



You Choose, We Do It
St. JOSEPH'S COLLEGE OF ENGINEERING
(An Autonomous Institution)
St. Joseph's Group of Institutions
Jeppiaar Educational Trust
OMR, Chennai - 119.



B.TECH INFORMATION TECHNOLOGY
REGULATION – 2021
CHOICE BASED CREDIT SYSTEM
I - VIII SEMESTERS CURRICULA AND SYLLABI



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I TO VIII SEMESTERS CURRICULAM AND SYLLABUS
PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO 1: To ensure graduates will be capable of applying the basic knowledge of physical sciences, mathematics and Information Technology for the applications pertinent to different fields of Engineering and Technology.

PEO 2: To enhance graduates with the core capabilities important for applying information on computers and telecommunication systems, gear to send, store, recover, control and investigate information with regards to business undertaking.

PEO 3: To enable graduates to think sensibly, pursue lifelong learning and will have the ability to comprehend technical issues related to computing systems and to come up with best possible solutions.

PEO 4: To empower graduates to create equipment and programming frameworks by comprehending the values of social, business and ecological necessities in the human setting.

PEO 5: To enable graduates to get placed in leading companies and develop themselves as professionals by applying their technological skills to real-world problems and meeting the diverse needs of business, education, and science.

COMPUTER COMMUNICATION PROGRAM OUTCOMES POs:

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review 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 the public health and safety, and the 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 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.

PROGRAM SPECIFIC OBJECTIVES (PSOs):

PSO1:To analyse and design an efficient information management system which uses the concepts of Information technology to deliver technological solutions and to analyse its impact in the societal and human context.

PSO2:To identify the resources needed for building complex IT projects with an understanding of risk management processes, operational and policy implications considering human, financial and ecological factors.

PSO3:To develop and test software projects by applying IT tools and techniques for the development of computational systems to serve the needs of the community at large.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

Abroad relation between the Programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3										
2	1		1		2							
3												3
4						2	1	3	2			
5			1	2	1					2	1	

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

Abroad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAM SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	2			3				2	2		
2				3			3	3			3	
3	1		2		3	2						

Contribution 1: Reasonable

2: Significant

3: Strong

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES

A broad relation between the Course Outcomes and Program Outcomes (POs) and Program Specific Outcomes (PSOs) are given in the following table

Sem	Course Title	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	Communicative English								√	√	√		√	√	√	√
	Engineering Mathematics-I	√	√	√						√				√	√	√
	Engineering Physics	√	√	√										√	√	√
	Engineering Chemistry	√	√	√										√	√	√
	Problem Solving and Python Programming	√	√	√										√	√	√
	Engineering Graphics	√	√	√		√			√	√	√		√	√	√	√
	Python Programming Laboratory	√	√	√					√	√	√		√	√	√	√
	Physics and Chemistry Laboratory	√	√	√					√	√	√			√	√	√
II	Professional English								√	√	√		√	√	√	√
	Engineering Mathematics-II	√	√	√						√				√	√	√
	Physics for Information Science	√	√	√										√	√	√
	Environmental Science and Engineering	√	√	√				√	√	√	√		√	√	√	√
	Basic Electrical, Electronics and Measurement Engineering	√	√	√										√	√	√
	Programming in C	√	√	√					√	√	√		√	√	√	√
	Engineering Practice Laboratory	√	√	√	√	√	√		√	√	√		√	√	√	√
	Programming in C Laboratory	√	√	√					√	√	√		√	√	√	√
III	Probability and Statistics	√	√	√						√				√	√	√
	Java Programming	√	√	√										√	√	√
	Digital Principles & Logic Design (Lab Integrate)	√	√	√										√	√	√

	Data Structures	√	√	√	√	√	√							√	√	√
	Computer Architecture	√	√	√										√	√	√
	Software Engineering	√	√	√					√	√	√		√	√	√	√
	Data Structures Laboratory using C	√	√	√					√	√	√		√	√	√	√
	Java Programming Laboratory	√	√	√			√		√	√	√		√	√	√	√
	Professional Skills Laboratory						√	√	√	√	√	√	√	√	√	√
IV	Discrete Mathematics	√	√	√						√	√		√	√	√	√
	Design and Analysis of Algorithm	√	√	√	√	√				√		√	√	√	√	√
	Operating Systems	√	√	√	√	√					√	√	√	√	√	√
	Database Design and Management (Lab Integrated)	√	√	√	√	√					√	√	√	√	√	√
	Computer Communication	√	√	√										√	√	√
	Foundations of Machine Learning	√	√	√	√	√	√	√			√	√	√	√	√	√
	Operating Systems Laboratory	√	√	√	√	√					√	√	√	√	√	√
	Machine Learning Laboratory	√	√	√	√	√			√		√	√	√	√	√	√
V	Algebra and Number Theory	√	√	√						√				√	√	√
	Object Oriented Analysis and Design	√	√	√										√	√	√
	Web Technology	√	√	√		√				√		√	√	√	√	√
	Computational Intelligence (Lab Integrated)	√	√	√			√							√	√	√
	Web Technology Laboratory	√	√	√			√	√	√	√	√		√	√	√	√
	Object Oriented Analysis and Design Laboratory	√	√	√		√	√		√	√	√		√	√	√	√
VI	Theory of Computation and Compiler Design	√	√	√					√	√	√		√	√	√	√
	Mobile Networks And Application Development	√	√	√										√	√	√
	Computer Graphics and Applications	√	√	√	√	√					√	√	√	√	√	√
	Data Science and Big Data Analytics	√	√	√	√	√	√	√				√	√	√	√	√

	Mobile Networks And Application Development Laboratory	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Mini Project	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VII	Advanced Neural Network	√	√	√	√	√			√				√	√	√	√
	Principles of Cloud Technologies	√	√	√										√	√	√
	Cryptography Algorithms and Applications	√	√	√										√	√	√
	Management Concepts and Organizational Behavior	√	√	√					√	√	√		√	√	√	√
	Cloud Application and development Lab	√	√	√					√	√	√		√	√	√	√
	Project Phase- I	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VIII	Project Phase- II	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

PROFESSIONAL ELECTIVE COURSES (PEC)

Sem	Course Title	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
V	Optimization Techniques	√	√	√	√	√					√	√	√	√	√	√
	Introduction to Digital Currencies	√	√	√	√	√					√	√	√	√	√	√
	Information Storage and Management	√	√	√	√	√				√	√	√	√	√	√	√
	Software Reliability	√	√	√	√	√					√	√	√	√	√	√
	Fundamentals of Digital Image Processing	√	√	√					√				√	√	√	√
VI	Fuzzy Logic and Artificial Neural Network	√	√	√	√	√					√	√	√	√	√	√
	Software Testing and Quality Assurance	√	√	√	√	√						√	√	√	√	√
	Natural Language Processing Tools And Applications	√	√	√	√	√		√	√	√			√	√	√	√
	Knowledge Engineering	√	√	√	√	√			√	√	√	√	√	√	√	√

	Engineering Ethics and Human Values	√	√	√		√			√				√	√	√	√
VII	Web Development Frameworks				√		√	√	√	√	√	√		√	√	√
	Information Management	√	√	√	√	√					√	√	√	√	√	√
	Cyber Forensics				√		√	√	√	√	√	√		√	√	√
	Parallel Algorithms	√	√	√	√	√					√	√	√	√	√	√
	Augmented and Virtual Reality	√	√	√	√					√	√	√	√	√	√	√
VII	Storage Area Networks	√	√	√		√			√				√	√	√	√
	NoSQL Database	√	√	√					√				√	√	√	√
	Software Agents	√	√	√	√	√					√	√	√	√	√	√
	Quantum Computing	√	√	√		√			√					√	√	√
	Disaster Management	√	√	√		√			√	√	√			√	√	√
VIII	Information Theory and Coding	√	√	√		√							√	√	√	√
	Electronic Commerce	√	√	√		√			√				√	√	√	√
	Affective Computing	√	√	√					√		√	√	√	√	√	√
	Social Media Mining	√	√	√	√	√			√				√	√	√	√
	Secure Coding	√	√	√	√	√					√	√	√	√	√	√
VIII	IoT Platform For Smart City Planning	√	√	√										√	√	√
	Trust Networks	√	√	√	√	√	√				√	√	√	√	√	√
	Artificial Intelligence and Robotics	√	√	√	√	√					√	√	√	√	√	√
	Software Defined Networks	√	√	√	√	√				√	√	√	√	√	√	√
	Business Analytics	√	√	√					√				√	√	√	√

SEMESTER – I

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS1101	Communicative English (Common for all branches of B.E. /B. Tech Programmes)	HSMC	3	3	0	0	3
2.	MA1102	Engineering Mathematics – I (Common for all branches of B.E. /B. Tech Programmes)	BSC	4	4	0	0	4
3.	PH1103	Engineering Physics (Common for all branches of B.E. /B. Tech Programmes)	BSC	3	3	0	0	3
4.	CY1104	Engineering Chemistry (Common for all branches of B.E. /B. Tech Programmes)	BSC	3	3	0	0	3
5.	GE1105	Problem Solving and Python Programming (Common for all branches of B.E. /B. Tech Programmes)	ESC	4	3	1	0	3
6.	GE1106	Engineering Graphics (Common for all branches of B.E. /B. Tech Programmes)	ESC	5	1	0	4	4
PRACTICALS								
7.	GE1107	Python Programming Laboratory (Common for all branches of B.E. /B. Tech Programmes)	ESC	4	0	0	4	2
8.	BS1108	Physics and Chemistry Laboratory (Common for all branches of B.E. /B. Tech Programmes)	BSC	4	0	0	4	2
TOTAL				30	17	1	12	24

SEMESTER II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS1201	Professional English (Common for all branches of B.E. /B. Tech Programmes)	HSMC	3	3	0	0	3
2.	MA1202	Engineering Mathematics- II (Common for all branches of B.E. /B. Tech Programmes Except AI-DS & AI-ML)	BSC	4	4	0	0	4
3.	PH1252	Physics for Information Science (Common to CSE, AI-DS & AI-ML)	BSC	3	3	0	0	3
4.	GE1204	Environmental Science and Engineering (Common for all branches of B.E. /B. Tech Programmes)	HSMC	3	3	0	0	3
5.	BE1251	Basic Electrical Electronics and Measurement Engineering (Common to CSE, AI-DS & AI-ML)	ESC	3	3	0	0	3
6.	CS1206	Programming in C (Common to CSE, AI-DS & AI-ML)	PCC	4	3	1	0	3
PRACTICALS								
7.	GE1207	Engineering Practices Laboratory (Common for all branches of B.E. /B. Tech Programmes)	ESC	4	0	0	4	2
8.	CS1208	Programming in C Laboratory (Common to CSE, AI-DS & AI-ML)	PCC	4	0	0	4	2
TOTAL				28	19	1	8	23

SEMESTER – III

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA1351	Probability and Statistics (Common to CSE & AI-DS)	BSC	4	4	0	0	4
2	IT1301	Java Programming	PCC	3	3	0	0	3
3	CS1301	Digital Principles & Logic Design(Lab Integrated) (Common to CSE)	ESC	5	3	0	2	4
4	CS1302	Data Structures (Common to CSE & AI-DS)	PCC	3	3	0	0	3
5	CS1304	Computer Architecture (Common to CSE)	PCC	4	3	1	0	3
6	CS1305	Software Engineering (Common to CSE)	PCC	3	3	0	0	3
PRACTICALS								
7	CS1307	Data Structures Laboratory using C (Common to CSE)	PCC	4	0	0	4	2
8	IT1308	Java Programming Laboratory	PCC	4	0	0	4	2
9.	HS1310	Professional Skills Laboratory (Common to AI-ML)	HSMC	2	0	0	2	1
Total				32	19	1	12	25

SEMESTER – IV

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA1453	Discrete Mathematics (Common to CSE & AI-DS)	BSC	4	4	0	0	4
2	CS1401	Design and Analysis of Algorithm (Common to CSE, AI-DS & AI-ML)	PCC	3	3	0	0	3
3	CS1402	Operating Systems (Common to CSE, AI-DS & AI-ML)	PCC	3	3	0	0	3
4	CS1403	Database Design and Management (Lab Integrated) (Common to CSE, AI-DS & AI-ML)	PCC	5	3	0	2	4
5	IT1401	Computer Communication	PCC	3	3	0	0	3
6	ML1401	Foundations of Machine Learning (Common to AI-ML)	PCC	3	3	0	0	3
PRACTICALS								
7	CS1407	Operating Systems Laboratory (Common to CSE, AI-DS & AI-ML)	PCC	4	0	0	4	2
8	ML1408	Machine Learning Laboratory (Common to AI-ML)	PCC	4	0	0	4	2
Total				29	19	0	10	24

SEMESTER – V

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	MA1501	Algebra and Number Theory (Common to CSE)	BSC	4	4	0	0	4
2	CS1502	Object Oriented Analysis and Design (Common to CSE)	PCC	3	3	0	0	3
3	IT1501	Web Technology	PCC	4	3	1	0	3
4	IT1502	Computational Intelligence (Lab Integrated)	PCC	5	3	0	2	4
5		Open Elective-I	OEC	3	3	0	0	3
6		Professional Elective-1	PEC	3	3	0	0	3
PRACTICALS								
7	IT1507	Web Technology Laboratory	PCC	4	0	0	4	2
8	CS1508	Object Oriented Analysis and Design Laboratory (Common to CSE)	PCC	4	0	0	4	2
Total				30	19	1	10	24
10		Value Added Course	Audit Course	Two Weeks				1

SEMESTER – VI

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	IT1601	Theory of Computation and Compiler Design	PCC	4	3	1	0	3
2	IT1602	Mobile Networks And Application Development	PCC	4	3	1	0	3
3	IT1603	Computer Graphics and Applications	PCC	4	3	1	0	3
4	IT1604	Data Science and Big Data Analytics	PCC	4	3	1	0	3
5		Open Elective-II	OEC	3	3	0	0	3
6		Professional Elective-II	PEC	3	3	0	0	3
PRACTICAL								
7	IT1607	Mobile Networks And Application Development Laboratory	PCC	4	0	0	4	2
8	IT1608	Mini Project	EEC	4	0	0	4	2
Total				30	18	4	8	22
10		Audit Course (Optional)	Audit Course					

SEMESTER – VII

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	IT1701	Advanced Neural Network	PCC	4	3	1	0	3
2	IT1702	Principles of Cloud Technologies	PCC	4	3	1	0	3
3	IT1703	Cryptography Algorithms and Applications	PCC	4	3	1	0	3
4	MB1101	Management Concepts and Organizational Behavior (Common to MBA)	PCC	4	3	1	0	3
5		Professional Elective-III	PEC	3	3	0	0	3
6		Professional Elective-IV	PEC	3	3	0	0	3
PRACTICALS								
7	IT1707	Cloud application and Development Laboratory	PCC	4	0	0	4	2
8	IT1708	Project Phase-I	EEC	4	0	0	4	2
Total				30	18	4	8	22

SEMESTER – VIII

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1		Professional Elective-V	PEC	3	3	0	0	3
2		Professional Elective-VI	PEC	3	3	0	0	3
PRACTICALS								
3	IT1807	Project Phase-II	EEC	20	0	0	20	10
Total				26	6	0	20	16

* Audit Course is optional

* Students will undergo Industrial Training / Internship during vacation

Total Credits: 180

HUMANITICS SCIENCE AND MANAGEMENT COURSES (HSMC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	HS1101	Communicative English	HSMC	3	3	0	0	3
2	HS1201	Professional English	HSMC	3	3	0	0	3
3	GE1204	Environmental Science and Engineering	HSMC	3	3	0	0	3
4	HS1309	Professional Skills Laboratory	HSMC	2	0	0	2	1

BASIC SCIENCE COURSES (BSC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	MA1102	Engineering Mathematics - I	BSC	4	4	0	0	4
2	PH1103	Engineering Physics	BSC	3	3	0	0	3
3	CY1104	Engineering Chemistry	BSC	3	3	0	0	3
4	BS1108	Physics and Chemistry Laboratory	BSC	4	0	0	4	2
5	MA1202	Engineering Mathematics- II	BSC	4	4	0	0	4
6	PH1252	Physics for Information Science	BSC	3	3	0	0	3
7	MA1351	Probability and Statistics	BSC	4	4	0	0	4
8	MA1453	Discrete Mathematics	BSC	4	4	0	0	4
9	MA1501	Algebra and Number Theory	BSC	4	4	0	0	4

ENGINEERING SCIENCE COURSES (ESC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	GE1105	Problem Solving and Python Programming	ESC	4	3	1	0	3
2	GE1106	Engineering Graphics	ESC	5	1	0	4	4
3	GE1107	Python Programming Laboratory	ESC	4	0	0	4	2
4	BE1251	Basic Electrical and Electronics Engineering	ESC	3	3	0	0	3
5	GE1207	Engineering Practice Laboratory	ESC	4	0	0	4	2
6	CS1301	Digital Principles & Logic Design(Lab Integrated)	ESC	5	3	0	2	4

PROFESSIONAL CORE COURSES (PCC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	CS1206	Programming in C	PCC	4	3	1	0	3
2	CS1208	Programming in C Laboratory	PCC	4	0	0	0	2
3	IT1301	Java Programming	PCC	3	3	0	0	3
4	CS1302	Data Structure	PCC	3	3	0	0	3
5	CS1304	Computer Architecture	PCC	4	3	1	0	3
6	CS1305	Software Engineering	PCC	3	3	0	0	3
7	CS1307	Data Structures Laboratory using C	PCC	4	0	0	4	2
8	IT1308	Java Programming Laboratory	PCC	4	0	0	4	2
9	CS1401	Design and Analysis of Algorithm	PCC	3	3	0	0	3
10	CS1402	Operating Systems	PCC	3	3	0	0	3
11	CS1403	Database design and Management (Lab Integrated)	PCC	5	3	0	2	4
12	IT1401	Computer Communication	PCC	3	3	0	0	3
13	ML1401	Foundations of Machine Learning	PCC	3	3	0	0	3
14	CS1407	Operating Systems Laboratory	PCC	4	0	0	4	2
15	ML1408	Machine Learning Laboratory	PCC	4	0	0	4	2
16	CS1502	Object Oriented Analysis and Design	PCC	3	3	0	0	3
17	IT1501	Web Technology	PCC	4	3	1	0	3
18	IT1502	Computational Intelligence	PCC	5	3	0	2	4
19	IT1507	Web technology Laboratory	PCC	4	0	0	4	2
20	CS1508	Object Oriented Analysis and Design Lab	PCC	4	0	0	4	2
21	IT1601	Theory of Computation and Compiler Design	PCC	4	3	1	0	3
22	IT1602	Mobile Networks And Application Development	PCC	4	3	1	0	3
23	IT1603	Computer Graphics and Applications	PCC	4	3	1	0	3

24	IT1604	Data Science and Big Data Analytics	PCC	4	3	1	0	3
25	IT1607	Mobile Networks And Application Development Laboratory	PCC	4	0	0	4	2
26	IT1701	Advanced Neural Network	PCC	4	3	1	0	3
27	IT1702	Principles of Cloud Technologies	PCC	4	3	1	0	3
28	IT1703	Cryptography Algorithms and Applications	PCC	4	3	1	0	3
29	MB1101	Management Concepts and Organizational Behavior	PCC	4	3	1	0	3
30	IT1707	Cloud Application and Development Laboratory	PCC	4	0	0	4	2

PROFESSIONAL ELECTIVE – I(SEMESTER V)

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1511	Optimization Techniques	PEC	3	3	0	0	3
2	IT1512	Introduction to Digital Currencies	PEC	3	3	0	0	3
3	IT1513	Information Storage and Management	PEC	3	3	0	0	3
4	IT1514	Software Reliability	PEC	3	3	0	0	3
5	CS1515	Fundamentals of Digital Image Processing	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVE – II (SEMESTER VI)

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1611	Fuzzy Logic and Artificial Neural Network	PEC	3	3	0	0	3
2	IT1612	Software Testing and Quality Assurance	PEC	3	3	0	0	3
3	IT1613	Natural Language Processing Tools And Applications	PEC	3	3	0	0	3
4	IT1614	Knowledge Engineering	PEC	3	3	0	0	3
5	MG1615	Engineering Ethics and Human Values	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVE – III (SEMESTER VII)

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1711	Web Development Frameworks	PEC	3	3	0	0	3
2	IT1712	Information Management	PEC	3	3	0	0	3
3	IT1713	Cyber Forensics	PEC	3	3	0	0	3
4	IT1714	Parallel Algorithms	PEC	3	3	0	0	3
5	IT1715	Augmented and Virtual Reality	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVE –IV (SEMESTER VII)

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1721	Storage Area Networks	PEC	3	3	0	0	3
2	IT1722	NoSQL Database	PEC	3	3	0	0	3
3	IT1723	Software Agents	PEC	3	3	0	0	3
4	CS1722	Quantum Computing	PEC	3	3	0	0	3
5	CE1025	Disaster Management	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVE – V (SEMESTER VIII)

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1811	Information Theory and Coding	PEC	3	3	0	0	3
2	IT1812	Electronic Commerce	PEC	3	3	0	0	3
3	IT1813	Affective Computing	PEC	3	3	0	0	3
4	IT1814	Social Media Mining	PEC	3	3	0	0	3
5	IT1815	Secure Coding	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVE – VI (SEMESTER VIII)

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1821	IoT Platform For Smart City Planning	PEC	3	3	0	0	3
2	IT1822	Trust Networks	PEC	3	3	0	0	3
3	IT1823	Artificial Intelligence and Robotics	PEC	3	3	0	0	3
4	CS1821	Software Defined Networks	PEC	3	3	0	0	3
5	MB1206	Business Analytics	PEC	3	3	0	0	3

OPEN ELECTIVE COURSES – I & II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	OBT101	Industrial Biotechnology	OEC	3	3	0	0	3
2	OBT104	Biosensors	OEC	3	3	0	0	3
3	OBT105	Introduction To Nanoscience And Nanotechnology	OEC	3	3	0	0	3
4	OCE102	Introduction To Geographic Information System	OEC	3	3	0	0	3
5	OCH101	Hospital Management	OEC	3	3	0	0	3
6	OEC103	Basics of Embedded Systems and IoT	OEC	3	3	0	0	3
7	OEE101	Basic Circuit Theory	OEC	3	3	0	0	3
8	OEE103	Introduction To Renewable Energy Systems	OEC	3	3	0	0	3
9	OEI102	Robotics	OEC	3	3	0	0	3
10	OMB101	Total Quality Management	OEC	3	3	0	0	3
11	OME104	Industrial Safety Engineering	OEC	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	IT1608	Mini Project	EEC	4	0	0	4	2
2	IT1708	Project Phase-I	EEC	4	0	0	4	2
3	IT1807	Project Phase-II	EEC	20	0	0	20	10

AUDIT COURSES (AC)

Sl. No.	Course Code	Subject Name	Category	Contact Periods	L	T	P	C
1	AD1001	Constitution of India	AC	2	2	0	0	0
2	AD1002	Value Education	AC	2	2	0	0	0
3	AD1003	Pedagogy Studies	AC	2	2	0	0	0
4	AD1004	Stress Management by Yoga	AC	2	2	0	0	0
5	AD1005	Personality Development Through Life Enlightenment Skills	AC	2	2	0	0	0
6	AD1006	Unnat Bharat Abhiyan	AC	2	2	0	0	0
7	AD1007	Essence of Indian Knowledge Tradition	AC	2	2	0	0	0
8	AD1008	Sanga Tamil Literature Appreciation	AC	2	2	0	0	0

* Registration for any of these courses is optional to students

CREDIT SUMMARY

	I	II	III	IV	V	VI	VII	VIII	Total	PERCENTAGE OF CREDIT
HSMC	3	6	1						10	5.56
BSC	12	7	4	4	4				31	17.22
ESC	9	5	4						18	10.00
PCC		5	16	20	14	14	14		83	46.11
PEC					3	3	6	6	18	10.00
OEC					3	3			6	3.33
EEC						2	2	10	14	7.78
Total	24	23	25	24	24	22	22	16	180	100



B.Tech. INFORMATION TECHNOLOGY
REGULATION – 2021
CHOICE BASED CREDIT SYSTEM
I - VIII SEMESTERS SYLLABUS

HS1101	COMMUNICATIVE ENGLISH	L	T	P	C
	(Common for all Branches of B.E. /B. Tech Programmes)	3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> 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. 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 – critical reading – finding key information in a given text – shifting facts from opinions - Writing - autobiographical writing - developing hints. Listening- short texts- short formal and informal conversations. Speaking- basics in speaking - introducing oneself - exchanging personal information- speaking on given topics & situations Language development– voices- Wh- Questions- asking and answering-yes or no questions– parts of speech. Vocabulary development-- prefixes- suffixes- articles - Polite Expressions.					CO1
UNIT II	GENERAL READING AND FREE WRITING	9			
Reading: Short narratives and descriptions from newspapers (including dialogues and conversations ; Reading Comprehension Texts with varied question types - Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –. Listening - long texts - TED talks - extensive speech on current affairs and discussions Speaking – describing a simple process – asking and answering questions - Language development – prepositions, clauses. Vocabulary development- guessing meanings of words in context –use of sequence words.					CO2
UNIT III	GRAMMAR AND LANGUAGE DEVELOPMENT	9			
Reading- short texts and longer passages (close reading) & making a critical analysis of the given text Writing – types of paragraph and writing essays – rearrangement of jumbled sentences. Listening: Listening to ted talks and long speeches for comprehension. Speaking- role plays - asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- Direct vs. Indirect Questions. Vocabulary development – idioms and phrases- cause & effect expressions, adverbs.					CO3
UNIT IV	READING AND LANGUAGE DEVELOPMENT	9			
Reading- comprehension-reading longer texts- reading different types of texts- magazines. Writing- letter writing, informal or personal letters-e-mails-conventions of personal email- Listening: Listening comprehension (IELTS, TOEFL and others). Speaking -Speaking about friends/places/hobbies - Language development- Tenses- simple present-simple past- present					CO4

continuous and past continuous- conditionals – if, unless, in case, when and others
Vocabulary development- synonyms-antonyms- Single word substitutes- Collocations.

UNIT V

EXTENDED WRITING

9

Reading: Reading for comparisons and contrast and other deeper levels of meaning –Writing- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing- Listening - popular speeches and presentations - Speaking - impromptu speeches & debates Language development-modal verbs- present/ past perfect tense - Vocabulary development-Phrasal verbs- fixed and semi-fixed expressions.

CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Board of Editors. Using English A Course book for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2020
2. Sanjay Kumar & Pushp Lata Communication Skills Second Edition, Oxford University Press: 2015.
3. 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 Face 2 Face (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. John Eastwood et al : Be Grammar Ready: The Ultimate Guide to English Grammar, Oxford University Press: 2020. .

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
CO2	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Listen/view and comprehend different spoken discourses/excerpts in different accents
CO5	Identify topics and formulate questions for productive inquiry

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	2	3	-	-	2	-	2
CO2	-	1	-	2	-	-	-	-	-	3	-	-	2	-	2
CO3	-	2	-	3	-	-	-	-	-	2	-	-	2	-	1
CO4	-	-	-	-	-	-	-	-	2	2	-	-	2	-	2
CO5	-	2	1	1	2	-	2	-	-	3	-	-	1	-	2

MA1102	ENGINEERING MATHEMATICS –I	L	T	P	C
	(Common for all branches of B.E. /B. Tech Programmes)	4	0	0	4
OBJECTIVES					
<ul style="list-style-type: none"> The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. This is a foundation course of Single Variable and multivariable calculus plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines. 					
UNIT I	MATRICES	12			
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms					CO1
UNIT II	CALCULUS OF ONE VARIABLE	12			
Limit of a function - Continuity - Derivatives - Differentiation rules – Interval of increasing and decreasing functions – Maxima and Minima - Intervals of concavity and convexity.					CO2
UNIT III	CALCULUS OF SEVERAL VARIABLES	12			
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.					CO3
UNIT IV	INTEGRAL CALCULUS	12			
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.					CO4
UNIT V	MULTIPLE INTEGRALS	12			
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Change of variables from Cartesian to polar in double integrals-Triple integrals – Volume of solids					CO5
TOTAL : 60 PERIODS					

TEXT BOOKS

1. Grewal B.S., Higher Engineering MathematicsII, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendental", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 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, 7.2 - 7.4 and 7.8].

REFERENCE BOOKS

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., —Advanced Engineering MathematicsII, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., —Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. T. Veerarajan. Engineering Mathematics – I, McGraw Hill Education; First edition 2017.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Have a clear idea of matrix algebra pertaining Eigenvalues and Eigenvectors in addition dealing with quadratic forms.
CO2	Understand the concept of limit of a function and apply the same to deal with continuity and derivative of a given function. Apply differentiation to solve maxima and minima problems, which are related to real world problems.
CO3	Have the idea of extension of a function of one variable to several variables. Multivariable functions of real variables are inevitable in engineering.
CO4	Understand the concept of integration through fundamental theorem of calculus. Also acquire skills to evaluate the integrals using the techniques of substitution, partial fraction and integration by parts along with the knowledge of improper integrals.
CO5	Do double and triple integration so that they can handle integrals of higher order which are applied in engineering field.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	1	2	3	-	-	3	2	3	3	3	3	2
CO2	3	3	3	2	2	1	-	-	-	-	1	2	3	3	2
CO3	3	3	3	2	2	1	-	-	-	-	1	2	2	3	2
CO4	3	3	3	2	2	1	-	-	-	-	1	2	2	3	1
CO5	3	3	3	2	1	1	-	-	-	-	1	2	2	3	1

PH1103	ENGINEERING PHYSICS	L	P	T	C
(Common for all branches of B.E. /B. Tech Programmes)		3	0	0	3
OBJECTIVES To make the students conversant with <ul style="list-style-type: none"> • Elastic properties of materials and various moduli of elasticity. • Principles of laser and fiber optics and its various technological applications. • Thermal conduction in solids, heat exchangers and its applications in various devices. • Quantum concepts to explain black body radiation, Compton effect and matter waves. • Various crystal structures, Miller indices and crystal growth techniques. 					
UNIT I	PROPERTIES OF MATTER	9			
Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – Practical applications of modulus of elasticity- I shaped girders - stress due to bending in beams.					CO1
UNIT II	LASER 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 – Industrial and medical applications of Laser– Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers – Fabrication of Optical fiber-Double crucible method-fibre optic sensors: pressure and displacement-Industrial and medical applications of optical fiber- Endoscopy-Fiber optic communication system.					CO2
UNIT III	THERMAL PHYSICS	9			
Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity –Rectilinear flow of heat- conduction through compound media (series and parallel)- Lee's disc method: theory and experiment - Radial flow of heat– thermal insulation – applications: heat exchangers, refrigerators, oven, Induction furnace and solar water heaters.					CO3
UNIT IV	QUANTUM PHYSICS	9			
Black body radiation – Planck's theory (derivation) – 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 rigid box – Electron microscope- tunnelling (qualitative) - scanning tunnelling microscope-Applications of electron microscopy.					CO4
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 structures – Graphite structure-crystal imperfections: point defects, line defects – Burger vectors, stacking faults – growth of single crystals: solution and melt growth techniques- Epitaxial growth-Applications of Single crystal (Qualitative).

CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2017.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2013.

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, 2019.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H. Freeman, 2014.

