSIS **9**

Optical Microscopy sample preparation: Grinding, polishing and etching, SEM sample preparation: size constrains, TEM sample preparation: Disk preparation, electro polishing,

ion milling, lithography, storing specimens.

UNIT - V: CHEMICAL ANALYSIS 9

Surface chemical composition (Principle and applications) - Mass spectroscopy and X-ray emission spectroscopy - Energy Dispersive Spectroscopy- Wave Dispersive Spectroscopy. Electron spectroscopy for chemical analysis (ESCA), X ray Photoelectron Spectroscopy (XPS), Auger Electron Spectroscopy (AES)- Applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Able to understand the physics behind the microscopy.
- Ability to describe the principle, construction and working of light microscopy.
- Ability to describe electron microscopy.
- Ability to understand about the important of sample preparation technique.
- Ability to identify the appropriate spectroscopy technique for chemical analysis.

TEXT BOOKS:

- Douglas B. Murphy, Fundamentals of light microscopy and electronic imaging, 2001, Wiley- Liss, Inc. USA
- David B. Williams and C. Barry Carter, Transmission Electron Microscopy-A Textbook for Materials Science, Springer US, 2nd edition, 2009.

REFERENCE BOOKS:

1. Brandon D. G, “Modern Techniques in Metallography”, Von Nostrand Inc. NJ, USA,1986.
2. Whan R E (Ed), ASM Handbook, Volume 10, Materials Characterization“, Ninth Edition, ASM international, USA, 1986.
3. Thomas G., “Transmission electron microscopy of metals”, John Wiley, 1996.

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5	3	3	2	2	3	2	-	-	-	-	1	1

1921501 ADVANCED ENGINEERING CHEMISTRY L T P C

3 0 0 3

OBJECTIVES:

- To make the students conversant with basics of polymer chemistry.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To develop and understand the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.

UNIT – I: POLYMERS AND SPECIALITY POLYMER 9

Polymers – Types of polymerization – Degree of polymerization – Plastics and types – Mechanism of polymerization (free radical mechanism) properties of polymers - T_g and tacticity – Compounding of plastics – Fabrication of plastics – Blow and extrusion mouldings. Speciality polymers-Conducting polymers: Polyacetylene, polyaniline, synthesis, mechanism of conduction – Applications of conducting polymers. Bio-degradable polymers: Requirements, factors affecting degradation – PLA– preparation, properties –applications.

UNIT - II: ENERGY SOURCES AND STORAGE DEVICES 9

Solar energy conversion – Solar cells: Types – Wind energy. Batteries: Types of batteries – Primary battery (alkaline battery), secondary battery (lead acid battery, NICAD battery, lithium, lithium-ion & lithium-sulphur battery), fuel cells – H_2-O_2 fuel cell.

UNIT - III: PHOTOCHEMISTRY & ANALYTICAL TECHNIQUES 9

Photochemistry: Laws of photochemistry - Grothuss–Draper law, Stark–Einstein law and Beer-Lambert's Law. Quantum efficiency – determination - Photophysical processes (Jablonski diagram) - photosensitization - Chemiluminescence and bioluminescence.

Analytical techniques: IR, UV – principle, Instrumentation and applications. Thermal analysis: TGA & DTA - principle, instrumentation and applications. Chromatography: Basic principles of column & TLC – principles and applications.

UNIT - IV: THERMODYNAMICS 9

Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; Entropy of phase transitions; Clausius inequality. Free energy and work function- Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore.

UNIT - V: PHASE RULE AND ALLOYS 9

Phase rule: Introduction, definition of terms with examples, One component system - Water system – Reduced phase rule – Thermal analysis and cooling curves – Two component systems – Lead-silver system – Pattinson process, Zn-Mg System. Alloys: Introduction- Definition- properties of alloys- Significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Gain knowledge on polymer chemistry and its developments.
- Understand the process of advanced energy storage devices.
- Analyze the materials using spectroscopic techniques.
- Explain the various state of thermodynamics.
- Outline the nature of alloys by drawing phase rule.

TEXT BOOKS:

1. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2016.
2. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2015.
3. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd., 2012.

REFERENCE BOOKS:

1. P. C. Jain and Monika Jain, “Engineering Chemistry” Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2019.
2. S. S. Dara and S. S. Umare, “A Textbook of Engineering Chemistry”, S. Chand & Company LTD, New Delhi, 2015.
3. B. K. Sharma, “Engineering Chemistry”, Krishna Prakashan Media (P) Ltd, Meerut, 2012.

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3	1	-	-	2	-	-	1	-	-	-	-	1
4	-	-	1	-	-	-	2	-	1	-	-	1
5	3	2	2	3	1	-	2	-	-	-	-	1

1921502 INDUSTRIAL NANOTECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To elucidate on advantages of nanotechnology based applications in each industry
- To provide instances of contemporary industrial applications of nanotechnology
- To provide an overview of future technological advancements and increasing role of nanotechnology in each i9ndustry
- To provide an awareness on the nanomaterial synthesis for electronic materials
- To make the student conversant with the latest characterization techniques

UNIT – I: NANO ELECTRONICS 9

Micro and Nano electromechanical systems – Sensors, Actuators, Data memory –Lighting and Displays – Applications of piezoelectric and ferroelectric materials- Nano for energy systems - Fuel cells and Photo-voltaic cells – Electric double layer capacitors –Nanoparticle coatings for electrical products

UNIT - II: BIONANOTECHNOLOGY 9

Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis – Nanorobotics in Surgery –Nanosensors in Diagnosis– Neuro-electronic Interfaces– Therapeutic applications

UNIT - III: NANOTECHNOLOGY IN CHEMICAL INDUSTRY 9

Nanocatalyts – Smart materials – Heterogenous nanostructures and composites – Nanostructures for Molecular recognition (Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors

UNIT - IV: NANOTECHNOLOGY IN AGRICULTURE AND FOOD TECHNOLOGY 9

Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry

UNIT - V: CHARACTERIZATION TECHNIQUES 9

X-ray Diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including High-resolution imaging, Surface Analysis techniques-AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the nanoparticle coatings for electrical products.
- Define various therapeutic applications of bionanotechnology.
- Explain the process of molecular encapsulation and nanoreactors.
- Ability to understand the uses of nanotechnology in food industry.
- Outline the nanofiber production and formulation of gels.

TEXT BOOKS:

1. V.A. Rai and J.A. Bai, Nanotechnology Applications in the Food Industry, CRC Press, 2018.
2. S. Thomas, Y. Grohens and Y.B. Pottathara, Industrial Applications of Nanomaterials, Elsevier Press, 2019.
3. N John Dinardo, Nanoscale Characterization of surfaces & Interfaces, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCE BOOKS:

1. Neelina H. Malsch, Biomedical Nanotechnology, CRC Press, 2005.
2. Udo H. Brinker, Jean-Luc Mieusset, Molecular Encapsulation: Organic Reactions in Constrained Systems, Wiley Publishers, 2010.
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in Agriculture and Food Production, Woodrow Wilson International Center, 2006.
4. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, 2007.
5. Y-W. Mai, Polymer Nano composites, Woodhead Publishing Limited, 2006.
6. W.N. Chang, Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, 2009.

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2	1	2	3	-	1	3	1	-	1	-	-	1
3	2	1	2	-	1	1	1	-	1	-	-	1
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5	2	2	1	2	1	1	1	-	1	-	-	1

OPEN ELECTIVE II

1903706 GREEN BUILDING DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To develop buildings which use the natural resources to the minimal at the time of construction as well as operation.
- To ensure minimum negative impact on the environment by the construction and operation of a building.
- To gain knowledge on natural lighting and temperature control.
- To develop a design to further reduce the carbon footprint as well as reduce cost of operation.
- To preserve the external environment to the building location.

UNIT – I: ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT - II: IMPLICATIONS OF BUILDING TECHNOLOGIES 9

EMBODIED ENERGY OF BUILDINGS

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT - III: COMFORTS IN BUILDING 9

Thermal Comfort in Buildings – Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings – Implications of Geographical Locations.

UNIT - IV: UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT - V: GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilization in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Describe the concepts of sustainable design and green building techniques including energy efficiency and indoor environmental quality management.
- Create drawings and models of their own personal green building project.
- Reducing waste, pollution and environmental degradation.
- Efficiently using energy, water, and other resources.
- Protecting occupant health and improving employee productivity.

