PANIMALAR ENGINEERING COLLEGE

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

B.TECH - COMPUTER SCIENCE AND BUSINESS SYSTEMS

REGULATION 2021

CURRICULUM & SYLLABUS

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Bangalore Trunk Road, Varadharajapuram,

Poonamallee, Chennai – 600 123.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS
B.TECH- COMPUTER SCIENCE AND BUSINESS SYSTEMS

CURRICULUM AND SYLLABUS

REGULATION-2021

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. To acquire technical knowledge and proficiency required for the employment and lifelong learning and recognized as a valued professional and effective communicator in industries related to computer science and computing technologies.
2. To engage in lifelong learning and Practice their profession in a cooperative, team- oriented manner that holds the multidisciplinary and multicultural environment of suits the current business world.
3. To Function as a responsible member of society and an understanding of the ethics and responsibility of their work in a global context

PROGRAM OUTCOMES (PO)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. 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. Use research-based knowledge and research methods including design ofexperiments, analysis and interpretation of data, and synthesis of the information.
5. 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. 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. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. 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. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO 1: Ability to apply the analytical and business skills to provide sustainable solutions as an engineer/researcher for the real-world problems using core topics in Computer Science with equal appreciation to IT Management.

PSO 2: Ability to understand the evolutionary changes in computing, apply innovative ideas by adapting to a rapidly changing environment by applying their knowledge in technology abstraction and common business principles to solve the real world problems and meet the challenges of the future.

PSO 3: Ability to practice high ethical, human values and professional standards with soft- skills qualities in computer science and business disciplines and to emerge as an entrepreneur for the growth and development of the society.

PANIMALAR ENGINEERING COLLEGE

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

B.TECH- COMPUTER SCIENCE AND BUSINESS SYSTEMS

CHOICE BASED CREDIT SYSTEM

CURRICULA AND SYLLABI - R 2021

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21HS1101	Communicative English & Language Skills Lab I Integrated	HS	5	3	0	2	4
2.	21MA1101	Engineering Mathematics – I	BS	4	3	1	0	4
3.	21PH1101	Engineering Physics	BS	3	3	0	0	3
4.	21CY1101	Engineering Chemistry	BS	3	3	0	0	3
5.	21ES1101	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	21ES1102	Engineering Graphics	ES	5	3	0	2	4
PRACTICALS								
7.	21ES1111	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	21BS1111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
			TOTAL	**31**	**18**	**1**	**12**	**25**

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21HS1201	Communicative English & Language Skills Lab II Integrated	HS	5	3	0	2	4
2.	21MA1202	Linear Algebra & Numerical Methods	BS	4	3	1	0	4
3.	21ES1201	Basic Electrical, Electronics and Measurements Engineering	ES	3	3	0	0	3
4.	21CB1201	Fundamentals of Computer Science	PC	3	3	0	0	3
5.	21CB1202	Digital Principles and Computer Organization	PC	3	3	0	0	3
6.		Mandatory Course – I	MC	2	2	0	0	0
PRACTICALS								
7.	21CB1211	Fundamentals of Computer Science Laboratory	PC	4	0	0	4	2
8.	21ES1211	Engineering Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**28**	**17**	**1**	**10**	**21**

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21MA1301	Discrete Mathematics	BS	4	3	1	0	4
2.	21CB1301	Fundamentals of Economics	PC	3	3	0	0	3
3.	21IT1301	Data Structures	PC	3	3	0	0	3
4.	21IT1302	Operating Systems (Lab Integrated)	PC	5	3	0	2	4
5.	21CS1401	Database Management Systems	PC	3	3	0	0	3
6.		Mandatory Course – II	MC	2	2	0	0	0
PRACTICALS								
7.	21IT1311	Data Structures Laboratory	PC	4	0	0	4	2
8.	21CS1411	Database Management Systems Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**17**	**1**	**10**	**21**

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21MA1407	Probability and Statistics	BS	4	3	1	0	4
2.	21CB1401	Design and Analysis of Computer Algorithms (Lab Integrated)	PC	5	3	0	2	4
3.	21IT1304	Object Oriented Programming	PC	3	3	0	0	3
4.	21CS1303	Software Engineering	PC	3	3	0	0	3
5.	21CS1403	Computer Networks	PC	3	3	0	0	3
6.		Open Elective-I	OE	3	3	0	0	3
PRACTICALS								
7.	21IT1312	Object Oriented Programming Laboratory	PC	4	0	0	4	2
8.	21CS1412	Networks Laboratory	PC	4	0	0	4	2
			TOTAL	**29**	**18**	**1**	**10**	**24**