COURSE OUTCOMES

Upon completion of the course, the students will gain knowledge on

CO1	The elastic property and stress strain diagram, determination of rigidity modulus by torsional pendulum and Young's modulus by various methods.
CO2	Principle of laser, Einstein's coefficients of laser action, semiconductor laser and its applications, optical fibers and their applications in sensors and communication system.
CO3	The heat transfer through solids and the determination of thermal conductivity in a bad conductor by Lee's disc method and radial flow of heat.
CO4	The quantum concepts and its use to explain black body radiation, Compton effect and wave equation for matter waves, tunnelling electron microscopy and its applications.
CO5	The importance of various crystal structures, Miller indices and various growth techniques.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	1	3	2	1	2	3	2	2
CO2	3	3	3	2	3	2	2	1	2	2	2	1	2	2	3
CO3	3	3	2	2	2	1	2	1	2	1	1	2	2	2	2
CO4	3	3	2	2	2	1	1	1	1	1	1	3	3	3	3
CO5	3	3	3	3	2	1	2	1	3	1	1	3	3	3	3

CY1104	ENGINEERING CHEMISTRY	L	P	T	C
(Common for all branches of B.E. /B. Tech Programmes)		3	0	0	3
OBJECTIVES To make the student conversant with the <ul style="list-style-type: none"> Principles of water characterization and treatment for industrial purposes. Principles and applications of surface chemistry and catalysis. Phase rule and various types of alloys Various types of fuels, applications and combustion Conventional and non-conventional energy sources and energy storage device 					
UNIT I	WATER AND ITS TREATMENT	9			
Hardness of water – Types – Expression of hardness – Units – Estimation of hardness by EDTA method – Numerical problems on EDTA method – Boiler troubles (scale and sludge, caustic embrittlement, boiler corrosion, priming and foaming) – Treatment of boiler feed water – Internal treatment (carbonate, phosphate, colloidal, sodium aluminate and calgon conditioning) – External treatment – Ion exchange process, Zeolite process – Desalination of brackish water by reverse Osmosis.					CO1
UNIT II	SURFACE CHEMISTRY AND CATALYSIS	9			
Surface chemistry : Types of adsorption – Adsorption of gases on solids – Adsorption of solute from solutions – Adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – Kinetics of uni-molecular surface reactions – Adsorption in chromatography – Applications of adsorption in pollution abatement using PAC. Catalysis : Catalyst – Types of catalysis – Criteria – Contact theory – Catalytic poisoning and catalytic promoters – Industrial applications of catalysts – Catalytic convertor – Auto catalysis – Enzyme catalysis – Michaelis-Menten equation.					CO2
UNIT III	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. Alloys : Introduction – Definition – Properties of alloys – Significance of alloying – Functions and effect of alloying elements – Nichrome, Alnico, Stainless steel (18/8) – Heat treatment of steel – Non-ferrous alloys – Brass and bronze.					CO3
UNIT IV	FUELS AND COMBUSTION	9			
Fuels : Introduction – classification of fuels – Comparison of solid, liquid, gaseous fuels – Coal – Analysis of coal (proximate and ultimate) – Carbonization – Manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – Cracking – Manufacture of synthetic petrol (Bergius process, Fischer Tropsch Process) – Knocking – Octane number – Diesel oil – Cetane number – Compressed natural gas (CNG) – Liquefied petroleum gases (LPG) – Power alcohol and biodiesel. Combustion of fuels : Introduction – Calorific value – Higher and lower calorific values – Theoretical calculation of calorific value – Ignition temperature – Spontaneous ignition temperature – Explosive range – Flue gas analysis by Orsat Method.					CO4
UNIT V	NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES	9			
Nuclear energy – Fission and fusion reactions – Differences – Chain reactions – Nuclear reactors – Classification of reactors – Light water nuclear reactor for power generation – Breeder reactor – Solar energy conversion – Solar cells – Wind energy – Fuel cells – Hydrogen-oxygen fuel cell .Batteries – Types of batteries - Alkaline batteries – Lead-acid, Nickel-cadmium and Lithium batteries.					CO5
TOTAL : 45 PERIODS					

TEXT BOOKS

1. P.C.Jain, Monica Jain, "Engineering Chemistry" 17th Ed., Dhanpat Rai Pub. Co., New Delhi, (2015).
2. S.S. Dara, S.S. Umare, "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2020).
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India (P) Ltd. New Delhi, (2018).
4. P. Kannan, A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company (P) Ltd., Chennai, (2009).

REFERENCE BOOKS

1. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
3. Prasanta Rath, "Engineering Chemistry", Cengage Learning India (P) Ltd., Delhi, (2015).
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, (2015).
5. A. Pahari, B. Chauhan, "Engineering Chemistry", Firewall Media, New Delhi., (2010).
6. A. Sheik Mideen, Engineering Chemistry, Airwalk Publications, Chennai (2018)

COURSE OUTCOMES

Upon completion of the course, the students should be

CO1	Able to understand impurities in industrial water, boiler troubles, internal and external treatment methods of purifying water.
CO2	Able to understand concepts of absorption, adsorption, adsorption isotherms, application of adsorption for pollution abatement, catalysis and enzyme kinetics.
CO3	Able to recognize significance of alloying, functions of alloying elements and types of alloys, uses of alloys, phase rule, reduced phase and its applications in alloying.
CO4	Able to identify various types of fuels, properties, uses and analysis of fuels. They should be able to understand combustion of fuels, method of preparation of bio-diesel, synthetic petrol.
CO5	Able to understand conventional, non-conventional energy sources, nuclear fission and fusion, power generation by nuclear reactor, wind, solar energy and preparation, uses of various batteries.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	2	2	2	2	2	2	2	1
CO2	3	3	2	2	2	2	2	1	1	1	1	2	2	1	1
CO3	3	3	3	3	3	2	2	1	2	2	2	2	2	2	2
CO4	3	3	3	2	2	3	3	2	2	3	2	2	3	1	2
CO5	3	2	3	3	3	3	3	2	2	2	2	2	3	2	3

GE1105	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
	(Common for all branches of B.E. /B. Tech Programmes)	3	1	0	3
OBJECTIVES <ul style="list-style-type: none"> To know the basics of algorithmic problem solving To write simple python programs To develop python program by using control structures and functions To use python predefined data structures To write file based program 					
UNIT I	ALGORITHMIC PROBLEM SOLVING	9			
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, Basic algorithms, flowcharts and pseudocode for sequential, decision processing and iterative processing strategies, Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.					CO1
UNIT II	INTRODUCTION TO PYTHON	9			
Python Introduction, Technical Strength of Python, Python interpreter and interactive mode; Introduction to colab, pycharm and jupyter idle(s) ,values and types: int, float, boolean, string, and list; Built-in data types, variables, Literals, Constants, statements, Operators; Assignment, Arithmetic, Relational, Logical, Bitwise operators and their precedence, , expressions, tuple assignment; Accepting input from Console, printing statements, Simple 'Python' programs.					CO2
UNIT III	CONTROL FLOW, FUNCTIONS AND STRINGS	9			
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: while, for; Loop manipulation using pass, break, continue, and else; Modules and Functions, function definition and use, flow of execution, parameters and arguments; local and global scope, return values, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.					CO3
UNIT IV	LISTS, TUPLES, DICTIONARIES	9			
Lists: Defining list and list slicing, list operations, list slices, list methods, list loop, List Manipulation, mutability, aliasing, cloning lists, list parameters; Lists as arrays, Tuples: tuple assignment, tuple as return value, Tuple Manipulation; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.					CO4

UNIT V	FILES, MODULES, PACKAGES	9
Files and exception: Concept of Files, Text Files; File opening in various modes and closing of a file, Format Operators, Reading from a file, Writing onto a file, File functions-open(), close(), read(), readline(), readlines(), write(), writelines(), tell(), seek(), Command Line arguments. Errors and exceptions, handling exceptions, modules, packages; introduction to numpy, matplotlib. Illustrative programs: word count, copy file.		CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. 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/thinkpython/>)
2. Guido van Rossum and Fred L. Drake Jr, — An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press, 2019

REFERENCE BOOKS

1. John V Guttag, —Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring PythonII, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First ProgramsII, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop algorithmic solutions to simple computational problems
CO2	Develop simple console application in python
CO3	Develop python program by applying control structure and decompose program into functions.
CO4	Represent compound data using python lists, tuples, and dictionaries.
CO5	Read and write data from/to files in Python.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	2	-	-	2	3	2	-	2	2	1	1
CO2	3	3	3	-	2	-	-	2	3	2	-	2	2	1	1
CO3	3	3	3	-	2	-	-	2	3	2	-	2	1	2	2
CO4	3	3	3	-	2	-	-	2	3	2	-	2	1	2	2
CO5	3	3	3	-	2	-	-	2	3	2	-	2	1	2	1

GE1106	ENGINEERING GRAPHICS	L	T	P	C
(Common for all branches of B.E. /B. Tech Programmes)		1	0	4	4
OBJECTIVES <ul style="list-style-type: none">To develop in students, graphic skills for communication of concepts, ideas and design of Engineering productsTo expose them to existing national standards related to technical drawings.					
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 FREEHAND SKETCHING				7+12
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.					CO1
Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects					
UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACE				6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. 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 and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.					CO2
UNIT III	PROJECTION OF SOLIDS				5+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.					CO3
UNIT IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES				6+12
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.					CO4

UNIT V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	6+12													
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.		CO5													
TOTAL : 90 PERIODS															
TEXT BOOKS															
1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, Twenty Ninth Edition 2016 2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2011.															
REFERENCE BOOKS															
1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019. 2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008. 3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2018. 4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Comput er Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005. 5. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015. 6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Understand the fundamentals and standards of Engineering graphics														
CO2	Perform freehand sketching of basic geometrical constructions and multiple views of objects														
CO3	Understand the concept of orthographic projections of lines and plane surfaces														
CO4	Draw the projections of section of solids and development of surfaces														
CO5	Visualize and to project isometric and perspective sections of simple solids														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	-	-	3	3	2	3	1	1	1
CO2	3	1	2	2	1	1	-	-	3	3	2	3	1	1	1
CO3	3	1	1	3	1	1	-	-	3	3	2	3	1	1	1
CO4	3	1	1	3	1	1	-	-	3	3	2	3	1	1	1
CO5	3	1	2	3	1	1	-	-	3	3	2	3	1	1	1

GE1107	PYTHON PROGRAMMING LABORATORY	L	T	P	C
	(Common for all branches of B.E. /B. Tech Programmes)	0	0	4	2
OBJECTIVES					
<ul style="list-style-type: none">To write, test, and debug simple Python programs.To implement Python programs with conditionals and loops.Use functions for structuring Python programs.Represent compound data using Python lists, tuples, and dictionaries.Read and write data from/to files in Python.					
LIST OF EXPERIMENTS					
1. Write an algorithm, draw flowchart illustrating mail merge concept.					CO1
2. Write an algorithm , draw flowchart and write pseudo code for a real life or scientific or technical problems					
3. Scientific problem solving using decision making and looping. <ul style="list-style-type: none">Armstrong number, palindrome of a number, Perfect number.					
4. Simple programming for one dimensional and two dimensional arrays. <ul style="list-style-type: none">Transpose, addition, multiplication, scalar , determinant of a matrix					
5. Program to explore string functions and recursive functions.					CO2
6. Utilizing 'Functions' in Python <ul style="list-style-type: none">Find mean, median, mode for the given set of numbers in a list.Write a function dups to find all duplicates in the list.Write a function unique to find all the unique elements of a list.Write function to compute gcd, lcm of two numbers.					
7. Demonstrate the use of Dictionaries and tuples with sample programs.					
8. Implement Searching Operations: Linear and Binary Search.					
9. To sort the 'n' numbers using: Selection, Merge sort and Insertion Sort.					
10. Find the most frequent words in a text of file using command line arguments.					CO3
11. Demonstrate Exceptions in Python.					
12. Applications: Implementing GUI using turtle, pygame.					
TOTAL : 60 PERIODS					
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS					
Python 3 interpreter for Windows/Linux					
REFERENCE BOOKS					
1. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press, 2019					

2. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.
3. Shroff “Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
4. David M.Baezly “Python Essential Reference”. Addison-Wesley Professional; Fourth edition, 2009.
5. David M. Baezly “Python Cookbook” O’Reilly Media; Third edition (June 1, 2013)

WEB REFERENCES

1. <http://www.edx.org>

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop simple console applications through python with control structure and functions
CO2	Use python built in data structures like lists, tuples, and dictionaries for representing compound data.
CO3	Read and write data from/to files in Python and applications of python.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	-	2	-	-	2	3	2	-	2	2	-	-
CO2	3	3	3	-	2	-	-	2	3	2	-	2	2	1	1
CO3	3	3	3	-	2	-	-	2	3	2	-	2	2	-	1

BS1108	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
(Common for all branches of B.E. /B. Tech Programmes)		0	0	4	2
OBJECTIVES					
The students will be trained to perform experiments to study the following.					
<ul style="list-style-type: none">• The Properties of Matter• The Optical properties , Characteristics of Lasers & Optical Fibre• Electrical & Thermal properties of Materials• Enable the students to enhance accuracy in experimental measurements.• To make the student to acquire practical skills in the determination of water quality parameters through volumetric analysis• Instrumental method of analysis such as potentiometry, conductometry and pHmetry					
LIST OF EXPERIMENTS - PHYSICS					
(A minimum of 5 experiments to be performed from the given list)					
1. Determination of Young's modulus of the material of the given beam by Non-uniform bending method.		CO1			
2. Determination of rigidity modulus of the material of the given wire using torsion pendulum.		CO1			
3. Determination of wavelength of mercury spectra using Spectrometer and grating.		CO2			
4. Determination of dispersive power of prism using Spectrometer.		CO2			
5. (a) Determination of wavelength and particle size using a laser.					
(b) Determination of numerical aperture and acceptance angle of an optical fibre.		CO2			
(c) Determination of width of the groove of compact disc using laser.					
6. Determination of Young's modulus of the material of the given beam by uniform bending method.		CO1			
7. Determination of energy band gap of the semiconductor.		CO2			
8. Determination of coefficient of thermal conductivity of the given bad conductor using Lee's disc.		CO2			
DEMONSTRATION EXPERIMENT					
1. Determination of thickness of a thin sheet / wire – Air wedge method		CO1			
LIST OF EXPERIMENTS - CHEMISTRY					
(A minimum of 6 experiments to be performed from the given list)					
1. Estimation of HCl using Na ₂ CO ₃ as primary standard and determination of alkalinity in water sample.		CO5			
2. Determination of total, temporary & permanent hardness of water by EDTA method.		CO5			
3. Determination of DO content of water sample by Winkler's method.		CO5			
4. Determination of chloride content of water sample by argentometric method.		CO3			
5. Estimation of copper content of the given solution by Iodometry.		CO3			
6. Determination of strength of given hydrochloric acid using pH meter.		CO3			
7. Determination of strength of acids in a mixture of acids using conductivity meter.		CO4			
8. Estimation of iron content of the given solution using potentiometer.		CO4			
9. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.		CO4			
10. Conductometric titration of strong acid vs strong base.		CO4			
DEMONSTRATION EXPERIMENTS					
1. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method).		CO3			

2. Estimation of sodium and potassium present in water using flame													CO5		
COURSE OUTCOMES															
Upon completion of the course, the students should be															
CO1	Able to understand the concept about the basic properties of matter like stress, strain and types of moduli. Able to understand the procedure to estimate the amount of dissolved oxygen present in the water.														
CO2	Able to understand the concept of optics like reflection, refraction, diffraction by using spectrometer grating. Able to understand the concept about measuring the conductance of strong acid and strong base and mixture of acids by using conductivity meter.														
CO3	Able to understand the thermal properties of solids and to calculate thermal conductivity of a bad conductor. Able to understand the principle and procedure involved in the amount of chloride present in the given sample of water.														
CO4	Able to understand the concept of microscope and its applications in determining the moduli. Able to understand the concept of determining the emf values by using potentiometer.														
CO5	Able to calculate the particle size of poly crystalline solids. Able to understand the concept of determining the pH value and strength of a given acid sample by using pH meter.														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	1	1	1	3	2	2	3	2	2	2
CO2	3	1	2	1	1	1	1	1	2	1	1	2	2	2	2
CO3	3	1	2	1	2	2	2	1	2	1	1	1	2	2	1
CO4	3	2	1	1	2	1	1	1	2	1	1	2	2	1	2
CO5	3	2	1	1	1	2	2	1	2	1	2	1	2	1	1

HS1201	PROFESSIONAL ENGLISH	L	T	P	C
(Common for all branches of B.E. /B. Tech Programmes)		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> 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	READING AND STUDY SKILLS	9			
Listening-Listening Comprehension of a discussion on a technical topic of common interest by three or four participants (real life as well as online videos). -Speaking – describing a process- Reading: Practice in chunking and speed reading - Paragraphing- Writing- interpreting charts, graphs- Vocabulary Development: Important foreign expressions in Use, homonyms, homophones, homographs- easily confused words Language Development- impersonal passive voice, numerical adjectives.					CO1
UNIT II	READING AND STUDY SKILLS	9			
Listening-Listening Comprehension of a discussion on a technical topic of common interest by three or four participants (real life as well as online videos). -Speaking – describing a process- Reading: Practice in chunking and speed reading - Paragraphing- Writing- interpreting charts, graphs- Vocabulary Development: Important foreign expressions in Use, homonyms, homophones, homographs- easily confused words Language Development- impersonal passive voice, numerical adjectives.					CO2
UNIT III	TECHNICAL WRITING AND GRAMMAR	9			
Listening – listening to conversation – effective use of words and their sound aspects, stress, intonation & pronunciation - Speaking – mechanics of presentations -Reading: Reading longer texts for detailed understanding. (GRE/IELTS practice tests); Writing- Describing a process, use of sequence words- Vocabulary Development- sequence words- Informal vocabulary and formal substitutes-Misspelled words. Language Development- embedded sentences and Ellipsis.					CO3
UNIT IV	REPORT WRITING	9			
Listening – Model debates & documentaries and making notes. Speaking – expressing agreement/disagreement, assertiveness in expressing opinions-Reading: Technical reports, advertisements and minutes of meeting - Writing- email etiquette- job application – cover letter –Résumé preparation(via email and hard copy)- analytical essays and issue based essays--Vocabulary Development- finding suitable synonyms-paraphrasing- Language Development- clauses- if conditionals.					CO4
UNIT V	GROUP DISCUSSION AND JOB APPLICATIONS	9			
Listening: Extensive Listening. (radio plays, rendering of poems, audio books and others) Speaking –participating in a group discussion - Reading: Extensive Reading (short stories, novels, poetry and others)– Writing reports- minutes of a meeting- accident and survey- Writing a letter/ sending an email to the Editor - cause and effect sentences -Vocabulary Development- verbal analogies. Language Development- reported speech.					CO5
TOTAL : 45 PERIODS					

TEXT BOOKS

1. Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2020.
2. Barun K Mitra, Effective Technical Communication Oxford University Press : 2006.
3. 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, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
6. Caroline Meyer & Bringi dev, Communicating for Results Oxford University Press: 2021.
7. Aruna Koneru, Professional Speaking Skills, Oxford University Press :2015.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
CO2	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Listen/view and comprehend different spoken discourses/excerpts in different accents
CO5	Identify topics and formulate questions for productive inquiry

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	1	2	3	-	-	-	-	3
CO2	-	1	-	2	-	-	-	-	-	3	-	-	-	-	-
CO3	-	2	-	3	-	-	-	-	1	2	-	-	3	-	1
CO4	-	-	-	-	1	-	-	-	2	2	-	-	1	-	2
CO5	-	2	1	1	2	-	2	-	-	3	-	-	2	-	1

MA1202	ENGINEERING MATHEMATICS - II	L	T	P	C
(Common for all branches of B.E. /B. Tech Programmes Except AI-DS & AI-ML)		4	0	0	4
OBJECTIVES <ul style="list-style-type: none"> This course is designed to cover topics such as Differential Equation, Vector Calculus, Complex Analysis and Laplace Transform. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines 					
UNIT I	ORDINARY DIFFERENTIAL EQUATIONS	12			
Higher order linear differential equations with constant coefficients - Method of variation of parameters– Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients					CO1
UNIT II	VECTOR CALCULUS	12			
Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals					CO2
UNIT III	COMPLEX VARIABLES	12			
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions $w = Z + C$, CZ , $1/Z$ - Bilinear transformation					CO3
UNIT IV	COMPLEX INTEGRATION	12			
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 semi circular contour(excluding poles on the real line)					CO4
UNIT V	LAPLACE TRANSFORMS	12			
Existence conditions – Transforms of elementary functions –Basic properties – Transform of unit step function and unit impulse function - 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					CO5
TOTAL : 60 PERIODS					

TEXT BOOKS

1. Grewal B.S., —Higher Engineering MathematicsII, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016

REFERENCE BOOKS

1. G Bali N., Goyal M. and Watkins C., —Advanced Engineering MathematicsII, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., — Advanced Engineering Mathematics II, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O'Neil, P.V. —Advanced Engineering MathematicsII, Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, —Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., —Advanced Engineering Mathematics —Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Apply various techniques in solving differential equations
CO2	Gradient, divergence and curl of a vector point function and related identities
CO3	Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification
CO4	Analytic functions, conformal mapping and complex integration
CO5	Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	2	-	-	1	1	3	3	3	3
CO2	3	3	2	3	2	2	1	-	-	-	-	2	2	2	2
CO3	3	2	2	2	2	1	1	-	-	-	-	1	2	2	2
CO4	3	3	3	2	2	2	1	-	-	-	-	1	2	2	2
CO5	3	3	3	2	2	2	1	-	-	-	-	1	2	3	3

PH1252	PHYSICS FOR INFORMATION SCIENCE	L	P	T	C
(Common to CSE, AI-DS & AI-ML)		3	0	0	3
OBJECTIVES To make the student <ul style="list-style-type: none"> To acquire knowledge on the electron transport properties To understand the essential principles of semiconductor device To have the necessary understanding in optical properties of materials. To grasp the principles of magnetic materials and its applications. To understand the basics of Nano-electronic devices. 					
UNIT I	ELECTRICAL PROPERTIES OF MATERIALS	9			
Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, expression - Wiedemann-Franz law - Success and failures - electrons in metals - Particle in a three dimensional box - degenerate states - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential - Energy bands in solids - Electron effective mass - concept of hole - Applications of low resistive and high resistive materials.					CO1
UNIT II	SEMICONDUCTOR PHYSICS	9			
Intrinsic semiconductors - Energy band diagram - direct and indirect band gap 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 - carrier transport in semiconductors - Hall effect and devices - Ohmic contacts – Schottky diode - Semiconducting polymers.					CO2
UNIT III	MAGNETIC PROPERTIES OF MATERIALS	9			
Magnetism in materials - magnetic dipole moment - magnetic permeability and susceptibility - Microscopic classification of magnetic materials : diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - Curie temperature - Domain Theory - M versus H behaviour - Hard and soft magnetic materials - examples and uses - Magnetic principle in computer data storage - Magnetic hard disc - Spintronics - GMR Sensor (Giant Magnetoresistance) - TMR (Tunnel Magnetoresistance)					CO3
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 - p-i-n Photodiodes - Avalanche Photodiodes -Optical data storage techniques- Holography - applications.					CO4

UNIT V	NANO DEVICES	9
Electron density in bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials - Tunneling: single electron phenomena and single electron transistor - Quantum dot laser - Ballistic transport - Carbon nanotubes: properties and applications - Material Processing by chemical vapour deposition and Laser ablation method - Graphene: properties and applications		CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Jasprit Singh, — Semiconductor Devices: Basic Principles, Wiley 2012.
2. Donald Neaman, Dhruves Biswas, Semiconductor Physics and Devices (SIE), 4th Edition, 2017
3. Salivahanan, S., Rajalakshmi, A., Karthie, S., Rajesh, N.P., "Physics for Electronics Engineering and Information Science", McGraw Hill Education (India) Private Limited, 2018.
4. Kasap, S.O. — Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
5. 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 Nanoelectronics, Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S. —Nanotechnology: Understanding small systems, CRC press, 2014

COURSE OUTCOMES

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

CO1	Gain knowledge on classical and quantum electron theories and energy band structures.
CO2	Acquire knowledge on basics of semiconductor physics and its applications in various devices.
CO3	Get knowledge on magnetic properties of materials and their applications in data storage.
CO4	Have the necessary understanding on the functioning of optical materials for Optoelectronics.
CO5	Understand the basics of quantum structures and their applications in nano electronic devices.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	2	1	1	1	2	1	3	2	2
CO2	3	3	1	1	3	1	1	1	2	2	2	1	2	2	3
CO3	3	3	1	1	2	2	1	1	1	1	1	2	2	2	2
CO4	3	3	3	2	2	1	1	1	2	2	1	3	3	3	3
CO5	3	3	3	2	3	1	1	1	2	1	2	3	3	3	3

GE1204	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	P	T	C
(Common for all branches of B.E. /B. Tech Programmes)		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none">• To study the inter relationship between living organisms 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 find and implement scientific, technological, economic and political solutions to environmental problems.• To study the integrated themes and biodiversity, natural resources, pollution control and waste management.• To study the dynamic processes and understand the features of the earth's interior and surface.					
UNIT I	ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY	11			
Definition, scope and importance of environment – Need for public awareness – Role of Individual in Environmental protection – Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Food chains, food webs and ecological pyramids – Ecological succession – Types, characteristic features, structure and function of forest, grass land, desert and aquatic (ponds, lakes, rivers, oceans, estuaries) ecosystem.		CO1			
Biodiversity – Definition – Genetic, species and ecosystem diversity – Value of biodiversity – Consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega diversity nation – Hot spots of biodiversity – Threats to biodiversity– Habitat loss, poaching of wild life, human-wildlife conflicts – Wildlife protection act and forest conservation act – Endangered and endemic species – Conservation of biodiversity – In-situ and ex-situ conservation of biodiversity.					
UNIT II	ENVIRONMENTAL POLLUTION	9			
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 – Problems of e-waste – Role of an individual in prevention of pollution – Pollution case studies – Disaster management – Floods, earthquake, cyclone, tsunami and landslides – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.		CO2			
UNIT III	NATURAL RESOURCES	9			
Forest resources: Uses and over-exploitation – Deforestation – Case studies – Timber extraction, mining, dams and their effects on forests and tribal people – Water resources – Use and overutilization of surface and ground water, floods, drought, conflicts over water – Dams: benefits and problems – Mineral resources: Uses 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 – Case studies – Energy resources: Growing energy needs – Renewable and non renewable energy sources – Use of alternate energy sources – Case studies – Land resources: Land as a resource – Land degradation, man induced landslides, soil erosion and desertification – 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.		CO3			
UNIT IV	SOCIAL ISSUES AND THE ENVIRONMENT	8			
From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Role of non-governmental organization – Environmental ethics – Issues and possible solutions – Climate change – Global warming – Acid		CO4			

rain, Ozone layer depletion –Nuclear accidents and holocaust – Case studies – Wasteland reclamation – Consumerism and waste products – Principles of Green Chemistry – Environment protection 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– National Green Tribunal – Public awareness.

UNIT V	HUMAN POPULATION AND THE ENVIRONMENT	8
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Population growth – Variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – COVID 19 – Women and child welfare – Role of information technology in environment and human health – Case studies	CO5
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TOTAL : 45 PERIODS

TEXT BOOKS

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2014).
2. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, (2004).
3. Dr. A. Sheik Mideen and S.Izzat Fathima, "Environmental Science and Engineering", Airwalk Publications, Chennai, (2018).

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. G. Tyler Miller, Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd, Delhi, (2014).
4. R. Rajagopalan, 'Environmental Studies - From Crisis to Cure', Oxford University Press, (2005).
5. Anubha Kaushik , C.P. Kaushik, "Perspectives in Environmental Studies", New Age International Pvt. Ltd, New Delhi, (2004).
6. Frank R. Spellman, "Handbook of Environmental Engineering", CRC Press, (2015).

COURSE OUTCOMES

Upon completion of the course, the students should be able

CO1	To obtain knowledge about environment, ecosystems and biodiversity.
CO2	To take measures to control environmental pollution.
CO3	To gain knowledge about natural resources and energy sources.
CO4	To find and implement scientific, technological, economic and political solutions to the environmental problems.
CO5	To understand the impact of environment on human population and human health.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	3	3	3	2	2	2	3	2	1	2
CO2	3	2	3	3	2	3	3	3	3	2	2	3	2	2	2
CO3	3	3	2	2	3	3	2	2	1	2	1	3	2	2	2
CO4	3	3	3	3	1	2	3	3	2	2	2	2	2	1	2
CO5	3	2	3	2	3	3	3	2	2	2	2	3	3	2	3

BE1251	BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING	L	T	P	C
(Common to CSE, AI-DS & AI-ML)		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To learn the fundamental laws, network theorems and analyse the electric circuits. To study the basic principles of electrical machines and their performance. To study the fundamentals of power systems. To learn the characteristics of various electron devices and Op Amp integrated circuit. To understand the principle and operation of measuring instruments and transducers. 					
UNIT I	ELECTRIC CIRCUITS ANALYSIS	9			
Ohms Law, Kirchhoff's Law-Instantaneous power - Series and parallel circuit: analysis of resistive, capacitive and inductive network, star delta conversion, Nodal analysis and mesh analysis. Network theorems: Thevenin's theorem, Norton's theorem, superposition theorem and maximum power transfer theorem. Three phase ac supply –Instantaneous power, Reactive power and apparent power.					CO1
UNIT II	ELECTRICAL MACHINES	9			
DC and AC ROTATING MACHINES: Types, Construction, principle, EMF and torque equation, application, Speed Control. Basics of Stepper Motor and Brushless DC motors. Transformers- Introduction, types and construction, working principle of Ideal transformer, EMF equation, All day efficiency calculation.					CO2
UNIT III	FUNDAMENTALS OF POWER SYSTEM	9			
Structure of power system. Sources of electrical energy – Non-renewable, Renewable- Storage systems: Batteries-Ni-Cd, Pb -Acid and Li-ion, SOC (State of Charge), DOD (Depth of Discharge) Characteristics. Utilization of electrical power - DC and AC load applications. - Electric circuit Protection-need for earthing, fuses and circuit breakers.					CO3
UNIT IV	ELECTRON DEVICES AND INTEGRATED CIRCUITS	9			
PN Junction-VI Characteristics of Diode, Zener diode, Rectifiers, Zener voltage regulator. Transistor configurations – CE amplifier - RC and LC oscillators. Op Amps – Basic characteristics and its applications.					CO4
UNIT V	MEASURING INSTRUMENTS AND TRANSDUCERS	9			
Characteristic of measurement-errors in measurement – Principle and working of inducting instrument- Moving Coil meter, Moving Iron meter, Energy meter and watt meter, Cathode Ray					CO5

Oscilloscope — Transducers, thermo-electric, RTD, Strain gauge, LVDT, LDR, and piezoelectric transducer.

TOTAL : 45 PERIODS

TEXT BOOKS

1. D.P. Kotharti and I.J Nagarath, Basic Electrical and Electronics Engineering, Mc Graw Hill, fourth Edition, 2019
2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

REFERENCE BOOKS

1. S.B. Lal Seksena and Kaustuv Dasgupta, Fundaments of Electrical Engineering, Cambridge, 2016
2. B.L Theraja, Fundamentals of Electrical Engineering and Electronics. S.Chand & Co, 2008.
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015
4. John Bird, —Electrical and Electronic Principles and Technologyll, Fourth Edition, Elsevier, sixth edition,2017.
5. Mittle,Mittal, Basic Electrical Engineeringll, 2nd Edition, Tata McGraw-Hill Edition, 2016.
6. C.L.Wadhwa, —Generation, Distribution and Utilisation of Electrical Energyll, New Age international pvt.ltd.,2003

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Ability to learn the fundamental laws, theorems of electrical circuits and to analyze them
CO2	Ability to understand the basic construction and operating principle of dc and ac machines.
CO3	Ability to understand the electrical power generation, energy storage and utilization of electric power.
CO4	Ability to understand the characteristics of various electronic devices and Op Amp integrated circuit
CO5	Ability to understand the principles and operation of measuring instruments and transducers.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1	2	3	2	1	2	3	1	2
CO2	3	3	3	3	1	1	1	2	3	2	1	2	3	1	2
CO3	3	3	3	3	1	1	1	2	3	2	1	2	3	1	2
CO4	3	3	3	3	1	1	1	3	3	3	1	3	3	1	3
CO5	3	3	3	3	1	1	1	2	3	2	1	2	3	1	2

CS1206	PROGRAMMING IN C	L	T	P	C
(Common to CSE, AI-DS & AI-ML)		3	1	0	3
OBJECTIVES <ul style="list-style-type: none"> To develop C Programs using basic programming constructs To develop C programs using arrays, strings and functions To develop applications in C using pointers To develop applications in C using structures and union To develop applications using sequential and random-access file processing. 					
UNIT I	BASICS OF C PROGRAMMING	9			
An overview of C: History of C; Compiler Vs. Interpreter, Structure of a C Program, Library and Linking, Compiling a C Program; Basic data types , Modifying the basic data types, Variables: Type qualifiers, Storage class specifiers; Constants: Enumeration Constants; Keywords; Operators: Precedence and Associativity; Expressions: Order of evaluation, Type conversion in expression, Casts; Input/Output statements; Assignment statements, Selection statements; Iteration statements; Jump statements; Expression statements; Pre-processor directives: Compilation process					CO1
UNIT II	ARRAYS, STRINGS AND FUNCTIONS	9			
Introduction to Arrays: Declaration, Initialization, Single dimensional array, Two dimensional arrays, Array Manipulations; String operations: length, compare, concatenate, copy; Functions: General form of a function, Function Arguments, Built-in functions, return statement, Recursion					CO2
UNIT III	POINTERS	9			
Pointers: Declaring and defining pointers, Pointer operators, Pointer expression; Pointer Assignment, Pointer Conversions, Pointer arithmetic, Pointer Comparisons; Pointers and Arrays: Array of pointers; Multiple Indirection; Pointers to function; Problems with Pointers; Parameter passing: Pass by value, Pass by reference.					CO3
UNIT IV	STRUCTURES AND UNIONS	9			
Structure: Accessing Structure members, Structure Assignments; Nested structures; Pointer and Structures; Array of structures; Passing Structures to Functions: Passing structure member to function, Passing entire structure to functions; Arrays in Structures; Self-referential structures; Dynamic memory allocation ; typedef statement, Union and Enumeration.					CO4
UNIT V	FILE PROCESSING	9			
File System Basics: File Pointer, Opening and Closing a File; Reading and Writing Character;					CO5

Working with String: fputs() and fgets(); rewind(); ferror(); fread() and fwrite(); Erasing files; Types of file processing: Sequential access; Random access: fprintf() and fscanf(), fseek() and ftell(); Command line arguments.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Herbert Schildt, C The Complete Reference, Fourth Edition, McGraw-Hill.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
3. Kernighan, B.W and Ritchie,D.M, -The C Programming language, Second Edition, Pearson Education, 2006.