TEXT BOOKS:

1. K.S.Jagadish, B. U. Venkatarama Reddy and K. S. Nanjunda Rao. "Alternative Building Materials and Technologies". New Age International, 2007.
2. "Low Energy Cooling For Sustainable Buildings". John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCE BOOKS:

1. Osman Attmann, Green Architecture Advanced Technologies and Materials, McGraw Hill, 2010.
2. Jerry Yudelson, Green building Through Integrated Design, McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building by Marian Keeler, Bill Burke.

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3	-	-	2	1	2	-	-	1	2	2	-	-
4	-	-	-	-	-	3	-	-	-	-	-	2
5	-	-	-	-	-	-	-	-	-	-	2	3

1903716 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT L T P C

3 0 0 3

OBJECTIVES:

- To impart the knowledge of screening of environmental and social assessment.
- To gain the knowledge of methods for impact assessment.
- To mitigate the environmental and social impacts of developmental projects.
- To develop knowledge on Assessment of Impact on land, water, air, noise and energy, flora and fauna.
- To study on report preparation of EIA.

UNIT – I: INTRODUCTION 9

Impacts of Development on Environment – Rio Principles of Sustainable Development Environmental Impact Assessment (EIA) – OBJECTIVES: – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework–Stakeholders and their Role in EIA– Selection & Registration Criteria for EIA Consultants

UNIT - II: ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction – Analysis of alternatives.

UNIT - III: ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Addressing the issues related to the Project Affected People -Environmental Clearance Post Project Monitoring.

UNIT - IV: SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis.

UNIT - V: CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Real Estate Development - Roads and Bridges – Multi-storey Buildings Mass Rapid Transport Systems - Ports and Harbor – Airports - Dams and Irrigation projects - Power plants – Water supply and drainage projects- Waste water treatment plants, STP – Mining Projects.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Carry out scoping and screening of developmental projects for environmental and social assessments.
- To explain different methodologies for environmental impact prediction and assessment.
- Plan environmental impact assessments and environmental management plans.
- Evaluate environmental impact assessment reports.
- Analyze case studies on various projects.

TEXT BOOKS:

1. Canter, R.L, "Environmental impact Assessment", 2nd Edition, McGraw Hill Inc, New Delhi, 1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. E
3. veritt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
4. Peter Morris, RikiTherivel "Methods of Environmental Impact Assessment", Routledge Publishers, 2009.

REFERENCE BOOKS:

1. Becker H. A., Frank Vanclay, “The International handbook of social impact assessment” conceptual and methodological advances, Edward Elgar Publishing, 2003.
2. Barry Sadler and Mary McCabe, “Environmental Impact Assessment Training Resource Manual”, United Nations Environment Programme, 2002.
3. Judith Petts, “Handbook of Environmental Impact Assessment Vol. I and II”, Blackwell Science New York, 1998.

4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

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5	-	-	-	-	-	-	1	-	-	-	2	3

1904703 TAMIL COMPUTING L T P C

3 0 0 3

OBJECTIVES:

- To understand the Tamil grammar and programming basics for Tamil computing.
- To understand the various types of Tamil Computing applications.
- To make the students understand the use of Tamil computing tools and Resources.
- To strengthen the students' ability to carry out the Computational Linguistics in Tamil computing.
- To understand the concepts of Tamil text processing using open – Tamil python library.

UNIT – I: TAMIL GRAMMAR 9

Alphabets: Classification & Properties - Words: classification and components - Sentences: Structures and word ordering.

UNIT - II: PROGRAMMING BASICS FOR TAMIL COMPUTING 9

History of Tamil Computing - Standards & Fonts - UNICODE - Object Oriented Tamil Computing -Tamil text processing using open-tamil python library.

UNIT - III: COMPUTATIONAL LINGUISTICS 9

Basic linguistics - Phonology – Phonology computing – Tholkappiar's Morphological pattern– lexicography – syntax – semantics – pragmatics, Languages for specific purpose & disconise computing

UNIT - IV: TAMIL COMPUTING TOOLS & RESOURCES 9

POS Tagger - Morphological Analyser - Morphological Generator - Sentence Parser - Named Entity Recognizer - Word Sense Disambiguator - Ontologies – Universal Networking Language & UNL Enconvertor.

UNIT - V: TAMIL COMPUTING APPLICATIONS 9

Machine Translation – Speech : Synthesis & Processing - Information : retrieval & Extraction – Question Answering – Text Summarization – Automatic Indexing – Text Mining – Conceptual Search.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain classification of Tamil grammar and properties
- Adopt a suitable process for tamil computing tools.
- Analyze the different types of computational linguistics such as phonology, Morphology, lexicography.
- Perform and analyze the Tamil computing applications.
- Analyze and process the Tamil python library.

TEXT BOOKS:

1. The Oxford Handbook of Computational Linguistics, Edited by RuslanMitkov, Oxford University Press, 2014.

REFERENCE BOOKS:

1. Translation - Theory and Application, Valarmathi, International Institute of Tamil Studies, First Edition, 2001.
2. Tholkaappiyam - Thodariyal, Shanmugam, International Institute of Tamil Studies, First Edition, 2004.
3. Tholkaappiyam: Phonology & Morphology, Albert, International Institute of Tamil Studies, First Edition, 1985.
4. Natural language processing and computational linguistics, Bhargav Srinivasa-Desikan Packt Publishing, first edition 2018.
5. The Phonology and morphology of tamil chrisdas Prathima, 2016.
6. Pos Tasser R Morphological Analzser Shodhganga inflibnet.ac.in
7. Atamil Programming language ayxiv.org, muthiah Annamalai.

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1905711 ELECTRICAL CIRCUITS L T P C

3 0 0 3

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams of three phase circuits
- To analysis the three phase circuits

UNIT – I: BASIC CIRCUITS ANALYSIS 9

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchhoff's laws – Mesh current and node voltage - methods of analysis.

UNIT - II: NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Theremins' and Norton Theorems – Superposition Theorem – Maximum power transfer theorem –Reciprocity Theorem – Millman's theorem.

UNIT - III: AC CIRCUITS 9

Introduction to AC circuits, inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation – mesh and node analysis, Theremins' and Norton Theorems – Superposition Theorem – Maximum power transfer theorem –Reciprocity Theorem – Millman's theorem.

UNIT - IV: THREE PHASE CIRCUITS 9

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.-Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT - V: RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits –

Single tuned circuits – SMPS.

OUTCOMES:

- Ability to introduce electric circuits and its analysis
- Ability to impart knowledge on solving circuit equations using network theorems.
- Ability to introduce the phenomenon of resonance in coupled circuits.
- Ability to introduce Phasor diagrams of three phase circuits
- Ability to analysis of three phase circuits

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, “Circuit Analysis Theory and Practice”, Cengage Learning India, 2013.

REFERENCE BOOKS:

1. Chakrabarti A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., “Analysis of Electric Circuits,” McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum‟s series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, “Network Analysis”,Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015
6. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

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3	1	-	-	2	1	1	-	-	2	-	-	2
4	1	-	-		2	2	1	2	-	-	1	1
5	1	3	2	1	-	1	2	1	-	-	1	1

1905712 RENEWABLE ENERGY SYSTEMS L T P C

3 0 0 3

OBJECTIVES:

- About the stand alone and grid connected renewable energy systems. .
- Design of power converters for renewable energy applications.
- Wind electrical generators.
- Solar energy systems.
- Power converters used for renewable energy systems.

UNIT – I: INTRODUCTION 9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT – II: ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Reference theory fundamentals-principle of operation and analysis: IG and PMSG.

UNIT - III: POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers

UNIT - IV: ANALYSIS OF WIND AND PV SYSTEMS 9

Standalone operation of fixed and variability speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.

UNIT - V: HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

OUTCOMES:

At the end of the course, the student should be able to:

- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.
- Ability to understand the stand alone and grid connected renewable energy systems.
- Ability to design of power converters for renewable energy applications.
- Ability to acquire knowledge on wind electrical generators and solar energy systems.

TEXTBOOKS

1. S. N. Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company New Delhi, 2009.

REFERENCE BOOKS:

1. Rashid .M. H “power electronics Hand book”, Academic press, 2001.
2. Ion Boldea, “Variability speed generators”, Taylor & Francis group, 2006.
3. Rai. G.D, “Non conventional energy sources”, Khanna publishes, 1993.
4. Gray, L. Johnson, “Wind energy system”, prentice hall linc, 1995.
5. Andrzej M. Trzynnadlowski, „Introduction to Modern Power Electronics", Second edition, wiley India Pvt. Ltd, 2012.