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21CB1501	Statistical Computing with R	PC	3	3	0	0	3
2.	21CB1502	Software Design with UML	PC	3	3	0	0	3
3.	21CB1503	Fundamentals of Management	PC	3	3	0	0	3
4.	21MA1502	Operations Research (Lab Integrated)	BS	5	3	0	2	4
5.	21CS1503	Theory of Computation	PC	3	3	0	0	3
6.		Professional Elective-I	PE	3	3	0	0	3
PRACTICALS								
7.	21CB1511	Software Design with UML Laboratory	PC	4	0	0	4	2
8.	21CB1512	R Programming Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21CB1601	Human Resource Management	PC	3	3	0	0	3
2.	21CS1602	Artificial Intelligence and Machine Learning	PC	3	3	0	0	3
3.	21CS1603	Compiler Design (Lab Integrated)	PC	5	3	0	2	4
4.		Professional Elective-II	PE	3	3	0	0	3
5.		Open Elective-II	OE	3	3	0	0	3
6.	21CB1602	Design Thinking	EEC	3	3	0	0	3
PRACTICALS								
7.	21CB1611	Socially Relevant Mini Project	EEC	2	0	0	2	1
8.	21CS1612	Artificial Intelligence and Machine Learning Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	21CB1701	Introduction to Innovation, IP Management and Entrepreneurship	PC	3	3	0	0	3
2.	21CB1702	Information Security and Management	PC	3	3	0	0	3
3.	21IT1502	Web Technologies	PC	3	3	0	0	3
4.		Professional Elective-III	PE	3	3	0	0	3
5.		Professional Elective-IV	PE	3	3	0	0	3
PRACTICALS								
6.	21CB1711	Information Security Laboratory	PC	4	0	0	4	2
7.	21IT1511	Web Technologies Laboratory	PC	4	0	0	4	2
			TOTAL	**23**	**15**	**0**	**8**	**19**

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective-V	PE	3	3	0	0	3
2.		Professional Elective-VI	PE	3	3	0	0	3
PRACTICALS								
3.	21CB1811	Project Work	EEC	16	0	0	16	8
			TOTAL	**22**	**6**	**0**	**16**	**14**

TOTAL NO. OF CREDITS: 169

CREDIT DISTRIBUTION

Sl. No	Subject Area	Credits Per Semester								Credits Total	Percentage
	Semester	I	II	III	IV	V	VI	VII	VIII		
1.	Humanities and Social Studies (HS)	4	4							8	4.73
2.	Basic Sciences (BS)	12	4	4	4	4				28	16.57
3.	Engineering Sciences(ES)	9	5							14	8.28
4.	Professional Core (PC)		8	17	17	16	12	13		83	49.11
5.	Professional Electives (PE)					3	3	6	6	18	10.65
6.	Open Electives (OE)				3		3			6	3.55
7.	Project Work (PR/EEC)						4		8	12	7.10
8.	Non-Credit/ (Mandatory)										
	Total	25	21	21	24	23	22	19	14	169	100%

DOMAIN WISE GROUPING OF PROFESSIONAL ELECTIVES:

PROFESSIONAL ELECTIVES

Vertical I **Full Stack Development**	**Vertical II Cloud Computing and Data Center Technologies**	**Vertical III Emerging Technologies**	**Vertical IV Artificial Intelligence Techniques**	**Vertical V Management**	**Vertical VI Marketing**
Open Source Technologies **21IT1901**	Cloud Tools and Techniques **21CS1901**	Augmented Reality/Virtual Reality **21CS1908**	Knowledge Engineering **21AD1923**	Customer Relation Management **21CB1901**	Financial Analytics **21CB1908**
App Development **21IT1902**	Virtualization **21CS1902**	Robotic Process Automation **21CS1915**	Soft Computing **21AD1903**	Business Analytics **21AD1920**	Recommender Systems **21AD1902**
Cloud Services Management **21CS1903**	Cloud Services Management **21CS1903**	Neural Networks and Deep Learning **21AD1918**	Neural Networks and Deep Learning **21AD1918**	Financial Management **21CB1902**	Digital Marketing **21CS1911**
UI and UX Design **21IT1903**	Storage Technologies **21CS1904**	Cyber Security **21IT1915**	Text and Speech Analysis **21AD1919**	Supply Chain Management **21CB1903**	Enterprise Security **21CB1909**
Software Testing and Automation **21IT1904**	Site Reliability Engineering **21CS1905**	Quantum Computing **21CS1916**	Optimization Techniques in Machine Learning **21AD1924**	IT Project Management **21CB1904**	Conversational Systems **21CB1910**
Web Application Security **21IT1905**	Stream Processing **21CS1906**	Cryptocurrency and Blockchain Technologies **21IT1913**	Game Theory **21AD1916**	Entrepreneurship Development **21CB1905**	Social Text and Media Analytics **21CB1911**
DevOps **21IT1906**	DevOps **21IT1906**	Game Development **21CS1913**	Cognitive Science **21AD1917**	Business Strategy Management **21CB1906**	Marketing Research and Management **21CB1912**
Principles of Programming Languages **21IT1907**	Security and Privacy in Cloud **21CS1907**	3D Printing and Design **21CS1917**	Ethics and AI **21AD1907**	Behavioral Economics **21CB1907**	Risk Analytics **21CB1913**