REFERENCE BOOKS

1. Paul Deitel and Harvey Deitel, -C How to Program, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, -Programming in C, CENGAGE Learning India Pvt. Ltd., 2011.
3. Pradip Dey, Manas Ghosh, -Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, -Computer Fundamentals and Programming in C, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop simple applications in C using basic constructs.
CO2	Design and implement applications using arrays, strings and functions.
CO3	Develop and implement applications in C using pointers.
CO4	Develop applications in C using structures and union.
CO5	Design applications using sequential and random-access file processing.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2
CO2	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2
CO3	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2
CO4	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2
CO5	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2

GE 1207	ENGINEERING PRACTICES LAB	L	P	T	C
(Common for all branches of B.E. /B. Tech Programmes)		0	0	4	2
OBJECTIVES:					
<ul style="list-style-type: none">To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering					
LIST OF EXPERIMENTS					
GROUP A (CIVIL & MECHANICAL)					
I CIVIL ENGINEERING PRACTICE		13		CO1	
<p>Buildings:</p> <p>(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.</p> <p>Plumbing Works:</p> <p>(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.</p> <p>(b) Study of pipe connections requirements for pumps and turbines.</p> <p>(c) Preparation of plumbing line sketches for water supply and sewage works.</p> <p>(d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.</p> <p>(e) Demonstration of plumbing requirements of high-rise buildings.</p> <p>Carpentry using Power Tools only:</p> <p>(a) Study of the joints in roofs, doors, windows and furniture.</p> <p>(b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.</p>					
II MECHANICAL ENGINEERING PRACTICE		18		CO2	
<p>Welding:</p> <p>(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.</p> <p>(b) Gas welding practice</p> <p>Basic Machining:</p> <p>(a) Simple Turning and Taper turning</p> <p>(b) Drilling Practice</p> <p>Sheet Metal Work:</p> <p>(a) Forming & Bending:</p> <p>(b) Model making – Trays and funnels.</p> <p>(c) Different type of joints.</p> <p>Machine assembly practice:</p> <p>(a) Study of centrifugal pump</p> <p>(b) Study of air conditioner</p> <p>Demonstration on:</p> <p>(a) Smithy operations, upsetting, swaging, setting down and bending. Example –Exercise – Production of hexagonal headed bolt.</p> <p>(b) Foundry operations like mould preparation for gear and step cone pulley.</p> <p>(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.</p>					

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE****13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

CO3

5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

CO4**IV ELECTRONICS ENGINEERING PRACTICE****16**

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. Measurement of ripple factor of HWR and FWR.

CO5**TOTAL : 60 PERIODS****LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

Sl.No.	Description of Equipment	Quantity required
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.	15 Sets.
4.	Models of industrial trusses, door joints, furniture joints	5 each
5.	Power Tools: (a) Rotary Hammer (b) Demolition Hammer (c) Circular Saw (d) Planer (e) Hand Drilling Machine (f) Jigsaw	2 Nos
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.	1 each

ELECTRICAL															
1.	Assorted electrical components for house wiring.													15 Sets	
2.	Electrical measuring instruments.													10 Sets	
3.	Study purpose items: Iron box, fan and regulator, emergency lamp.													1 each	
4.	Megger (250V/500V).													1 No.	
5.	Power Tools: (a) Range Finder (b) Digital Live-wire detector													2 Nos	
ELECTRONICS															
1.	Soldering guns 10 Nos.													10 Nos.	
2.	Assorted electronic components for making circuits 50 Nos.													50 Nos.	
3.	Small PCBs.													10 Nos.	
4.	Multimeters													10 Nos.	
5.	Study purpose items: Telephone, FM radio, low-voltage power supply													1 each	
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Fabricate carpentry components and pipe connections including plumbing works. Use welding equipments to join the structures.														
CO2	Carry out the basic machining operations Make the models using sheet metal works														
CO3	Carry out basic home electrical works and appliances.														
CO4	Measure the electrical quantities														
CO5	Elaborate on the components, gates, soldering practices														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	3	-	-	3	-	-	-	-	-	3	3	3	3
CO2	3	2	3	-	-	3	-	-	-	-	-	3	3	3	3
CO3	3	1	2	-	-	2	-	-	-	-	-	3	3	3	3
C04	3	1	3	-	-	3	-	-	-	-	-	3	3	3	3
C05	3	2	2	-	-	2	-	-	-	-	-	3	2	2	2

CS1208	PROGRAMMING IN C LAB												L	T	P	C
(Common to CSE, AI-DS & AI-ML)													0	0	4	2
OBJECTIVES																
<ul style="list-style-type: none">To develop programs in C using basic constructs.To develop applications in C using strings, pointers, functions, structures.To develop applications in C using file processing																
LIST OF EXPERIMENTS																
1. C programming using simple statements and expressions.														CO1		
2. Scientific problem-solving using decision making and looping.																
3. Generating different patterns using multiple control statements.																
4. Problems solving using one dimensional array.																
5. Mathematical problem solving using two dimensional arrays.																
6. Solving problems using string functions.														CO2		
7. Solving problems with user defined functions.																
8. Solving problems using recursive function.																
9. Solving problems with dynamic memory allocation.																
10. Realtime application using structures and unions.																
11. Realtime problem solving using sequential and random-access file.														CO3		
12. Solving problems with command line argument.																
TOTAL : 60 PERIODS																
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS																
Standalone desktops with C compiler 30 Nos.																
(or)																
Server with C compiler supporting 30 terminals or more.																
REFERENCE BOOKS																
<ol style="list-style-type: none">Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.Programming in C by Pradip Dey, Manas Ghosh 2nd edition Oxford University Press. E.Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill.A first book of ANSI C by Gray J.Brosin 3rd edition Cengagedelmer Learning India P.Ltd.AL Kelly, Iraphol,Programming in C,4th edition Addison-Wesley – Professional.Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI.																
COURSE OUTCOMES																
Upon completion of the course, students will be able to																
CO1	Develop C programs for simple applications making use of basic constructs.															
CO2	Develop C programs involving string, functions, recursion, pointers, and structures.															
CO3	Design applications using sequential and random-access file processing.															
MAPPING OF COs WITH POs AND PSOs																
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	
CO1	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2	
CO2	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2	
CO3	3	3	3	2	2	1	1	1	1	1	1	1	2	2	2	

MA1351	PROBABILITY AND STATISTICS	L	T	P	C
Common to CSE, AI & DS		4	0	0	4
OBJECTIVES <ul style="list-style-type: none"> To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon. To understand the basic concepts of random processes which are widely used in engineering applications. To acquaint the knowledge of testing of hypothesis for small and large samples, which plays an important role in real life problems. To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control. 					
UNIT I	PROBABILITY AND RANDOM VARIABLES	12			
Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.					CO1
UNIT II	TWO - DIMENSIONAL RANDOM VARIABLES	12			
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Central limit theorem (for independent and identically distributed random variables).					CO2
UNIT III	RANDOM PROCESSES	12			
Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.					CO3
UNIT IV	TESTING OF HYPOTHESIS	12			
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.					CO4
UNIT V	DESIGN OF EXPERIMENTS	12			
One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.					CO5

TEXT BOOKS

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2017.
2. Ibe, O.C., —Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Indian Reprint, 2014.

REFERENCE BOOKS

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2017.
2. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2014.
3. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2017.
4. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 4th Edition, Elsevier, 2009.
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, 2008.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Give exposure to random variables and well-founded knowledge of standard distributions which can describe real life phenomena.
CO2	Pave ideas to handle situations involving more than one random variable and functions of random variables.
CO3	Give an understanding and characterizes phenomena which evolve with respect to time in a probabilistic manner and modelling the real life phenomena.
CO4	Gain the knowledge on Large Samples and Samples. These concepts are very useful in biological, economical and social experiments and all kinds of generalizations based on information about a smaller sample and larger samples. Apply the appropriate test in the problems related with sampling.
CO5	Design of experiments, carry them out, and analyze the data.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	1	-	-	-	-	1	1	3	2	1
CO2	3	3	2	2	2	1	-	-	-	-	1	1	3	2	1
CO3	3	2	2	1	1	1	-	-	-	-	1	1	3	2	1
CO4	3	3	2	3	3	2	1	-	-	-	2	2	3	2	1
CO5	3	3	2	3	2	2	1	-	-	-	1	2	2	1	1

IT1301	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand Object Oriented Programming concepts and fundamentals of Java To know the principles of packages, inheritance and interfaces To define exceptions and use I/O streams To develop a java application with threads and generics classes To design and build simple Graphical User Interfaces with database connectivity 					
UNIT I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	9			
Object Oriented Programming concepts - Abstraction – objects and classes - Encapsulation- Inheritance –Polymorphism- Characteristics of Java – The Java Environment-. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays - JavaDoc comments.					CO1
UNIT II	PACKAGES, INHERITANCE AND INTERFACES	9			
Inheritance – Super classes- sub classes – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface - Object cloning -inner classes, ArrayLists – Strings, Packages					CO2
UNIT III	EXCEPTION HANDLING AND I/O CONCEPTS	9			
Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files					CO3
UNIT IV	CONCURRENT AND GENERIC PROGRAMMING	9			
Multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types					CO4
UNIT V	EVENT DRIVEN PROGRAMMING AND DATABASE CONNECTIVITY	9 + 6			
Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events – AWT event hierarchy – layout management - Swing Components- JDBC Architecture - Establishing Connectivity – Working with statements - Creating and executing SQL statements - Working with Result Set.-Simple Java Applications					CO5
TOTAL : 75 PERIODS					
TEXT BOOKS					
1. Cay S. Horstmann, “Core Java SE 9 for the Impatient”, 2 nd Edition, Addison-Wesley,2017 . 2. Herbert schildt , “The complete reference”, 11 th Edition, Tata Mc Graw Hill, New Delhi. 2018. 3. Judith Bishop, “Java Gently : Programming Principles Explained”, 3 rd Edition, 2000.					
REFERENCE BOOKS					

1. T. Budd, "An Introduction to Object Oriented Programming", 3rd Edition, Pearson Education, 2009.
2. Y. Daniel Liang, "Introduction to Java programming", 7th Edition, Pearson education, 2010.
3. C Xavier, "Java Programming – A Practical Approach", Tata McGraw-Hill Edition, 2011.
4. K. Arnold and J. Gosling, "The Java programming language", 3rd Edition, Pearson Education, 2000.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand the fundamental ideas behind the object oriented approach to programming
CO2	Inculcate concepts of inheritance to create new classes from existing one & Design the classes needed given a problem specification
CO3	Build Java applications using exceptions and I/O streams
CO4	A modern coverage of concurrent programming that focuses on high-level synchronization constructs
CO5	Know the concept of event handling used in GUI with Database Connectivity

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	2	-	-	2	1	1	1	2	2	1
CO2	1	1	2	1	1	1	2	1	2	1	1	1	2	2	2
CO3	1	1	1	1	1	-	-	1	2	2	2	1	1	2	2
CO4	1	1	2	-	1	-	1	-	1	1	2	1	3	1	3
CO5	2	2	2	2	2	-	1	1	2	1	2	2	1	2	2

CS1301	DIGITAL PRINCIPLES AND LOGIC DESIGN (Lab Integrated)	L	T	P	C
(Common to CSE)		3	0	2	4
OBJECTIVES <ul style="list-style-type: none"> To learn Boolean algebra and simplification of Boolean functions. To learn to design and analyze different combinational circuits. To study the basics of synchronous sequential logic, analyze and design sequential circuits. To learn about basic memory devices and programmable logic devices to build simple digital systems. To learn to write code in Hardware Definition Language for designing larger digital systems 					
UNIT I	BOOLEAN ALGEBRA AND GATES	9+6			
Number Systems: Binary, Octal, Hexadecimal – Representation of Negative Numbers – 1's and 2's Complements – Arithmetic Operations – Binary Codes – Boolean Algebra – Theorems and Postulates – Functions – Truth Table – Logic Gates – Universal gates–Canonical and Standard Forms – Minterms and Maxterms – Sum of Products and Product of Sum Lab component: <ul style="list-style-type: none"> Verification of Boolean Theorems using basic gates 					CO1
UNIT II	KARNAUGH MAP AND COMBINATIONAL LOGIC	9+6			
Simplification of Boolean Functions –Karnaugh Map – 2, 3, 4 variables – NAND/NOR Implementations – Combinational Circuits – Arithmetic Circuits – Half and Full Adders – Subtractors – Introduction to HDL Lab component: <ul style="list-style-type: none"> Design and implement Half/Full Adder and Subtractor. Coding combinational circuits using HDL 					CO2
UNIT III	COMBINATIONAL LOGIC	9+6			
Binary Parallel Adder – Carry Look-ahead Adder – BCD Adder – Binary Multiplier –Magnitude Comparator – Code Converters – Decoder – Encoder – Priority Encoder – Mux/Demux – Applications Lab component: <ul style="list-style-type: none"> Design and implement combinational circuits using MSI devices: <ul style="list-style-type: none"> ➤ 4 – bit binary adder / subtractor. ➤ Parity generator / checker . ➤ Magnitude Comparator ➤ Application using multiplexers 					CO3
UNIT IV	SEQUENTIAL LOGIC	9+6			
RS Latch – D Latch – Flip Flops – JK, T, D – Master/Slave Flip Flop – Flip flop excitation tables – Analysis of clocked sequential circuits – Moore /Mealy models – Registers: Shift Registers, Universal Shift Register – Counters – Asynchronous Ripple Counters, Synchronous Counters Lab component: <ul style="list-style-type: none"> Design and implement shift-registers. Design and implement synchronous counters 					CO4
UNIT V	SYSTEM DESIGN	9+6			
Memory Systems – RAM – ROM – Memory Decoding – Digital System Design using PLA, PAL					CO5

and FPGA

Lab component:

- Design and implementation of a simple digital system (Mini Project).

TOTAL : 75 PERIODS

TEXT BOOKS

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Fifth Edition, Pearson Education, 2013.
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann/Elsevier, 2013.

REFERENCE BOOKS

1. Charles H. Roth Jr., "Fundamentals of Logic Design", Fifth Edition, Jaico Publishing House, 2003.
2. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.
3. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, 2003.
4. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand Boolean functions circuits using basic logic gates.
CO2	Simplify complex Boolean functions.
CO3	Implement digital circuits using combinational logic ICs and PLDs.
CO4	Understand the characteristics of various Flip-Flops.
CO5	Design digital circuits with combinational and sequential components

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO2	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO4	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO5	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2

CS1302	DATA STRUCTURES	L	T	P	C
(Common to CSE & AI-DS)		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To understand the concepts of ADTs To Learn linear data structures – lists, stacks, and queues To Learn Non-linear data structures – Trees To apply Graph structures To understand sorting, searching and hashing algorithms 					
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).					CO1
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 – deQueue – applications of queues.					CO2
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.					CO3
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.					CO4
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.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> Benjamin Baka, David Julian, “Python Data Structures and Algorithms”, Packt Publishers,2017. Rance D. Necaie, Data Structures and Algorithms Using Python, Willy Student Edition, 2016. 					

3. Narasimha Karumanchi, Data Structure and Algorithmic Thinking with python, CareeMonk,2015.

REFERENCE BOOKS

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++” , Fourth Edition, Pearson Education, 2013.
2. Reema Thareja, —Data Structures Using C++, Second Edition , Oxford University Press, 2011.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Implement abstract data types for linear data structures.
CO2	Apply the different linear data structures to problem solutions.
CO3	Implement abstract data types for non-linear data structures.
CO4	Apply Graph data structure for the real world problems.
CO5	Critically analyze the various sorting, searching algorithms and hash functions that result in a collision free scenario for data storage and retrieval.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	-	-	-	2	2	2	3	3	3
CO2	3	3	3	2	2	2	-	-	-	2	2	2	3	3	3
CO3	3	3	3	2	2	2	-	-	-	2	2	2	3	3	3
CO4	3	3	3	2	2	2	-	-	-	2	2	2	3	3	3
CO5	3	3	3	2	2	2	-	-	-	2	2	2	3	3	3

CS1304	COMPUTER ARCHITECTURE	L	P	T	C
Common to CSE & EEE (Elective)		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> ❖ 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 parallelism and multi-core processors. ❖ To understand the memory hierarchies and the ways of communication with I/O devices. 					
UNIT I	BASIC STRUCTURE OF A COMPUTER SYSTEM	9			
Eight ideas-Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.					CO1
UNIT II	DATA REPRESENTATION AND ARITHMETIC FOR COMPUTERS	9			
Signed number representation, Addition and Subtraction – Multiplication – Division – Fixed- and Floating-Point Representation – Floating Point Operations.					CO2
UNIT III	DATA PATH AND CONTROL UNIT	9			
A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined data path and control – Handling Data Hazards & Control Hazards – Exceptions.					CO3
UNIT IV	PARALLELISM	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.					CO4
UNIT V	MEMORY AND PERIPHERAL DEVICES	9			
Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB_s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits – USB					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 1. M. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014. 2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012 					

REFERENCE BOOKS

1. William Stallings, —Computer Organization and Architecture – Designing for Performance, Tenth Edition, Pearson Education, 2016.
2. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
3. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
4. Jim Ledin, —Modern Computer architecture and Organization, Packt Publishing, 2020.
5. Douglas Comer, —Essentials of Computer Architecture, Taylor and Francis Group 2020

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand the basics structure of computers, operations and instructions.														
CO2	Design arithmetic and logic unit.														
CO3	Understand pipelined execution and design control unit.														
CO4	Understand parallel processing architectures.														
CO5	Understand the various memory systems and I/O communication														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO2	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO4	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2
CO5	3	3	3	3	2	1	1	1	1	2	2	2	3	3	2

CS1305	SOFTWARE ENGINEERING	L	T	P	C
	(Common to CSE)	3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand the phases in a software project To understand fundamental concepts of requirements engineering and Analysis Modeling. To understand the various software design methodologies To learn various testing, SQA and maintenance measures 					
UNIT I	SOFTWARE PROCESS AND AGILE DEVELOPMENT	9			
Introduction: The Evolving Role of Software, Software Characteristics, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process.					CO1
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.					CO2
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.					CO3
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.					CO4
UNIT V	PROJECT MANAGEMENT AND SQA	9			
Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning –					CO5

Project Plan, Planning Process, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan, SQA-Concepts, Cost of Quality, Software Quality Group (SQA).

TOTAL : 45 PERIODS

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. Rajib Mall, —Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, —Software Engineering, A Precise Approach, Wiley India, 2010.
3. Kelkar S.A., —Software Engineering, Prentice Hall of India Pvt Ltd, 2007.
4. Fairley R., —Software Engineering Concepts, Tata McGraw Hill, New Delhi, 2008.
5. Harry Hariom Choudhary, —Java Coding Standards, Amazon Kindle, USA, 2013.
3. Bernard Homes., —Fundamentals of Software Testing, Wiley & Sons, USA, 2012.
6. Stephen R. Schach, —Software Engineering, Tata McGraw-Hill Publishing Company Limited, 2007.
7. <http://nptel.ac.in>

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Identify the key activities in managing a software project and process models.
CO2	Concepts of requirements engineering and Analysis Modeling.
CO3	Apply systematic procedure for software design and deployment.
CO4	Compare and contrast the various testing and maintenance.
CO5	Manage project schedule, SQA, estimate project cost and effort required.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3	2	3	3	3	3	3	2	2
CO2	3	3	3	3	2	2	3	2	3	3	3	3	2	3	3
CO3	2	3	3	3	3	2	3	2	3	3	3	3	2	3	3
CO4	3	2	3	3	3	2	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3	3	3	2	2

CS1307	DATA STRUCTURES LABORATORY USING C												L	T	P	C
(Common to CSE)													0	0	4	2
OBJECTIVES																
<ul style="list-style-type: none">To develop programs in C for simple applicationsTo implement linear and non-linear data structuresTo understand the different operations of trees and graphsTo get familiarized to hashing and sorting algorithms																
LIST OF EXPERIMENTS																
1. Programs using I/O statements, expressions and decision making constructs.															CO1	
2. Array implementation of List ADT																
3. Implementation of singly linked list																
4. Application of list – polynomial manipulation																
5. Array implementation and linked list implementation of Stack ADTs																
6. Array implementation and linked list implementation of Queue ADTs															CO2	
7. Applications of Stack – Conversion of infix to postfix expression and evaluation of postfix expression																
8. Implementation of Binary Search Trees and tree traversal																
9. Implementation of AVL Trees																
10. Implementation of graph traversal algorithms															CO3	
11. Implementation of sorting algorithm – Radix sort, Quick sort																
12. Implementation of hashing techniques – Separate Chaining																
TOTAL : 60 PERIODS																
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS																
Standalone desktops with Windows with C Programming Language and Compiler																
REFERENCE BOOKS																
<ul style="list-style-type: none">ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2002.																
COURSE OUTCOMES																
Upon completion of the course, students will be able to																
CO1	Write functions to implement linear/non-linear data structure															
CO2	Choose and implement efficient data structures and apply them to solve problems															
CO3	Implement appropriate hashing and sorting techniques for a given problem															
MAPPING OF COs WITH POs AND PSOs																
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2	
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2	
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2	

IT1308	JAVA PROGRAMMING LABORATORY	L	P	T	C
		0	0	4	2
OBJECTIVES					
<ul style="list-style-type: none">• To build software development skills using java programming for real-world applications• Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.• Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem• Identify and describe common abstract user interface components to design GUI in Java using Swing along with response to events and Database Connectivity using JDBC.					
LIST OF EXPERIMENTS					
<p>1. Develop a java application to generate electricity bill. Create a class with the following Consumer no., consumer name, previous month reading, current month reading, and type of EB connection (i.e. domestic or commercial) .Compute the bill amount using the following tariff. If the type of the EB connection is domestic. Calculate the amount to be pain follows.</p> <p>First 100 units –Rs.1 per unit 101-200 units –Rs.2.50 per unit 201-500 units –Rs.4 per unit >501 unit –Rs.6 per unit</p> <p>If the type of the EB connection is commercial ,calculate the amount to be paid follows</p> <p>First 100 units –Rs.2 per unit 101-200 units –Rs.4.50 per unit 201-500 units –Rs. 6 per unit >501 units –Rs. 7 per unit</p>					CO1
<p>2. Develop a java application with Employee class with Emp_name, Emp_id, Address,Mail_id,Moblie_no as members. Inherit the classes,Programmer,Assistant Professor, Associate Professor with Professor from employee class. Add basic Pay(BP) as the member of all the inherited classes with 97% of BP as DA,10% of BP as HRA,12% of BP as PF,0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.</p>					
<p>3. Write a Java program to make frequency count of words in a given text</p>					
<p>4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.</p>					
<p>5. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementation</p>					
<p>6. Complete the following:</p> <p>1. Create a package named shape.</p> <p>2. Create some classes in the package representing some common shapes like Square,Triangle, and Circle.</p> <p>3. Import and compile these classes in other program.</p>					
<p>7. Write a Java program to implement user defined exception handling.</p>					CO2
<p>8. Write a java program to find the maximum value from the given type of elements using a generic function.</p>					
<p>9. Write a program in Java for String handling which performs the following:</p> <p>i) Checks the capacity of StringBuffer objects.</p> <p>ii) Reverses the contents of a string given on console and converts the resultant string in upper case.</p> <p>iii) Reads a string from console and appends it to the resultant string of ii.</p>					
<p>10. Write a program to perform string operations using ArrayList. Write functions for the following a. Append - add at end</p>					

b. Insert – add at particular index c. Search d. List all string starts with given letter	
11. Write a Java program to read copy content of one file to other by handling all file related exceptions	
12. Write a Java program that creates three threads. First thread displays “Good Morning” everyone second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.	
13. Write a java Program to create a window when we press <ul style="list-style-type: none"> a. M or m the window displays Good Morning b. A or a the window displays Good After Noon c. E or e the window displays Good Evening d. N or n the window displays Good Night 	CO3
14. Create a GUI program in java with the following components. <ul style="list-style-type: none"> a. A frame with Flow layout. b. Add the following components on to the frame. <ul style="list-style-type: none"> i. Two Text Field ii. A button with the label display c. Allow the user to enter data into the JTextField d. When the button is clicked paint the frame by displaying the data entered in the JTextField e. Allow the user to properly close the frame 	
15. Design and Develop the GUI application with database connectivity of your choice	

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Standalone desktops with any JDK IDE (like NetBeans 1.8v) 30 Nos.

(or)

Server with Java Web Server supporting 30 terminals

REFERENCE BOOKS

1. Herbert schildt , The complete reference, 11th edition, Tata Mc Graw Hill, New Delhi. 2018.

WEB REFERENCES

1. <https://www.startertutorials.com/corejava/resources>
2. <https://docs.oracle.com/javase/tutorial/>
3. <https://wiki.c2.com/?JavaLinks>

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved
CO2	To be able to make an understanding to developing Strings and exception handling, Multithreading and File Handling
CO3	Identify, Design & develop Graphical user interfaces using principal Java Swing components and JDBC

MAPPING OF COs WITH POs AND PSOs

Cos	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	3	1	2	-	-	2	2	2	-	2	2	3	2
CO2	3	3	3	2	2	-	-	2	2	2	1	2	3	3	2
CO3	3	3	3	2	2	-	-	2	2	2	1	2	2	3	2

HS1310	PROFESSIONAL SKILLS LABORATORY	L	T	P	C
Common to CSE & AI-DS		0	0	2	1
OBJECTIVES					
<ul style="list-style-type: none"> ❖ Enhance the Employability and Career Skills of students ❖ Orient the students towards grooming as a professional ❖ Make them Employable Graduates ❖ Develop their confidence and help them attend interviews successfully. 					
LIST OF EXPERIMENTS					
UNIT I					6
Introduction to Soft Skills- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Making an Oral Presentation—Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language-General awareness of Current Affairs.					CO1
UNIT II					6
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— Making a Power Point Presentation -- Structure and format; Covering elements of an effective presentation; Body language dynamics. Making an Oral Presentation—Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language					CO2
UNIT III					6
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic – questioning and clarifying –GD strategies- Structure and dynamics of a GD; Techniques of effective participation in group discussion; Preparing for group discussion; Accepting others' views / ideas; Arguing against others' views or ideas, etc					CO3
UNIT IV					6
Basics of public speaking; Preparing for a speech; Features of a good speech; Speaking with a microphone. (Famous speeches may be played as model speeches for learning the art of public speaking). Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview & panel interview –Job Interviews: purpose and process; How to prepare for an interview; Language and style to be used in an interview; Types of interview questions and how to answer them.					CO4

UNIT V														6	
Recognizing differences between groups and teams- managing time managing stress- networking professionally- respecting social protocols understanding career management- developing a long- term career plan making career changes														CO5	
TOTAL : 30 PERIODS															
REFERENCE BOOKS															
1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015															
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015															
3. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014															
4. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010															
5. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Make effective presentations														
CO2	Participate confidently in Group Discussions														
CO3	Attend job interviews and be successful in them.														
CO4	Develop adequate Soft Skills required for the workplace														
CO5	Develop their speaking skills to enable them speak fluently in real contexts														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	1	2	3	-	-	2	1	2
CO2	-	1	-	2	-	-	-	-	-	3	-	-	1	-	2
CO3	-	2	-	3	-	-	-	-	1	2	-	-	-	-	2
CO4	-	-	-	-	1	-	-	-	2	2	-	-	-	-	2
CO5	-	2	1	1	2	-	2	-	-	3	-	-	1	2	2

MA1453	DISCRETE MATHEMATICS	L	T	P	C
(Common to CSE & AI-DS)		4	0	0	4
OBJECTIVES <ul style="list-style-type: none"> To introduce Mathematical Logic, Inference Theory and proof methods. To provide fundamental principles on combinatorial counting techniques. To introduce graph models, their representation, connectivity and traverse ability. To explain the fundamental algebraic structures, groups and their algebraic properties. To introduce partial ordering and some functions on a set. 					
UNIT I	LOGIC AND PROOFS	12			
Propositional Logic – Propositional Equivalences – Normal Forms - Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.					CO1
UNIT II	COMBINATORICS	12			
Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting - The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations -Generating Functions - Solving Linear Recurrence Relations Using Generating Functions– Inclusion – Exclusion – Principle and Its Applications.					CO2
UNIT III	SETS AND FUNCTIONS	12			
Set -Relations on sets – Types of relations and their properties – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram. Functions: Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions.					CO3
UNIT IV	GRAPHS	12			
Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.					CO4
UNIT V	ALGEBRAIC STRUCTURES	12			
Groups – Subgroups – Homomorphisms – Isomorphism - Normal Subgroup and Coset – Lagrange's Theorem.					CO5
TOTAL : 60 PERIODS					
TEXT BOOKS					
1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw Hill Pub. Co.Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2012. 2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, Thirtieth Reprint, New Delhi, 2011.					

REFERENCE BOOKS

1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education, Fifth Edition, New Delhi, 2014
2. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013.
3. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, Boston, 2004.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Construct proofs by using direct proof, proof by contraposition, proof by contradiction. Construct mathematical arguments using logical connectives and quantifiers and verify the correctness of an argument using propositions. Logic helps in arriving inferences for any problem.
CO2	Solve problems such as permutation and combination and in generating functions. Prove mathematical theorems using mathematical induction. Demonstrate basic counting principles, compute and interpret the meaning in the context of the particular application. Helps to apply the combinatorial techniques in Algorithms and Data structure for analysis and design.
CO3	Understand relations on a set and functions on a set
CO4	Apply the concepts of graph theory in data structures, data mining, image segmentation and in clustering.
CO5	Familiar with algebraic systems, groups, sub groups, Lagrange's theorem and normal subgroups. In Coding algorithms and in theoretical computer science algebraic structures are applied.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	-	-	-	1	1	2	2	2	1
CO2	3	3	2	2	1	1	-	-	-	1	1	2	2	2	1
CO3	3	3	2	2	1	1	-	-	-	1	1	2	2	2	1
CO4	3	3	2	2	1	1	-	-	-	-	1	2	2	2	1
CO5	3	3	2	2	1	1	-	-	-	-	1	2	2	1	1

CS1401	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
Common for CSE, AI-DS and AI-ML		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> ❖ To learn the general framework for analyzing algorithm efficiency ❖ To be conversant with algorithms for common problems. ❖ To analyse the algorithms for time/space complexity. ❖ To write algorithms for a given problem using different design paradigms. ❖ To understand computational complexity of problems 					
UNIT I	INTRODUCTION	9			
Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – The Analysis Framework – Asymptotic Notations and Basic Efficiency Classes – Mathematical Analysis of Nonrecursive and Recursive Algorithms – Empirical Analysis of Algorithms.					CO1
UNIT II	DECREASE AND CONQUER AND DIVIDE-AND-CONQUER	9			
Decrease-and-Conquer– Insertion Sort – Binary Search – Computing a Median and the Selection Problem – Divide-and-Conquer – Merge Sort – Quicksort – The Closest –Pair and Convex –Hull Problems by Divide-and-Conquer.					CO2
UNIT III	DYMANIC PROGRAMMING AND GREEDY TECHNIQUE	9			
The Knapsack Problem and Memory Functions – Optimal Binary Search Trees – Warshall's Algorithm – Floyd's Algorithm – Greedy Technique – Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Trees and Codes.					CO3
UNIT IV	ITERATIVE IMPROVEMENT	9			
Graphical Method – The Simplex Method – The maximum Flow Problem – Maximum Matching in Bipartite Graphs – The Stable Marriage Problem.					CO4
UNIT V	BACKTRACKING, BRANCH-AND-BOUND AND APPROXIMATION ALGORITHMS	9			
P, NP, and NP- Complete Problems – Backtracking – n-Queens Problem – Hamiltonian Circuit Problem – Subset-Sum Problem – Branch-and-Bound – Assignment Problem – Knapsack Problem – Traveling Salesman Problem – Approximation Algorithms for the Traveling Salesman Problem and the Knapsack Problem.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012. 2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, McGraw Hill, 2009. 					