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1905713 ELECTRIC VEHICLES AND POWER MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To understand the concept of electrical vehicles and its operations.
- To provide knowledge about Power train components.
- To understand the various Control strategies in AC and DC drives.
- To understand the need for energy storage in hybrid vehicles.
- To provide knowledge about alternative energy storage technologies that can be used in electric vehicles.

UNIT – I: ELECTRIC VEHICLES AND VEHICLE MECHANICS 9

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics – EV Testing.

UNIT - II: ARCHITECTURE OF EV's AND POWER TRAIN COMPONENTS 9

Architecture of EV's and HEV's – Plug-n Hybrid Electric Vehicles (PHEV) - Standards - Power train components and sizing, Gears, Clutches, Transmission and Brakes.

UNIT - III: CONTROL OF DC AND AC DRIVES 9

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motor and permanent motor-based vector control operation – Switched reluctance motor (SRM) drives.

UNIT - IV: BATTERY ENERGY STORAGE SYSTEM 9

Battery Basics, Different types, Battery Parameters, Battery modeling, Traction Batteries, Energy management system in Electric vehicle – Battery Management

Systems.

UNIT - V: ALTERNATIVE ENERGY STORAGE SYSTEMS 9

Fuel cell – Characteristics- Types – hydrogen Storage Systems and Fuel cell EV – Ultra Capacitors

TOTAL: 45 PERIODS

OUTCOMES:

- Learners will understand the operation of Electric vehicles and Hybrid Electric vehicles.
- Learners will gain knowledge on Power train components.
- Learners can analyze the control strategies in AC and DC drives.
- Learners will gain knowledge on various energy storage technologies for electrical vehicles.
- Learners know about alternative energy storage technologies for electric vehicles.

TEXT BOOKS:

1. Iqbal Hussain, “Electric and Hybrid Vehicles: Design Fundamentals, Second Edition**”** CRC Press, Taylor & Francis Group, Second Edition (2011).
2. Ali Emadi, Mehrdad Ehsani, John M.Miller, “Vehicular Electric Power Systems” , Special Indian Edition, Marcel dekker, Inc 2010
3. James Larminie and John Loury, “Electric Vehicle Technology – Explained”, John Wiley & Sons Ltd, 2003.

REFERENCE BOOKS:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric and Fuel cell Vehicles” CRC Press, Taylor & Francis Group, Second Edition (2010).
2. Emanuele Crisostomi, Robert Shorten, SonjaStudli & Fabian Wirth “Electric and Plug-in Hybrid Vehicle Networks” Taylor & Francis group 2018.
3. Ronald K Jurgen, “Electric and Hybrid – Electric Vehicles”, SAE, 2002.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	1	-	2	2	2	-	-	-	1	2
2	2	-	2	-	1	-	1	-	2	-	2	-
3	3	2	1	-	2	-	-	-	2	-	-	-
4	3	2	2	-	1	-	2	-	-	-	2	
5	3	2	1	-	1	-	-	-	1	-	2	2

1906705 **ACOUSTICS** **L T P C**

3 0 0 3

OBJECTIVES:

- To learn the origin of sound.
- To understand the knowledge in sound propagation.
- To enhance the concepts in Sound analysis.
- To acquire basic knowledge in Physiological acoustics.
- To enable the student to understand the analysis of acoustics.

UNIT – I: INTRODUCTION **9**

Origin of sound. Objective and subjective sound. Sound vibrations, Amplitude, form, and period. Sound waves and their wavelength and speed. Sound pressure level. Energy parameters of sound. Dynamical range. Sound envelope, Sound frequency, Relation between frequency and period.

UNIT - II: PROPAGATION OF SOUND **9**

Sound propagation. Spherical and plane waves. Change of intensity of a propagating sound wave. Sound reflections, echo, absorption, diffraction, refraction. Relation between pitch and frequency. Pitch standard. Sound spectrum. Types of Public Addressing system. Hi.fi speakers. Microphones: types and its applications.

UNIT - III: SOUND ANALYSIS **9**

Natural scales. Origin of musical scale. Tonal material and modal scale. Pythagorean tuning, Temperaments. Non-equal temperaments. Equal temperaments. Relation of musical scale and kind of music. Sound Pre-Processing and analysis, Audio analysis tools.

UNIT - IV: PHYSIOLOGICAL ACOUSTICS **9**

Physiological and psychological acoustics. Loudness. Loudness level. Fletcher-Munson diagram. Range of hearing. Masking. Compression of sound information, Pitch, timbre, subjective duration. Absolute pitch. Acoustics instruments. Peripheral auditory system.

UNIT - V: ACOUSTICAL ANALYSIS **9**

Sound phenomena in rooms. Direct sound. Early reflections. Reverberation and its formation, Criteria for good acoustics of a room and methods of their realization, Reverberation time. Dependence of reverberation time on room volume and surfaces

(area and absorption), Evaluation of reverberation time. Optimal reverberation times for various types of music and room sizes.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the basic parameters of sound.
- Understand the effects of propagation.
- Know the basic functions of sound analysis.
- Derive the output using Physiological acoustics.
- Understand the Applications of acoustics.

TEXT BOOKS:

1. Rossing T. D., Moore R. F., Wheeler P. A.," The Science of Sound" 3rd edition San Francisco: Addison Wesley, 2002.
2. Hall D. E.," Musical Acoustics" 3rd edition Pacific Grove, CA: Brooks/Cole, 2001
3. Howard D. M., Angus J. A. S.," Acoustics and psychoacoustics" 5th edition New York, London: Routledge 2017.

REFERENCE BOOKS:

1. Everest F. A., Pohlmann K. C.," Master Handbook of Acoustics" 5th edition New York: McGraw-Hill, 2001.
2. Rossing T. D., ed.," Springer Handbook of Acoustics" 2nd edition Berlin, Heidelberg: SpringerVerlag 2014.
3. Chakrabarti, Pradip Kumar and Chowdhury, Satyabrata, "A Textbook on Waves and Acoustics", New Central book agency, 2010.

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	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	-	-	-	2	2	-	-	-	-	-
2	2	2	-	2	-	2	3	-	-	-	-	-
3	2	2	2	-	-	2	3	-	-	-	-	-
4	2	3	2	2	-	2	2	-	-	-	-	-
5	2	2	1	2	-	2	-	2	-	-	-	-

1906706 VISUAL COMMUNICATION L T P C

3 0 0 3

OBJECTIVES:

- To know about the basics of communication.
- To learn and acquire the art of visual communication.
- To understand and relate the importance of visual communication
- To gain knowledge about the basic of Visual Communication.
- To acquire idea and concepts of various forms of Media

UNIT – I: INTRODUCTION 9

Need for and the Importance of Human and Visual Communication. Communication a expression, skill and process, Understanding Communication: SMRC-Model.

UNIT - II: PROCESS IN COMMUNICATION 9

Communication as a process. Message, Meaning, Connotation, Denotation Culture/Codes etc Levels of communication: Technical, Semantic, and Pragmatic. The semiotic landscape: language and visual communication, narrative representation

UNIT – III: METHODOLOGY 9

Fundamentals of Design: Definition. Approaches to Design, Centrality of Design, EIements/Elements of Design: Line, Shape, Space, Color, Texture. Form Etc. Principles of Design: Symmetry. Rhythm, Contrast, Balance Mass/Scale etc. Design and Designers (Need, role, process, methodologies etc.).

UNIT - IV: DESIGN PROCESS 9

Principles of Visual and other Sensory Perceptions. Color psychology and theory (some aspects) Definition, Optical / Visual Illusions Etc Various stages of design process-problem identification, search for solution refinement, analysis, decision making, Implementation.

UNIT - V: GRAPHIC DESIGN 9

Basics of Graphic Design. Definition, Elements of GD, Design process-research, a source of concept, the process of developing ideas-verbal, visual, combination & thematic, visual thinking, associative techniques, materials, tools (precision instruments etc.) design execution, and presentation.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Learn about the history & evolution of Communication.
- Understand Nature & functions of Visual Communication.
- Acquire knowledge on different types of perception & illusion.
- Gain knowledge on semiotics.
- Remember the world of ideation creating.