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: FULL STACK DEVELOPMENT

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21IT1901	Open Source Technologies	PE	3	3	0	0	3
2.	21IT1902	App Development	PE	3	3	0	0	3
3.	21CS1903	Cloud Services Management	PE	3	3	0	0	3
4.	21IT1903	UI and UX Design	PE	3	3	0	0	3
5.	21IT1904	Software Testing and Automation	PE	3	3	0	0	3
6.	21IT1905	Web Application Security	PE	3	3	0	0	3
7.	21IT1906	DevOps	PE	3	3	0	0	3
8.	21IT1907	Principles of Programming Languages	PE	3	3	0	0	3

VERTICAL 2: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1901	Cloud Tools and Techniques	PE	3	3	0	0	3
2.	21CS1902	Virtualization	PE	3	3	0	0	3
3.	21CS1903	Cloud Services Management	PE	3	3	0	0	3
4.	21CS1904	Storage Technologies	PE	3	3	0	0	3
5.	21CS1905	Site Reliability Engineering	PE	3	3	0	0	3
6.	21CS1906	Stream Processing	PE	3	3	0	0	3
7.	21IT1906	DevOps	PE	3	3	0	0	3
8.	21CS1907	Security and Privacy in Cloud	PE	3	3	0	0	3

VERTICAL 3: EMERGING TECHNOLOGIES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1908	Augmented Reality / Virtual Reality	PE	3	3	0	0	3
2.	21CS1915	Robotic Process Automation	PE	3	3	0	0	3
3.	21AD1918	Neural Networks and Deep Learning	PE	3	3	0	0	3
4.	21IT1915	Cyber security	PE	3	3	0	0	3
5.	21CS1916	Quantum Computing	PE	3	3	0	0	3
6.	21IT1913	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3
7.	21CS1913	Game Development	PE	3	3	0	0	3
8.	21CS1917	3D Printing and Design	PE	3	3	0	0	3

VERTICAL 4: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21AD1923	Knowledge Engineering	PE	3	3	0	0	3
2.	21AD1903	Soft Computing	PE	3	3	0	0	3
3.	21AD1918	Neural Networks and Deep Learning	PE	3	3	0	0	3
4.	21AD1919	Text and Speech Analysis	PE	3	3	0	0	3
5.	21AD1924	Optimization Techniques in Machine Learning	PE	3	3	0	0	3
6.	21AD1916	Game Theory	PE	3	3	0	0	3
7.	21AD1917	Cognitive Science	PE	3	3	0	0	3
8.	21AD1907	Ethics and AI	PE	3	3	0	0	3

VERTICAL 5: MANAGEMENT

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CB1901	Customer Relation Management	PE	3	3	0	0	3
2.	21AD1920	Business Analytics	PE	3	3	0	0	3
3.	21CB1902	Financial Management	PE	3	3	0	0	3
4.	21CB1903	Supply Chain Management	PE	3	3	0	0	3
5.	21CB1904	IT Project Management	PE	3	3	0	0	3
6.	21CB1905	Entrepreneurship Development	PE	3	3	0	0	3
7.	21CB1906	Business Strategy Management	PE	3	3	0	0	3
8.	21CB1907	Behavioral Economics	PE	3	3	0	0	3

VERTICAL 6: MARKETING

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CB1908	Financial Analytics	PE	3	3	0	0	3
2.	21AD1902	Recommender Systems	PE	3	3	0	0	3
3.	21CS1911	Digital Marketing	PE	3	3	0	0	3
4.	21CB1909	Enterprise Security	PE	3	3	0	0	3
5.	21CB1910	Conversational Systems	PE	3	3	0	0	3
6.	21CB1911	Social Text and Media Analytics	PE	3	3	0	0	3
7.	21CB1912	Marketing Research and Management	PE	3	3	0	0	3
8.	21CB1913	Risk Analytics	PE	3	3	0	0	3

VERTICALS FOR MINOR DEGREE

(In addition to all the verticals of other programmes)

Vertical I Fintech and Block Chain	**Vertical II Entrepreneurship**	**Vertical III Public Administration**	**Vertical IV Business Data Analytics**	**Vertical V Environment and Sustainability**
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable Infrastructure Development
Fundamentals of Investment	Team Building and Leadership Management for Business	Constitution of India	Data mining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable development
-	-	-	-	Energy Efficiency for Sustainable Development