REFERENCE BOOKS

1. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
2. Robert Sedgewick, Kevin Wayne, "Algorithms", Fourth Edition, Pearson Education, 2011.
3. Donald E. Knuth, "Art of Computer Programming, Volume I - Fundamental Algorithms", Third Edition, Addison Wesley, 1997.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Ability to investigate an algorithm's efficiency with respect to running time
CO2	Design and implement problems using algorithmic design techniques such as decrease and conquer and divide and conquer
CO3	Ability to understand the design techniques such as Dynamic programming and Greedy technique
CO4	Ability to understand the iterative design techniques
CO5	Understand the variations among tractable and intractable problems

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	3	-	2	3	3	2	2
CO2	3	3	3	3	2	-	-	-	3	-	2	3	3	2	2
CO3	3	3	3	3	2	-	-	-	3	-	2	3	3	2	2
CO4	3	3	3	3	2	-	-	-	3	-	2	3	3	2	2
CO5	3	3	3	3	2	-	-	-	3	-	2	3	3	2	2

CS1402	OPERATING SYSTEMS	L	T	P	C
Common for CSE, AI-DS and AI-ML		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To understand the basic concepts and functions of operating systems. To understand Processes and Threads To analyze Scheduling algorithms. To understand the concept of Deadlocks. To analyze various memory management schemes. To understand I/O management and File systems. To be familiar with the basics of Linux system and Mobile OS like iOS and Android 					
UNIT I	OPERATING SYSTEM OVERVIEW	9			
Introduction to OS: - Functionality of OS - OS Design issues- Evolution of Operating System- Operating System Structuring methods(monolithic, layered, modular, micro-kernel models)and operations-system calls-system/Application Call Interface ,system programs- Hardware Protection user/kernel modes-interrupts-Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization.					CO1
UNIT II	PROCESS MANAGEMENT	9			
Processes – Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization – The critical-section problem, Semaphores, Classical problems of synchronization, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.					CO2
UNIT III	STORAGE MANAGEMENT	9			
Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Need for Page Replacement, Page Replacement Algorithm, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.					CO3
UNIT IV	FILE SYSTEMS AND I/O SYSTEMS	9			
Mass Storage Structure – Overview, Disk Scheduling and Management, swap space management; File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, File system recovery, Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.					CO4
UNIT V	CASE STUDY	9			
Linux System – Design Principles, Kernel Modules, Virtual Machines - Virtualization (Hardware/Software, Server, Service, Network - Hypervisors - Container virtualization - Cost of virtualization - Journaling - Soft updates - Log-structured file system - Distributed file system- Mobile OS – iOS and Android.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System ConceptsII, 9th Edition, John Wiley and Sons Inc., 2012.					

REFERENCE BOOKS

1. RamazElmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approachll, Tata McGraw Hill Edition, 2010.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7 th Edition, Prentice Hall, 2011.
3. AchyutS.Godbole, AtulKahate, —Operating Systemsll, McGraw Hill Education, 2016.
4. Andrew S. Tanenbaum, —Modern Operating Systemsll, 4th Edition, Pearson Education, 2014.
5. D M Dhamdhere, “Operating Systems: A Concept-Based Approach”, Second Edition, Tata McGraw-Hill Education
6. Daniel P Bovet and Marco Cesati, —Understanding the Linux kernelll, 3rd edition, O’Reilly, 2005.
7. Neil Smyth, —iPhone iOS 4 Development Essentials – Xcodell, Fourth Edition, Payload media, 2011.
8. <http://nptel.ac.in/>.
9. William Stallings, Operating Systems: Internals and Design Principles, Pearson, 9 th Edition (2018).

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Analyze various scheduling algorithms.
CO2	Understand deadlock, prevention and avoidance algorithms.
CO3	Compare and contrast various memory management schemes.
CO4	Understand the functionality of file systems.
CO5	Perform administrative tasks on Linux Servers and Compare iOS and Android

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

CS1403	DATABASE DESIGN AND MANAGEMENT (Lab Integrated)	L	T	P	C
Common for CSE, AI-DS & AI-ML		3	0	2	4
OBJECTIVES <ul style="list-style-type: none"> ❖ To learn the fundamentals of data models, ER diagrams and to study SQL and relational database design. ❖ To familiarize relational model with Relational Database design and Normal Forms. ❖ To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures. ❖ To understand the implementation techniques by learning file organization and Query Optimization. <p>To understand the concepts of distributed databases, Object Oriented databases and XML databases.</p>					
UNIT I	INTRODUCTION TO RELATIONAL DATABASES	9 + 6			
Purpose of Database System – Views of data – Data Models – Database System Architecture Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping– Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features Lab Component <ul style="list-style-type: none"> • Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements .Database Querying – Simple queries, Nested queries, Sub queries and Joins • Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views, Synonyms, Sequences. • Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) 		CO1			
UNIT II	RELATIONAL DATABASE DESIGN	9 + 6			
Embedded SQL– Dynamic SQL - 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 Lab Component <ul style="list-style-type: none"> • Simple Embedded SQL Program to demonstrate the concepts. • Database Design using normalization and Implementation for any application. 		CO2			
UNIT III	TRANSACTIONS	9 + 6			
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. Lab Component <ul style="list-style-type: none"> • Usage of Transaction control language commands like commit, rollback and save point. • Develop Programs using BEFORE and AFTER Triggers for INSERT, DELETE and UPDATE statements 		CO3			
UNIT IV	IMPLEMENTATION TECHNIQUES	9 + 6			
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 – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation. Lab Component <ul style="list-style-type: none"> • Implementation of B tree and B+ Tree. • Develop programs to demonstrate hashing techniques. 		CO4			

UNIT V		ADVANCED TOPICS														9 + 6		
Distributed Databases: Architecture, Data Storage, Data Fragmentation - Replication and Allocation Techniques for Distributed Database Design. Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery. Lab Component <ul style="list-style-type: none">Database Connectivity with Front End ToolsCase Study using real life database applications.																CO5		
PRACTICALS: 30 PERIODS THEORY: 45 PERIODS TOTAL : 75 PERIODS																		
TEXT BOOKS																		
1. Ramez Elmasri and Shamkant B. Navathe; Fundamentals of Database Systems, Pearson, Seventh Edition, Global Edition,2016 2. A Silberschatz, H Korth, S Sudarshan, “Database System and Concepts”, fifth Edition McGraw-Hill,2012. 3. Vlad Vlasceanu, Wendy A. Neu, Andy Oram, Sam Alapati, An Introduction to Cloud Databases, O'Reilly Media, Inc.,2019.																		
REFERENCE BOOKS																		
1. C.J.Date, “An Introduction to Database Systems”, Eighth Edition, Pearson Education,2004. 2. Raghu Ramakrishnan, —Database Management SystemsII, Fourth Edition, McGraw-Hill College Publications, 2015.																		
COURSE OUTCOMES																		
Upon completion of the course, students will be able to																		
CO1	Map ER model to Relational model to perform database design effectively																	
CO2	Write queries using normalization criteria and optimize queries																	
CO3	Design the Query Processor and Transaction Processor																	
CO4	Learn different database concepts like distributed databases, spatial databases and mobile databases.																	
CO5	Apply security concepts to databases, review cloud databases, streaming and graph databases.																	
MAPPING OF COs WITH POs AND PSOs																		
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)					
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3			
CO1	3	3	3	3	2	1	1	-	-	2	2	2	2	3	3			
CO2	3	3	3	3	2	1	1	-	-	2	2	2	2	3	3			
CO3	3	3	3	3	2	1	1	-	-	2	2	2	2	3	3			
CO4	3	3	3	3	2	1	1	-	-	2	2	2	2	3	3			
CO5	3	3	3	3														

IT1401	COMPUTER COMMUNICATION	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand the basics of communication To impart knowledge on basics of analog and digital communication. To understand the basics of data communication models To explore the various layers and its functionalities in data communication model 					
UNIT I	BASICS OF COMMUNICATION	9			
Introduction to Communication systems – basic model, point to point, broadcast communication; modulation-need for modulation, types of modulation, Base band and Pass band transmission; Demodulation (detection) - Coherent and Non-coherent detection; Noise – types of noise; Analog to Digital Conversion (ADC) process– Sampling , Quantization and Coding; Sampling theorem, types of sampling – ideal, natural and flat –top sampling; nyquist rate, Signal reconstruction, types of quantization, Quantization noise, Aliasing.					CO1
UNIT II	ANALOG AND DIGITAL COMMUNICATION	9			
Amplitude modulation – types of amplitude modulation- Standard AM with Full Carrier ,Comparison of different amplitude modulations; Angle modulation (FM and PM), FM generation using PM, PM generation using FM, Comparison of Narrowband and Wideband FM, Comparison of AM,FM and PM. Analog pulse modulation – PAM,PWM,PPM; Digital pulse modulation – Pulse Code Modulation (PCM), Delta modulation (DM), Adaptive Delta modulation (ADM), Multiplexing – Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM).					CO2
UNIT III	INTRODUCTION TO DATA COMMUNICATION AND OSI MODEL	9			
Introduction to computer communication: Transmission modes - Switching: circuit switching and packet switching, OSI model, Layers in OSI model, TCP/IP protocol suite. Physical Layer: Guided and unguided transmission media (Co-axial cable, UTP,STP, Fiber optic cable), Data Link Layer: Framing, Flow control (stop and wait , sliding window flow control) ,Error control, HDLC, Media access control: Ethernet (802.3), CSMA/CD, Logical link control, Wireless LAN (802.11), CSMA/CA.					CO3
UNIT IV	NETWORK LAYER COMPONENTS AND FUNCTIONS	9			
Network Layer Logical addressing: IPv4 & IPV6, Subnetting, DHCP, Virtual LAN, Networking devices (Hubs, Bridges & Switches), Network topologies. Routing: Routing and Forwarding,					CO4

Static routing and Dynamic routing, Routing Algorithms: Distance vector routing algorithm, Link state routing (Dijkstra's algorithm), Routing Protocols: Routing Information protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), MPLS.

UNIT V

TRANSPORT, SESSION AND APPLICATION LAYER

9

Transport Layer –UDP, TCP, Congestion Control & Quality of Service – Data traffic, Congestion, Congestion Control, QoS and Flow Characteristics, Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP, POP3, MIME, SNMP.

CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Wayne Thomasi, "Advanced Electronic Communication Systems", 6th Edition, PHI Publishers, 2003.
2. Simon Haykins, "Communication Systems" John Wiley, 5th Edition, March 2009.
3. John G. Proakis, Masoud Salehi, "Digital Communication", McGraw Hill 5th edition November 6, 2007.

REFERENCE BOOKS

1. Bernard Sklar, "Digital Communication, Fundamentals and Application", Pearson Education Asia, 2nd Edition, Jan. 21, 2001.
2. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.
3. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson, 2011.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Describe the essential basics of communication
CO2	Classify different types of analog digital modulation schemes
CO3	Comprehend the need of data communication models
CO4	Identify the required network layer components and functions
CO5	Analyze the various protocols required in various layers

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

ML1401	FOUNDATIONS OF MACHINE LEARNING	L	T	P	C
(Common to AIDS & AI-ML)		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand the basic concepts of machine learning and probability theory. To appreciate supervised learning and their applications. To understand unsupervised learning like clustering and EM algorithms. To understand the theoretical and practical aspects of probabilistic graphical models. To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and other technologies. 					
UNIT I	INTRODUCTION	9			
Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory –Turning Data into Probabilities – The BiasVarianceTradeoff, FIND– S Algorithm, Candidate - Elimination Algorithm					CO1
UNIT II	SUPERVISED LEARNING	9			
Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms – k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines					CO2
UNIT III	UNSUPERVISED LEARNING	9			
Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models(LVM) – Latent Dirichlet Allocation (LDA)					CO3
UNIT IV	GRAPHICAL MODELS	9			
Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.					CO4

UNIT V	ADVANCED LEARNING	9													
Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning		CO5													
TOTAL : 45 PERIODS															
TEXT BOOKS															
1. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall of India, 2015.															
REFERENCE BOOKS															
1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006. 2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012. 3. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, CRC Press, 2014. 4. Tom Mitchell, “Machine Learning”, McGraw-Hill, 2017. 5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning”, Second Edition, Springer, 2008. 6. Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition, Apress, 2018.															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Gain knowledge about basic concepts of machine learning techniques														
CO2	Develop predictive model based on both input and output data														
CO3	Ability to understand the unsupervised learning algorithm and dimensionality reduction techniques														
CO4	Design systems that uses the appropriate graphical models of machine learning														
CO5	Ability to address the problem of learning control strategies for autonomous agents														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	2	2	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	2	2	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	2	2	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	2	2	-	-	2	2	2	3	3	2

CS1407	OPERATING SYSTEMS LABORATORY			L	T	P	C
(Common to CSE, AI-DS & AI-ML)				0	0	4	2
OBJECTIVES							
<ul style="list-style-type: none">To learn basic Unix commands, shell programming and to implement various Process Management functions such as IPC and Scheduling.To implement Process Synchronization, Deadlock Detection and Avoidance and Memory Allocation methods.To implement Paging Techniques and File Management Techniques.							
LIST OF EXPERIMENTS							
1. Simulation of Unix Commands like cp, ls, grep, cd, mkdir, cat, rm etc.,						CO1	
2. a) Implementation of Shell Program for comparing two strings. b) Implementation of Shell Program for finding the greatest among three numbers.							
3. Implement the following CPU Scheduling Algorithms a)FCFS b) SJF c) Priority d) Round Robin							
4. Implementation of Producer Consumer problem using Semaphore .							
5. Implementation of Inter-process Communication using Shared memory.							
6. Implementation of Threading and Synchronization Applications using pthread and Mutex Variable						CO2	
7. Implementation of Bankers Algorithm for Deadlock Avoidance							
8. Implementation of Deadlock Detection Algorithm.							
9. Implementation of Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit							
10. Implementation of Paging Techniques by constructing the page table and memory mapping scheme in Memory Management.						CO3	
11. Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU							
12. Implementation of the various File Organization Techniques a) Single level directory b) Two level c) Hierarchical							
13. Implementation of the following File Allocation Strategies a) Sequential b) Indexed c) Linked							
TOTAL : 60 PERIODS							

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Standalone desktops with C / C++/ Java compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

REFERENCE BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Conceptsll, 9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7 th Edition, Prentice Hall, 2011.

COURSE OUTCOMES**Upon completion of the course, students will be able to**

CO1 Develop simple applications with shell programming and Scheduling mechanisms.

CO2 Design and develop applications for synchronization, deadlock avoidance and detection.

CO3 Develop applications for implementing Paging and File management concepts.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	3	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	3	-	-	-	-	2	2	2	3	3	2

ML1408	MACHINE LEARNING LABORATORY	L	T	P	C
(Common to AI-ML)		0	0	4	2
OBJECTIVES					
<ul style="list-style-type: none">To make use of Data sets in implementing the machine learning algorithmsTo implement the machine learning concepts and algorithms in any suitable language of choiceTo understand the practical aspects of probabilistic graphical models.					
LIST OF EXPERIMENTS					
1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file					CO1
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm. Output a description of the set of all hypotheses consistent with the training examples.					
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample					CO2
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets					
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.					
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.					CO3
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API					
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.					
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set.					

Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.	
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs	

TOTAL : 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Standalone desktops with Python 30 Nos.

(or)

Standalone desktops with JAVA 30 Nos.

REFERENCE BOOKS

1. Aurelien Geron , “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow : Concepts, Tools, and Techniques to Build Intelligent Systems”, Second Edition, O'Reilly Media
2. Fabio Nelli, “Python Data Analytics with Pandas, Numpy, and Matplotlib”, Second Edition, Apress, 2018
3. Practical Machine Learning with Python: A Problem-Solver's Guide to Building Real-World Intelligent Systems” Dipanjan Sarkar, Raghav Bali, Tushar Sharma, Apress.

WEB REFERENCES

1. <https://machinelearningmastery.com/machine-learning-in-python-step-by-step/>
2. Web Resources: <https://www.anaconda.com/enterprise-machine-learning-getting-started/>
3. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Update the general and specific boundary for each new examples in concept learning
CO2	Develop supervised learning predictive model for general data set
CO3	Ability to apply knowledge representation and machine learning techniques to real world problems

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	2	-	2	2	2	3	3	3
CO2	3	3	3	3	2	-	-	2	-	2	2	2	3	3	3
CO3	3	3	3	3	2	-	-	2	-	2	2	2	3	3	3

MA1501	ALGEBRA AND NUMBER THEORY	L	T	P	C
(Common to CSE)		4	0	0	4
OBJECTIVES <ul style="list-style-type: none"> To introduce the basic notions of groups, rings, fields which will then be used to solve related problems. To introduce and apply the concepts of rings, finite fields and polynomials. To understand the basic concepts in number theory To examine the key questions in the Theory of Numbers. To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject 					
UNIT I	GROUPS AND RINGS	9			
Groups : Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets - Lagrange's theorem. Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism					CO1
UNIT II	FINITE FIELDS AND POLYNOMIALS	9			
Rings - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields					CO2
UNIT III	DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS	9			
Division algorithm – Base - b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM					CO3
UNIT IV	DIOPHANTINE EQUATIONS AND CONGRUENCES	9			
Linear Diophantine equations – Congruence's – Linear Congruence's - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems					CO4
UNIT V	CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS	9			
Wilson's theorem – Fermat's little theorem – Euler's theorem – Euler's Phi functions – Tau and Sigma functions					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, New Delhi, 2007. Koshy, T., —Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002 					

REFERENCE BOOKS

1. Lidl, R. and Pitz, G, "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.
2. Niven, I., Zuckerman.H.S., and Montgomery, H.L., —An Introduction to Theory of Numbers, John Wiley and Sons , Singapore, 2004.
3. San Ling and Chaoping Xing, —Coding Theory – A first Course, Cambridge Publications, Cambridge, 2004

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Apply the basic notions of groups, rings, fields which will then be used to solve related problems.
CO2	Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
CO3	Demonstrate accurate and efficient use of advanced algebraic techniques.
CO4	Demonstrate their mastery by solving non - trivial problems related to the concepts, and by proving simple theorems about the, statements proven by the text.
CO5	Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	2	-	2	-	-	2	2	1	-	2	3	3	2
CO2	3	3	2	-	2	-	-	2	2	1	-	2	3	3	2
CO3	3	3	3	-	2	-	-	2	2	1	-	2	3	3	2
CO4	3	3	3	-	2	-	-	2	2	1	-	2	3	3	2
CO5	3	3	3	-	2	-	-	2	2	1	-	2	3	3	2

CS1502	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
(Common to CSE)		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none">❖ To capture the requirements specifications of an intended software system❖ To design software with static and dynamic UML diagrams❖ To map the design properly to code❖ To improve the software design with design patterns To test the software against its requirements specifications					
UNIT I	INTRODUCTION				9
Introduction to OOAD with OO Basics - Unified Process – UML diagrams, Use Cases – Case study – the Next Gen Point of Sale (POS) system, Inception Use case Modelling, use case modeling - Relating Use cases – include, extend and generalization.					CO1
UNIT II	STATIC MODELLING				9
Class Diagram - Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes - Domain Modeling using class diagrams - Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition					CO2
UNIT III	DYNAMIC MODELLING				9
Dynamic Diagrams - UML interaction diagrams - System sequence diagram – Collaboration diagram - Communication diagram - State machine diagram and Modelling – State Diagram - Activity diagram, Implementation Diagram - UML package diagram - Component and Deployment Diagrams					CO3
UNIT IV	DESIGN PATTERNS				9
GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller. Design Patterns – Creational – Factory method – Structural – Bridge – Adapter – Behavioral– Strategy – Observer, Applying Gang of Four design patterns – Mapping design to code					CO4
UNIT V	TESTING				9
Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans, Revisiting and consolidating all salient points and key insights based on the team projects.					CO5

TEXT BOOKS

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", 3rd. Edition, Pearson Education, 2005.
- 2.
3. Carol Britton, Jill Doake, "A Student Guide to Object-oriented Development", Elsevier Butterworth-Heinemann, 2005

REFERENCE BOOKS

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition, Addison Wesley, 2003.
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", Pearson, 2015.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Identify and map basic software system requirements in UML
CO2	Express software design with UML diagrams
CO3	Design and implement software systems using OO methodology
CO4	Improve software design using design patterns
CO5	Test the software system developed against the intended requirements

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1501	WEB TECHNOLOGY	L	T	P	C
		3	1	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand and explore HTML, CSS and Javascript To design interactive web pages using Scripting languages To understand the concepts of TypeScript and practice Angular JS Framework To work with Express, a Node.js web application framework To develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management 					
UNIT I	Web Essentials, HTML & CSS	9			
Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients-Web Servers - XHTML: Syntax and Semantics - HTML Basic Elements - HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.					CO1
UNIT II	Client-Side Scripting and HTML DOM	9			
Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements Operators- Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers. DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling					CO2
UNIT III	MVC and REACT	9			
Web Application Frameworks - MVC (Model-View-Controller) framework - Need front end frameworks – JSX - Getting started with React - Creating components – Props – States - Handling user events - Conditional rendering - Loop rendering - HTML forms using React					CO3
UNIT IV	Node.js and MongoDB	9			
Understanding Node.js - Event Model – Express Framework - Configuring Routes - Using Requests Objects - Using Response Objects - Handling POST Body Data Sending and Receiving Cookies - Implementing Sessions - Applying Basic HTTP Authentication - Implementing Session Authentication - Working with JSON - Processing URLs - Processing Query Strings and Form Parameters - Understanding Request, Response, and Server Objects – Implementing HTTP Clients and Servers in Node.js - Creating a simple server, Rendering HTML, Rendering JSON Data- MongoDB-Manipulating and Accessing MongoDB Documents from Node.js					CO4
UNIT V	WEB FRAMEWORKS	9			
Implementing AJAX Frameworks - AJAX with JSON - Implementing Security and Accessibility in					CO5

AJAX Applications - Secure AJAX Applications - Web Frameworks - Data store and access methods - Redux – Vuex - Stateless and Stateful – REST API - Declarative UI – Performance improvement through caching and server side rendering

THEORY : 45 PERIODS

TEXT BOOKS

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2007
2. Zammetti, Frank, "Modern Full-Stack Development", Apress, 2020
3. Brad Dayley, "Node.js, MongoDB, and AngularJS Web Development", 2 edition, Addison Wesley, 2017
4. Alex Banks, Eve Porcello, "Learning React, Modern Patterns for Developing React Apps", O'Reilly Media, 2020

REFERENCE BOOKS

1. Jon Duckett, "JavaScript and JQuery: Interactive Front-End Web Development", Wiley, 2014
2. Krasimir Tsonev, "Node.js by Example Paperback", May 2015
3. Amol Nayak, "MongoDB Cookbook Paperback", November 2014
4. Wieruch Robin, "The Road to React", 2021 Edition with React Hooks

WEB REFERENCES

- <https://javascript.info/>
- <https://nodejs.org/en/>
- <https://www.mongodb.com/>

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand web fundamentals
CO2	Create dynamic web pages using DHTML and java script that is easy to navigate and use
CO3	Implement Angular features and create component-based web pages using them
CO4	Generate dynamic page content using Node.js, use JSON to pass AJAX updates between Client and Server and create application using Node.js with MongoDB
CO5	Build scalable web apps quickly and efficiently using appropriate toolkits and framework

MAPPING OF COs WITH POs AND PSOs

Cos	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	1	-	1	-	2	1	1	1	2	2	2
CO2	2	-	2	-	1	-	1	-	2	1	1	1	2	2	2
CO3	2	1	2	1	2	1	1	-	2	1	2	2	2	2	3
CO4	2	1	2	1	2	1	1	-	2	1	2	2	2	3	3
CO5	2	2	2	2	3	1	2	1	2	2	3	2	2	3	3

IT1502	Computational Intelligence (Integrated Lab)	L	T	P	C
		3	0	0	3
OBJECTIVES <div>1. To understand the various characteristics of intelligent agents.</div> <div>2. To learn the different search strategies in AI.</div> <div>3. To understand the knowledge in solving AI problems.</div> <div>4. To learn the concepts of learning and communication in AI.</div> <div>5. To know about the various applications of AI.</div>					
UNIT I	INTRODUCTION AND PROBLEM SOLVING				9
Introduction – Foundations of AI – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information. Lab Component: <div>1. Solve any problem using depth and breadth first search.</div> <div>2. Write a program to solve water Jug Problem</div>					CO1
UNIT II	INFORMED SEARCH AND GAME PLAYING				
Informed search – Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem – Local Search in continuous space – Genetic algorithm – Optimal decisions in games - Pruning - Imperfect decisions –Alpha-Beta pruning – Games that include an element of chance. Lab Component <div>3. Write a program to perform A* search</div> <div>4. Write a program to solve 8 queens problem</div>					CO2
UNIT III	KNOWLEDGE AND REASONING				
Knowledge based agent – The Wumpus world environment – Propositional logic – Inference rules – First-order logic – Syntax and semantics – Situation calculus – Building a knowledge base – Electronic circuit domain – Ontological Engineering – Forward and backward chaining – Resolution – Truth maintenance system-Mental Events and Mental Objects Lab Component <div>5. Study of PROLOG. Write the following programs using PROLOG Program to perform the operations on list. Program to categorize animal characteristics. Program to read address of a person using compound variable. Program of fun to show concept of cut operator</div> <div>6. Write a program to demonstrate family relationship</div>					CO3
UNIT IV	UNCERTAINTY				
Non monotonic reasoning-Closed-World Reasoning- Circumscription- Default Logic-Vagueness, Uncertainty, and Degrees of Belief- Objective Probability- Subjective Probability-Dempster–Shafer Theory- Fuzzy Logic-Fuzzy rules-fuzzy inference-Temporal Logic-Temporal					CO4

Reasoning	
Lab Component	
7. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets	

UNIT V	APPLICATIONS	9
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APPLICATIONS	
Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis-All applications – Language Models – Information Retrieval – Information Extraction – Machine Translation – Machine Learning – Symbol-Based – Machine Learning: Connectionist – Machine Learning.	
8. Write a program to preprocessing in text using NLTK library	CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Stuart J. Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rd Edition, Pearson Education, 2009.

REFERENCE BOOKS

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
2. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., 1 st Edition, 2008.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	An ability to identify, analyze the search algorithm for the AI problems.
CO2	Represent a problem using first order logic.
CO3	Provide the knowledge based agent to solve the problem.
CO4	Understand the Informed search strategies.
CO5	Apply the baye's rule to solve the problem for societal concern.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	-	-	1	2	2	3	3	3	3
CO2	3	3	3	3	3	1	-	-	1	2	2	3	3	3	3
CO3	3	3	3	3	3	1	-	-	1	2	2	3	3	3	3
CO4	3	3	3	3	3	1	-	-	2	2	2	3	3	3	3
CO5	3	3	3	3	3	1	-	-	2	2	2	3	3	3	3

IT1507	Web Technology Laboratory	L	T	P	C
		0	0	4	2
OBJECTIVES					
<ul style="list-style-type: none">To design dynamic websites with good aesthetic sense using HTML5, CSS3 and JavascriptTo work with Express, Node.js, MongoDBTo practice AJAX framework and explore REST API					
LIST OF EXPERIMENTS					
1. Design a Webpage using all HTML elements					CO1
2. Create a web page with all types of Cascading style sheets and CSS Selectors					
3. Write Client-Side Scripts for Validating Web Form Controls using DHTML					
4. Design the following using JavaScript and DOM <ul style="list-style-type: none">Include Image Slide ShowDigital clock					
5. Develop a web application to implement online quiz system using HTML, CSS and Javascript					
6. Design a shopping cart application using React. Your shopping webpage should have the provisions for selecting the list of items from different category, Once the items are selected on clicking the submit button the items in the cart with its price should be displayed.					CO2
7. Design an online super market using ExpressJS and MongoDB database <ul style="list-style-type: none">Perform a search based on product id or nameOn retrieving the results, display the product details of different brands in table format with the Price field in sorted order using React					
8. Create a <TodoItem> component in React and reuse it inside a <TodoList> component					
9. Create a basic CRUD operation API by following REST syntax for a given model student with the following fields [field names]					CO3
10.To build an AJAX Application					
TOTAL : 60 PERIODS					
LIST OF EQUIPMENT FOR A BATCH OF 60 STUDENTS					
Standalone desktops 60 Nos. with internet					
Node JS (along with NPM), Chrome/Mozilla Firefox, Mongo DB Server, Visual Studio Code, NPM Libraries: angular-cli, react, mongodb, express					

REFERENCE BOOKS

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2007
2. AmolNayak, "MongoDB Cookbook Paperback", November 2014
3. KrasimirTsonev, "Node.js by Example Paperback", May 2015
4. Wieruch Robin, "The Road to React", 2021 Edition with React Hooks

WEB REFERENCES

<https://nodejs.org/en/download/>
<https://www.mongodb.com/cloud/atlas/>
<https://reactjs.org/>

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Create an interactive Webpage
CO2	Build a Webpage and use Node.js as Server-Side JS framework and create component based web pages using React and Express JS
CO3	Understand AJAX Framework and REST API

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	-	2	-	3	1	1	1	1	2	1	2	2	1	2
CO2	1	-	2	-	3	2	2	1	2	2	2	2	3	3	3
CO3	1	-	2	-	3	1	1	1	1	2	1	2	2	2	2

CS1508	OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY	L	T	P	C
(Common to CSE)		0	0	4	2
OBJECTIVES					
<ul style="list-style-type: none">To capture the requirements specification for an intended software systemTo draw the UML diagrams for the given specificationTo map the design properly to codeTo test the software system thoroughly for all scenariosTo improve the design by applying appropriate design patterns.					
LIST OF EXPERIMENTS					
1. Identify a software system that needs to be developed.					CO1
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 usingUML Sequence and Collaboration Diagrams					CO2
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					CO3
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 domain for mini project					
<ul style="list-style-type: none">Passport automation system.Book bankExam registrationStock maintenance system.Online course reservation systemAirline/Railway reservation systemSoftware personnel management systemCredit card processinge-book management systemRecruitment systemForeign trading systemConference management systemBPO management system					

- Library management system
- Student information system

TOTAL : 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Desktop or server with node of 30 systems

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

REFERENCE BOOKS

1. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third Edition, Addison Wesley, 2003.
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", Pearson, 2015.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Approach a real world problem, which is uncertain and provide appropriate reasoning.
CO2	Develop solutions using supervised learning techniques and know how to deal with problems with hidden variables.
CO3	Use natural language processing and program basics of robotics.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	1	2	2	2	3	3	3	3
CO2	3	3	3	3	2	2	1	1	2	2	2	3	3	3	3
CO3	3	3	3	3	3	2	1	1	2	2	2	3	3	3	3

HS1509	PROFESSIONAL SKILLS LAB	L	T	P	C
		0	0	2	1
OBJECTIVES					
<ul style="list-style-type: none"> Enhance the Employability and Career Skills of students Orient the students towards grooming as a professional Make them Employable Graduates Develop their confidence and help them attend interviews successfully. 					
LIST OF EXPERIMENTS					
UNIT I					6
Introduction to Soft Skills- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Making an Oral Presentation—Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language-General awareness of Current Affairs.					CO1
UNIT II					6
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— Making a Power Point Presentation -- Structure and format; Covering elements of an effective presentation; Body language dynamics. Making an Oral Presentation—Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language					CO2
UNIT III					6
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies- Structure and dynamics of a GD; Techniques of effective participation in group discussion; Preparing for group discussion; Accepting others' views / ideas; Arguing against others' views or ideas, etc					CO3
UNIT IV					6
Basics of public speaking; Preparing for a speech; Features of a good speech; Speaking with a microphone. (Famous speeches may be played as model speeches for learning the art of public speaking). Interview etiquette – dress code – body language – attending job interviews—					CO4

telephone/skype interview -one to one interview &panel interview –Job Interviews: purpose and process; How to prepare for an interview; Language and style to be used in an interview; Types of interview questions and how to answer them.

UNIT V

6

Recognizing differences between groups and teams- managing time managing stress- networking professionally- respecting social protocols understanding career management- developing a long- term career plan making career changes

CO5

TOTAL : 30 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

One Server

30 Desktop Computers

One Hand Mike

One LCD Projector

REFERENCE BOOKS

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
4. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010
5. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1 | Make effective presentations

CO2 | Participate confidently in Group Discussions

CO3 | Attend job interviews and be successful in them.