TEXT BOOKS:

1. Lester, E Visual Communications: Images with Messages. Thomson Learning, 2013.

2. Jonathan Baldwin, “Visual Communication: From Theory to Practice”, AVA publishing, 2006.

REFERENCE BOOKS:

1. Schildgen, T., “Pocket Guide to color with digital applications”, Thomsom Learning, 2000.
2. Palmer, Frederic, “Visual Elements of Art and Design”, Longman, 1990.
3. Carter, “Typographic Design : Form and Communication”, 6/e, John Wiley, 2014.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	2	1	1	1	-	-	-	-	-	-	1
2	3	2	3	2	3	-	-	-	-	-	-	1
3	3	2	1	2	-	-	-	-	-	-	-	-
4	3	3	3	3	-	-	-	-	-	-	-	-
5	3	-	2	2	3	-	-	-	-	-	-	2

1906707	MEMS AND NEMS	L T P C
		3 0 0 3

OBJECTIVES:

- To introduce the concepts of micro and nano electromechanical devices.
- To know the fabrication process of Microsystems.
- To know the design concepts of micro sensors
- To understand the design of various micro actuators.
- To introduce the concepts of quantum mechanics and nano systems.

UNIT – I: INTRODUCTION TO MEMS AND NEMS 9

Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

UNIT - II: MEMS FABRICATION TECHNOLOGIES 9

Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA, Micromolding.

UNIT - III: MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- Case Study: Piezo-resistive pressure sensor.

UNIT - IV: MICRO ACTUATORS 9

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study: RF Switch.

UNIT - V: NANO DEVICES 9

Atomic Structures and Quantum Mechanics, Shrodinger Equation, ZnO nanorods based NEMS device: Gas sensor.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Interpret the basics of micro/nano electromechanical systems including their applications and advantages.
- Recognize the use of materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA.
- Analyze the key performance aspects of electromechanical sensors.
- Illustrate the design of micro actuators using various actuations.
- Comprehend the theoretical foundations of quantum mechanics and Nano systems.

TEXT BOOKS:

1. Marc Madou, “Fundamentals of Microfabrication”, CRC press 1997.
2. Stephen D. Senturia, “Micro system Design”, Kluwer Academic Publishers, 2001.

REFERENCES BOOKS:

1. Tai Ran Hsu, “MEMS and Microsystems Design and Manufacture”, Tata McGraw Hill, 2002.
2. Chang Liu, “Foundations of MEMS”, Pearson education India limited, 2006.
3. Sergey Edward Lyshevski, “MEMS and NEMS: Systems, Devices, and Structures”, CRC Press, 2002.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	3	3	3	-	-	-	-	-	3	-	-
2	3	-	3	3	-	2	1	-	-	2	-	-
3	3	-	3	3	-	-	1	-	-	2	-	-
4	3	2	3	3	-	-	-	1	-	2	-	-
5	3	2	3	3	-	-	-	1	-	2	-	-

1907001 **TRANSDUCERS ENGINEERING** **L T P C**

3 0 0 3

OBJECTIVES:

- To make the students to know the methods of measurement, classification of transducers and to analyze error.
- To make the students to understand the behavior of transducers under static and dynamic conditions and hence to model the transducer.
- To expose the students to different types of resistive transducers and their application areas.
- To make the students to acquire knowledge on capacitive and inductive transducers.
- To impart knowledge on variety of transducers and get introduced to MEMS and Smart transducers.

UNIT – I: SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS **9**

Units and standards – Static calibration – Classification of errors–Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT - II: CHARACTERISTICS OF TRANSDUCERS **9**

Static characteristics: - Accuracy, precision, resolution, sensitivity, linearity. Dynamic characteristics: Mathematical model of transducer, Zero, I and II order transducers, Response to impulse, step, ramp and sinusoidal inputs.

UNIT - III: VARIABLE RESISTANCE TRANSDUCERS **9**

Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezo-resistive sensor and humidity sensor.

UNIT - IV: VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS **9**

Inductive transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – EI pickup-– Principle of operation, construction details, characteristics of capacitive transducers - Capacitor microphone, Proximity sensor.

UNIT - V: OTHER TRANSDUCERS 9

Piezoelectric transducer – Hall Effect transducer – Magneto elastic sensor – Digital transducers – Smart transducers - Fiber optic sensors – Thick & Thin Film sensors (Bio sensor & Chemical Sensor) – Nano sensors

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply the mathematical knowledge and science & engineering fundamentals gained to solve problems pertaining to measurement applications.
- Analyze the problems related to sensors & transducers.
- Select the right sensor/transducer for a given application.
- Determine the static and dynamic characteristics of transducers
- Understand fiber optic sensor, smart transducers and their applications.

TEXT BOOKS:

1. Doebelin E.O. and Manik D.N., “Measurement Systems”, 7th Edition, McGraw-Hill Education Pvt. Ltd., 2019.
2. A.K. Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2015.

REFERENCE BOOKS:

1. Bela G.Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol. 1, ISA/CRC Press, 2003.
2. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010.
3. E.A. John P. Bentley, Principles of Measurement Systems, 4th Edition, Pearson Education, 2004.
4. W.Bolton, Engineering Science, Elsevier Newnes, Fifth edition, 2006.
5. Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

6. S.Ranganathan,"Transducer Engineering", Allied Publishers Pvt. Ltd. 2003.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	-	-	-	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-	-	-	-	-
3	-	-	1	-	2	3	-	-	-	-	-	1
4	-	-	-	-	2	2	-	-	-	-	-	-
5	-	-	-	1	1	1	-	-	-	-	-	1

1907003 PROCESS MODELING AND SIMULATION L T P C

3 0 0 3

OBJECTIVES:

- To give an overview of various methods of process modeling, different computational techniques for simulation.
- To analyze the simulation for steady state lumped system.
- To analyze the simulation for unsteady state lumped system.
- To analyze the simulation for steady state distributed system.
- To analyze the simulation for unsteady state distributed system.

UNIT – I: INTRODUCTION 9

Introduction to modeling and simulation, classification of mathematical models, conservation equations and auxiliary relations.

UNIT - II: STEADY STATE LUMPED SYSTEMS 9

Degree of freedom analysis, single and network of process units, systems yielding linear and nonlinear algebraic equations, flow sheeting – sequential modular and equation oriented approach, tearing, partitioning and precedence ordering, solution of linear and non-linear algebraic equations.

UNIT - III: UNSTEADY STATE LUMPED SYSTEMS 9

Analysis of liquid level tank, gravity flow tank, jacketed stirred tank heater, reactors, flash and distillation column, solution of ODE initial value problems, matrix differential equations, simulation of closed loop systems.

UNIT - IV: STEADY STATE DISTRIBUTED SYSTEM 9

Analysis of compressible flow, heat exchanger, packed columns, plug flow reactor, solution of ODE boundary value problems.

UNIT - V: UNSTEADY STATE DISTRIBUTED SYSTEM & OTHER MODELLING APPROACHES 9

Analysis laminar flow in pipe, sedimentation, boundary layer flow, conduction, heat exchanger, heat transfer in packed bed, diffusion, packed bed adsorption, plug flow reactor. Empirical modeling, parameter estimation, population balance and stochastic modeling.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Develop the process models based on Conservation principles and Process data.
- Understand the characteristics of state lumped systems.
- Understand the characteristics of state distributed lumped systems.
- Carry out the analysis and design empirical modeling of systems.
- Apply computational techniques to solve the process models..

TEXT BOOKS:

1. Ramirez, W.; “Computational Methods in Process Simulation “, 2nd Edn, Butterworths Publishers, New York, 2000.
2. Luyben, W.L., “ Process Modelling Simulation and Control “,2nd Edn, McGraw-Hill Book Co.,1990

REFERENCE BOOKS:

1. Felder, R. M. and Rousseau, R. W., “Elementary Principles of Chemical Processes “, John Wiley, 2000.
2. Franks, R. G. E., “Mathematical Modelling in Chemical Engineering “, John Wiley, 1967.
3. Amiya K. Jana,”Process Simulation and Control Using ASPEN”, 2nd Edn, PHI Learning Ltd 2012.
4. Amiya K. Jana,”ChemicalProcess Modelling and Computer Simulation”, 2nd Edn, PHI Learning Ltd, 2012.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	3	2	3	2	-	-	-	-	-	-	1
2	3	3	2	3	2	-	-	-	-	-	-	1
3	3	3	2	3	3	-	-	-	-	-	-	1
4	3	3	2	3	3	-	-	-	-	-	-	1
5	3	3	2	3	3	-	-	-	-	-	-	1

1907708 STATE VARIABLE ANALYSIS AND DESIGN L T P C

3 0 0 3

OBJECTIVES:

1. To provide knowledge on design in state variable form.

- To study the design of state variable.
- To study the design of state estimator.
- To study the design of optimal controller.
- To study the design of optimal estimator including Kalman Filter.

UNIT – I: STATE FORMULATION 9

Formulation of state variable model, non-uniqueness, controllability, observability, stability.