HUMANITIES AND SOCIAL SCIENCES (HS) COURSES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21HS1101	Communicative English & Language Skills Lab I Integrated	HS	5	3	0	2	4
2.	21HS1201	Communicative English & Language Skills Lab II Integrated	HS	5	3	0	2	4

BASIC SCIENCES (BS) COURSES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21MA1101	Engineering Mathematics-I	BS	4	3	1	0	4
2.	21PH1101	Engineering Physics	BS	3	3	0	0	3
3.	21CY1101	Engineering Chemistry	BS	3	3	0	0	3
4.	21BS1111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	21MA1202	Linear Algebra & Numerical Methods	BS	4	3	1	0	4
6.	21MA1301	Discrete Mathematics	BS	4	3	1	0	4
7.	21MA1406	Probability and Statistics	BS	4	3	1	0	4
8.	21MA1502	Operations Research (Lab Integrated)	BS	5	3	0	2	4

ENGINEERING SCIENCES (ES) COURSES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21ES1101	Problem Solving and Python Programming	ES	3	3	0	0	3
2.	21ES1102	Engineering Graphics	ES	5	3	0	2	4
3.	21ES1111	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
4.	21ES1201	Basic Electrical, Electronics and Measurements Engineering	ES	3	3	0	0	3
5.	21ES1211	Engineering Practices Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC) COURSES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CB1201	Fundamentals of Computer Science	PC	3	3	0	0	3
2.	21CB1202	Digital Principles and Computer Organization	PC	3	3	0	0	3
3.	21CB1211	Fundamentals of Computer Science Laboratory	PC	4	0	0	4	2
4.	21CB1301	Fundamentals of Economics	PC	3	3	0	0	3
5.	21IT1302	Operating Systems (Lab Integrated)	PC	5	3	0	2	4
6.	21CS1401	Database Management Systems	PC	3	3	0	0	3
7.	21IT1311	Data Structures Laboratory	PC	4	0	0	4	2
8.	21CS1411	Database Management Systems Laboratory	PC	4	0	0	4	2
9.	21CB1401	Design and Analysis of Computer Algorithms (Lab Integrated)	PC	5	3	0	2	4
10.	21IT1304	Object Oriented Programming	PC	3	3	0	0	3
11.	21CS1303	Software Engineering	PC	3	3	0	0	3
12.	21CS1403	Computer Networks	PC	3	3	0	0	3
13.	21IT1312	Object Oriented Programming Laboratory	PC	4	0	0	4	2
14.	21CS1412	Networks Laboratory	PC	4	0	0	4	2
15.	21CB1501	Statistical Computing with R	PC	3	3	0	0	3
16.	21CB1502	Software Design with UML	PC	3	3	0	0	3
17.	21CB1402	Fundamentals of Management	PC	3	3	0	0	3
18.	21CS1503	Theory of Computation	PC	3	3	0	0	3
19.	21CB1511	Software Design with UML Laboratory	PC	4	0	0	4	2
20.	21CB1512	R Programming Laboratory	PC	4	0	0	4	2
21.	21CB1601	Human Resource Management	PC	3	3	0	0	3
22.	21CS1602	Artificial Intelligence and Machine Learning	PC	3	3	0	0	3
23.	21CS1603	Compiler Design (Lab Integrated)	PC	5	3	0	2	4

24.	21CS1612	Artificial Intelligence and Machine Learning Laboratory	PC	4	0	0	4	2
25.	21CB1701	Introduction to Innovation, IP Management and Entrepreneurship	PC	3	3	0	0	3
26.	21CB1702	Information Security and Management	PC	3	3	0	0	3
27.	21IT1502	Web Technologies	PC	3	3	0	0	3
28.	21CB1711	Information Security Laboratory	PC	4	0	0	4	2
29.	21IT1511	Web Technologies Laboratory	PC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CB1602	Design Thinking	EEC	3	3	0	0	3
2.	21CB1611	Socially Relevant Mini Project	EEC	2	0	0	2	1
3.	21CB1811	Project Work	EEC	16	0	0	16	8

MANDATORY COURSES

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21MC1001	Environmental Science	MC	2	2	0	0	0
2.	21MC1002	Constitution of India	MC	2	2	0	0	0
3.	21MC1003	Human Values	MC	2	2	0	0	0
4.	21MC1005	Essence of Indian Knowledge Tradition	MC	2	2	0	0	0
5.	21MC1006	Soft Skills and Personality Development	MC	2	2	0	0	0