CO4 | Develop adequate Soft Skills required for the workplace

CO5 | Develop their speaking skills to enable them speak fluently in real contexts

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	1	2	3	-	-	2	1	2
CO2	-	1	-	2	-	-	-	-	-	3	-	-	1	-	2
CO3	-	2	-	3	-	-	-	-	1	2	-	-	-	-	2
CO4	-	-	-	-	1	-	-	-	2	2	-	-	-	-	2
CO5	-	2	1	1	2	-	2	-	-	3	-	-	1	2	2

IT1601	THEORY OF COMPUTATION AND COMPILER DESIGN	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages. To explore the principles, algorithms, and data structures involved in the design and construction of compilers. 					
UNIT I	INTRODUCTION TO AUTOMATA	9			
Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of a regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.					CO1
UNIT II	AUTOMATA GRAMMAR AND PARSING	9			
Context-Free grammars and parsing: Context-free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing Bottom-up parsing, handle pruning, LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.					CO2
UNIT III	SEMANTIC AND CONTEXT-SENSITIVE FEATURES	9			
Semantics: Syntax directed translation, S-attributed, and L-attributed grammars, Intermediate code – abstract syntax tree, translation of simple statements, and control flow statements. Context-Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, the equivalence of type expressions, overloading of functions and operations.					CO3
UNIT IV	CODE OPTIMIZATION	9			
The symbol table, Storage organization, storage allocation strategies scope access to non local names, parameters, language facilities for dynamics storage allocation. Code optimization Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, optimization techniques.					CO4
UNIT V	CODE GENERATION	9			
Code generation: Machine-dependent code generation, object code forms, generic code generation algorithm, Register allocation, and assignment. Using DAG representation of Block.					CO5
TOTAL : 45 PERIODS					

TEXT BOOKS

1. John E. Hopcroft, Rajeev M & J D Ullman: "Introduction to Automata Theory Languages & Computation", 3rd Edition, Pearson Education, 2007.
2. Aho, Ullman, Ravisethi: "Compilers Principles, Techniques, and Tools", 2nd Edition, Pearson Education, 2009.

REFERENCE BOOKS

1. Tremblay J P, Sorenson G P: "The Theory & Practice of Compiler writing", 1st Edition, BSP publication, 2010.
2. Appel W & Andrew G M: "Modern Compiler Implementation in C", 1st Edition, Cambridge University Press, 2003.
3. Louden: "Compiler Construction, Principles & Practice", 1st Edition, Thomson Press, 2006.
4. Sipser Michael: "Introduction to Theory of computation", 1st Edition, Thomson, 2009.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Explain deterministic and non-deterministic machines.
CO2	Comprehend the hierarchy of problems arising in the computer sciences.
CO3	Design a deterministic finite-state machine to accept a specified language.
CO4	Explain how a compiler can be constructed for a simple context-free language.
CO5	Determine a language's location in the Chomsky hierarchy (regular sets, context-free, context-sensitive, and recursively enumerable languages).

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1602	MOBILE NETWORKS AND APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To endow with the knowledge required to understand emerging communications networks To describe the basic concepts and principles in mobile computing To understand the concept of Wireless LANs, PAN, and Mobile Networks To explain the structure and components for Mobile IP and Mobility Management To familiarize with Mobile apps development aspects 					
UNIT I	WIRELESS COMMUNICATION SYSTEMS	9			
Cellular Networks - Types of handover - IEEE 802.11: System and Protocol Architecture - Bluetooth : User Scenarios– Architecture - GSM – Architecture - Location tracking and call setup - Mobility management - Handover- GSM SMS–International roaming for GSM – Mobile Number portability - VoIP service for Mobile Networks – GPRS –Architecture - Attach and detach procedures					CO1
UNIT II	MOBILE NETWORK AND TRANSPORT LAYERS	9			
Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols– Multicast routing-TCP overWireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery –Transmission/Timeout Freezing-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wirelessNetworks					CO2
UNIT III	INTRODUCTION TO ANDROID	9			
Mobile Application development and trends – Android overview and Versions – Android open stack, features – Setting up Android environment (Eclipse, SDK, AVD)- Simple Android application development – Anatomy of Android applications – Activity and Life cycle – Intents, services and Content Providers					CO3
UNIT IV	ANDROID USER INTERFACE	9			
Android Architecture - Activity life cycle - Android User Interface – Layouts: Linear, Absolute, Table, Relative, Frame, Scrollview, Resize and reposition - Screen orientation – Views: Textview, EditText, Button, ImageButton, Checkbox, ToggleButton, RadioButton, RadioGroup, ProgressBar, AutocompleteText, Picker, Listviews and Webview– Displaying pictures with views: Gallery and ImageView, ImageSwitcher, Gridview – Displaying Menus: Helper methods, Option and Context					CO4
UNIT V	NETWORKING SERVICES & APPLICATION COMPONENTS IN ANDROID	9			
SMS Messaging: Sending and Receiving – Sending email and networking – Downloading					CO5

binary and text data files – Access Web services – Developing android services: create your own services, performing long running task in a serviceperforming repeated task in a service- Location based service - Display map, zoom control, view and change, Marking, Geocoding, Get location - Publish Android applications and Deployment

TOTAL : 45 PERIODS

TEXT BOOKS

1. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2008.
2. Yi Bing Lin Inrichchlamtac, "Wireless and mobile network architecture", Wiley India Edition, Second Edition, 2008.
3. Bill Phillips, Chris Stewart, and Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", Pearson Education, Third Edition, 2017.

REFERENCE BOOKS

1. William Stallings, "Wireless Communications and Networks", Pearson Education, Second Edition, 2009.
2. Ed Burnette (2010), "Hello Android: Introducing Google's Mobile Development Platform", The Pragmatic Publishers, 3rd edition, North Carolina USA
3. Wei-Meng Lee, "Beginning Android 4 Application Development", John Wiley, First edition, 2012.
4. Reto Meier, "Professional Android 4 Application Development", John Wiley, Second edition, 2012.
5. ZigurdMednieks, Laird Dornin, Blake Meike G, Masumi Nakamura (2011), "Programming Android: Java Programming for the New Generation of Mobile Devices", O'Reilly Media, USA

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Identify the various types of handoff and Mobile Networks
CO2	Attain the knowledge to administrate and to maintain a Mobile Communication
CO3	Apply the network and transport layer protocols for mobile networks
CO4	Design and develop simple mobile applications with Android
CO5	Develop mobile applications using various components in Android

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1603	COMPUTER GRAPHICS AND APPLICATIONS	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none">To learn the line, circle and ellipse drawing algorithms and to study the 2-D transformationsTo apply transformations and texture on the objectTo motivate the students to create the 3-D scenes by adding lighting and shades to the objects in the scene.To enable the students to perform modelingTo have in-depth idea about advanced rendering.					
UNIT I	ILLUMINATION MODELS & OUTPUT PRIMITIVES	9			
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. Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems,Graphics Software-Application; Output primitives – points and lines, line drawing algorithms, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.					
UNIT II	2D GRAPHICS	9			
Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations- Affine Transformations ; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.		CO2			
UNIT III	3D 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.		CO3			
UNIT IV	FRACTALS AND ANIMATIONS				
Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals – Overview of Ray Tracing – Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects; Animations – General Computer Animation- Design of Animation sequences –		CO4			

animation function – raster animation – key frame systems – motion specification –morphing – tweening.

UNIT V GRAPHICS PROGRAMMING

OpenGL – Basic graphics primitives – Drawing three dimensional objects - Drawing three dimensional scenes- Introduction to Shading models – Flat and Smooth shading – Adding texture to faces – Adding shadows of objects – Building a camera in a program – Creating shaded objects – Rendering texture – Drawing Shadows; WebGL Application- Context-Geometry- Shaders- Associating attributes and buffer objects -Drawing a model

CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007
2. Edward Angel, Dave Shreiner, "Interactive Computer Graphics: A Top Down Approach with WebGL", Pearson Education, Seventh Edition, 2015
3. F .S. Hill, "Computer Graphics using OPENGL", Pearson Education, Second Edition, 2003

REFERENCE BOOKS

1. Kouichi Matsuda, Rodger Lea, "WebGL Programming Guide: Interactive 3D Graphics Programming with WebGL", Pearson Education, 2013
2. Patrick Cozzi, "WebGL Insights", CRC Press
3. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, "Computer Graphics Principles and Practice in C", Pearson Education, Second Edition, 2007.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop the line, circle and ellipse drawing algorithms .
CO2	Design and Apply two dimensional objects & transformations
CO3	Design and Apply three dimensional objects & transformations
CO4	Design Animation Sequences
CO5	Create and Design objects using Graphics programming

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1604	DATA SCIENCE AND BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none">• To Introduce a data analytics problem solving framework• To Develop technical skills in probability modeling and statistical inference for the practical application of statistical methods.• To make Use of existing and develop new statistical tools for datascience problems across different applied domains.					
UNIT I	Data Analytics Life Cycle	9			
	Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalise, Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA..	CO1			
UNIT II	Overview of Supervised Learning	9			
	Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias–Variance Tradeoff. Association Analysis: Association rules, Apriori algorithm, FP-Growth Technique	CO2			
UNIT III	Time Series Analysis	9			
	Overview of Time Series Analysis, ARIMA Model; Text Analysis: Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency— Inverse Document Frequency (TFIDF).	CO3			
UNIT IV	Introduction to Big Data	9			
	Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics; Hadoop Distributed File Systems: Architecture of Apache Hadoop HDFS and other File Systems, HDFS File Blocks, HDFS File Commands	CO4			
UNIT V	NoSQL Data Management	9			
	Types of NOSQL data bases, Benefits of NO SQL, Map Reduce: Introduction, Map reduce example, Job Tracker, Map Operations. Data Stream Mining: The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing	CO5			
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. EMC Education Services “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley Publishers, 2012.					

2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain, "Big Data & Hadoop", Khanna Publishing House, 2017.

REFERENCE BOOKS

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012
2. Mark Gardener, "Beginning R The statistical Programming Language", Wiley, 2015.
3. Han, Kamber, and J Pei, "Data Mining Concepts and Techniques", 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India
5. V.K. Jain, "Data Science & Analytics", Khanna Publishing House Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, ISBN: 978-93-86173454.
6. Montgomery, Douglas C., and George C. Runger John, "Applied statistics and probability for engineers", Wiley & Sons, 6th edition, 2013.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1 Understands various phases of the data analytics life cycle.

CO2 Apply statistical methods to data for inferences.

CO3 Analyze data using Classification, Graphical and computational methods

CO4 Understand Big Data technologies and NOSQL

CO5 Analyze various types of data using Data Analytics Techniques.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	-	-	1	1	2	2	2
CO2	1	2	2	1	2	1	1	-	-	-	1	1	2	2	2
CO3	2	2	2	2	1	1	1	-	-	-	1	1	2	2	2
CO4	2	2	2	2	2	1	1	-	-	-	1	1	2	2	2
CO5	2	2	2	2	2	1	1	-	-	-	1	1	2	2	2

IT1607	MOBILE NETWORKS AND APPLICATION DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2
OBJECTIVES					
<ul style="list-style-type: none">To demonstrate knowledge of programming for Mobile network communicationsTo develop mobile Applications using Android					
LIST OF EXPERIMENTS					
1. Simulation of mobile network					CO1
2. Measurement of network parameters in mobile Network					
3. Develop an application for changing the font, color and size of the given text that uses GUI components, Font and Colors					
4. Develop an application for collecting students information that uses Layout Managers and event listeners.					
5. Implement a native Calculator to perform various operations using appropriate GUI Components.					
6. Write an application that display line, circle, rectangle and other 2D graphical primitives on the screen.					
7. Develop an application for implementing payroll system by connecting the database where the actual data is stored and retrieved.					CO2
8. Develop an application that makes use of RSS Feed.					
9. Implement an application that implements Multi-threading					
10. Develop a native application that uses GPS location information.					
11. Implement an application that writes data to the SD card.					CO3
12. Implement an application that creates an alert upon receiving a message.					
13. Develop an application to send an email.					
14. Write a mobile application that creates alarm clock.					
TOTAL : 60 PERIODS					
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS					
Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development					

Tools with appropriate emulators and debuggers 30 Nos.

REFERENCE BOOKS

1. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.
3. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016.
4. AnubhavPradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Create, test and debug Android application by setting up Android development environment
CO2	Demonstrate methods in storing, sharing and retrieving data in Android applications
CO3	Simulate Mobile networks and analyze the QoS Parameters

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1701	ADVANCED NEURAL NETWORK	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To explain different network architectures and how these are used in current applications To introduce major learning algorithms, the problem settings, and their applications to solve real world problems. To understand the concept behind neural networks for learning non-linear functions To understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling. 					
UNIT I	NEURAL NETWORKS	9			
Gradient Descent, Stochastic gradient descent and ADAM (adaptive methods), Loss function The Construction of Deep Neural Networks, CNNs, Back propagation and Chain Rule, Hyper Parameters, The world of Machine learning.					CO1
UNIT II	BOLTZMANN MACHINES	9			
Introduction to Boltzmann, Machines, Restricted Boltzmann Machines, Collaborative filtering using Boltzmann Machines.					CO2
UNIT III	RECURRENT NEURAL NETWORK	9			
Mini-Batch gradient descent, Recurrent Neural Network, Predicting the next character using RNN, Introduction to Deep Learning, Introduction to Tensor flow, creating a Deep Learning Network using Tensor flow.					CO3
UNIT IV	BELIEF NETWORKS	9			
Introduction to Deep Belief Networks, Stacking RBMs to make Deep Belief Nets, The wake-sleep algorithm.					CO4
UNIT V	MODERN STATISTICAL CONCEPT	9			
Model free confidence interval, Jackknife regression, Hidden decision trees, Bayesian networks, Better goodness of fit and yield metrics.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016. 2. Phil Kim, "Matlab Deep Learning with Machine Learning, Neural Networks and Artificial Intelligence",Apress, 2017					

REFERENCE BOOKS

1. Daniel Graupe, "Principles of Artificial Neural Networks", World Scientific Publishing Company; 2013.
2. Yoav Goldberg, "Neural Network Models in Natural Language Processing", Morgan & Claypool, 2017.
3. Simon O. Haykin, "Neural Networks and Learning Machines", 3rd Edition. Prentice Hall, 2008.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Identify the learning algorithms which are more appropriate for various types of learning tasks in various domains
CO2	Implement, train, and evaluate neural networks using existing software libraries.
CO3	Present and critically assess current research on neural networks and their applications.
CO4	Analyze and Predict various classification problem.
CO5	Apply neural networks to particular applications to know what steps to take to improve performance.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2
CO2	2	2	1	2	2	1	1	2	1	1	1	2	2	2	2
CO3	2	2	2	2	2	1	1	2	1	1	1	2	2	2	2
CO4	2	2	2	2	2	1	1	2	1	1	1	2	2	2	2
CO5	2	2	2	2	2	1	1	2	1	1	1	2	2	2	2

IT1702	PRINCIPLES OF CLOUD TECHNOLOGIES	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To have the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges; To have knowledge on the various virtualization techniques that serve in computation and storage services on the cloud. To understand the technologies, architecture and applications of cloud computing To understand the key security and compliance challenges of cloud computing 					
UNIT I	INTRODUCTION TO CLOUD COMPUTING	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. Cloud Architectures – Basic Approach, NIST and Layered Cloud Architectures.					CO1
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.					CO2
UNIT III	CLOUD SERVICES AND MODELS	9			
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Types of cloud - Public, Private and Hybrid Clouds; Cloud Services –Infrastructure as a Service (IaaS), Platform as a Service (PaaS), - Software as a Service (SaaS), Storage-as-a-Service(SaaS) – Architectural Design Challenges – Cloud Storage –Advantages of Cloud Storage – Cloud Storage Providers – S3. Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management					CO3
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.					CO4

UNIT V	CLOUD ADVANCEMENTS AND CASE STUDIES												9				
Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Cloud application development using third party APIs, Working with EC2 API – Facebook API, Twitter API. Federation in the Cloud – Four Levels of Federation –Federated Services and Applications – Future of Federation. A Case Study: The Grep TheWeb Application.															CO5		
TOTAL : 45 PERIODS																	
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 Securityll, CRC Press, 2017.																	
REFERENCE BOOKS																	
1. Jason Venner, “Pro Hadoop- Build Scalable, Distributed Applications in the Cloud”, A Press, 2009 2. Tom White, “HadoopThe Definitive Guide”, First Edition. O”Reilly, 2009. 3. Bart Jacob (Editor), “Introduction to Grid Computing”, IBM Red Books, Vervante, 2005 4. Ian Foster, Carl Kesselman, “The Grid: Blueprint for a New Computing Infrastructure”, 2nd Edition, Morgan Kaufmann. 5. Frederic Magoules and Jie Pan, “Introduction to Grid Computing” CRC Press, 2009. 6. Daniel Minoli, “A Networking Approach to Grid Computing”, John Wiley Publication, 2005. 7. Barry Wilkinson, “Grid Computing: Techniques and Applications”, Chapman and Hall, CRC, Taylor and Francis Group, 2010.																	
COURSE OUTCOMES																	
Upon completion of the course, students will be able to																	
CO1	Understand about the basics of Grid and Cloud environment																
CO2	Apply grid computing techniques to solve large scale scientific problems																
CO3	Apply the concept of virtualization.																
CO4	Use the grid and cloud tool kits																
CO5	Apply the security models in the grid and the cloud environment.																
MAPPING OF COs WITH POs AND PSOs																	
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO3		
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2		
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2		
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2		
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2		
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2		

IT1703	CRYPTOGRAPHY ALGORITHMS AND APPLICATIONS	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To introduce the fundamental concepts and techniques in cryptography and network security To illustrate the working principles of various Symmetric Ciphers To explore knowledge on Asymmetric Ciphers To learn the various Data integrity algorithms To realize the potential applications of cryptography in security 					
UNIT I	INTRODUCTION	9			
Computer Security Concepts - OSI Security Architecture - Security Attacks - Security Services - Security Mechanisms - Model for Network Security - Classical Encryption Techniques - Symmetric Cipher Model - Substitution Techniques - Transposition Techniques - Rotor Machines - Steganography - Basic Concepts in Number Theory and Finite Fields - Divisibility and the Division Algorithm - Euclidean Algorithm - Modular Arithmetic - Groups, Rings, and Fields - Finite Fields of the Form GF(p)					CO1
UNIT II	MODERN SYMMETRIC CIPHERS	9			
Block Ciphers and the Data Encryption Standard-Block Cipher Principles - The Data Encryption Standard (DES) - Strength of DES-Triple DES - Differential and Linear Cryptanalysis - Block Cipher Design Principles - Advanced Encryption Standard - Block Cipher Modes of Operation - Random Bit Generation and Stream Ciphers - RC4					CO2
UNIT III	ASYMMETRIC CIPHERS	9			
Prime Numbers - Fermat's and Euler's Theorem - Testing for Primality - Chinese Remainder Theorem - Discrete Logarithms- Principles of Public-Key Cryptosystems - RSA Algorithm - Diffie-Hellman Key Exchange - ElGamal Cryptosystem - Elliptic Curve Arithmetic - Elliptic Curve Cryptography					CO3
UNIT IV	DATA INTEGRITY ALGORITHMS	9			
Cryptographic Hash Functions - Applications of Cryptographic Hash Functions - Secure Hash Algorithm (SHA) - Birthday Attack - Message Authentication Codes - HMAC - Security of MACs - Digital Signatures - ElGamal Digital Signature Scheme - Digital Signature Standard (DSS)					CO4
UNIT V	APPLICATIONS	9			
X.509 Certificates - Kerberos - Transport Level Security – SSL - SET- E-mail Security - Pretty Good Privacy - IP Security - Overview of IPSec – IP and IPv6 -Authentication Header -					CO5

Encapsulation Security Payload (ESP) - Internet Key Exchange - UNIX Password
Encipherment - Protecting ATM Transactions

TOTAL : 45 PERIODS

TEXT BOOKS

1. William Stallings, "Cryptography and network Security", 7th edition Pearson, 2017
2. Alan G. Konheim, "Computer security & cryptography", John Wiley & Sons, 2007

REFERENCE BOOKS

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in computing", Prentice Hall of India, 3rd Edition, 2006
2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", 2nd edition, Pearson, 2007
3. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002
4. Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw Hill, 2010
5. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education, Second Edition, 2007

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Apply essential mathematical concepts to Cryptography and identify the vulnerabilities in Classical cryptosystems
CO2	Experiment Symmetric-Key cipher algorithms
CO3	Apply Asymmetric-Key Cryptographic techniques
CO4	Manipulate the data integrity algorithms
CO5	Use cryptographic principles for real-time applications

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

MB1101	MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR	L	T	P	C
(Common to MBA)		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To familiarize the students to the basic concepts of management in order to aid in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms. To acquaint the students with the fundamentals of managing business and to understand individual and group behaviour at workplace so as to improve the effectiveness of an organization. The course will use and focus on Indian experiences, approaches and cases. 					
UNIT I	NATURE AND THEORIES OF MANAGEMENT	9			
Evolution of management Thought - Classical, Behavioral and Management Science Approaches Management - meaning, levels, management as an art or science, Managerial functions and Roles, Evolution of Management Theory - Classical era - Contribution of F. W. Taylor, Henri Fayol, Neo – Classical - Mayo & Hawthorne Experiments. Modern era –system & contingency approach Managerial Skills.					CO1
UNIT II	PLANNING AND ORGANISING	9			
Planning - Steps in Planning Process - Scope and Limitations - Forecasting and types of Planning - Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies -Scope and Formulation - Decision Making - Types, Techniques and Processes. Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation – Interdepartmental Coordination – Impact of Technology on Organisational design – Mechanistic vs Adoptive Structures -Formal and Informal Organisation. Control: meaning, function, Process and types of Control.					CO2
UNIT III	INDIVIDUAL BEHAVIOUR	9			
Meaning of Organizational behavior, contributing disciplines, importance of organizational behavior, Perception and Learning - Personality and Individual Differences - Motivation theories and Job Performance - Values, Attitudes and Beliefs – Communication Types - Process – Barriers – Making Communication Effective.					CO3
UNIT IV	GROUP BEHAVIOUR	9			
Groups and Teams: Definition, Difference between groups and teams, Stages of Group Development, Group Cohesiveness, Types of teams, Group Dynamics - Leadership – Styles - Approaches – Power and Politics – Organisational Structure – Organisational Climate and Culture, Conflict: concept, sources, Types, Stages of conflict, Management of conflict Organisational Change and Development.					CO4
UNIT V	EMERGING ASPECTS OF ORGANIZATIONAL BEHAVIOUR	9			
Comparative Management Styles and approaches - Japanese Management Practices Organisational Creativity and Innovation – Organizational behavior across cultures -					CO5

Conditions affecting cross cultural organizational operations, Managing International Workforce, Productivity and cultural contingencies, Cross cultural communication, Management of Diversity.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Stephen P. Robbins, David DeCenzo and Mary Coulter, Fundamentals of Management, Prentice Hall of India, 9th edition 2016.
2. Andrew J. Dubrin, Essentials of Management, Thomson Southwestern, 10th edition, 2016.
3. Samuel C. Certo and S. Trevis Certo, Modern Management: Concepts and Skills, Pearson education, 15th edition, 2018.
4. Charles W. L Hill and Steven L McShane, Principles of Management, McGraw Hill Education, Special Indian Edition, 2017.

REFERENCE BOOKS

1. Harold Koontz and Heinz Weihrich, Essentials of Management: An International, Innovation, And Leadership Perspective, 10th edition, Tata McGraw – Hill Education, 2015.
2. Stephen P. Robbins, Timothy A. Judge, Organisational Behavior, PHIL earning / Pearson Education, 16th edition, 2014.
3. Fred Luthans, Organisational Behavior, McGraw Hill, 12th Edition, 2013.
4. Don Hellriegel, Susan E. Jackson and John W, Jr Slocum, Management: A competency – Based Approach, Thompson South Western, 11th edition, 2008.
5. Heinz Weihrich, Mark V Cannice and Harold Koontz, Management – Aglobal entrepreneurial perspective, Tata McGraw Hill, 12th edition, 2008

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understanding of various management concepts and skills required in the business world
CO2	In-depth knowledge of various functions of management in areal time management context
CO3	Understanding of the complexities associated with management of individual behavior in the organizations
CO4	Develop the skill set to have manage group behaviour in Organizations
CO5	Insights about the current trends in managing organizational behavior

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAMME OUTCOMES (POs)												PROGRAMME SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO2	PSO3
CO1	3	2	3	2	2	1	1	1	2	2	1	1	2	3	2
CO2	3	2	3	3	2	2	1	1	2	2	1	2	2	3	3
CO3	2	3	3	3	2	3	2	1	1	2	2	1	3	3	3
CO4	3	2	3	2	1	2	2	2	1	1	2	1	2	3	2
CO5	2	3	2	3	3	1	1	3	1	2	2	1	3	2	3

IT1707	CLOUD APPLICATION DEVELOPMENT LAB	L	T	P	C
		0	0	4	2

OBJECTIVES

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

Exp. No	Experiment	Course Outcomes
1	Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories.	CO1
2	Install Virtualbox/VMware Workstation with different flavors of Linux or Windows OS on top of windows7 or 8.	CO1
3	Find a procedure to transfer the files from one virtual machine to another virtual machine	CO1
4	Install a C compiler in the virtual machine and execute simple programs	CO1
5	Use GCC to compile c-programs in Virtual Machine	CO1
6	Install Google App Engine. Create hello world app using Python/Java and launch the web applications.	CO2
7	DaaS – Deployment of a basic web app and add additional Functionality (Javascripts based)	CO2
8	Simulate a cloud scenario using CloudSim and run a scheduling algorithm	CO2
9	Experiment cloud load balancing algorithms using Cloud Sim	CO2
10	Find a procedure to launch a virtual machine using try stack (Online Openstack Demo Version)	CO3
11	Install Hadoop single node cluster and run simple applications like wordcount	CO3
12	Install the Hadoop framework and create an application using Map Reduce Programming Model	CO3

TOTAL : 30 PERIODS

COURSE OUTCOMES

1. Examine the installation and configuration of VM and simple GCC-based execution.
2. Analyze and understand the functioning of different components involved in the GAE Web services cloud platform.
3. Design & Synthesize new techniques and tools in own Cloud

MAPPING BETWEEN CO AND PO, PSO WITH CORRELATION LEVEL 1/2/3

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	1	2	2	2	2	-	-	1	1	-	-	1	2	2
CO2	1	2	2	2	2	-	-	1	1	-	-	1	2	2
CO3	1	2	2	2	2	-	-	1	1	1	-	1	2	2

SEMESTER V
PROFESSIONAL ELECTIVE – I

IT1511	OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To introduce the basic concepts of linear programming To educate on the advancements in Linear programming techniques To introduce non-linear programming techniques To introduce the interior point methods of solving problems To introduce the dynamic programming method 					
UNIT I	LINEAR PROGRAMMING	9			
Introduction - formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.					CO1
UNIT II	ADVANCES IN LPP	9			
Dualit theory- Dual simplex method - Sensitivity analysis--Transportation problems– Assignment problems-Traveling sales man problem -Data Envelopment Analysis.					CO2
UNIT III	NON LINEAR PROGRAMMING	9			
Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.					CO3
UNIT IV	INTERIOR POINT METHODS	9			
Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm Barrier algorithm.					CO4
UNIT V	DYNAMIC PROGRAMMING	9			
Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion– Computational procedure–Conversion offinal value problem in to Initial value problem.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000. 2. R.Panneerselvam, “Operations Research”, PHI, 2006					

3. Hamdy ATaha, "Operations Research –An Introduction", Prentice Hall India, 2003.

REFERENCE BOOKS

1. Philips, Ravindran and Solberg, "Operations Research", John Wiley, 2002.
2. Ronald L.Rardin, "Optimization in Operation Research" Pearson Education Pvt. Ltd. New Delhi, 2005."

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	To understand ethical issues, environmental impact and acquire management skills
CO2	To Understand about the linear programming techniques
CO3	To Understand about the Non Linear programming techniques
CO4	To Understand about interior point methods of solving problems.
CO5	To Understand the dynamic programming method

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	2	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	2	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	2	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	2	2	-	-	-	-	2	2	2	3	3	2

IT1512	INTRODUCTION TO DIGITAL CURRENCIES	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To study the concepts of Bitcoins To study Bitcoin Client and Transactions To understand Bitcoin Network and Blockchain To understand Storage and Mining To study Alternative Chains. 					
UNIT I	INTRODUCTION	9			
How Bitcoins works-Transactions, Blocks, Mining, and the Blockchain-Bitcoin Transactions-Constructing a Transaction-Bitcoin Mining-Mining transactions in blocks -Spending the transaction-Public key cryptography and crypto-currency-Bitcoin Addresses-Wallets					CO1
UNIT II	THE BITCOIN CLIENT AND TRANSACTIONS	9			
Bitcoin Core - The reference implementation-Using Bitcoin Core's JSON-RPC API from the command line-Alternative clients, libraries and toolkits-Transaction Lifecycle-Structure-Outputs and Inputs-Chaining and Orphan TransactionsScripts and Script Language-Standard Transactions					CO2
UNIT III	BITCOIN NETWORK AND BLOCKCHAIN	9			
Peer-to-Peer Network Architecture-Nodes Types and Roles-The Extended Bitcoin Network-Network Discovery-Full Nodes-Simplified Payment Verification (SPV) Nodes-Bloom Filters and Inventory Updates-Transaction Pools Blockchain-Structure of a Block-Block Header-Block Identifiers-Genesis Block-Linking Blocks in the Blockchain Merkle Trees					CO3
UNIT IV	BITCOIN STORAGE AND MINING	9			
Simple Local Storage - Hot and Cold Storage - Splitting and Sharing Keys - Online Wallets and Exchanges - Payment Services - Transaction Fees - Currency Exchange Markets - Task of Bitcoin Miners – Mining Hardware – Energy Consumption and Ecology – Mining Pools – Mining Incentives and strategies – Anonymity Basics – Deanonymize Bitcoin– Mixing - Decentralized Mixing – Zerocoin and Zerocash					CO4
UNIT V	ALTCOINS	9			
Altcoins: History and Motivation – Few Altcoins - Relationship Between Bitcoin and Altcoins - Merge Mining - Atomic Cross-chain Swaps - Bitcoin-Backed Altcoins, “Side Chains” - Ethereum					CO5

and Smart Contracts - The Block Chain as a Vehicle for Decentralization - Routes to Block Chain Integration - Template for Decentralization

TOTAL : 45 PERIODS

TEXT BOOKS

1. Andreas M.Antonopoulos, "masteringbitcoins" o'reilly media, inc., 2014
2. Arvind Narayanan, "Bitcoin and Cryptocurrency Technologies" Princeton University Press, 2016

REFERENCE BOOKS

1. Chris Dannen, Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners. Apress 2017
2. Chris Burniske & Jack Tatar, cryptoassets The Innovative Investor's Guide to Bitcoin and Beyond, McGrawHill, 2018
3. S Shukla, M. Dhawan, S. Sharma and S. Venkatesan, "Blockchain Technology: Cryptocurrency and Applications", Oxford University Press, 2019.
4. Josh Thompson, "Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming", Create Space Independent Publishing Platform, 2017

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Implement the basic element of Bitcoins
CO2	Realize Bitcoin Client and Transactions
CO3	Use Bitcoin Network and Blockchain
CO4	Work with Mining techniques
CO5	Work with alternate bitcoin techniques.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2

IT1513	INFORMATION STORAGE AND MANAGEMENT	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand the storage architecture and available technologies. To learn to establish & manage datacenter. To learn security aspects of storage & data center. 					
UNIT I	STORAGE TECHNOLOGY	9			
Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.					CO1
UNIT II	STORAGE SYSTEMS ARCHITECTURE	9			
Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system.					CO2
UNIT III	INTRODUCTION TO NETWORKED STORAGE	9			
Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS full fill the need, understand the appropriateness of the different networked storage options for different application environments					CO3
UNIT IV	INFORMATION AVAILABILITY, MONITORING & MANAGING DATACENTERS	9			
List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime -Business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identifysingle points of failure in a storage infrastructure and list solutions to mitigate these failures, architecture of backup/recovery and the different backup/ recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication					CO4

technologies and their role in providing disaster recovery and business continuity capabilities. Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center																
UNIT V		SECURING STORAGE AND STORAGE VIRTUALIZATION													9	
Information security, Critical security attributes for information systems, Storage security domains,List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes.														CO5		
TOTAL : 45 PERIODS																
TEXT BOOKS																
EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley, India, 2010																
REFERENCE BOOKS																
1. Marc Farley, —Building Storage Networksll, Tata McGraw Hill ,Osborne, 2001. 2. Robert Spalding, —Storage Networks: The Complete Reference—, Tata McGraw Hill , Osborne, 2003.																
COURSE OUTCOMES																
Upon completion of the course, students will be able to																
CO1		Select from various storage technologies to suit for required application.														
CO2		Apply security measures to safeguard storage & farm														
CO3		understand the nature of networked storage														
CO4		Have knowledge of Data Centers														
CO5		Analyze QoS on Storage.														
MAPPING OF COs WITH POs AND PSOs																
COs		PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO3
CO1		3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2		3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3		3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4		3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5		3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1514	SOFTWARE RELIABILITY	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> • Learn different definitions of software quality • Know different notions of defects and classify them • Understand the basic techniques of data collection and how to apply them • Learn software metrics that define relevant metrics in a rigorous way • Gain confidence in ultra-high reliability 					
UNIT I	INTRODUCTION TO SOFTWARE RELIABILITY	9			
Basic Concepts – Failure and Faults – Environment – Availability –Modeling –uses – requirements reliability metrics – design & code reliability metrics – testing reliability metrics.					CO1
UNIT II	SOFTWARE RELIABILITY MODELING	9			
Concepts – General Model Characteristic – Historical Development of models – Model Classification scheme – Markovian models – General concepts – General Poisson Type Models – Binomial Type Models – Poisson Type models – Fault reduction factor for Poisson Type models.					CO2
UNIT III	COMPARISON OF SOFTWARE RELIABILITY MODELS	9			
Comparison Criteria – Failure Data – Comparison of Predictive Validity of Model Groups – Recommended Models – Comparison of Time Domains – Calendar Time Modeling – Limiting Resource Concept – Resource Usage model – Resource Utilization – Calendar Time Estimation and confidence Intervals					CO3
UNIT IV	FUNDAMENTALS OF MEASUREMENT	9			
Measurements in Software Engineering – Scope of Software metrics – Measurements theory – Goal based Framework – Software Measurement Validation.					CO4
UNIT V	MEASURING SOFTWARE PRODUCT	9			
Measurement of Internet Product Attributes – Size and Structure – External Product Attributes – Measurement of Quality – Software Reliability: Measurement and Prediction.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. John D. Musa, —Software Reliability EngineeringII, Tata McGraw Hill, 1999 2. John D. Musa, Anthony Iannino, KazuhiraOkumoto, —Software Reliability – Measurement, Prediction, Application, Series in Software Engineering and TechnologyII, McGraw Hill, 1987					

REFERENCE BOOKS

1. Norman Fenton, James Bieman, —Software Metrics: A Rigorous and Practical Approachll, 3rd edition, CRC Press, 2015

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Perform some simple statistical analysis relevant to software measurement data
CO2	Use from practical examples both the benefits and limitations of software metrics
CO3	Analyze for quality control and assurance
CO4	Understand about fundamentals of measurement
CO5	Analyze the performance of the software Product

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2

CS1515	FUNDAMENTALS OF DIGITAL IMAGE PROCESSING	L	T	P	C
(Common to CSE)		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To become familiar with digital image fundamentals To get exposed to simple image enhancement techniques in Spatial and Frequency domain. To learn concepts of degradation function and restoration techniques. To study the image segmentation and representation techniques. To become familiar with image compression and recognition methods 					
UNIT I	DIGITAL IMAGE FUNDAMENTALS	9			
Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.					CO1
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, Homomorphic filtering, Color image enhancement					CO2
UNIT III	IMAGE RESTORATION	9			
Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering					CO3
UNIT IV	IMAGE SEGMENTATION	9			
Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing-erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.					CO4
UNIT V	IMAGE COMPRESSION AND RECOGNITION	9			
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes –					CO5

Recognition based on matching.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Pearson, Third Edition, 2010.
2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002.