UNIT - II: STATE VARIABLE DESIGN 9

Modes, controllability of modes -effect of state and output Feedback- pole placement Design

UNIT - III: STATE ESTIMATION 9

Need for state estimation - design of state Observers - full and reduced order - disturbance estimation - separation principle

UNIT - IV: OPTIMAL CONTROL 9

Introduction - Time varying optimal control - LQR steady state optimal control - Solution of Ricatti's equation - Application examples.

UNIT - V: OPTIMAL ESTIMATION 9

Optimal estimation - Kalman Bucy Filter-Solution by duality principle - Discrete systems - Kalman Filter - Application examples.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply advanced control theory to practical engineering problems.
- Understand and analyse state variable design.
- Understand and analyse state estimation.

- Understand and analyse optimal controller.
- Understand and analyse optimal estimator.

TEXT BOOKS:

1. K. P. Mohandas, “Modern Control Engineering”, 2nd Edition, Sanguine Technical Publishers, 2016.
2. G. J. Thaler, “Automatic Control Systems”, Jaico Publishing House 1993.
3. M.Gopal, “Modern Control System Theory”, 3rd Edition, New Age International Publishers, 2014.

REFERENCE BOOKS:

1. William S Levine, “Control System Fundamentals,” The Control Handbook, CRC Press, Tayler and Francies Group, 2011.
2. Ashish Tewari, “Modern Control Design with Matlab and Simulink”, John Wiley, New Delhi, 2002.
3. K. Ogata, “Modern Control Engineering”, 5th Edition, PHI, New Delhi, 2002.
4. T. Glad and L. Ljung,, “Control Theory –Multivariable and Non-Linear Methods”, Taylor & Francis, 2002.
5. D.S.Naidu, “Optimal Control Systems” First Indian Reprint, CRC Press, 2009.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	2	-	-	-	-	-	-	-	-	-	-
2	-	2	-	2	-	-	-	-	-	-	-	-
3	-	2	-	2	-	-	-	-	-	-	-	-
4	-	2	-	2	-	-	-	-	-	-	-	-
5	-	2	-	2	-	-	-	-	-	-	-	-

1909718 **ROBOTICS** **L T P C**

3 0 0 3

OBJECTIVES:

- Understand the functions of robots and review the need and application of robots in different engineering fields.
- Exemplify the different types of robot drive systems as well as robot end effectors.
- Apply the different sensors and image processing techniques in robotics to improve the ability of robots.
- Develop robotic programs for different tasks and analyze the kinematics motions of robot.
- Implement robots in various industrial sectors and interpolate the economic analysis of robots.

UNIT – I: FUNDAMENTALS OF ROBOT **9**

Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load-Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT - II: ROBOT DRIVE SYSTEMS AND END EFFECTORS **9**

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic-Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT - III: SENSORS AND MACHINE VISION **9**

Requirements of a sensor, Principles and Applications of the following types of sensors-Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data-Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature

Extraction, Object Recognition, Other Algorithms, Applications-Inspection, Identification, Visual Serving and Navigation.

UNIT - IV: ROBOT KINEMATICS AND ROBOT PROGRAMMING 9

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT - V: IMPLEMENTATION AND ROBOT ECONOMICS 9

RGV, AGV; Implementation of Robots in Industries -Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the functions of robots and review the need and application of robots in different engineering fields.
- Exemplify the different types of robot drive systems as well as robot end effectors.
- Apply the different sensors and image processing techniques in robotics to improve the ability of robots.
- Develop robotic programs for different tasks and analyze the kinematics motions of robot.
- Implement robots in various industrial sectors and interpolate the economic analysis of robots.

TEXT BOOKS:

1. Klafter R.D., Chmielewski T.A and Negin M., “Robotic Engineering - An Integrated Approach”, Prentice Hall, 2003.
2. Groover M.P., “Industrial Robotics -Technology Programming and Applications”, McGraw Hill, 2001.

REFERENCE BOOKS:

1. Craig J.J., “Introduction to Robotics Mechanics and Control”, Pearson Education,

2008.

2. Deb S.R., “Robotics Technology and Flexible Automation” Tata McGraw Hill Book Co., 1994.
3. Koren Y., “Robotics for Engineers", McGraw Hill Book Co., 1992.
4. Fu.K.S., Gonzalz R.C. and Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”,McGraw Hill Book Co., 1987.
5. Rajput R.K., “Robotics and Industrial Automation”, S.Chand and Company, 2008.

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1	3	-	1	2	-	-	-	-	-	-	-	-
2	3	-	2	2	-	-	-	-	-	-	-	1
3	3	3	2	2	-	-	-	-	-	-	-	1
4	3	-	2	3	-	-	-	-	-	-	-	1
5	3	-	3	3	-	-	-	-	-	-	-	1

1909719	TESTING OF MATERIALS	L T P C
		3 0 0 3

OBJECTIVES:

- Apply the concept of testing to various materials and result analysis.
- Apply various mechanical testing procedures to different materials.
- Apply different nondestructive testing procedures to different materials.
- Apply material characterization testing for analysis.
- Apply advanced testing techniques for thermal and chemical fields.

UNIT – I: INTRODUCTION TO MATERIALS TESTING 9

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT - II: MECHANICAL TESTING 9

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT - III: NON DESTRUCTIVE TESTING 9

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission- Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT - IV: MATERIAL CHARACTERIZATION TESTING 9

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

UNIT - V: OTHER TESTING 9

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermo-mechanical and Dynamic mechanical analysis: Principles, Advantages, Applications.

Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply the concept of testing to various materials and result analysis.
- Apply various mechanical testing procedures to different materials.
- Apply different nondestructive testing procedures to different materials.
- Apply material characterization testing for analysis.
- Apply advanced testing techniques for thermal and chemical fields.

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.
2. Cullity, B. D., “Elements of X-ray diffraction”, 3rd Edition, Addison-Wesley Company Inc., New York, 2000.

REFERENCE BOOKS:

1. P. Field Foster, “The Mechanical Testing of Metals and Alloys” 7th Edition, Cousens Press, 2007.
2. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9th Edition, American Society for Metals, 1978.
3. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA.
4. Brandon D.G., “Modern Techniques in Metallography”, Von Nostrand Inc. NJ, USA, 1986.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	2	1	1	-	-	-	-	-	-	-	1
2	3	2	1	1	-	-	-	-	-	-	-	1
3	2	2	1	1	-	-	-	-	-	-	-	1
4	3	2	1	1	-	-	-	-	-	-	-	1
5	3	2	1	1	-	-	-	-	-	-	-	1

1909720 DESIGN OF ELECTRICAL VEHICLES L T P C

3 0 0 3

OBJECTIVES:

- Understand about electric vehicle technology.
- Understand the load distribution and stability of vehicles.
- Analyze the handling characteristics of road vehicles.
- Analyze the steering, suspension and designing of breaks
- Understand hybrid vehicles, power electronics and fuel cell vehicles.

UNIT – I: INTRODUCTION TO ELECTRIC VEHICLES 9

Electric Vehicle – Need - Types – Cost and Emissions – End of life. Electric Vehicle Technology – layouts, cables, components, Controls. Batteries – overview and its types. Battery plug-in and life. Ultra-capacitor, Charging – Methods and Standards. Alternate charging sources – Wireless & Solar.

UNIT - II: STABILITY OF VEHICLES 9

Load distribution for three wheeler and four wheeler-Stability of vehicle running on slope, banked road and during turn-calculation of Tractive effort, maximum acceleration and reaction forces for different drives.

UNIT - III: HANDLING CHARACTERISTICS OF ROAD VEHICLES 9

Steering geometry-Steady state handling characteristics- Steady state response to steering input-Testing of handling characteristics-Transient response characteristics-Directional stability.

UNIT - IV: STEERING, SUSPENSION AND BRAKE 9

Steering System - Ackerman Principle of Steering - Front End Geometry - Steering Gearbox- Types-Recirculating Ball - Rack and Pinion - Power Steering. Suspension - Front and Rear Forks - Springs for Suspension - Telescopic Suspension - Monoshock Suspension - Hydraulic Shock Absorber - Dampers. Design Consideration – Brake - Drum Brakes - Disc Brakes - ABS.

UNIT - V: POWER ELECTRONICS AND CONTROL FOR HYBRID AND FUEL CELL VEHICLES 9

Series Hybrid Vehicle Propulsion System, Parallel Hybrid Vehicle Propulsion System, Fuel Cell Vehicles, Power Electronics Requirements, Propulsion Motor Control Strategies, APU Control System in Series Hybrid Vehicles, Fuel Cell for APU Applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand about electric vehicle technology.
- Understand the load distribution and stability of vehicles.
- Analyze the handling characteristics of road vehicles.
- Analyze the steering, suspension and designing of breaks.
- Understand hybrid vehicles, power electronics and fuel cell vehicles.