OPEN ELECTIVES

SEMESTER IV

OPEN ELECTIVE I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CE1010	Air Pollution and Control Engineering	OE	3	3	0	0	3
2.	21CE1001	Energy Conservation and Management	OE	3	3	0	0	3
3.	21GE1004	Hospital Waste Management	OE	3	3	0	0	3
4.	21CY1001	Industrial Nanotechnology	OE	3	3	0	0	3
5.	21EE1003	Logic and Distributed Control Systems	OE	3	3	0	0	3
6.	21EC1011	Telehealth Technology	OE	3	3	0	0	3

SEMESTER VI

OPEN ELECTIVE II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21EE1001	Basic Circuit Theory	OE	3	3	0	0	3
2.	21CY1002	Energy Technology	OE	3	3	0	0	3
3.	21EC1004	Electronic Devices	OE	3	3	0	0	3
4.	21CE1009	Environmental and Social Impact Assessment	OE	3	3	0	0	3
5.	21GE1003	Hospital Management	OE	3	3	0	0	3
6.	21EC1002	Medical Electronics	OE	3	3	0	0	3
7.	21EC1006	Signals and Systems	OE	3	3	0	0	3
8.	21ME1006	Systems Engineering	OE	3	3	0	0	3
9.	21CY1003	Waste Water Treatment	OE	3	3	0	0	3

SEMESTER I

21HS1101	COMMUNICATIVE ENGLISH & LANGUAGE SKILLS LAB I INTEGRATED	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

- To induce the basic reading and writing skills among the first year engineering and technology students.
- To assist the learners to develop their listening skills, which will enable them listening to lectures and comprehend them by asking questions and seeking clarifications.
- To succor the learners to develop their speaking skills and speak fluently in real contexts.
- To motivate the learners to develop vocabulary of a general kind by developing their reading skills for meeting the competitive exams like GATE, TOFEL, GRE, IELTS, and other exams conducted by Central and State governments.

UNIT - I **INTRODUCING ONESELF** **9**

Listening: Listening and filling details, Listening to Speeches by Specialists and Completing Activities such as Answering Questions, Identifying the Main Ideas, Style, etc.

Speaking: Introducing Oneself – Introducing Friend/ Family.

Reading: Descriptive Passages (From Newspapers / Magazines).

Writing: Writing a Paragraph (Native Place, School Life), Developing Hints.

Grammar: Noun, Pronoun & Adjective.

Vocabulary Development: One Word Substitution.

UNIT - II **DIALOGUE WRITING** **9**

Listening: Listening to Conversations (Asking for and Giving Directions).

Speaking: Making Conversation Using (Asking for Directions, Making an Enquiry), Role Plays, and Dialogues.

Reading: Reading a Print Interview and Answering Comprehension Questions.

Writing: Writing a Checklist, Dialogue Writing.

Grammar: Tenses and Voices.

Vocabulary Development: Prefix & Suffix, Word formation.

UNIT - III **DRAFTING OFFICIAL COMMUNICATIONS** **9**

Listening: Listening for specific information.
Speaking: Giving Short Talks on a given Topic.
Reading: Reading Motivational Essays on Famous Engineers and Technologists (Answering Open – Ended and Closed Questions).
Writing: Writing Formal Letters / Emails. Grammar: Adverb, Prepositions & Conjunctions.
Vocabulary Development: Collocations – Fixed Expressions.

UNIT -IV WRITTEN COMMUNICATION 9

Listening: Listening to Short Talks (5 Minutes Duration and Fill a Table, Gap-Filling Exercise) Note Taking/Note Making.
Speaking: Small Group Discussion, Giving Recommendations.
Reading: Reading Problem – Solution Articles/Essays Drawn From Various Sources.
Writing: Making Recommendations Note Making – Complaint Letters.
Grammar: Subject-Verb Agreement, Framing Questions.
Vocabulary Development: Connectives, Reference Words, Technical Vocabulary.

UNIT -V WRITING DEFINITIONS AND PRODUCT DESCRIPTION 9

Listening: Listening to a Product Description (Labeling and Gap Filling) Exercises.
Speaking: Describing a Product and Comparing and Contrasting it with Other Products.
Reading: Reading Graphical Material for Comparison (Advertisements).
Writing: Writing Definitions (Short and Long)-Compare and Contrast Paragraphs, Essay writing.
Grammar: Phrasal Verbs – Cause and Effect Sentences –Compound Nouns
Vocabulary Development: Use of Discourse Markers.

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of the course student will be able to:

- The students will be able to comprehend conversations and short talks delivered in English.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions English
- Read articles of a general kind in magazines and newspapers
- Write short essays of a general kind and personal letters and emails in English
- Recognize the use of grammar in speech and writing

TEXT BOOKS:

1. N P Sudharshana & C Savitha. English for Technical Communication Delhi: CUP, 2019.
2. Board of Editors English for Engineers and Technologists Volume 1 Orient Black Swan Limited, 2020.