REFERENCE BOOKS

1. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
3. D.E. Dudgeon and R.M. Mersereau, Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing John Wiley, New York, 2002
5. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	To become familiar with digital image fundamentals
CO2	To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
CO3	To learn concepts of degradation function and restoration techniques.
CO4	To study the image segmentation and representation techniques.
CO5	To become familiar with image compression and recognition methods

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	1	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	1	2	2	2	3	2	3
CO3	3	3	3	3	2	-	-	-	1	2	2	2	3	2	3
CO4	3	3	3	3	2	-	-	-	1	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	1	2	2	2	3	3	3

SEMESTER VI
PROFESSIONAL ELECTIVE – II

IT1611	FUZZY LOGIC AND ARTIFICIAL NEURAL NETWORKS	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To impart knowledge on fuzzy logic principles To understand models of ANN To use the fuzzy logic and neural network for application related to design and manufacture 					
UNIT I	INTRODUCTION TO FUZZY LOGIC PRINCIPLES	9			
Basic concepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relations – Fuzzy relational equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference – Predicate Logic – Inference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference – fuzzy rule based systems – fuzzification and defuzzification – types.					CO1
UNIT II	ADVANCED FUZZY LOGIC APPLICATIONS	9			
Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multiobjective decision making – fuzzy classification – means clustering – fuzzy pattern recognition – image processing applications – systactic recognition – fuzzy optimization.					CO2
UNIT III	INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS	9			
Fundamentals of neural networks – model of an artificial neuron – neural network architectures – Learning methods – Taxonomy of Neural network architectures – Standard back propagation algorithms – selection of various parameters – variations Applications of back propagation algorithms.					CO3
UNIT IV	OTHER ANN ARCHITECTURES	9			
Associative memory – exponential BAM – Associative memory for real coded pattern pairs – Applications adaptive reasonance theory – introduction – ART 1 – ART2 – Applications – neural networks based on competition – kohenen self organizing maps – learning vector quantization – counter propagation networks – industrial applications..					CO4
UNIT V	RECENT ADVANCES	9			
Fundamentals of genetic algorithms – genetic modeling – hybrid systems – integration of fuzzy logic, neural networks and genetic algorithms – non traditional optimization techniques like ant					CO5

colony optimization – Particle swarm optimization and artificial immune systems – applications in design and manufacturing.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Rajasekaran. S.. Vijayalakshmi Pai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003
2. Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw Hill, 2017
3. Zurada J.M. "Introduction to Artificial Neural Systems", Jaico publishing house, 2016.

REFERENCE BOOKS

1. Klir.G, Yuan B.B. "Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited, 1997.
2. Laurene Fausett, "Fundamentals of Neural Networks", Prentice hall, 1992
3. Gen, M. and Cheng R. "Genetic Algorithm and Engineering Design", John Wiley 1997

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop the skill in basic understanding on fuzzy logic.
CO2	Develop the skill in basic understanding on neural network.
CO3	Explore the functional components of neural classification conductor and the functional components of fuzzy logic classification on controller
CO4	Develop and implement a basic trainable neural network (or) a fuzzy logic system to design and manufacturing.
CO5	Understand the recent advances in fundamentals of genetic algorithm.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2

IT1612	SOFTWARE TESTING AND QUALITY ASSURANCE	L	P	T	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To understand software testing and quality assurance as a fundamental component of software life cycle To define the scope of SW T & QA projects To efficiently perform T & QA activities using modern software tools To estimate cost of a T & QA project and manage budgets To prepare test plans and schedules for a T&QA project To develop T & QA project staffing requirements To effectively manage a T & QA project. 					
UNIT I	SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES	9			
Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, . Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group, System Test Team Hierarchy, Team Building					CO1
UNIT II	SYSTEM TESTING	9			
System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built-in Testing. Functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models.					CO2
UNIT III	SYSTEM TEST CATEGORIES	9			
System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote.					CO3
UNIT IV	SOFTWARE QUALITY	9			
Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.					CO4
UNIT V	SOFTWARE QUALITY ASSURANCE	9			

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

CO5

TOTAL : 45 PERIODS

TEXT BOOKS

1. Software Testing And Quality Assurance-Theory and Practice, Kshirasagar Nak Priyadarshi Tripathy, John Wiley & Sons Inc,2008.

REFERENCE BOOKS

1. Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
2. Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004.
3. Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Familiar with the process of verification, validation and understand the process of applying tests to software and the fundamental components of a test case.
CO2	Derive test cases from software requirement specifications - including being able to partition input and output domains, form test specifications, and identify valid combinations of input.
CO3	Distinguish between methods of judging test case adequacy and how to design tests that will accomplish the obligations of such methods.
CO4	Understand how to build models of system behavior and prove that their obey required properties.
CO5	Make logical arguments that prove the correctness of program implementations and write code to automate test execution and analysis.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	2	1
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	2	1
CO3	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	-	2	2	3	2	1
CO5	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2

IT1613	NATURAL LANGUAGE PROCESSING TOOLS AND APPLICATIONS	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none">To explore the fundamental concepts of Natural Language ProcessingTo learn the different data pre-processing steps in lexical analysisTo understand the working of syntactic and semantic analysis using NLTKTo familiar with text classification and topic modeling methodsTo work with sentiment analysis and machine translation using python					
UNIT I	INTRODUCTION TO NLP	9			
	Natural language processing – History of NLP – Early NLP systems – Phases of natural language processing – Evaluation of NLP systems - Origins and challenges of NLP – Basic English concepts – Language and Grammar - Processing Indian Languages	CO1			
UNIT II	LEXICAL ANALYSIS USING NLTK	9			
	Introduction and installation of NLTK – Data Pre-processing: Tokenization – Part of Speech (PoS) Tagging - Word Frequency Counting – Stop Words Removal – Text Normalization – Spelling Correction - Stemming – Lemmatization – Named Entity Recognition	CO2			
UNIT III	SYNTACTIC AND SEMANTIC ANALYSIS USING NLTK	9			
	Feature Extraction: Building Bag of Words (BoW) Model – Building TF-IDF Model – Word Embeddings using word2vec - Sentence Boundary Detection – Parsing - Lexical Resources: WordNet – FrameNet - Word Synonyms and Antonyms using NLTK – Word Negation Tracking - Word Sense Disambiguation	CO3			
UNIT IV	TEXT CLASSIFICATION AND TOPIC MODELING	9			
	Introduction to Text Classification – Machine Learning Overview – Classification Metrics – Confusion Matrix – Developing a Text Classifier – Saving and Loading Models - Introduction to Topic Modelling – Topic Discovery – Topic Modelling Algorithms: Latent Semantic Analysis – Latent Dirichlet Algorithms.	CO4			
UNIT V	SENTIMENT ANALYSIS AND MACHINE TRANSLATION	9			
	Introduction to Sentiment Analysis – Need and Growth of Sentiment Analysis – TextBlob – Understanding Data for Sentiment Analysis – Training Sentiment Models – Introduction to Machine Translation - Problems in Machine Translation - Machine Translation Approaches - Translation involving Indian Languages using Python	CO5			
TOTAL : 45 PERIODS					

TEXT BOOKS

1. Ela Kumar, "Natural Language Processing", I.K International, New Delhi 2011.
2. Sohom Ghosh, Dwight Gunning, "Natural Language Processing Fundamentals", Packt Publishing Limited, 2019.
3. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, 1st Edition, 2009.

REFERENCE BOOKS

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition 2008.
3. Christopher D. Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing", MIT Press, 2003.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Familiarize with concept of Natural Language Processing
CO2	Pre-process the data from the collected dataset using NLTK
CO3	Extract the features and do the syntactic and semantic analysis using NLTK
CO4	Classify the text using text classification algorithm and find the recent topic using LSA and LDA
CO5	Find the different emotions and sentiment using sentiment analysis and translate from one natural language to other using machine translation

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	3	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	3	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	3	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	3	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	3	-	2	2	2	3	3	2

IT1614	KNOWLEDGE ENGINEERING	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To learn about first order logics To acquire knowledge about reasoning To apply object-oriented concepts for various expert systems To assess uncertainty using non monotonic logic To understand various action and planning strategies for problem solving 					
UNIT I	INTRODUCTION	9			
Knowledge Representation and Reasoning – First order Logic – Syntax- Semantics Pragmatics – Expressing Knowledge – Levels of Representation – Knowledge Acquisition and Sharing – Sharing Ontologies – Language Ontologies –Language Patterns – Tools for Knowledge Acquisition					CO1
UNIT II	RESOLUTION AND REASONING	9			
Proportional Case – Handling Variables and Quantifiers – Dealing with Intractability – Reasoning with Horn Clauses - Procedural Control of Reasoning – Rules in Production– Description Logic - Issues in Engineering					CO2
UNIT III	REPRESENTATION	9			
Object Oriented Representations – Frame Formalism – Structured Descriptions – Meaning and Entailment - Taxonomies and Classification – Inheritance – Networks – Strategies for Defeasible Inheritance – Formal Account of Inheritance Networks					CO3
UNIT IV	DEFAULTS, UNCERTAINTY AND EXPRESSIVENESS	9			
Defaults – Introduction – Closed World Reasoning – Circumscription – Default Logic imitations of Logic – Fuzzy Logic – Non monotonic Logic – Theories and World – Semiotics – Auto epistemic Logic - Vagueness – Uncertainty and Degrees of Belief – Non categorical Reasoning – Objective and Subjective Probability- linguistic fuzzy rule-based classification system - fuzzy cognitive maps- fuzzy for large data					CO4
UNIT V	ACTIONS AND PLANNING	9			
Explanation and Diagnosis – Purpose – Syntax, Semantics of Context – First Order Reasoning Modal Reasoning in Context – Encapsulating Objects in Context – Agents – Actions – Situational Calculus – Frame Problem – Complex Actions – Planning –Strips– Planning as Reasoning – Hierarchical and Conditional Planning					CO5

TEXT BOOKS

1. Michael K. Bergman "A Knowledge Representation Practionary: Guidance from Charles Sanders Peirce." Springer -2018.
2. Ronald Brachman, Hector Levesque, "Knowledge Representation and Reasoning ", The Morgan Kaufmann Series, First Edition.

REFERENCE BOOKS

1. John F. Sowa, "Knowledge Representation: Logical, Philosophical, and Computational Foundations", Brokes/Cole, First Edition, 2000.
2. Arthur B. Markman, "Knowledge Representation", Lawrence Erlbaum Associates, 1998.
3. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill Publishing Company Ltd., New Delhi, Third Edition, ISBN: 13:978-0-07-008770-5, 2010.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Formulate problem in first order logic and ontologies
CO2	Improve resolution and reasoning with horn clauses
CO3	Apply object-oriented abstractions for knowledge representation
CO4	Solve problems with uncertainty using fuzzy rules
CO5	Design and develop applications with action and planning

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2

MG1615	ENGINEERING ETHICS AND HUMAN VALUES	L	P	T	C
(Common to CSE)		3	0	0	3
OBJECTIVES					
1. Students will understand the importance of Values and Ethics in their Personal lives and professional careers 2. The students will learn the rights and responsibilities 3. Responsibilities of employee, team member and a global citizen.					
UNIT I	HUMAN VALUES	9			
Morals, 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 – Spirituality.					CO1
UNIT II	Engineering Et	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					CO2
UNIT III	Engineering as Social Ex	9			
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study					CO3
UNIT IV	Safety, Responsibilities and Ri	9			
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination					CO4
UNIT V	Global Is	9			
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2nd Edition, 2009.					
REFERENCE BOOKS					
1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004. 2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United					

States, 2000

3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understanding basic purpose of profession, professional ethics and various moral and social issues.
CO2	Awareness of professional rights and responsibilities of a Engineer, safety and risk benefit analysis of a Engineer
CO3	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels
CO4	Professional Ethical values and contemporary issues
CO5	Excelling in competitive and challenging environment to contribute to industrial growth.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO2	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO3	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO4	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO5	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2

SEMESTER VII
PROFESSIONAL ELECTIVE – III

IT1711	WEB DEVELOPMENT FRAMEWORKS	L	T	P	C
		3	0	0	3
OBJECTIVES <ol style="list-style-type: none"> 1. Understand the fundamentals of web framework 2. Know the concept of the Java web framework 3. Learn the technologies of the Python web framework 4. Be exposed to the concepts of the Web framework 5. Be familiar with the Web framework. 					
UNIT I	FUNDAMENTALS OF WEB FRAMEWORK	9			
Web framework-History-Types of framework architectures-Model-view-controller (MVC)-Three-tier organization-Introduction to frameworks-Framework applications -General-purpose website frameworks-Server-side-Client-side-Features					CO1
UNIT II	JAVA WEB FRAMEWORK	9			
Java Web Frameworks-Struts-The Struts Framework- The Struts Tag Libraries- – Struts Configuration Files- Applying Struts					CO2
UNIT III	STRUTS	9			
Struts and Agile Development -Basic Configuration.-Actions and Action Support.-Results and Result Types.-OGNL, the Value Stack, and Custom Tags-Form Tags-Form Validation and Type ConversionExceptions and Logging-Getting Started with JavaScript-Advanced JavaScript, the DOM, and CSSThemes and Templates-Rich Internet Applications.					CO3
UNIT IV	PYTHON WEB FRAMEWORKS	9			
Introduction to Python Frameworks-Web 2.0, Python, and Frameworks-The Role of AJAX in Web 2.0-Web 2.0 with Traditional Python-Introducing the Frameworks-Web Application Frameworks-MVC in Web Application Frameworks-Common Web Application Framework Capabilities					CO4
UNIT V	TURBOGEARS WEB FRAMEWORK	9			
Introduction to TurboGears-TurboGears History-Main TurboGears Components-Alternate Components-MVC Architecture in TurboGears-Creating an Example Application-The Controller and View-Introduction to Django-Django History-Django Components-Alternate Components-MVC Architecture in Django-Creating an Example Application					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 1. James Holmes, Struts The Complete Reference, 2nd Edition, Mc.Graw Hill Professional 2006 2. Donald Brown, Chad Michael Davis, Scott Stanlick ,Struts 2 In Action Dreamtech press 					

2008

3. Dana Moore, Raymond Budd, William Wright, Professional Python Frameworks Web 2.0 John Wiley and sons, 2008
4. Programming with Django and TurboGears, Wiley Publishing
5. Carlos De La Guardia, Python Web Frameworks, O'Reilly

REFERENCE BOOKS

1. Sue Spielman, The Struts Framework 1: A Practical guide for Java Programmers, 1st Edition. Elsevier 2002
2. Adrian Holovaty Jacob Kaplan-Moss, The Definitive Guide to Django: Web Development Done Right, Apress, 2009
3. Mark Ramm, Rapid Web applications with TurboGears, Prentice Hall. 2009

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Analyze the fundamentals of web framework
CO2	Use the concept of Java web framework
CO3	Implement the concept using Struts framework
CO4	Apply the concept of python web framework to the problem solutions.
CO5	Critically analyze the various Web frameworks.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1712	INFORMATION MANAGEMENT	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To understand the importance of information in business To know the technologies and methods used for effective decision making in an organization. 					
UNIT I	INTRODUCTION	9			
Data, Information, Intelligence, Information Technology, Information System, evolution, types based on functions and hierarchy, System development methodologies, Functional Information Systems, DSS, EIS, KMS, GIS, International Information System.					CO1
UNIT II	SYSTEM ANALYSIS AND DESIGN	9			
Case tools - System flow chart, Decision table, Data flow Diagram (DFD), Entity Relationship (ER), Object Oriented Analysis and Design(OOAD), UML diagram.					CO2
UNIT III	DATABASE MANAGEMENT SYSTEMS	9			
DBMS – HDBMS, NDBMS, RDBMS, OODBMS, Query Processing, SQL, Concurrency Management, Data warehousing and Data Mart					CO3
UNIT IV	SECURITY, CONTROL AND REPORTING	9			
Security, Testing, Error detection, Controls, IS Vulnerability, Disaster Management, Computer Crimes, Securing the Web, Intranets and Wireless Networks, Software Audit, Ethics in IT, User Interface and reporting					CO4
UNIT V	NEW IT INITIATIVES	9			
Role of information management in ERP, e-business, e-governance, Data Mining, Business Intelligence, Pervasive Computing, Cloud computing, CMM.					CO5
TOTAL: 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> Robert Schultheis and Mary Summer, Management Information Systems – The Managers View, Tata McGraw Hill, 2008. Kenneth C. Laudon and Jane Price Laudon, Management Information Systems – Managing the digital firm, PHI Learning / Pearson Education, PHI, Asia, 2012. 					
REFERENCE BOOKS					
<ol style="list-style-type: none"> Rahul de, MIS in Business, Government and Society, Wiley India Pvt Ltd, 2012 Gordon Davis, Management Information System : Conceptual Foundations, Structure and Development, Tata McGraw Hill, 21st Reprint 2008. 					

3. Haag, Cummings and Mc Cubbrey, Management Information Systems for the Information Age, McGraw Hill, 2005. 9th edition, 2013.
4. Turban, McLean and Wetherbe, Information Technology for Management – Transforming Organisations in the Digital Economy, John Wiley, 6th Edition, 2008.
5. Raymond McLeod and Jr. George P. Schell, Management Information Systems, Pearson Education, 2007.
6. James O Brien, Management Information Systems – Managing Information Technology in the E-business enterprise, Tata McGraw Hill, 2004.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Gains knowledge on effective applications of information systems in business
CO2	Gains knowledge on system analysis and design
CO3	Gains knowledge on database management systems
CO4	Gains knowledge on security, control and reporting
CO5	Gains knowledge on new IT Initiatives

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	3	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	2	3	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	2	3	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	2	3	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	2	3	3	3	2

IT1713	CYBER FORENSICS	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To learn computer forensics To become familiar with forensics tools To learn to analyze and validate forensics data 					
UNIT I	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.					CO1
UNIT II	EVIDENCE COLLECTION AND FORENSICS TOOLS	9			
Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools					CO2
UNIT III	ANALYSIS AND VALIDATION	9			
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics					CO3
UNIT IV	ETHICAL HACKING	9			
Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing					CO4
UNIT V	ETHICAL HACKING IN WEB	9			
Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —Computer Forensics and InvestigationsII, Cengage Learning, India Edition, 2016. 2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015					
REFERENCE BOOKS					
1. John R.Vacca, —Computer ForensicsII, Cengage Learning, 2005					

2. MarjieT.Britz, —Computer Forensics and Cyber Crimell: An Introductionll, 3rd Edition, Prentice Hall, 2013.
3. AnkitFadia — Ethical Hackingll Second Edition, Macmillan India Ltd, 2006
4. Kenneth C.Brancik —Insider Computer Fraudll Auerbach Publications Taylor & Francis Group–2008..

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand the basics of computer forensics
CO2	Apply a number of different computer forensic tools to a given scenario
CO3	Analyze and validate forensics data
CO4	Identify the vulnerabilities in a given network infrastructure
CO5	Implement real-world hacking techniques to test system security

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2

IT1714	PARALLEL ALGORITHMS	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none">To understand different parallel architectures and models of computation.To introduce the various classes of parallel algorithms.To study parallel algorithms for basic problems.					
UNIT I	INTRODUCTION	9			
Need for Parallel Processing - Data and Temporal Parallelism - Models of Computation - RAM and PRAM Model – Shared Memory and Message Passing Models- Processor Organisations - PRAM Algorithm – Analysis of PRAM Algorithms- Parallel Programming Languages		CO1			
UNIT II	PRAM ALGORITHMS	9			
Parallel Algorithms for Reduction – Prefix Sum – List Ranking –Preorder Tree Traversal – Searching -Sorting - Merging Two Sorted Lists – Matrix Multiplication - Graph Coloring - Graph Searching		CO2			
UNIT III	SIMD ALGORITHMS -I	9			
2D Mesh SIMD Model - Parallel Algorithms for Reduction - Prefix Computation - Selection - Odd-Even Merge Sorting - Matrix Multiplication		CO3			
UNIT IV	SIMD ALGORITHMS -II	9			
Hypercube SIMD Model - Parallel Algorithms for Selection- Odd-Even Merge Sort- Bitonic Sort- Matrix Multiplication Shuffle Exchange SIMD Model - Parallel Algorithms for Reduction - Bitonic Merge Sort - Matrix Multiplication - Minimum Cost Spanning Tree		CO4			
UNIT V	MIMD ALGORITHMS	9			
UMA Multiprocessor Model -Parallel Summing on Multiprocessor- Matrix Multiplication on Multiprocessors and Multicomputer - Parallel Quick Sort - Mapping Data to Processors.		CO5			
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none">Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, Second edition, 2017.Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", University press, Second edition , 2011.V Rajaraman, C Siva Ram Murthy, " Parallel computers- Architecture and Programming ", PHI learning, 2016.					

REFERENCE BOOKS

1. AnanthGrame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", 2nd Edition, Addison Wesley, 2003.
2. M Sasikumar, Dinesh Shikhare and P Ravi Prakash , " Introduction to Parallel Processing", PHI learning , 2013.
3. S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Develop parallel algorithms for standard problems and applications.
CO2	Understand various classes of parallel algorithms
CO3	Apply parallel algorithms for basic problems
CO4	Apply techniques for Multiprocessor Model
CO5	Analyze efficiency of different parallel algorithms.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	2	-	-	2	2	2	3	3	2

IT1715	AUGMENTED AND VIRTUAL REALITY	L	P	T	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To introduce the relevance of this course to the existing technology through demonstrations, case studies and applications with a futuristic vision along with socio-economic impact and issues To understand virtual reality, augmented reality and using them to build Biomedical engineering applications To know the intricacies of these platform to develop PDA applications with better optimality 					
UNIT I	VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS	9			
The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces					CO1
UNIT II	3D USER INTERFACE INPUT HARDWARE	9			
Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces					CO2
UNIT III	SOFTWARE TECHNOLOGIES	9			
Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market					CO3
UNIT IV	3D INTERACTION TECHNIQUES	9			
3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Design Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestural Commands, Tools, Multimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry . DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation. VIRTUAL REALITY APPLICATIONS: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.					CO4

UNIT V	Augmented and Mixed Reality	9
Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.		CO5

TOTAL : 45 PERIODS

REFERENCE BOOKS

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Merging Real and Virtual Worlds", 2005.
5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.
6. John Vince, "Virtual Reality Systems", Addison Wesley, 1995.
7. Howard Rheingold, "Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society", Simon and Schuster, 1991.
8. William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
9. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013. A Grama, AGupra, G Karypis, V Kumar. Introduction to Parallel Computing (2nd ed.). Addison Wesley, 2003.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Analyse and Design a system or process to meet given specifications with realistic engineering constraints.
CO2	Identify problem statements and function as a member of an engineering design team.
CO3	Utilize technical resources
CO4	Propose technical documents related to design mini project results.
CO5	Give technical oral presentations related to design mini project results.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO2	2	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO3	2	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO4	2	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO5	2	2	2	2	1	-	-	1	1	1	1	1	2	2	2

SEMESTER VII
PROFESSIONAL ELECTIVE – IV

IT1721	STORAGE AREA NETWORKS			L	T	P	C
				3	0	0	3
OBJECTIVES <ul style="list-style-type: none">To Identify key challenges in managing information and analyze different storage networking technologies and virtualizationTo Know about components and the implementation of NASUnderstand CAS architecture and types of archives and forms of virtualizationUnderstand the storage infrastructure and management activitiesUnderstand the Securing Infrastructure.							
UNIT I	Storage System						9
Introduction to Information Storage: Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. Data Center Environment: Application, Host (Compute), Connectivity, Storage. Data Protection: RAID: RAID Implementation Methods, RAID Techniques, RAID Levels, RAID Impact on Disk Performance. Intelligent Storage Systems: Components of Intelligent Storage System, Storage Provisioning.							CO1
UNIT II	Storage Networking Technologies						9
Fibre Channel Storage Area Networks: Components of FC SAN, FC connectivity, Fibre Channel Architecture, Zoning, FC SAN Topologies, Virtualization in SAN. IP SAN and FCoE: iSCSI, FCIP, FCoE. Network Attached Storage: Components of NAS, NAS I/O Operation, NAS File-Sharing Protocols, File-Level Virtualization, Object-Based Storage and Unified Storage: Object-Based Storage Devices, Content-Addressed Storage, Unified Storage.							CO2
UNIT III	Backup, Archive and Replication						9
Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, BC Technology Solutions. Backup and Archive: Backup Methods, Backup Topologies, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive. Local Replication: Replication Terminology, Uses of Local Replicas, Local Replication Technologies, Local Replication in a Virtualized Environment. Remote Replication: Remote Replication Technologies, Three-Site Replication, Remote Replication and Migration in a Virtualized Environment.							CO3
UNIT IV	Cloud Computing and Virtualization						9
Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits of Cloud Computing, Cloud Service Models, Cloud Deployment Models, Cloud Computing Infrastructure,							CO4

Cloud Challenges and Cloud Adoption Considerations. Virtualization Appliances: Black Box Virtualization, In-Band Virtualization Appliances, Outof-Band Virtualization Appliances, High Availability for Virtualization Appliances, Appliances for Mass Consumption. Storage Automation and Virtualization: Policy-Based Storage Management, Application-Aware Storage Virtualization, Virtualization-Aware Applications.

UNIT V Securing and Managing Storage Infrastructure

9

Securing and Storage Infrastructure: Information Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking, Securing Storage Infrastructure in Virtualized and Cloud Environments.