TEXT BOOKS:

1. Hybrid Electric Vehicle System Modeling and Control - Wei Liu, General Motors, USA, John Wiley & Sons, Inc., 2017.
2. Rajesh Rajamani, "Vehicle Dynamics and Control", 1st edition, Springer, 2005

REFERENCE BOOKS:

1. Thomas D. Gillespie, "Fundamentals of Vehicle Dynamics", Society of Automotive Engineers Inc, 1992.
2. Dr.Kirpal Singh, ‘Automobile Engineering’- Vol. I and II, Standard Publishers, New Delhi, 2011.
3. V. Ganesan, ‘Internal Combustion Engines’, Tata McGraw Hill Book Co, Eighth Reprint, 2010.
4. Ali Emadi, “Handbook of Automotive Power Electronics and Drives”, Taylor & Francis Group, First Edition, USA, 2005.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	-	2	1	1	-	1	-	1	-	-	1	2
2	2	-	-	1	2	-	-	-	1	-	-	-
3	1	-	1	-	-	1	-	-	-	-	1	-
4	-	2	2	1	-	-	2	-	-	-	-	-
5	2	2	-	1	-	-	-	-	-	-	2	-

1910703	CLINICAL TRIALS	L T P C
		3 0 0 3

OBJECTIVES:

- To highlight the epidemiologic methods, study design, protocol preparation.
- To learn about the crossover and factorial trial designs.
- To gain knowledge in the basic bio-statistical techniques involved in clinical research.
- To describe the principles involved in ethical, legal and regulatory issues in clinical trials.
- To explore the reporting of trials.

UNIT – I: ROLE OF CLINICAL TRIALS IN NEW DRUG DEVELOPMENT **9**

Drug Discovery, regulatory guidance and governance, pharmaceutical manufacturing, nonclinical research, clinical trials, post-marketing surveillance, ethical conduct during clinical trials.

UNIT - II: FUNDAMENTALS OF TRIAL DESIGN **9**

Randomised clinical trials, uncontrolled trials. Protocol development, endpoints, patient selection, source and control of bias, randomization, blinding, sample size and power.

UNIT - III: ALTERNATE TRIAL DESIGNS **9**

Crossover design, factorial design, equivalence trials, bioequivalence trials, non-inferiority trials, cluster randomized trials, multi-center trials.

UNIT - IV: BASICS OF STATISTICAL ANALYSIS **9**

Types of data and normal distribution, significance tests and confidence intervals, comparison of means, comparison of proportions, analysis of survival data, subgroup analysis, regression analysis, missing data.

UNIT - V: REPORTING OF TRIALS **9**

Overview of reporting, trial profile, presenting baseline data, use of tables, figures, critical appraisal of report, meta-analysis.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain key concepts in the design of clinical trials.
- Describe study designs used in data management for clinical trials.
- Identify key issues and determine alternate trial designs.
- Recognize the roles of regulatory affairs in clinical trials.
- Provide the overview of reporting trials to the students.

TEXT BOOKS:

1. Lawrence M. Friedman, “Fundamentals of Clinical Trials”, Springer Science & Business Media, Fifth Edition, 2015.
2. Stuart J. Pocock, “Clinical Trials: A Practical Approach”, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. David Machin, Simon Day, Sylvan Green, “Textbook of Clinical Trials”, Second Edition, John Wiley & Sons, 2007.
2. Duolao Wang, Ameet Bakhai, “Clinical trials, A practical guide to design, analysis and reporting”, First Edition, Remedica, 2006.
3. T.A. Durham, J Rick Turner, “Introduction to statistics in pharmaceutical clinical trials”, First Edition, Pharmaceutical Press, 2008.
4. Tom Brody, “Clinical Trials: Study Design, Endpoints and Biomarkers, Drug Safety, and FDA and ICH Guidelines”, Second Edition, Academic Press, 2016.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	-	-	-	-	-	2	-	-	-	2
2	3	2	2	-	-	-	-	2	-	-	-	2
3	3	3	2	2	-	-	-	2	-	-	-	2
4	3	3	-	-	-	-	2	3	-	-	-	2
5	3	-	-	-	-	-	-	3	-	-	-	2

1910704 REGULATORY REQUIREMENTS IN PHARAMACEUTICAL INDUSTRIES **L T P C 3 0 0 3**

OBJECTIVES:

- To acquire the knowledge of pharmaceutical industry regulations.
- To learn about the packaging and labeling of drugs.
- To learn about the patent filling process.
- To gain knowledge about the quality guidelines in drug products.
- To gain knowledge on documentation.

UNIT – I: REGULATORY CONCEPTS **9**

Quality assurance – Quality control – Practice of cGMP – Schedule M – USFDA.

UNIT - II: REGULATORY ASPECTS **9**

Pharmaceuticals: Bulk drug manufacture; Personnel, Buildings and Facilities, Process Equipment, Documentation and Records, Materials Management, Production and In-Process Controls, Packaging and Identification Labelling of API‟s and Intermediates, Storage and distribution, – Biotechnology derived products; Principles, Personnel, Premises and equipments, Animal quarters and care, production, labelling, Lot processing records and distribution records, quality assurance and quality control.

UNIT - III: INTELLECTUAL PROPERTY RIGHTS **9**

Patent system – Different types of patents – Filing process of application for patent – Infringement of patents – The patent rules 2003 as amended by the patents (amendment) rules 2016.

UNIT - IV: ICH GUIDELINES **9**

Quality guidelines – Impurities in new drug substances (Q3A(R2)) – Impurities in newdrug products(Q3B(R2)) – Validation of analytical procedures text and methodology (Q2 (R1)).

UNIT - V: QUALITY AUDIT AND SELF INSPECTIONS **9**

SOPs – Documentation – Loan license auditing – Common technical documentation (CTD) – Drug master file (DMF).

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the pharmaceutical industry manufacturing practices and regulatory aspects of pharmacy products.
- Describe the process of patenting activities.
- Assess the different types of patents and filling process.
- Explore the quality guidelines followed for pharmaceutical products.
- Enumerate the aspects involved in document preparation for pharmaceutical product registration.

TEXT BOOKS:

1. C.V.SSubbrahmanyam & J.Thimmasetty, Pharmaceutical regulatory affairs, 1stEdn., vallabhPrakashan, New Delhi, 2012.
2. Willig, H., Tuckeman, M.M. and Hitchings, W.S., “Good Manufacturing Practices for Pharmaceuticals”, 5th Edition, Marcel Dekker Drugs and the Pharmaceutical Sciences, by CRC Press, New York, 2000.
3. N Udupa, Krishnamurthy Bhat, A Concise Textbook of Drug Regulatory Affairs, Manipal University Press (MUP); First Edition, 2015.

REFERENCE BOOKS:

1. Ira R. Berry,The Pharmaceutical Regulatory Process, marcel dekker Series: Drugs and the Pharmaceutical Sciences, by CRC Press, Newyork, 2004.
2. Mindy J. Allport-Settle, Current Good Manufacturing Practices: Pharmaceutical, Biologics, and Medical Device Regulations and Guidance Documents Concise Reference, Pharmalogika Inc., USA, 2009.
3. Sharma, P.P., “How to Practice GMPs”, 3rd Edition, Vandana Publications, 2006.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	-	-	-	-	-	3	3	-	-	-	3
2	2	3	-	-	-	2	3	3	-	-	-	2
3	2	2	3	2	-	2	3	3	-	-	-	2
4	2	-	-	-	-	2	3	3	-	-	-	2
5	2	-	-	-	-	2	3	3	-	-	-	2

1910705 MICROBIOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To understand the principles of Microbiology.
- To emphasize the structure and biochemical aspects of various microbes.
- To learn about the Nutritional classification of microorganisms.
- To gain knowledge on the physical and chemical control of microorganisms.
- To acquire knowledge about the preservation of food.

UNIT – I: INTRODUCTION TO MICROBIOLOGY 9

Classification and nomenclature of microorganisms, microscopic examination of microorganisms: light, fluorescent, dark field, phase contrast, and electron microscopy.