REFERENCES:

1. Board of Editors. Using English-A course book for Undergraduate engineers and Technologists Orient Black Swan Limited, 2017
2. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2011.
3. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
4. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning ,USA:2007
5. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005.

WEB REFERENCES:

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabulary-exams/wordformation
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.htm
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/

ONLINE COURSES / RESOURCES:

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/20180316 21.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions

LANGUAGE SKILLS LAB

List of exercises : MINIMUM OF EXERCISES TO BE CONDUCTED 15

1. Reading: Different text type
2. Reading: Predicting content using pictures and title.
3. Reading: Use of graphic organizers to review
4. Reading: Aid comprehension.
5. Reading: Understanding reference words.
6. Reading: Use of connectors in a passage.
7. Reading: Speed reading Techniques.
8. Reading and Comprehending the passages in the competitive exams like GATE, TOFEL, GRE, IELTS, and other exams conducted by Central and State governments.

9. Reading: Sentence Completion: Exercises used in competitive exams.
10. Writing: Error Detection:
11. Writing: Spotting and reasoning the errors found from the passages in competitive exams
12. Writing: Email writing
13. Writing: Job Application: Resume
14. Writing: Elements of a good essay-
15. Writing: Types of essays- Descriptive-Narrative- issue based.
16. Writing: Statement of Purpose
17. Writing: Letter of recommendation
18. Writing: Vision statement
19. Writing: Verbal Analogy,
20. Writing Phrases, and Idioms associated with competitive exams

TOTAL: 30 PERIODS

SOFTWARE REQUIRED

Globarena

REFERENCES:

1. Suresh Kumar.E and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
2. Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge UniversityPress: Cambridge, 2004
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000

21MA1101	ENGINEERING MATHEMATICS- I	L	T	P	C
		3	1	0	4

OBJECTIVES: To impart Knowledge on the following topics:

- Matrix transforms are very useful within the world of computer graphics. A matrix algebra can be readily applied to the structural properties of graphs from an algebraic point of view.
- The aim of this course to get depth knowledge about calculus.
- Familiarize the functions of two variables and finding its extreme points.
- To make the students understand various techniques of integration.

UNIT - I MATRICES 9 + 3

Eigen values and Eigen vectors of a real matrix —Rank of the matrix – Characteristic equation - Properties of Eigenvalues and Eigen vectors — Cayley Hamilton theorem — Diagonalization of matrices— Reduction of a quadratic form to canonical form by orthogonal transformation and similarity transformation —Nature of quadratic forms.

UNIT - II DIFFERENTIAL CALCULUS 9 + 3

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules (Sum, Product & Quotient rule, Chain rule, logarithmic and implicit differentiation) – Maxima and Minima of functions of one variable-Rolle's theorem- Mean value theorem.

UNIT - III FUNCTIONS OF SEVERAL VARIABLES 9 + 3

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.

UNIT -IV INTEGRAL CALCULUS 9 + 3

Definite and Indefinite integrals – Substitution rule – Techniques of Integration – Integration by parts – Bernoulli's formula- Trigonometric integrals – Trigonometric substitutions – Integration of rational functions by partial fraction – Integration of irrational functions – Improper integrals.

UNIT -V MULTIPLE INTEGRALS 9 + 3

Double integrals in modelling and polar coordinates – Change of order of integration in modelling coordinates– Area enclosed by plane curves – Change of variables in double integrals – Triple integrals –Volume of Solids.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Able to find eigen values and eigen vectors, diagonalization of a matrix, symmetric matrices, positive definite matrices and similar matrices.
- Apply limit definition and rules of differentiation to differentiate functions.
- Understand familiarity in the knowledge of Maxima and Minima, Jacobian, Taylor series and apply the problems involving Science and Engineering
- Understand the knowledge of Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction.
- Understand the knowledge of Area enclosed by plane curves, Change of variables in double integrals, Triple integrals, Volume of Solids

TEXT BOOKS:

1. Grewal B.S., —Higher Engineering Mathematics‖, Khanna Publishers, NewDelhi,43rd Edition, 2014.
2. James Stewart, –Calculus: Early Transcendentals‖, Cengage Learning,7th Edition, NewDelhi, 2015.
3. Bali N., Goyal M. and Walkins C., —Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt. Ltd.,), New Delhi, 7th Edition, 2009.