CO5

Monitoring the Storage Infrastructure, Storage Infrastructure Management activities, Storage Infrastructure Management Challenges, Information Lifecycle management, Storage Tiering.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Information Storage and Management, Author : EMC Education Services, Publisher: Wiley
ISBN: 9781118094839

REFERENCE BOOKS

1. Storage Virtualization, Author: Clark Tom, Publisher: Addison Wesley Publishing Company
ISBN : 9780321262516

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization
CO2	Explain components and the implementation of NAS
CO3	Describe CAS architecture and types of archives and forms of virtualization
CO4	Illustrate the storage infrastructure and management activities
CO5	Illustrate the Securing Infrastructure

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2

IT1722	NoSQL DATABASE	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> Define, compare and use the four types of NoSQL Databases (Document-oriented, Key/Value Pairs, Column-oriented and Graph). Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases. Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases. 					
UNIT I	NoSQL Basics	9			
Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases. More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,					CO1
UNIT II	Distribution Models	9			
Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes					CO2
UNIT III	Map-Reduce	9			
Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets					CO3
UNIT IV	Document Databases	9			
Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, ECommerce Applications, When Not to Use, Complex Transactions Spanning Different					CO4

Operations, Queries against Varying Aggregate Structure																
UNIT V		Graph Databases											9			
Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.															CO5	
TOTAL : 45 PERIODS																
TEXT BOOKS																
1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012																
REFERENCE BOOKS																
1. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)																
2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)																
3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2 nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)																
COURSE OUTCOMES																
Upon completion of the course, students will be able to																
CO1	Define, compare and use the four types of NoSQL Databases (Document-oriented, Key/Value Pairs, Column-oriented and Graph).															
CO2	Demonstrate an understanding of the detailed architecture, define objects, load data, query data															
CO3	Analyze the performance tune Column-oriented NoSQL databases															
CO4	Explain the detailed architecture, define objects, load data, query data and performance															
CO5	Analyze the performancetuneDocument-oriented NoSQL databases															
MAPPING OF COs WITH POs AND PSOs																
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	
CO1	3	3	3	3	2	-	-	-	-	1	2	2	3	3	2	
CO2	3	3	3	3	2	-	-	-	-	1	2	2	3	3	2	
CO3	3	3	3	3	2	-	-	-	-	1	2	2	3	3	2	
CO4	3	3	3	3	2	-	-	-	-	1	2	2	3	3	2	
CO5	3	3	3	3	2	-	-	-	-	1	2	2	3	3	2	

IT1723	SOFTWARE AGENTS	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> Understand the how software agents reduce information overhead gain knowledge in use of software agents for cooperative learning and personal assistance, to know how agent can communicate and share knowledge using agent communication language gain knowledge in design of an agent interpreter and intelligent agent understand the concept of mobile technology and mobile agents and its security 					
UNIT I	AGENT AND USER EXPERIENCE	9			
Agent characteristics- object Vs agent. Agent types- Interacting with Agents - Agent From Direct Manipulation to Delegation - Interface Agent, Metaphor with Character – Designing Agents –problem solving agent, rational agent. Direct Manipulation versus Agent Path to Predictable					CO1
UNIT II	AGENTS FOR LEARNING AND ASSISTANCE	9			
Agents for Information Sharing and Coordination - Agents that Reduce Work Information Overhead - Agents without Programming Language - Life like Computer character - S/W Agents for cooperative Learning – Multiple Reasoning agents –M system. Learning agents: computational architectures for learning agents; evolution, adaptation; multi-agent learning.					CO2
UNIT III	AGENT COMMUNICATION AND COLLABORATION	9			
Overview of Agent Oriented Programming - Agent Communication Language – KQML-Per formatives. Agent Based Framework of Interoperability. Virtual agents: agents in games and virtual environments; companion and coaching agents; modeling personality, emotions; multimodal interaction; verbal and non-verbal expressiveness.					CO3
UNIT IV	AGENT ARCHITECTURE	9			
Strategies for agent design. Agent interpreter- BDI architecture. Architecture of Intelligent Agents. Agents for Information Gathering - Open Agent Architecture - Communicative Action for Artificial Agent. Agent societies and societal issues.					CO4
UNIT V	MOBILE AGENTS	9			
Mobile agent paradigm - Mobile agent concepts -Mobile agent technology – programming mobile agents –application of mobile agents- Teleshopping. Mobile agent security- trust, reliability and reputation.					CO5
TOTAL : 45 PERIODS					

TEXT BOOKS

1. Jeffrey M. Bradshaw, "Software Agents", MIT Press 2000, Pearson Indian Reprint 2010.

REFERENCE BOOKS

1. Lin, Fuhua Oscar (Ed.), "Designing Distributed Learning Environments with Intelligent Software Agents", Information Science Publishing, 2004
2. Russel & Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 2nd Edition, 2002.
3. Murch Richard, Johnson Tony 'Intelligent Software Agents', Prentice Hall, 1998.
4. Joseph P. Bigus & Jennifer Bigus, "Constructing Intelligent agents with Java: A Programmer's Guide to Smarter Applications", Wiley, 1997.
5. Knapik, Michael and Jay Johnson 'Developing Intelligent Agents for Distributed Systems: Exploring Architecture, Technologies, and Applications', McGraw-Hill, 1998
6. William R. Cockayne, Michael Zyda, "Mobile Agents", Prentice Hall, 1998

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understanding the fundamentals of agents and agent programming paradigms.
CO2	Apply agents for learning and assistance
CO3	Apply agent for communication and collaboration
CO4	Understand agent architecture
CO5	Apply in mobile agents

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	-	2	2	3	3	2

CS1722	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none">To introduce the fundamentals of quantum computingThe problem solving approach using finite dimensional mathematics					
UNIT I	COMPLEX NUMBERS AND VECTORS	9			
Complex numbers and its geometrical representations, Complex vector spaces, inner products and Hilbert spaces, Hermitian and unitary matrices, Tensor products of vector spaces		CO1			
Quantum bits, Bloch sphere representation of a qubit, multiple qubits, Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis					
UNIT II	QUANTUM MECHANICS	9			
Quantum Circuits: Single qubit gates, multiple qubit gates, design of quantum circuits. Classical gates versus quantum gates		CO2			
UNIT III	QUANTUM INFORMATION AND CRYPTOGRAPHY	9			
Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem		CO3			
UNIT IV	QUANTUM ALGORITHMS	9			
Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search		CO4			
UNIT V	NOISE AND ERROR CORRECTION	9			
Graph states and codes, Quantum error correction, fault-tolerant computation		CO5			
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008.					
REFERENCE BOOKS					
1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008					

2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010
3. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995
4. Pittenger A. O., An Introduction to Quantum Computing Algorithms 2000

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Basics of complex vector spaces
CO2	Quantum mechanics as applied in Quantum computing
CO3	Architecture and algorithms
CO4	Fundamentals of Quantum computations
CO5	Understand noise and error correction techniques

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	3	-	-	2	2	2	3	2	1
CO2	3	3	3	3	2	-	3	-	-	2	2	2	3	2	1
CO3	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	3	-	-	2	2	2	3	2	1
CO5	3	3	3	3	2	-	3	-	-	2	2	2	3	3	2

CE1025	DISASTER MANAGEMENT				L	T	P	C
					3	0	0	3
OBJECTIVES <ul style="list-style-type: none">❖ To provide students an exposure to disasters, their significance and types.❖ To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction❖ To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)❖ To enhance awareness of institutional processes in the country❖ To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity								
UNIT I		INTRODUCTION TO DISASTERS						9
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.								CO1
UNIT II		APPROACHES TO DISASTER RISK REDUCTION						9
Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.								CO2
UNIT III		INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT						9
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.								CO3
UNIT IV		DISASTER RISK MANAGEMENT IN INDIA						9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.								CO4
UNIT V		DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS						9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.	CO5
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TOTAL : 45 PERIODS

TEXT BOOKS

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010.
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012.
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCE BOOKS

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	differentiate the types of disasters, causes and their impact on environment and society
CO2	assess vulnerability and various methods of risk reduction measures as well as mitigation
CO3	enhance awareness of institutional processes in the country
CO4	develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity
CO5	draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	0	0	2	2	1	3	0	1	2			
CO2	3	2	0	0	0	2	2	1	2	0	2	1			
CO3	3	2	0	0	0	1	2	1	2	0	1	2			
CO4	3	2	0	0	0	1	1	1	1	0	1	3			
CO5	3	2	0	0	0	1	2	1	3	0	1	3			

SEMESTER VIII
PROFESSIONAL ELECTIVE – V

IT1811	INFORMATION THEORY AND CODING	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> Understand error–control coding. Understand encoding and decoding of digital data streams. Be familiar with the methods for the generation of these codes and their decoding techniques. Be aware of compression and decompression techniques. Learn the concepts of multimedia communication. 					
UNIT I	INFORMATION THEORY	9			
Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.					CO1
UNIT II	SOURCE CODING: TEXT, AUDIO AND SPEECH	9			
Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding					CO2
UNIT III	SOURCE CODING: IMAGE AND VIDEO	9			
Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard					CO3
UNIT IV	ERROR CONTROL CODING: BLOCK CODES	9			
Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC					CO4
UNIT V	ERROR CONTROL CODING: CONVOLUTIONAL CODES	9			
Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding					CO5
TOTAL : 45 PERIODS					

TEXT BOOKS

1. R Bose, "Information Theory, Coding and Crptography", TMH 2007
2. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002

REFERENCE BOOKS

1. K Sayood, "Introduction to Data Compression" 3/e, Elsevier 2006
2. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007
3. Amitabha Bhattacharya, "Digital Communication", TMH 2006

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Design an application with error-control
CO2	Use compression and decompression techniques
CO3	Apply the concepts of multimedia communication
CO4	Apply the concepts of error control coding: block codes
CO5	Apply the concepts of error control coding: convolutional codes

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2

IT1812	ELECTRONIC COMMERCE	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> • Discuss fundamentals of e-commerce, types and applications. • Evaluate the role of the major types of information systems in a business environment and their relationship to each other • Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business • Identify the major management challenges for building and using information systems and learn how to find appropriate solutions to those challenges. • Learn strategies for e-commerce, Mobile Commerce, Wireless Application Protocol, WAP technology and Mobile Information devices. 					
UNIT I	INTRODUCTION	9			
Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.					CO1
UNIT II	NETWORK INFRASTRUCTURE FOR E- COMMERCE	9			
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.					CO2
UNIT III	WEB SECURITY	9			
Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.					CO3
UNIT IV	ENCRYPTION	9			
Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.					CO4
UNIT V	ELECTRONIC PAYMENTS	9			
Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.EDI					CO5

Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.

REFERENCE BOOKS

1. Pete Lohsin , John Vacca "Electronic Commerce", New Age International
2. Goel, Ritendra "E-commerce", New Age International
3. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education
4. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
5. Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand the basic concepts and technologies used in the field of management information systems
CO2	Understand the processes of developing and implementing information systems
CO3	Be aware of the ethical, social, and security issues of information systems
CO4	Develop an understanding of how various information systems work together to accomplish the information objectives of an organization
CO5	Understand the role of information systems in organizations, the strategic management processes, and the implications for the management

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	1	3	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	1	3	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	1	3	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	1	3	3	2	-	-	-	-	2	2	2	3	3	2

IT1813	AFFECTIVE COMPUTING	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To learn emotional recognition techniques. To gain a broader knowledge and understanding of the various affective computing models. To learn about various machines developed using human emotion. 					
UNIT I	Introduction	9			
Affective Computing and the Challenge of mood measurement and forecasting. Affective phenomena: emotion, mood, attitude/sentiment, personality. Computers, robots, smartphones with emotional intelligence.					CO1
UNIT II	Emotion Theory	9			
Dual-process theories of emotion, Constructivist theories, Appraisal theories. Affective Technology Interaction and Empathy: Computational Appraisal Theory, reinforcement learning based approaches, recognizing emotional context, facial affect recognition					CO2
UNIT III	Emotion and Perception	9			
Ethical issues related to emotion and AI, Emotionally Intelligent Human Computer Interaction, Emotion and Perception, Decision-making, and Creativity, Emotion and Learning, Physiology of Emotion, Behavioral game theory, Neurological Mechanisms involved in Emotion,					CO3
UNIT IV	Affect Recognition	9			
Affect Recognition by Wearable's and other Machines, Communicating Frustration/Stress in Autism and in Customer Experience, Responding to User Emotion to Reduce User Frustration, Inducing Emotion, Robots/Agents that "have" Emotion, Expression of Emotion by Machines/Agents/Synthetic characters					CO4
UNIT V	Ethical Implications of Affective Computing	9			
Philosophical, Social, Ethical Implications of Affective Computing, Machine/Mobile Empathy and Emotional Support, Lie Detection and Stress Detection.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Affective Computing and Interaction: Psychological, Cognitive and Neuroscientific Perspectives by Didem Gökçay and Gülsen Yildirim, IGI Global. 2. The Encyclopedia of Human-Computer Interaction by Jonas Lowgren, John M. Carroll, Marc					

REFERENCE BOOKS

1. Affective Computing by R.W. Picard, MIT Press.
2. The Oxford Handbook of Affective Computing by R.A. Calvo, S.K. D'Mello, J. Gratch, and A. Kappas, Oxford University Press.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Have a good understanding of the role of emotion
CO2	Have a good understanding of machine interaction.
CO3	Have an understanding of the aesthetic aspect of machine design.
CO4	Develop systems to reduce the emotional gap between humans and machines
CO5	Develop systems to reduce the emotional gap all within the context of interactions.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO2	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO3	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO4	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2
CO5	3	3	3	3	2	-	-	-	-	2	-	2	3	3	2

IT1814	SOCIAL MEDIA MINING	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To implement Basics of Text Processing over Social Data To understand various Characteristics of OSNs To understand Fundamentals of Social Data Analytics To Apply the concepts of Social Data Analytics Able to properly handle Online experiments for Computational Social Science. 					
UNIT I	Online Social Networks (OSNs)	9			
Introduction - Types of social networks (e.g., Twitter, Facebook), Measurement and Collection of Social Network Data, Social Networks - Basic Structure and Measures, Basics of Text Processing over Social Data, Entity linking and entity resolution for Social data					CO1
UNIT II	Studying Characteristics of OSNs	9			
Information Diffusion, Experimental studies over OSNs, Sampling					CO2
UNIT III	Fundamentals of Social Data Analytics	9			
Topic Models, Random Walks, Heterogeneous Information Networks					CO3
UNIT IV	Applied Social Data Analytics	9			
Recommendation Systems, Community identification and link prediction					CO4
UNIT V	Advanced Topics	9			
Online experiments for Computational Social Science, Big Data Sampling					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Matthew A. Russell. Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, Github, and More, 2nd Edition, O'Reilly Media, 2013.					
REFERENCE BOOKS					
1. Jennifer Golbeck, Analyzing the social web, Morgan Kaufmann, 2013.					
2. Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 2011.					
COURSE OUTCOMES					
Upon completion of the course, students will be able to					
CO1	To implement Basics of Text Processing over Social Data				

CO2	To understand various Characteristics of OSNs														
CO3	To understand Fundamentals of Social Data Analytics														
CO4	To Apply the concepts of Social Data Analytics														
CO5	Able to properly handle Online experiments for Computational Social Science.														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO2	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO3	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO4	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2
CO5	3	3	1	3	2	-	-	-	-	2	2	2	3	3	2

IT1815	SECURE CODING	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> This course aims to provide an understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities. It gives an outline of the techniques for developing a secure application. 					
UNIT I	Introduction	9			
Security, CIA Triad, Viruses, Trojans, and Worms In a Nutshell, Security Concepts- exploit, threat, vulnerability, risk, attack. Malware Terminology: Rootkits, Trapdoors, Botnets, Key loggers, Honeypots. Active and Passive Security Attacks. IP Spoofing, Tear drop, DoS, DDoS, XSS, SQL injection, Smurf, Man in middle, Format String attack. Types of Security Vulnerabilities- buffer overflows, Invalidated input, race conditions, access-control problems, weaknesses in authentication, authorization, or cryptographic practices. Access Control Problems					CO1
UNIT II	Need for secure systems	9			
Proactive Security development process, Secure Software Development Cycle (S-SDLC) , Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code – Best Practices SD3 (Secure by design, default and deployment), Security principles and Secure Product Development Timeline.					CO2
UNIT III	Threat modelling process and its benefits	9			
Identifying the Threats by Using Attack Trees and rating threats using DREAD, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization. Defence in Depth and Principle of Least Privilege.					CO3
UNIT IV	Secure Coding Techniques	9			
Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices In Java Technology. ARP Spoofing and its countermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors, FormatString Bugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues- Memory Management Issues, Code Injection Attacks, Canary based countermeasures using StackGuard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC, ActiveX and DCOM					CO4
UNIT V	Database and Web-specific issues	9			
SQL Injection Techniques and Remedies, Race conditions, Time of Check Versus Time of Use					CO5

and its protection mechanisms. Validating Input and Page 21 of 46 Interprocess Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types – Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Writing Secure Code, Michael Howard and David LeBlanc, Microsoft Press, 2nd Edition, 2004

REFERENCE BOOKS

1. Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Deckar, Syngress, 1st Edition, 2005
2. Threat Modeling, Frank Swiderski and Window Snyder, Microsoft Professional, 1st Edition, 2004.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	To implement security as a culture and show mistakes that make applications vulnerable to attacks.
CO2	To understand various attacks like DoS, buffer overflow, web specific, database specific, web-spoofing attacks
CO3	To demonstrate skills needed to deal with common programming errors that lead to most security problems and to learn how to develop secure applications.
CO4	To identify the nature of the threats to software and incorporate secure coding practices throughout the planning and development of the product.
CO5	Able to properly handle application faults, implement secure authentication, authorization and data validation controls used to prevent common vulnerabilities.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	-	-	2	1	2	3	3	2
CO2	3	3	1	3	2	-	-	-	-	2	1	2	3	3	2
CO3	3	3	1	3	2	-	-	-	-	2	1	2	3	3	2
CO4	3	3	1	3	2	-	-	-	-	2	1	2	3	3	2
CO5	3	3	1	3	2	-	-	-	-	2	1	2	3	3	2

SEMESTER VIII
PROFESSIONAL ELECTIVE – VI

IT1821	IOT PLATFORM FOR SMART CITY PLANNING	L	T	P	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> • Concepts of Internet of Things. • IoT Architecture and Terminologies. • IoT working platform for different system. • IoT standards for smart city planning. • IoT applications on different sectors. 					
UNIT I	INTRODUCTION TO IOT	9			
Overview and Introduction - Internet of Things (IoT) - Web of Things (WoT) - Cloud of Things - Need for IoT on Cloud - Services in the Cloud for the Internet of Things - Applications of IoT – Detailed Domain Model.					CO1
UNIT II	IOT ARCHITECTURE	9			
IoT Architecture - Sensor Layer - Gateway and Network Layer - Management Service Layer - Application Layer - IoT Enabling Technologies - Addressing Schemes - Data Storage and Analytics – Visualization - Connected Domains – Connected Home -Connected Worker - Connected Automobile - Connected Industry.					CO2
UNIT III	IOT PLATFORMS DESIGN METHODOLOGY	9			
IoT Systems – Intel IoT Framework - Qualcomm IoT Framework - Microsoft IoT Framework - ARM IoT Framework - Logical Design - Programming IoT platform (eg: Python, Mono C# , Objective-C, Ruby), Raspberry Pi - Program for Firmware – Case Studies					CO3
UNIT IV	IOT STANDARDS	9			
Need for the IOT standards - IOT and Smart City Standards and Policies: Global perspective – Policy Research and Standardization in Europe – Indian Standards formulation – Sectional committee and composition – Challenges in standardization - Digital infrastructure					CO4
UNIT V	IOT APPLICATIONS	9			
Lighting as service – Smart Parking -Smart metering – Smart water management- Smart energy– Smart solid waste management - Smart mobility – Smart governance- Challenges in IoT Management.					CO5
TOTAL : 45 PERIODS					

TEXT BOOKS

1. Olivier Hersent, David Boswarthick and Omar Elloumi, "The Internet of Things: Key Applications and Protocols",
Second Edition, Wiley Publisher, 2012.
2. Uckelmann, Dieter, Mark Harrison, and Florian Michahelles, "Architecting the Internet of Things".
SpringerScience & Business Media, 2011.

REFERENCE BOOKS

1. ArshdeepBahga, Vijay Madiseti, "Internet of Things: A Hands-on Approach", 2014.
2. Doukas, Charalampos, Building internet of things with the Arduino, CreateSpace Independent Publishing Platform, 2012.
3. Lu, Yan, Yan Zhang, Laurence T. Yang, HuanshengNing. "The Internet of Things: From RFID to the NextGeneration Pervasive Networked Systems", CRC Press.
4. Massimo Banzi, "Getting Started with Arduino (Make: Projects)", O'Reilly Media. 2008.
5. Samuel Greengard, "The Internet of Things (The MIT Press Essential Knowledge series)", MIT Press, 2015.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Analyze the different concepts and theories of Internet of Things.
CO2	Assess the various components of IoT architecture.
CO3	Perform the IoT applications in programming platform
CO4	Adopt the IoT standards for smart city planning
CO5	Apply the understandings of IoT in different sectors of smart city planning.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	1	3	2	-	-	1	-	2	2	2	3	3	2
CO2	3	3	1	3	2	-	-	1	-	2	2	2	3	3	2
CO3	3	3	1	3	2	-	-	1	-	2	2	2	3	3	2
CO4	3	3	1	3	2	-	-	1	-	2	2	2	3	3	2
CO5	3	3	1	3	2	-	-	1	-	2	2	2	3	3	2

IT1822	TRUST NETWORKS	L	P	T	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> Understand how block chain systems (mainly Bitcoin and Ethereum) work To securely interact with them Design, build, and deploy smart contracts and distributed applications Integrate ideas from block chain technology into their own projects. 					
UNIT I	Block chain	9			
The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS) .					CO1
UNIT II	Crypto Currency	9			
cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography					CO2
UNIT III	Crypto Currency Regulation	9			
Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.					CO3
UNIT IV	Ethereum	9			
Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts					CO4
UNIT V	Trends and Topics	9			
Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)					
REFERENCE BOOKS					
Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}.					
2. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOI 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048)					
3. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (

4. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	List and describe differences between proof-of-work and proof-of-stake consensus
CO2	Understand the basics of cryptocurrency
CO3	Interact with a blockchain system by sending and reading transactions.
CO4	Explain design principles of Ethereum.
CO5	Design, build, and deploy a distributed application.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUCOMES		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO2	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO3	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO4	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2
CO5	1	2	2	2	1	-	-	1	1	1	1	1	2	2	2

IT1823	ARTIFICIAL INTELLIGENCE AND ROBOTICS	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To provide an introduction to the basic principles, techniques, and applications of Artificial Intelligence. To know about Lisp and Prolog and use of these languages in AI. 					
UNIT I	Scope of AI	9			
Games theorem, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction					CO1
UNIT II	Problem solving	9			
State space search; Production systems, search space control: depth first, breadth-first search, heuristic search - hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis					CO2
UNIT III	Knowledge Representation	9			
Predicate Logic: unification, modus ponens, resolution, dependency directed backtracking. Rule based Systems: forward reasoning, conflict resolution, backward reasoning, use of no backtracks. Structured Knowledge Representation: semantic net slots, exceptions and default frames, conceptual dependency, scripts					CO3
UNIT IV	Handling uncertainty and learning	9			
Non-monotonic reasoning, probabilistic reasoning, use of certainty factors, fuzzy logic, Concept of learning, learning automation, genetic algorithm, learning by inductions, neural network.					CO4
UNIT V	Robotics and its application	9			
Robotics and Its applications, DDD concept, Intelligent robots, Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> Elaine Rich, Kevin Knight, Artificial Intelligence TMH (Any Edition). S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009 Max Braber, Logic Programming with Prolog, Springer, 2005. E. Rich and K. Knight, "Artificial intelligence", MH, 2nd ed., 1992. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 2000. 					

REFERENCE BOOKS

1. Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000
2. D. W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
3. R. J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.
4. George Lugar, .AI-Structures and Strategies for and Strategies for Complex Problem solving, 4/e,2002, Pearson Educations.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Apply basics of Fuzzy logic and neural networks
CO2	Explain Expert System and implementation
CO3	Apply Knowledge representation and semantic in Knowledge representation.
CO4	Develop some familiarity with current research problems and research methods in AI.
CO5	Demonstrate and Illustrate about functionalities of Robots and Robotics.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	1	-	-	2	2	2	3	3	2
CO2	3	3	3	3	2	-	1	-	-	2	2	2	3	3	2
CO3	3	3	3	3	2	-	1	-	-	2	2	2	3	3	2
CO4	3	3	3	3	2	-	1	-	-	2	2	2	3	3	2
CO5	3	3	3	3	2	-	1	-	-	2	2	2	3	3	2

CS1821	SOFTWARE DEFINED NETWORKS	L	T	P	C
(Common to CSE)		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> To learn the fundamentals of software defined networks. To understand the separation of the data plane and the control plane. To study about the SDN Programming. To study about the various applications of SDN 					
UNIT I	INTRODUCTION	9			
History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Data Planes					CO1
UNIT II	OPEN FLOW & SDN CONTROLLERS	9			
Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via HypervisorBased Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts					CO2
UNIT III	DATA CENTERS	9			
Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE					CO3
UNIT IV	SDN PROGRAMMING	9			
Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications					CO4
UNIT V	SDN	9			
Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014. 2. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013.					

REFERENCE BOOKS

1. Siamak Azodolmolky, —Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, —SDN and Open Flow for BeginnersII, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Analyze the evolution of software defined networks
CO2	Express the various components of SDN and their uses
CO3	Explain the use of SDN in the current networking scenario
CO4	Design and develop various applications of SDN
CO5	Understand about SDN frameworks

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	3	2	-	-	-	1	-	2	2	2	3	2	2
CO2	3	1	3	2	-	-	-	1	-	2	2	2	3	2	2
CO3	3	1	3	2	-	-	-	1	-	2	2	2	3	2	2
CO4	3	1	3	2	-	-	-	1	-	2	2	2	3	2	2
CO5	3	1	3	2	-	-	-	1	-	2	2	2	3	2	2

MB1206	BUSINESS ANALYTICS	L	P	T	C
	(Common to MBA)	3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> To learn the fundamentals of Business Analytics To understand the importance of Resource Management in business Analytics To understand the fundamentals of Descriptive Analysis To understand the role of Predictive Analysis To understand the concepts of Prescriptive Analysis 					
UNIT I	INTRODUCTION TO BUSINESS ANALYTICS (BA)	9			
Business Analytics- Terminologies, Process, Importance, Relationship with Organisational Decision Making, BA for Competitive Advantage.					CO1
UNIT II	MANAGING RESOURCES FOR BUSINESS ANALYTICS	9			
Managing BA Personnel, Data and Technology. Organisational Structures aligning BA. Managing Information policy, data quality and change in BA.					CO2
UNIT III	DESCRIPTIVE ANALYTICS	9			
Introduction to Descriptive analytics - Visualising and Exploring Data - Descriptive Statistics – Sampling and Estimation – Probability Distribution for Descriptive Analytics – Analysis of Descriptive analytics					CO3
UNIT IV	PREDICTIVE ANALYTICS	9			
Introduction to Predictive analytics – Logic and Data Driven Models – Predictive Analysis Modeling and procedure – Data Mining for Predictive analytics. Analysis of Predictive analytics					CO4
UNIT V	PRESCRIPTIVE ANALYTICS	9			
Introduction to Prescriptive analytics – Prescriptive Modeling – Non Linear Optimisation – Demonstrating Business Performance Improvement.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> Marc J. Schniederjans, Dara G. Schniederjans and Christopher M. Starkey, "Business Analytics Principles, Concepts, and Applications-What, Why, and How", Pearson, 2014 Christian Albright and Wayne L. Winston, "Business Analytics-Data Analysis and Decision Making", Fifth edition, Cengage Learning, 2015. 					
REFERENCE BOOKS					

1. James R. Evans, "Business Analytics - Methods, Models and Decisions", Pearson Ed,2012.
2. Newbold, Carlson, Thorne – Statistics for Business and Economics, 6th ed., Pearson
3. S. C.Gupta – Fundamentals of Statistics, Himalaya Publishing
4. Walpole – Probability and Statistics for Scientists and Engineers, 8th ed., Pearson

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	To understand the fundamentals of Business Analytics
CO2	To understand the intricacies in managing resources for business Analytics
CO3	To understand the applications of Descriptive Analysis
CO4	To understand and importance of Predictive Analysis
CO5	To understand the importance and applications of Prescriptive Analytics

MAPPING OF COs WITH POs AND PSOs

Cos	PROGRAM OUTCOMES (POs)										PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	1	3	2	1	2	2	3
CO2	3	2	2	3	2	2	1	3	2	2	2	2	3
CO3	3	3	1	3	2	2	2	3	2	1	3	1	3
CO4	3	3	2	3	3	2	2	3	2	1	3	2	3
CO5	3	3	2	3	2	2	2	3	2	1	3	2	3

OPEN ELECTIVES – I & II

OBT101	INDUSTRIAL BIOTECHNOLOGY	L	T	P	C
		3	0	0	3
OBJECTIVE <p>❖ To motivate students to excel in research and to practice the technologies in the field of Industrial biotechnology. To provide students with a solid understanding of Biotechnology fundamentals and applications required to solve real life problems. To provide students with an academic environment that is aware of professional excellence and leadership through interaction with professional bodies</p>					
UNIT I	OVERVIEW OF THE CELL	9			
Cell, structure and properties, prokaryotic and eukaryotic cells, structural organization and function of intracellular organelles; Cell wall, Nucleus, Mitochondria, Golgi bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes and Chloroplast.					CO1
UNIT II	MICROBIAL GROWTH: PURE CULTURE TECHNIQUES	9			
Enrichment culture techniques for isolation of chemoautotrophs, chemoheterotrophs and photosynthetic microorganisms. The definition of growth, mathematical expression of growth, Growth curve, availability of oxygen, culture collection and maintenance of cultures. Media formulation: principles of microbial nutrition, formulation of culture medium, selective media, factors influencing the choice of various carbon and nitrogen sources, vitamins, minerals, precursors and antifoam agents. Importance of pH.					CO2
UNIT III	MANAGEMENT OF WASTE	9			
Management of Contaminated land, lake sediments and Solid Waste, Anaerobic digestion, Biostimulation, Bioaugmentation, Phytoremediation, Natural attenuation, Vermicomposting					CO3
UNIT IV	BIOREMEDIATION	9			
Definition, constraints and priorities of Bioremediation, Types of bioremediation, In-situ and Ex-situ bioremediation techniques, Factors affecting bioremediation. Bioremediation of Hydrocarbons. Lignocellulosic Compounds.					CO4
UNIT V	BIOENERGY AND BIOMINING	9			
Bio energy: Energy and Biomass Production from wastes, biofuels, bio hydrogen and biomass. Biomining: Bioleaching, monitoring of pollutants, microbially enhanced oil recovery, microbial fuel cells.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. Molecular Biology of cell, Alberts. B et al. Developmental Biology, SF Gilbert, Sinauer Associates Inc. 2. AVN Swamy, Industrial Pollution Control Engineering, 2006, Galgotia Publication,					

REFERENCE BOOKS

1. Environmental Biotechnology - Allan Stagg.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Design, perform experiments, analyze and interpret data for investigating complex problems in Biotechnology, Engineering and related fields.
CO2	Decide and apply appropriate tools and techniques in biotechnological manipulation.
CO3	Justify societal, health, safety and legal issues
CO4	Understand his responsibilities in biotechnological engineering practices
CO5	Understand the need and impact of biotechnological solutions on environment and societal context keeping in view need for sustainable solution.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	2	2	4	2	1	1	1	2	1	1
CO2	2	1	1	2	2	1	2	1	3	4	1	2	1	1	2
CO3	3	3	2	1	1	2	4	3	1	2	4	5	1	2	2
CO4	3	3	2	4	2	1	1	1	2	1	3	2	1	2	2
CO5	2	1	4	5	2	4	3	2	1	2	3	1	1	2	2

OBT104	BIOSENSORS	L	T	P	C
		3	0	0	3
OBJECTIVE					
❖ Understand protein based biosensors and their enzyme reactivity, stability and their application					
UNIT I	PROTEIN BASED BIOSENSORS	9			
Nano structure for enzyme stabilization - Single enzyme nano particles - Nanotubes microporus silica - Protein based nanocrystalline Diamond thin film for processing					CO1
UNIT II	DNA BASED BIOSENSOR	9			
Heavy metal complexing with DNA and its determination water and food samples - DNA zymo biosensors					CO2
UNIT III	ELECTRO CHEMICAL APPLICATION	9			
Detection in biosensors - Fluroescence - Absorption - Electrochemical. Integration of various techniques - Fibre optic biosensors					CO3
UNIT IV	FABRICATION OF BIOSENSORS	9			
Techniques used for microfabrication - Microfabrication of electrodes - On chip analysis					CO4
UNIT V	BIOSENSORS IN RESEARCH	9			
Future direction in biosensor research - Designed protein pores-as components of biosensors - Molecular design -Bionanotechnology for cellular biosensing - Biosensors for drug discovery - Nanoscale biosensors					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
REFERENCE BOOKS					
1. Biosensors: A Practical Approach, J. Cooper & C. Tass, Oxford University Press, 2004 2. Nanomaterials for Biosensors, Cs. Kumar, Willey - VCH, 2007 3. Smart Biosensor Technology, G.K. Knoff, A.S. Bassi, CRC Press, 2006.					
COURSE OUTCOMES					
Upon completion of the course, students will be able to					
CO1	The students will able to understand protein based biosensors and their enzyme reactivity, stability and their application in protein based nano crystalline thin film processing				
CO2	The students will able to describe DNA based biosensors to study the presence of heavy metals in the food products				
CO3	The students will able to understand fluorecence, UV-Vis and electrochemical applications of biosensors				
CO4	The students will able to study about the fabrication of biosensors and its application as nanochipalyzer				
CO5	To understand the Future direction in biosensor research				

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	1	2	2	4	2	1	1	1	2	1	1
CO2	3	2	1	2	2	1	2	1	3	4	1	2	1	1	2
CO3	1	2	4	3	1	2	4	3	1	2	4	5	1	2	2
CO4	1	2	2	4	2	1	1	1	2	1	3	2	1	2	2
CO5	2	1	3	1	2	4	3	2	1	2	3	1	1	2	2

OBT105	INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY	L	T	P	C
		3	0	0	3
OBJECTIVE					
❖ Understand the principles of processing, manufacturing and characterization of nanomaterials and nanostructures.					
UNIT I	BASICS OF NANOTECHNOLOGY	9			
Introduction - Time and length scale in structures -Definition of a nanosystem -Dimensionality and size dependent phenomena -Surface to volume ratio -Fraction of surface atoms - Surface energy and surface stress- surface defects-Effect of nanoscale on various properties - Structural, thermal, mechanical, magnetic, optical and electronic properties.					CO1
UNIT II	DIFFERENT CLASSES OF NANOMATERIALS	9			
Classification based on dimensionality-Quantum Dots,Wells and Wires- Carbon based nano materials (buckyballs, nanotubes, grapheme)- Metal based nanomaterials (nanogold, nanosilver and metal oxides) - Nanocomposites-Nanopolymers - Nano ceramics -Biological nanomaterials.					CO2
UNIT III	SYNTHESIS OF NANOMATERIALS	9			
Chemical Methods:Metal Nanocrystals by Reduction -Sol - gel processing -Solvothermal Synthesis-Photochemical Synthesis - Chemical Vapor Deposition(CVD) - Metal Oxide - Chemical Vapor Deposition (MOCVD).Physical Methods:Ball Milling - Electrodeposition - Spray Pyrolysis - DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).					CO3
UNIT IV	CHARACTERIZATION OF NANOSTRUCTURES	9			
Introduction, structural characterization, X-ray diffraction (XRD-Powder/Single crystal), Small angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM) - Energy Dispersive X-ray analysis (EDAX)- Transmission Electron Microscope (TEM) - Scanning Tunneling Microscope (STM)-Atomic Force Microscopy (AFM), UV-vis spectroscopy (liquid and solid state) - Raman Spectroscopy -X-ray Photoelectron Spectroscopy (XPS) - Auger Electron spectroscopy (AES).					CO4
UNIT V	APPLICATIONS	9			
Solar energy conversion and catalysis - Molecular electronics and printed electronics - Nanoelectronics -Polymers with a special architecture - Liquid crystalline systems - Applications in displays and other devices -Nanomaterials for data storage -Photonics, Plasmonics- Chemical and biosensors -Nanomedicine and Nanobiotechnology					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 1. Nano Technology: Basic Science and Emerging Technologies, Mick Wilson, KamaliKannargare., Geoff Smith Overseas Press (2005) 2. A Textbook of Nanoscience and Nanotechnology,Pradeep T., Tata McGrawHill Education Pvt.Ltd., 2012. 3. Nanostructured Materials and Nanotechnology,Hari Singh Nalwa,Academic Press, 2002. 4. Introduction to Nanotechnology, Charles P.Poole, FrankJ.Owens, Wiley Interscience (2003) 5. Textbook of Nanoscience and Nanotechnology, B.S. Murty, P. Shankar, Baldev Raj, B BRath, James Murday, Springer Science & Business Media, 2013. 					