UNIT - II: MICROBES- STRUCTURE AND REPRODUCTION 9

Structural organization and multiplication of bacteria, viruses (TMV, Hepatitis B), algae (cyanophyta, rhodophyta) and fungi (Neurospora), life history of actinomycetes (Streptomyces), yeast (Sacharomyces), mycoplasma (M. pneumoniae) and bacteriophages (T4 phage, ʎ phage)

UNIT - III: MICROBIAL NUTRITION, GROWTH AND METABOLISM 9

Nutritional classification of microorganisms based on carbon, energy and electron sources Definition of growth, balanced and unbalanced growth, growth curve and different methods to quantify bacterial growth:(counting chamber, viable count method, counting without equipment, different media used for bacterial culture (defined, complex, selective, differential, enriched) the mathematics of growth-generation time, specific growth rate.

UNIT - IV: CONTROL OF MICROORGANISMS 9

Physical and chemical control of microorganisms Definition of sterilization, dry and moist heat, pasteurization, tyndalization; radiation, ultrasonication, filtration. Disinfection sanitization, antiseptics sterilants and fumigation. mode of action and resistance to antibiotics; clinically important microorganisms

UNIT - V: INDUSTRIAL MICROBIOLOGY 9

Microbes involved in preservation (Lactobacillus,bacteriocins), spoilage of food and food borne pathogens (E.coli, S.aureus, Bacillus, Clostridium). Industrial use of microbes

(production of penicillin, alcohol, vitamin B-12); biogas; bioremediation(oil spillage leaching of ores by microorganisms ,pollution control); biofertilizers, biopesticides. Biosensors.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the fundamentals of Microbiology.
- Explore the scope of Microbiology.
- Apply knowledge to solve the problems in microbial infection and their control.
- Analyze the concept of food preservation.
- Describe the industrial use of microbes..

TEXT BOOKS:

1. Ananthanarayanan, R. and C.K. Jayaram Paniker, “Textbook of Microbiology”, University Press, Ninth Edition, 2015.
2. Prescott L.M., Harley J.P., Klein DA, “Microbiology”, Eleventh Edition, McGraw -Hill Inc., 2020.

REFERENCE BOOKS

1. Pelczar, M.J. “Microbiology”, Fifth Edition, Tata McGraw-Hill, 1993.
2. Talaron K, Talaron A, Casita, Pelczar and Reid. Foundations in Microbiology, W.C. Brown Publishers, 1993.
3. Schlegel, H.G. “General Microbiology”, Seventh Edition, Cambridge University Press, 1993.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	-	-	-	-	-	-	-	-	-	2
2	3	2	-	-	-	-	-	-	-	-	-	2
3	3	2	2	2	-	2	1	2	-	-	-	2
4	3	-	-	2	-	1	2	2	-	-	-	2
5	3	-	-	-	-	3	2	-	-	-	-	2

1920701 ANALYTICAL METHODS AND INSTRUMENTATION L T P C

3 0 0 3

OBJECTIVES:

- Make the students understand the basics of spectrometry
- To explore the knowledge on molecular spectroscopy.
- To introduce the NMR and MASS spectrometry.
- To elucidate the various separation methods in chromatography.
- To gain knowledge on potentiometry and surface microscope.

UNIT – I: SPECTROMETRY 9

Properties of electromagnetic radiation- wave properties – components of optical instruments– Sources of radiation – wavelength selectors – sample containers – radiation transducers – Signal process and read outs – signal to noise ratio - sources of noise – Enhancement of signal to noise - types of optical instruments – Applications.

UNIT - II: MOLECULAR SPECTROSCOPY 9

Molecular absorption spectrometry – Measurement of Transmittance and Absorbance – Beer's law – Instrumentation - Applications -Theory of fluorescence and Phosphorescence –Theory of Infrared absorption spectrometry – IR instrumentation – Applications – Theory of Raman spectroscopy – Instrumentation – applications.

UNIT - III: NMR AND MASS SPECTROMETRY 9

Theory of NMR – chemical shift- NMR-spectrometers – applications of 1H and 13C NMR-Molecular mass spectra – ion sources.Massspectrometer.Applications of molecular mass - Electron paramagnetic resonance- g values – instrumentation.

UNIT - IV: SEPARATION METHODS 9

General description of chromatography – Band broadening and optimization of column performance-Liquid chromatography – Partition chromatography – Adsorption chromatography – Ion exchange chromatography -size exclusion chromatography- Affinity chromatography- principles of GC and applications – HPLC- Capillary electrophoresis – Applications.

UNIT - V: ELECTRO ANALYSIS AND SURFACE MICROSCOPY 9

Electrochemical cells- Electrode potential cell potentials – potentiometry- reference

electrode – ionselective and molecular selective electrodes – Instrument for potentiometric studies – Voltametry – Cyclic and pulse voltametry- Applications of voltametry . Study of surfaces – Scanning probemicroscopes – AFM and STM.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Ability to understand the concept of spectrometry
- Ability to know the operations of various instruments.
- Able to apply molecular spectroscopy concepts in NMR and MASS spectrometry.
- Ability to understand surface microscopy and its applications.
- Ability to acquire knowledge on surface microscopic techniques and voltametric applications.

TEXT BOOKS:

1. Skoog, D.A. F. James Holler, and Stanky, R.Crouch “Instrumental Methods of Analysis”.Cengage Learning , 2007.
2. Willard, Hobart, etal, “Instrumental Methods of Analysis”. VIIth Edition, CBS, 1986.
3. Braun, Robert D. “Introduction to Instrumental Analysis”. Pharma Book Syndicate, 1987.
4. Ewing,G.W. “Instrumental Methods of Chemical Analysis”, Vth Edition, McGraw-Hill, 1985

REFERENCE BOOKS:

1. Sharma, B.K. “Instrumental Methods of Chemical Analysis : Analytical Chemistry” GoelPublishing House, 1972.
2. Haven, Mary C., etal., “Laboratory Instrumentation “. IVth Edition, John Wiley, 1995.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	-	3	2	2	-	-	3	-	3	2	1
2	2	2	3	2	2	-	-	2	2	3	2	1
3	2	2	3	3	3	-	2	2	2	3	3	1
4	3	2	3	3	3	-	-	3	2	3	3	1
5	3	-	3	2	2	-	-	3	-	3	2	1

1920702 MEDICAL PHYSICS L T P C

3 0 0 3

OBJECTIVES:

- To study the complete non-ionizing radiations including light and its effect in human body.
- To understand the principles of ultrasound radiation and its applications in medicine.
- To learn about radioactive nuclides.
- To know the interactions of radiation with matters and how isotopes are produced.
- To study the harmful effects of radiation and radiation protection regulations.

UNIT – I: NON-IONIZING RADIATION AND ITS MEDICAL APPLICATION 9

Introduction to EM waves - Tissue as a leaky dielectric - Relaxation processes: Debye model, Cole–Cole model- Overview of non-ionizing radiation effects-Low Frequency Effects- Higher frequency effects. Physics of light-Measurement of light and its unit- limits of vision and color vision an overview - Applications of ultraviolet in medicine, Thermography.

UNIT - II: ULTRASOUND IN MEDICINE 9

Ultrasound fundamentals – Generation of ultrasound (Ultrasound Transducer) - Interaction of Ultrasound with matter: Cavitation, Reflection, Transmission- Scanning systems – Artefacts- Ultrasound- Doppler-Double Doppler shift-Clinical Applications-Ultrasonography.

UNIT - III: PRINCIPLES OF RADIOACTIVE NUCLIDES AND DECAY 9

Introduction to Radioisotopes - Radioactive decay : Spontaneous Fission, Isomeric Transition, Alpha Decay, Beta Decay, Positron Decay, Electron Capture- Radioactive decay equations – Half life- Mean Life- Effective half-life - Natural and Artificial radioactivity, - Production of radionuclide – Cyclotron produced Radionuclide - Reactor produced Radionuclide: fission and electron Capture reaction, Target and Its Processing Equation for Production of Radionuclide - Radionuclide Generator-Technetium generator.

UNIT - IV: INTERACTION OF RADIATION WITH MATTER 9

Interaction of charged particles with matter –Specific ionization, Linear energy transfer, range, Bremsstrahlung, Annihilation - Interaction of X and Gamma radiation with matter: Photoelectric effect, Compton Scattering, Pair production- Attenuation of Gamma Radiation - Interaction of neutron with matter and their clinical significance- Radionuclide used in Medicine and Technology.