REFERENCES:

1. Anton, H, Bivens, I and Davis, S, –Calculus‖, Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., —Advanced Engineering Mathematics‖, Narosa Publications, NewDelhi, 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. Weir, M.D and Joel Hass, –Thomas Calculus‖, 12th Edition, Pearson India, 2016.
6. B.V. Ramana, — Higher Engineering Mathematics‖, McGraw Hill Education, India.
7. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley sons,10thedition,2015.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma60/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma58/preview

21PH1101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT - I MECHANICS 9

System of particles: centre of mass in one and two dimensions – rotational motion of continues system– torque – moment of inertia – conservation of angular momentum – Newton's laws for rotation – equations of rotational motion – work energy theorem for rotational motion. Stress, strain, Hooke's law and elastic moduli – twisting couple per unit twist for solid and hollow cylinders – torsional pendulum theory – bending moment of beam – cantilever and non-uniform bending theory – uniform bending theory – I shape girder.

UNIT - II ELECTROMAGNETIC THEORY 9

Divergence – curl – integral calculus – Gauss divergence theorem – Stoke's theorem – equation of continuity – displacement current – Maxwell's equations – Gauss's laws – Faraday's law –Ampere- Maxwell law – mechanism of electromagnetic wave propagation – Hertz observation – production and detection of electromagnetic wave – electromagnetic waves in free space and matter – energy carried by electromagnetic wave – momentum and radiation pressure – properties of electromagnetic waves.

UNIT - III THERMAL PHYSICS 9

Mode of heat transfer: conduction, convection and radiation – thermal expansion of solids – bimetallic strips – thermal conductivity – heat conduction through compound media (series & parallel) – Forbe's and Lee's disc method; theory and experiment – thermal insulation – applications – heat exchangers – refrigerators, solar water heater.

UNIT -IV OSCILLATORY MOTION, LASERS AND FIBER OPTICS 9

Spring mass system – differential equation-simple harmonic motion-damped oscillation-forced oscillation –analogy with LCR circuits and mechanical oscillation – plane wave equation – equations of wave motion in a rope and velocity of wave. Population of energy levels, Einstein's A and B coefficients derivation – optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction –components and principle of fiber optics – numerical aperture and acceptance angle derivation – types of optical fibers (material, refractive index, mode) – losses associated with optical fibers – fiber as pressure and displacement sensors.

UNIT -V QUANTUM MECHANICS 9

Blackbody radiation – Planck's hypothesis and derivation – wave particle duality of light: concepts of photon – Compton effect: theory and experiment – de Broglie hypotheses - concept of wave function and its physical significance – Schrodinger's wave equation – time independent and time dependent equations – particle in a one-dimensional box – tunnelling (qualitative) – scanning tunnelling microscope.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Upon completion of this course, the students will understand the basics of mechanics and especially elastic properties of materials.
- Upon completion of this course, the students will gain knowledge on the basic concepts of electromagnetic waves and its properties..
- Upon completion of this course, the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in heat exchangers
- Upon completion of this course, the students will acquire knowledge on the concepts of oscillations, lasers and fiber optics and their technological applications
- Upon completion of this course, the students will get knowledge on advanced physics concepts of quantum theory and its applications in modelling microscopes.

TEXT BOOKS:

1. Gaur, R.K. & Gupta, S.L. –Engineering Physics‖. Dhanpat Rai Publishers, 2012.
2. Santhosam, K. Russel Raj, K. & Maheswaran, A. —Engineering Physics, KRAM Publications, 2021
3. Pandey, B.K. & Chaturvedi, S. —Engineering Physics‖. Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. —Principles of Physics‖. Wiley, 2015.
2. Tipler, P.A. & Mosca, G. —Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.
3. Arthur Beiser, —Concepts of Modern Physics‖, Mc Graw Hill, Sixth edition, 1994.
4. Douglas. C., Giancoli. —Physics: Principles with applications‖, Pearson, 2014.

WEB REFERENCES:

1. https://kluniversity.in/physics/pdfs/crypdf.pdf
2. https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf
3. https://nptel.ac.in/content/storage2/courses/117101002/downloads/Lec01.pdf
4. https://nptel.ac.in/content/storage2/courses/117101002/downloads/Lec19.pdf
5. https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture- notes/MIT8_04S16_LecNotes3.pdf

   https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture- notes/MIT8_04S16_LecNotes5.pdf

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/115/102/115102023/
2. https://nptel.ac.in/courses/115/106/115106066/

21CY1101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know about the importance of Chemistry in Engineering domain.
- To understand the Chemistry background of industrial process.
- To apply Chemistry knowledge for Engineering disciplines.

UNIT - I WATER TECHNOLOGY 9

Hardness –Types of hardness – Estimation by EDTA method – Boiler troubles-scale, sludge, priming, foaming, caustic embrittlement, Boiler corrosion – Internal Conditioning – Carbonate, phosphate, Calgon conditioning – External Conditioning – Zeolite and Demineralization process – Desalination, Reverse Osmosis Method – Domestic water treatment.