REFERENCE BOOKS

1. Nanotechnology: A gentle introduction to the next Big idea, Mark A.Ratner, Daniel Ratner, Mark Ratne, Prentice Hall P7R:1st Edition (2002)
2. Fundamental properties of nanostructured materials Ed D. Fioran, G.Sberveglier, World Scientific 1994
3. Nanoscience: Nanotechnologies and Nanophysics, Dupas C., Houdy P., Lahmani M., Springer-Verlag Berlin Heidelberg, 2007

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Demonstrate the understanding of length scales concepts, nanostructures and nanotechnology
CO2	Understand the different classes of nanomaterials.
CO3	Identify the CVD, MOCVD
CO4	Outline the applications of nanotechnology and
CO5	Develop an ability to critically evaluate the promise of a nanotechnology device.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	1	2	2	4	2	1	1	1	2	1	1
CO2	3	2	1	2	2	1	2	1	3	4	1	2	1	1	2
CO3	1	2	4	3	1	2	4	3	1	2	4	5	1	2	2
CO4	1	2	2	4	2	1	1	1	2	1	3	2	1	2	2
CO5	2	1	3	1	2	4	3	2	1	2	3	1	1	2	1

OCE102	INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEM	L	P	T	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none">❖ To introduce the fundamentals and components of Geographic Information System❖ To provide details of spatial data models.❖ To know the details of data input and topology❖ To know the knowledge on data management and output processes❖ To know the data quality and standards					
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 - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.				CO1	
UNIT II	SPATIAL DATAMODELS				9
Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models.				CO2	
UNIT III	DATA INPUTANDTOPOLOGY				9
Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input –Digitiser – Datum Projection and reprojection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration				CO3	
UNIT IV	DATA QUALITYANDSTANDARDS				9
Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards – Interoperability - OGC - Spatial Data Infrastructure				CO4	
UNIT V	DATA MANAGEMENTANDOUTPUT				9
Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS- distributed GIS.				CO5	
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ul style="list-style-type: none">1. Kang - TsungChang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition,2011.2. Ian Heywood, Sarah Cornelius, SteveCarver,Srinivasa Raju, “An Introduction Geographical Information Systems, Pearson Education, 2ndEdition,2007.					
REFERENCE BOOKS					
<ul style="list-style-type: none">1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers,2006					

COURSE OUTCOMES**Upon completion of the course, students will be able to**

CO1	Have basic idea about the fundamentals of GIS.
CO2	Understand the types of data models.
CO3	Get knowledge about data input and topology.
CO4	Gain knowledge on data quality and standards.
CO5	Understand data management functions and data output

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	-	1	-	-	-	-	2	2	2	1
CO2	2	2	1	1	2	-	1	-	-	-	-	2	2	2	2
CO3	2	2	1	1	2	-	1	-	-	-	-	2	2	2	1
CO4	2	2	1	1	2	-	1	-	-	-	-	2	2	2	1
CO5	2	2	1	1	2	-	1	-	-	-	-	2	2	2	2

OCH101	HOSPITAL MANAGEMENT	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> ❖ To understand the fundamentals of hospital administration and management. ❖ To know the market related research process and its HRM ❖ To understand the recruitment and training processes in hospitals ❖ To explore various information management systems and relative supportive services. ❖ To learn the quality and safety aspects in hospital. 					
UNIT I	OVERVIEW OF HOSPITAL ADMINISTRATION	9			
Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning					CO1
UNIT II	HUMAN RESOURCE MANAGEMENT IN HOSPITAL	9			
Principles of HRM – Functions of HRM – Profile of HRD Manager –Human Resource Inventory – Manpower Planning.					CO2
UNIT III	RECRUITMENT AND TRAINING	9			
Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.					CO3
UNIT IV	SUPPORTIVE SERVICES	9			
Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.					CO4
UNIT V	COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL	9			
Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV.Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI – Fourth Edition, 2006. 2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi – Fifth Reprint 2007. 					
REFERENCE BOOKS					
<ol style="list-style-type: none"> 1. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977. 2. Norman Metzger, "Handbook of Health Care Human Resources Management", 2nd edition Aspen Publication Inc. Rockville, Maryland, USA, 1990. 3. Peter Berman "Health Sector Reform in Developing Countries" - Harvard University Press, 1995. 4. William A. Reinke "Health Planning For Effective Management" - Oxford University Press.1988 5. Blane, David, Brunner, "Health and SOCIAL Organization: Towards a Health Policy for the 21st Century", Eric Calrendon Press 2002. 6. Arnold D. Kalcizony& Stephen M. Shortell, "Health Care Management", 6th Edition Cengage Learning, 2011. 					
COURSE OUTCOMES					

Upon completion of the course, students will be able to															
CO1	Explain the principles of Hospital administration.														
CO2	Identify the importance of Human resource management.														
CO3	List various marketing research techniques.														
CO4	Identify Information management systems and issues in supporting departments of hospitals														
CO5	Understand safety procedures followed in hospitals														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	2	2	2	1	1	1
CO2	3	3	3	3	2	-	-	-	-	2	2	2	1	1	1
CO3	3	3	3	3	2	-	-	-	-	2	2	2	1	1	1
CO4	3	3	3	3	2	-	-	-	-	2	2	2	1	1	1
CO5	3	3	3	3	2	-	-	-	-	2	2	2	1	1	1

OEC103	BASICS OF EMBEDDED SYSTEMS AND IOT	L	T	P	C
		3	0	0	3
OBJECTIVES:					
<ul style="list-style-type: none">Understand the concepts of embedded system design and analysisLearn the architecture and programming of ARM processorBe exposed to the basic concepts of embedded programmingLearn the concepts of IOT					
UNIT I	INTRODUCTION TO EMBEDDED SYSTEM	9			
Complex systems and microprocessors– Embedded system design process - Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques–Design example: Model train controller.					
UNIT II	BASICS OF ARM ARCHITECTURE AND PERIPHERAL INTERFACING	9			
ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU					
UNIT III	EMBEDDED PROGRAMMING CONCEPTS	9			
Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing					
UNIT IV	INTRODUCTION TO IOT	9			
Functional blocks of an IoT system - Basics of Physical and logical design of IoT - IoT enabled domains - Difference between IoT - Passive and active sensors - Different applications of sensors - IoT front-end hardware Case Studies – Smart Parking, Air Pollution Monitoring.					
UNIT V	COMMUNICATION PROTOCOLS FOR EMBEDDED AND IOT	9			
Embedded Networking: Introduction-Serial/Parallel Communication - Serial communication protocols- RS485 - Synchronous Serial Protocols - Serial Peripheral Interface (SPI) - Inter Integrated Circuits (I2C). IoT Infrastructure - 6LowPAN - IPv6 - Wi-Fi, Bluetooth, ZigBee..					
TOTAL : 60 PERIODS					
TEXT BOOKS:					
<ol style="list-style-type: none">Marilyn Wolf, —Computers as Components - Principles of Embedded Computing System DesignII, Third Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, IV)ArshdeepBahga, Vijay Madiseti, “Internet of Things, A Hands-on-Approach”, 1st Edition, Universities press Pvt. Ltd., India, 2015.Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6, 1st Edition, John Wiley & Sons”, Inc, USA, 2013					
REFERENCES:					
<ol style="list-style-type: none">Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, 1st Edition, John Wiley & Sons Ltd, UK, 2014Peter Waher, “Learning Internet of Things”, 1st Edition, Packt Publishing Ltd, UK, 2015.Charles Bell, “Beginning Sensor Networks with Arduino and Raspberry Pi” , 1st Edition, Apress Publishers, USA, 2013.Rai Kamal, Internet of Things, Architecture and Design Principles, McGraw-Hill, 2017					

COURSE OUTCOMES:

By the end of this course, the student should be able to:

CO1	Understand the Embedded System Design Process
CO2	Describe the architecture and programming of ARM processor
CO3	Outline the concepts of embedded system programming
CO4	Explain the basic concepts of IOT
CO5	Model Networked systems with basic protocols

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	3	-	2	1	2	-	1	2	2	3	3	2
CO2	3	3	2	3	-	3	1	2	-	1	2	2	3	3	2
CO3	3	3	2	3	3	3	1	2	1	1	2	2	3	3	2
CO4	3	3	3	3	-	2	1	2	-	1	2	2	3	3	2
CO5	3	3	3	3	2	3	1	2	1	1	2	2	3	3	2

OEE101	BASIC CIRCUIT THEORY	L	P	T	C
		3	0	0	3
OBJECTIVES <ul style="list-style-type: none"> ❖ 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 and analysis of three phase circuits 					
UNIT I	BASIC CIRCUITS ANALYSIS	9			
Resistive elements - Resistors in series and parallel circuits; Ohm's Law; Kirchhoff's laws – methods of analysis-Mesh current and node voltage.					CO1
UNIT II	NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS	9			
Network reduction- voltage and current division, source transformation, star delta conversion; Network theorems- Thevenin's and Norton Theorems, Superposition Theorem, Maximum power transfer theorem, Reciprocity Theorem, Millman's theorem.					CO2
UNIT III	ANALYSIS OF AC CIRCUITS	9			
Introduction to AC circuits- Inductive reactance, Capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor; RL, RC, RLC networks; Network reductions- voltage and current division, source transformation; Mesh and node analysis; Network theorems- Thevenin's and Norton Theorems, Superposition Theorem, Maximum power transfer theorem, Reciprocity Theorem, Millman's theorem.					CO3
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 & unbalanced; phasor diagram of voltages and currents; power measurement in three phase circuits.					CO4
UNIT V	RESONANCE AND COUPLED CIRCUITS	9			
Series and parallel resonance – frequency response, Quality factor and Bandwidth; Self and mutual inductance; Coefficient of coupling; Tuned circuits – Single tuned circuits.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 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. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Ability to introduce electric circuits and its analysis
CO2	Ability to impart knowledge on solving circuit equations using network theorems
CO3	Ability to introduce the phenomenon of resonance in coupled circuits.
CO4	Ability to introduce Phasor diagrams and analysis of three phase circuits
CO5	Ability to impart knowledge on resonance and coupled circuits

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	3	3	3	1	1	1	3	1	1	1
CO2	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	1	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	1	2	3	3	3	3

OEE103	INTRODUCTION TO RENEWABLE ENERGY SYSTEMS	L	P	T	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> ❖ About the stand alone and grid connected renewable energy systems. ❖ Design of power converters for renewable energy applications. ❖ Wind electrical generators and 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.					CO1
UNIT II	ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION	9			
Reference theory fundamentals-principle of operation and analysis: IG and PMSG					CO2
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					CO3
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					CO4
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).					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
<ol style="list-style-type: none"> 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, 2017. 					
REFERENCE BOOKS					
<ol style="list-style-type: none"> 1. Muhammad H. Rashid, "Power Electronics Hand Book", Third Edition, Butterworth-Heinemann, 2015. 2. Ion Boldea, "Variability Speed Generators", Second Edition, CRC Press, 2015. 3. Rai. G.D, "Non- conventional Energy Sources", Khanna Publishers, 2004. 4. Gray, L. Johnson, "Wind Energy Systems", Prentice Hall, 2006. 5. Andrzej M. Trzynadlowski, "Introduction to Modern Power Electronics", Third Edition, WileyIndia Pvt. Ltd, 2016. 					

COURSE OUTCOMES**Upon completion of the course, students will be able to**

CO1	Ability to understand and analyze power system operation, stability, control and protection.
CO2	Ability to handle the engineering aspects of electrical energy generation and utilization.
CO3	Ability to understand the stand alone and grid connected renewable energy systems.
CO4	Ability to design of power converters for renewable energy applications.
CO5	Ability to acquire knowledge on wind electrical generators and solar energy systems.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	3	3	3	1	1	1	3	1	1	1
CO2	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	1	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	1	2	3	3	3	3

OEI102	ROBOTICS	L	T	P	C
		3	0	0	3
OBJECTIVE <ul style="list-style-type: none"> ❖ To understand the functions of the basic components of a Robot. ❖ To study the use of various types of End of Effectors and Sensors ❖ To impart knowledge in Robot Kinematics and Programming ❖ To learn Robot safety issues and economics. 					
UNIT I	FUNDAMENTALS OF ROBOT	9			
Robot - Definition - Robot Anatomy - Coordinate 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.					CO1
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.					CO2
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 Servoing and Navigation.					CO3
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.					CO4
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.					CO5
TOTAL : 45 PERIODS					
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", Mc Graw Hill Book Co., 1992.
4. Fu.K.S., Gonzalaz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
5. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
6. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
7. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH Publishing Co. Pvt. Ltd., 1991.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Understand the functions of the basic components of a Robot.
CO2	Study the use of various types of End of Effectors and Sensors
CO3	Understand Sensors and Machine Vision of Robot
CO4	Understand Robot Kinematics and Robot Programming
CO5	Understand the Implementation of Robots in Industries

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	-	2	2	3	2	1	2
CO2	3	3	1	2	2	-	-	-	-	2	2	3	3	2	2
CO3	3	3	1	2	2	-	-	-	-	2	2	3	3	2	2
CO4	3	2	1	2	2	-	-	-	-	2	2	3	3	2	2
CO5	2	2	1	2	2	-	-	-	-	2	2	3	2	2	2

OMB101	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3
OBJECTIVES					
❖ To learn the quality philosophies and tools in the managerial perspective.					
UNIT I	INTRODUCTION	9			
Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.					CO1
UNIT II	PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT	9			
Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles and 8D methodology					CO2
UNIT III	STATISTICAL PROCESS CONTROL	9			
Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma - concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve.Total productive maintenance (TMP), Terotechnology. Business process Improvement (BPI) – principles, applications, reengineering process, benefits and limitations.					CO3
UNIT IV	TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT	9			
Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven Tools (old & new). Bench marking and POKA YOKE.					CO4
UNIT V	QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION	9			
Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward - TQM framework, benefits, awareness and obstacles.					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					

1. Dale H.Besterfield, Carol Besterfield – Michna, Glen H. Besterfield, Mary Besterfield – SacreHermant – Urdhwareshe, Rashmi Urdhwareshe, Total Quality Management, Revised Third edition, Pearson Education, 2011
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

REFERENCE BOOKS

1. Douglas C. Montgomery, Introduction to Statistical Quality Control, Wiley Student Edition, 4th Edition, Wiley India Pvt Limited, 2008.
2. James R. Evans and William M. Lindsay, The Management and Control of Quality, Sixth Edition, Thomson, 2005.
3. PoornimaM.Charantimath, Total Quality Management, Pearson Education, First Indian Reprint 2003.
4. Indian standard – quality management systems – Guidelines for performance improvement (Fifth Revision), Bureau of Indian standards, New Delhi.

COURSE OUTCOMES

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

CO1	To apply quality philosophies and tools to facilitate continuous improvement and ensure customer delight.
CO2	To understand the principles of business process improvement
CO3	To understand and apply the concepts of statistical process control
CO4	To apply the tools and techniques used for quality management
CO5	To understand the methods in organizing and implementation of quality systems

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	-	-	-	-	2	2	2	1	1	1
CO2	3	3	3	3	2	-	-	-	-	2	2	2	1	1	1
CO3	3	3	2	3	3	-	-	-	-	2	2	2	1	1	1
CO4	2	3	3	3	2	-	-	-	-	2	2	2	1	1	1
CO5	3	3	2	3	2	-	-	-	-	2	2	2	1	1	1

OME104	INDUSTRIAL SAFETY ENGINEERING	L	T	P	C
		3	0	0	3
OBJECTIVES					
<ul style="list-style-type: none"> ❖ To provide exposure to the students about safety and health provisions related to hazardous processes as laid out in Factories act 1948 ❖ To familiarize students with powers of inspectorate of factories ❖ To help students to learn about Environment act 1986 and rules framed under the act. ❖ To provide wide exposure to the students about various legislations applicable to an industrial unit. ❖ To prepare onsite and offsite emergency plan. 					
UNIT I	FACTORIES ACT – 1948	9			
Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young persons – special provisions – penalties and procedures-Tamil Nadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948					CO1
UNIT II	ENVIRONMENT ACT – 1986	9			
General powers of the central government, prevention, control and abatement of environmental pollution-Biomedical waste (Management and handling Rules, 1989-The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board. Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards – prevention and control of air pollution and water pollution – fund – accounts and audit, penalties and procedures.					CO2
UNIT III	MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES 1989	9			
Definitions – duties of authorities – responsibilities of occupier – notification of major accidents – information to be furnished – preparation of offsite and onsite plans – list of hazardous and toxic chemicals – safety reports – safety data sheets.					CO3
UNIT IV	OTHER ACTS AND RULES	9			
Indian Boiler Act 1923, static and mobile pressure vessel rules (SMPV), motor vehicle rules, mines act 1952, workman compensation act, rules – electricity act and rules – hazardous wastes (management and handling) rules, 1989, with amendments in 2000- the building and other construction workers act 1996., Petroleum rules, Gas cylinder rules-Explosives Act 1983-Pesticides Act					CO4
UNIT V	INTERNATIONAL ACTS AND STANDARDS	9			
Occupational Safety and Health act of USA (The Willames - Steiger Act of 1970) – Health and safety work act (HASAWA 1974, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).					CO5
TOTAL : 45 PERIODS					
TEXT BOOKS					
1. The Factories Act 1948, Madras Book Agency, Chennai, 2000					

2. The Environment Act (Protection) 1986, Commercial Law Publishers (India) Pvt.Ltd., New Delhi.
3. Water (Prevention and control of pollution) act 1974, Commercial Law publishers (India) Pvt.Ltd., New Delhi.

REFERENCE BOOKS

1. Air (Prevention and control of pollution) act 1981, Commercial Law Publishers (India) Pvt.Ltd., New Delhi.
2. The Indian boilers act 1923, Commercial Law Publishers (India) Pvt.Ltd., Allahabad.
3. The manufacture, storage and import of hazardous chemical rules 1989, Madras Book Agency, Chennai.

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	To list out important legislations related to health, Safety and Environment.
CO2	To list out requirements mentioned in factories act for the prevention of accidents.
CO3	To understand the health and welfare provisions given in factories act.
CO4	To understand the statutory requirements for an Industry on registration, license and its renewal.
CO5	To prepare onsite and offsite emergency plan.

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	1	2	2	2	2	1	2	2	1	1	1
CO2	2	1	-	-	1	2	2	2	2	1	2	2	1	1	1
CO3	2	1	-	-	1	2	2	2	2	1	2	2	1	1	1
CO4	2	1	-	-	1	2	2	2	2	1	2	2	1	1	1
CO5	2	2	-	-	1	2	2	2	2	2	2	2	1	1	1

AUDIT COURSES

AD1001	CONSTITUTION OF INDIA				L	T	P	C
					2	0	0	0
OBJECTIVES								
<ul style="list-style-type: none">• Teach history and philosophy of Indian Constitution.• Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.• Summarize powers and functions of Indian government.• Explain emergency rule.• Explain structure and functions of local administration.								
UNIT I	INTRODUCTION							9
History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features							CO1	
UNIT II	CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES							9
Fundamental Rights-Right to Equality-Right to Freedom-Right against Exploitation Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies Directive Principles of State Policy-Fundamental Duties							CO2	
UNIT III	ORGANS OF GOVERNANCE							9
Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions							CO3	
UNIT IV	EMERGENCY PROVISIONS							9
Emergency Provisions - National Emergency, President Rule, Financial Emergency							CO4	

UNIT V	LOCAL ADMINISTRATION														9
District's Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy															CO5
TOTAL : 45 PERIODS															
TEXT BOOKS															
4. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015. 5. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015. 6. Jain M P, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014. 7. The Constitution of India (Bare Act), Government Publication,1950															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Able to understand history and philosophy of Indian Constitution.														
CO2	Able to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.														
CO3	Able to understand powers and functions of Indian government.														
CO4	Able to understand emergency rule.														
CO5	Able to understand structure and functions of local administration.														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-

AD1002	VALUE EDUCATION	L	T	P	C
		2	0	0	0
OBJECTIVES <ul style="list-style-type: none"> • Develop knowledge of self-development • Explain the importance of Human values • Develop the overall personality through value education • Overcome the self-destructive habits with value education • Interpret social empowerment with value education 					
UNIT I	INTRODUCTION TO VALUE EDUCATION	9			
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments					CO1
UNIT II	IMPORTANCE OF VALUES	9			
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline					CO2
UNIT III	INFLUENCE OF VALUE EDUCATION	9			
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.					CO3
UNIT IV	REINCARNATION THROUGH VALUE EDUCATION	9			
Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation					CO4

UNIT V	VALUE EDUCATION IN SOCIAL EMPOWERMENT														9
Equality, Non-violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively															CO5
TOTAL : 45 PERIODS															
REFERENCE:															
Chakroborty , S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press ,New Delhi															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Gain knowledge of self-development														
CO2	Learn the importance of Human values														
CO3	Develop the overall personality through value education														
CO4	Overcome the self destructive habits with value education														
CO5	Interpret social empowerment with value education														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
CO2	-	-	-	-	-	-	1	1	1	-	-	1	-	-	-
CO3	-	-	-	-	-	-	1	1	1	-	-	1	-	-	-
CO4	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-

AD1003	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0
OBJECTIVES <ul style="list-style-type: none"> • Understand the methodology of pedagogy. • Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries. • Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy. • Illustrate the factors necessary for professional development. • Identify the Research gaps in pedagogy. 					
UNIT I	INTRODUCTION AND METHODOLOGY	9			
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions – Overview of methodology and Searching.					CO1
UNIT II	THEMATIC OVERVIEW	9			
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.					CO2
UNIT III	EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES	9			
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.					CO3
UNIT IV	REINCARNATION THROUGH VALUE EDUCATION	9			
Professional development: alignment with classroom practices and follow up support – Peer support - Support from the head teacher and the community - Curriculum and assessment – Barriers to learning: limited resources and large class sizes					CO4

UNIT V	RESEARCH GAPS AND FUTURE DIRECTIONS														9
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.															CO5
TOTAL : 45 PERIODS															
REFERENCE:															
1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.															
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.															
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.															
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.															
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Understand the methodology of pedagogy														
CO2	Understand Pedagogical practices used by teachers in formal and informal classrooms in developing countries.														
CO3	Find how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.														
CO4	Know the factors necessary for professional development.														
CO5	Identify the Research gaps in pedagogy.														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

AD1004	STRESS MANAGEMENT BY YOGA	L	T	P	C
		2	0	0	0
OBJECTIVES <ul style="list-style-type: none"> • Develop healthy mind in a healthy body thus improving social health also improve efficiency • Invent Do's and Don't's in life through Yam • Categorize Do's and Don't's in life through Niyam • Develop a healthy mind and body through Yog Asans • Invent breathing techniques through Pranayam 					
UNIT I	INTRODUCTION TO YOGA	9			
Definitions of Eight parts of yog.(Ashtanga)					CO1
UNIT II	YAM	9			
Do's and Don't's in life. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan					CO2
UNIT III	NIYAM	9			
Do's and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha					CO3
UNIT IV	ASAN	9			
Professional development: alignment with classroom practices and follow up support – Peer support - Support from the head teacher and the community - Curriculum and assessment – Barriers to learning: limited resources and large class sizes					CO4

UNIT V	RESEARCH GAPS AND FUTURE DIRECTIONS													9	
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.														CO5	
TOTAL : 45 PERIODS															
REFERENCE:															
1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata															
2. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Develop healthy mind in a healthy body thus improving social health also improve efficiency														
CO2	Learn Do’s and Don’t’s in life through Yam														
CO3	Learn Do’s and Don’t’s in life through Niyam														
CO4	Develop a healthy mind and body through Yog Asans														
CO5	Learn breathing techniques through Pranayam														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
CO2	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
CO3	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
CO4	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-

AD1005	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
		2	0	0	0
OBJECTIVES <ul style="list-style-type: none"> • Develop basic personality skills holistically • Develop deep personality skills holistically to achieve happy goals • Rewrite the responsibilities • Reframe a person with stable mind 					
UNIT I	NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I	9			
Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)					CO1
UNIT II	NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II	9			
Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)					CO2
UNIT III	ORGANS OF GOVERNANCE	9			
Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48					CO3
UNIT IV	EMERGENCY PROVISIONS	9			
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter12 -Verses 13, 14, 15, 16,17, 18					CO4

UNIT V	LOCAL ADMINISTRATION														9
Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63															CO5
TOTAL : 45 PERIODS															
REFERENCE:															
1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari's ThreeSatakam , Niti-sringarvairagya, New Delhi,2010															
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016.															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	To develop basic personality skills holistically														
CO2	To develop deep personality skills holistically to achieve happy goals														
CO3	To rewrite the responsibilities														
CO4	To reframe a person with stable mind, pleasing personality and determination														
CO5	To awaken wisdom in students														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-

AD1006	UNNAT BHARAT ABHIYAN	L	T	P	C
		2	0	0	0
OBJECTIVES <ul style="list-style-type: none"> To engage the students in understanding rural realities To identify and select existing innovative technologies, enable customization of technologies, or devise implementation method for innovative solutions, as per the local needs. To leverage the knowledge base of the institutions to devise processes for effective implementation of various government programmes To understand causes for rural distress and poverty and explore solutions for the same To apply classroom knowledge of courses to field realities and thereby improve quality of learning 					
UNIT I	QUALITY OF RURAL LIFE IN VILLAGES AND UNNAT BHARAT ABHIYAN	9			
Introduction to Unnat Bharat Abhiyan - concept, scope and objectives, rural life, rural society, cast and gender relations, rural values with respect to community, nature and resources, elaboration of "Soul of India lies in villages" – (Gandhi Ji), Rural infrastructure, problems in rural area. Assignment: Prepare a map (Physical , visual and digital) of the village you visited and write an essay about inter-family relation in that village.					CO1
UNIT II	RURAL ECONOMY AND LIVELIHOOD	9			
Agriculture, farming, land ownership pattern, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural market . Assignment: Describe your analysis of rural household economy, it's challenges and possible pathways to address them. Group discussion in class- (4) Field visit 3.					CO2
UNIT III	RURAL INSTITUTIONS	9			
History of Rural Development, Traditional rural organizations, Self Help Groups, Gram Swaraj and 3- Tier Panchayat Raj Institutions (Gram Sabha, Gram Panchayat, Standing Committee), local civil society, local administration. Introduction to Constitution, Constitutional Amendments in Panchayati Raj – Fundamental Rights and Directive Principles. Assignment: Panchayati Raj institutions in villages? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual). Field Visit – 4.					CO3

UNIT IV	RURAL DEVELOPMENT PROGRAMMES	9
<p>National programmes - Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.</p> <p>Written Assignment: Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community, give suggestions about improving implementation of the programme for the rural poor.</p>		CO4
UNIT V	FIELD WORK	9
<p>Each student selects one programme for field visit Field based practical activities:</p> <ul style="list-style-type: none"> • Interaction with SHG women members, and study of their functions and challenges; planning for their skill building and livelihood activities • Visit MGNREGS project sites, interact with beneficiaries and interview functionaries at the work site • Field visit to Swachh Bharat project sites, conduct analysis and initiate problem solving measures • Conduct Mission Antyodaya surveys to support under Gram Panchayat Development Plan(GPDP) • Interactive community exercise with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization • Visit Rural Schools I mid-day meal centres, study Academic and infrastructural resources and gaps • Participate in Gram Sabha meetings, and study community participation • Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries • Attend Parent Teacher Association meetings, and interview school drop outs • Visit local Anganwadi Centre and observe the services being provided • Visit local NGOs, civil society organisations and interact with their staff and beneficiaries. • Organize awareness programmes, health camps, Disability camps and cleanliness camps o Conduct soil health test, drinking water analysis, energy use and fuel efficiency surveys • Raise understanding of people's impacts of climate change, building up community's disaster preparedness • Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers and promotion of traditional species of crops and plants • Formation of committees for common property resource management, village pond maintenance and fishing. 		CO5
TOTAL : 45 PERIODS		

Text Books:

1. . Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications, New Delhi, 2015
- 2.A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002
- 3.United Nations, Sustainable Development Goals, 2015 un.org/sdgs

Reference Books:

1. M.P.Boraian, Best Practices in Rural Development, Shanlax Publishers
2. Unnat Bharat Abhiyan Website : www.unnatbharatabhiyan.gov.in

COURSE OUTCOMES

Upon completion of the course, students will be able to

CO1	Able to understand of rural life, culture and social realities
CO2	Able to understand the concept of measurement by comparison or balance of parameters.
CO3	Able to develop a sense of empathy and bonds of mutuality with local community
CO4	Able to appreciate significant contributions of local communities to Indian society and economy
CO5	Learned to value the local knowledge and wisdom of the community

MAPPING OF COs WITH POs AND PSOs

COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

AD1007	ESSENCE OF INDIAN KNOWLEDGE TRADITION	L	T	P	C
		2	0	0	0
OBJECTIVES <ul style="list-style-type: none">• Get a knowledge about Indian Culture• Know Indian Languages and Literature religion and philosophy and the fine arts in India• Explore the Science and Scientists of Ancient, Medieval and Modern India• Understand education systems in India					
UNIT I	INTRODUCTION TO CULTURE	9			
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India				CO1	
UNIT II	INDIAN LANGUAGES AND LITERATURE	9			
Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature				CO2	
UNIT III	RELIGION AND PHILOSOPHY	9			
Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)				CO3	
UNIT IV	FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING)	9			
Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India				CO4	

UNIT V	EDUCATION SYSTEM IN INDIA														9
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India															CO5
TOTAL : 45 PERIODS															
REFERENCE:															
1. . Kapil Kapoor, “Text and Interpretation: The India Tradition”, ISBN: 81246033375, 2005 2. “Science in Samskrit”, Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007 3. NCERT, “Position paper on Arts, Music, Dance and Theatre”, ISBN 81-7450 494-X, 200 4. Narain, “Examinations in ancient India”, Arya Book Depot, 1993 5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989 6. M. Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN 13: 978-8120810990, 2014															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Understand philosophy of Indian culture.														
CO2	Distinguish the Indian languages and literature.														
CO3	Learn the philosophy of ancient, medieval and modern India.														
CO4	Acquire the information about the fine arts in India.														
CO5	Know the contribution of scientists of different eras.														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-

AD1008	SANGA TAMIL LITERATURE APPRECIATION	L	T	P	C
		2	0	0	0
OBJECTIVES The main learning objective of this course is to make the students an appreciation for: <ul style="list-style-type: none"> 1. Introduction to Sanga Tamil Literature. 2. 'Agathinai' and 'Purathinai' in SangaTamil Literature. 3. 'Attruppadai' in SangaTamil Literature. 4. 'Puranaanuru' in SangaTamil Literature. 5. 'Pathitru paththu' in SangaTamil Literature. 					
UNIT I	SANGA TAMIL LITERATURE – AN INTRODUCTION	9			
Introduction to Tamil Sangam–History of Tamil Three Sangams–Introduction to Tamil Sangam Literature–Special Branches in Tamil Sangam Literature- Tamil Sangam Literature's Grammar Tamil Sangam Literature's parables.					CO1
UNIT II	'AGATHINAI' AND 'PURATHINAI'	9			
Tholkappiyar's Meaningful Verses–Three literature materials–Agathinai's message- History of Culture from Agathinai– Purathinai–Classification–Mesaage to Society from Purathinai.					CO2
UNIT III	'ATTRUPPADAI'.	9			
Attruppadai Literature–Attruppadai in 'Puranaanuru' -Attruppadai in 'Pathitru paththu' -Attruppadai in 'Paththupaattu'.					CO3
UNIT IV	'PURANAANURU'	9			
Puranaanuru on Good Administration, Ruler and Subjects–Emotion & its Effect in Puranaanuru.					CO4

UNIT V	'PATHITRUPATHTHU'														9
Pathitrupaththu in 'Ettuthogai' – Pathitrupaththu's Parables – Tamil dynasty: Valor, Administration, Charity in Pathitrupaththu- Message to Society from Pathitrupaththu.															CO5
TOTAL : 45 PERIODS															
REFERENCE:															
1. . Sivaraja Pillai, The Chronology of the Early Tamils, Sagwan Press, 2018.															
2. Hank Heifetz and George L. Hart, The Purananuru, Penguin Books, 2002.															
3. Kamil Zvelebil, The Smile of Murugan: On Tamil Literature of South India, Brill Academic Pub, 1997.															
4. George L. Hart, Poets of the Tamil Anthologies: Ancient Poems of Love and War, Princeton University Press, 2015.															
5. Xavier S. Thani Nayagam, Landscape and poetry: a study of nature in classical Tamil poetry, Asia Pub. House, 1967.															
COURSE OUTCOMES															
Upon completion of the course, students will be able to															
CO1	Appreciate and apply the messages in Sanga Tamil Literature in their life.														
CO2	Differentiate 'Agathinai' and 'Purathinai' in their personal and societal life.														
CO3	Appreciate and apply the messages in 'Attruppadai' in their personal and societal life.														
CO4	Appreciate and apply the messages in 'Puranaanuru' in their personal and societal life.														
CO5	Appreciate and apply the messages in 'Pathitrupaththu' in their personal and societal life.														
MAPPING OF COs WITH POs AND PSOs															
COs	PROGRAM OUTCOMES (POs)												PROGRAM SPECIFIC OUTCOMES (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