UNIT - V: RADIATION EFFECTSAND REGULATIONS 9

Classification of Radiation Damage, Stochastic and Deterministic Effects, Acute Effects of Total Body Irradiation, Long-Term Effects of Radiation, Risk Versus Benefit in Diagnostic Radiology and Nuclear Medicine, Risk of Pregnant Women, Nuclear Regulatory Commission, ALARA Program, Medical Uses of Radioactive Materials, Survey for Contamination and Exposure Rate, Dose Calibrators and Survey Meters, Bioassay, Radioactive Waste Disposal.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the low frequency and high frequency effects of non-ionizing radiation and physics of light.
- Define various clinical applications based on ultrasound wave.
- Explain the process of radioactive nuclide production using different techniques.
- Analyze radiation mechanics involved with various physiological systems.
- Outline the detrimental effects of radiation and regulations for radiation safety.

TEXT BOOKS:

1. B H Brown, R H Smallwood, D C Barber, P V Lawford and D R Hose, Medical Physics and Biomedical Engineering, 2nd Edition, IOP Publishers.2001.
2. Gopal B. Saha, Physics and Radiobiology of Nuclear Medicine, 4th Edition, Springer, 2013.
3. R.Hendee and Russell Ritenour “Medical Imaging Physics”, Fourth Edition William, Wiley-Liss, 2002.

REFERENCE BOOKS:

1. S.Webb " The Physics of Medical Imaging", Taylor and Francis,1988
2. HyltonB.Meire and Pat Farrant "Basic Ultrasound" John Wiley & Sons,1995
3. John R Cameran , James G Skofronick "Medical Physics" John-Wiley & Sons.1978.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	1	1	-	-	2	1	-	-	-	-	3
2	3	1	2	2	1	-	1	-	-	-	-	3
3	3	1	2	-	-	2	2	-	-	-	-	2
4	2	1	1	-	1	1	1	-	-	-	-	1
5	3	2	3	-	2	1	3	-	-	-	-	3

1920703 ELECTRONIC MATERIALS L T P C

3 0 0 3

OBJECTIVES:

- To Understand the various materials and its properties towards electrical and electronics field.
- To cover the properties of conducting materials.
- Make the students to understand various semiconducting and magnetic materials and their properties.
- To give an idea on dielectric and insulating materials.
- To explore the knowledge on optoelectronic and nano materials

UNIT – I: INTRODUCTION 7

Structure: atomic structures and bonding, types of bonding, band formation. Defects and imperfections in solids: Point, Line and Planar defects; Interfacial defects and volume defects. Classification of materials based on bonding: conductors, semiconductors and insulators.

UNIT - II: CONDUCTING MATERIALS 9

Introduction, factors affecting the conductivity of materials, classification based on conductivity of materials, temperature dependence of resistivity, Low resistivity materials (graphite, Al, Cu and steel) and its applications, high resistivity materials (manganin, constantan, nichrome, tungsten) and their applications. Superconductors: Meissner effect, classification and applications.

UNIT - III: SEMICONDUCTING AND MAGNETIC MATERIALS 10

Semiconductors: Introduction, types of semiconductors, temperature dependence of semiconductors, compound semiconductors, basic ideas of amorphous and organic semiconductors. Magnetic Materials: classification of magnetic materials, ferromagnetism-B-H curve (Qualitative), hard and soft magnetic materials, magneto materials applications.

UNIT - IV: DIELECTRIC AND INSULATING MATERIALS 9

Dielectric Materials: Introduction, classification, temperature dependence on polarization, properties, dielectric loss, factors influencing dielectric strength and capacitor materials, applications. Insulators: Introduction, thermal and mechanical properties required for insulators, Inorganic materials, organic materials, liquid insulators, gaseous insulators and

ageing of insulators, applications.

UNIT - V: OPTOELECTRONIC ANDNANO ELECTRONIC MATERIALS **10**

Optoelectronic materials. Introduction, properties, factor affecting optical properties, role of optoelectronic materials in LEDs, LASERs, photo detectors, solar cells. Nano electronic Materials: Introduction, advantage of nanoelectronic devices, materials, fabrication, challenges in Nano electronic materials.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Ability to understand the fundamentals of conducting materials
- Able to define various applications of semiconducting and magnetic materials
- Able to explain the concepts of dielectrics and insulating materials
- Ability to explain various optoelectronic devices and nano electronic materials
- With the basis, students will be able to have clear concepts on electronic behaviors of materials.

TEXT BOOKS:

1. S.O. Kasap “Principles of Electronic Materials and Devices”, 3rd edition, McGraw-Hill Education (India) Pvt. Ltd., 2007.
2. W D Callister, “Materials Science & Engineering – An Introduction”, Jr., John Willey & Sons, Inc, New York, 7th edition, 2007.

REFERENCE BOOKS:

1. B.G. Streetman and S. Banerjee, Solid State Electronic Devices, 6th edition, PHI Learning, 2009.
2. Eugene A. Irene, Electronic Materials Science, Wiley, 2005
3. Wei Gao, Zhengwei Li, Nigel Sammes, An Introduction to Electronic Materials for Engineers, 2nd Edition, World Scientific Publishing Co. Pvt. Ltd., 2011.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1	1	2	1	1	1	1	-	-	-	-	-
2	2	2	2	1	2	-	-	-	-	-	-	-
3	3	3	3	-	3	2	-	-	-	-	-	-
4	2	3	3	1	3	3	-	-	-	-	-	-
5	2	3	2	1	3	3	-	-	-	-	-	-

1921701 WASTE WATER TREATMENT LT P C

3 0 0 3

OBJECTIVES:

- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic under standings about the requirements of water and its preliminary treatment.
- To study the dynamic processes and understand the features of corrosion and its effects
- To develop and understand the waste water treatment process
- To provide a broad view about the water quality and its standards

UNIT – I: WATER QUALITY AND PRELIMINARY TREATMENT 9

Water Quality-physical-chemical and biological parameters of water-Water quality requirement - potable water standards-Wastewater effluent standards-water quality indices. Water purification systems in natural systems- physical processes-chemical processes and biological processes-Primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification-sedimentation; Types-aeration and gas transfer-coagulation and flocculation, coagulation processes.

UNIT - II: INDUSTRIAL WATER TREATMENT 9

Filtration-size and shape characteristics of filtering media-sand filters hydraulics of filtration-design considerations-radial, upflow, highrate and multimedia filters, pressure filter. Water softening-lime soda, zeolite and demineralization processes – Boiler troubles-scale, sludge, priming, foaming, caustic embrittlement and boiler corrosion.

UNIT - III: CONVENTIONAL TREATMENT METHODS 9

Taste and odour control-Adsorption-activated carbon treatment-removal of color-iron and manganese removal-aeration, oxidation, ion exchange and other methods-effects of fluorides-fluoridation and defluoridation-desalination-Corrosion prevention and control-factors influencing corrosion-Langelier index-Corrosion control measures.

UNIT - IV: WASTEWATER TREATMENT 9

Wastewater treatment-pre and primary treatment-equalization neutralization-screening and grid removal-sedimentation-oil separation gas stripping of volatile organics-biological oxidation-lagoons and stabilization basins-aerated lagoons-activated sludge process-trickling filtration-anaerobic decomposition-Break point chlorination.

UNIT - V: ADSORPTION AND OXIDATION PROCESSES 9

Chemical process-Adsorption-theory of adsorption-Ion exchange process-chemical oxidation- advanced oxidation process-sludge handling and disposal-Miscellaneous treatment processes.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Gain idea about various methods available for water treatment.
- Appreciate the necessity of water and acquire knowledge of preliminary treatment.
- Interpret the nature of corrosion and its harmful effects.
- Value the various waste water treatment methods.
- Understand about adsorption and oxidation process.

TEXT BOOKS:

1. Metcalf and Eddy, “Wastewater Engineering”, 4th ed., McGraw Hill Higher Edu, 2002.
2. G.L.Karia and R.A. Christian, Waste Water Treatment, Concepts and Design Approach, Prentice Hall, 2013.
3. Joanne E. Drinon and Frank Spellman, Water and Waste Water Treatment, CRC Press, 2012.

REFERENCE BOOKS:

1. S.P. Mahajan, “Pollution control in process industries”, 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
2. M. Lancaster, “Green Chemistry: An Introductory Text”, 2nd edition, RSC publishing, 2010.
3. C.S. Rao, “Environmental Pollution Control Engineering”, New Age International, 2007.
4. M.J. Hammer and M.J. Hammer (Jr.), Water and Waste Water Technology,

Pearson, 2011.

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	1	1	1	-	1	-	-	2	-	-	1
2	1	2	1	1	-	-	-	-	1	-	-	1
3	3	1	1	-	3	1	-	-	-	-	-	1
4	2	-	-	-	1	-	-	-	-	-	-	1
5	3	-	-	-	1	-	-	-	-	-	-	1