UNIT - II HIGH POLYMERS AND NANOCHEMISTRY 9

Polymers – Introduction – Classification of Polymers (Origin/Source, Structure, Monomers, Inter- molecular Forces, Synthesis) – Commercial Polymers (Poly Vinyl Chloride (PVC), Polytetrafluoroethylene (PTFE), Nylon-6 6, Nylon-6, Polyethylene Terephthalate (PET) – Conducting Polymers – Polyaniline, Polythiophene, Trans-Polyacetylene – Basic definition – FRP – General Engineering applications of FRP (Civil Engineering Structures). **Nanomaterials –** Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: Top-down and bottom-up approaches, Chemical Synthesis – Co precipitation, Sol-Gel process and Chemical vapor deposition, Nanoscale materials: Fullerenes, Carbon nanotubes and 8odellin – Characterization, properties and applications. Green synthesis of Nanoparticles.

UNIT - III INSTRUMENTAL METHODS AND ANALYSIS 9

Introduction to Spectroscopy – Types of spectroscopy – Absorption spectra – Emission spectra – Wave length and Wave number- Electromagnetic radiation – Flame Photometry, Atomic Absorption Spectroscopy, UV-Visible spectrum. Introduction – basic principles – Instrumentation& Applications – Infrared Spectroscopy. Chromatographic methods – Types (column, Thin layer, paper, Gas, High Performance Liquid Chromatographic methods) – principle- Separation and quantification of Organic compounds by GC and HPLC. Conductometric Titrations: Instrumentation – Advantages – Applications Potentiometric Titrations: Instrumentation –Advantages-Applications. Measurement of pH: pH metry – Instrumentation – Applications.

UNIT -IV ELECTROCHEMISTRY AND CORROSION 9

Introduction- Electrode potentials-Electrochemical series-Electrochemical cell-redox reaction – measurement and applications – Nernst Equation Derivation- Electrochemical extraction of metals – Electrolytic refining of metals –Nano electrochemical Sensors. Corrosion – causes, factors, types, Chemical and Electrochemical Corrosion (Galvanic, Differential aeration) – Corrosion Control, Electrochemical protection – Sacrificial Anodic method – Impressed Current Cathodic Protection – Corrosion Inhibitors – Biocorrosion. Protective Coatings – Paints, Constituents, Functions- Surface preparation for metallic coatings, Electroplating and Electroless Plating.

UNIT -V ENERGY SOURCES AND STORAGE DEVICES 9

Introduction – Nuclear energy – Nuclear fission – Controlled Nuclear fission – Nuclear Fusion – Differences – Nuclear chain reactions –Nuclear Reactor – Classification of Nuclear Reactor – Light Water Nuclear Reactor, Breeder Reactor – Solar Energy, Conversion, Solar Cells – Wind Energy.

Batteries and Fuel Cells – Types of batteries –– Zinc – carbon dry cell –Lead Storage battery– Nickel- Cadmium Battery – Lithium battery – Battery Engineering – Battery hazards – Biological Batteries. Fuel Cells – Hydrogen-Oxygen Fuel Cell – Hondas cell- Supercapacitors (elementary idea)

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Analyze the water quality parameters in purification and significance in industries, daily life.
- Explain the types, fabrication and engineering applications of polymers. Develop economically ne methods of synthesizing nanomaterials and their applications.
- Demonstrate the knowledge of analytical techniques using spectroscopy.
- Relate the electrode potential for its feasibility in electrochemical reaction. Illustrate the causes, co corrosion and to achieve its protection.
- Compare the economic and efficient usage of non-conventional and conventional energy source and various storage devices.

TEXT BOOKS:

1. P.C.Jain and Monika Jain, ―Engineering Chemistry, Dhanpat Rai Publishing Company(P) LTD., New Delhi.
2. S. S. Dara and S.S. Umare, ―A Textbook of Engineering Chemistry‖ S. Chand and Company Ltd, New Delhi.
3. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, ―Polymer Science‖, New Age International P (Ltd.,), Chennai, 2006
4. P. Kannan and A. Ravikrishnan, ―Engineering Chemistry‖, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009. 16
5. S. Vairam, P. Kalyani and Suba Ramesh, ―Engineering Chemistry‖, Wiley India, 2011.

REFERENCES:

1. Friedrich Emich, —Engineering Chemistry, Scientific International Pvt. Ltd., NewDelhi
2. Prasantha Rath, —Engineering Chemistry, Cengage Learning India Pvt., Ltd., Delhi
3. P.W. Atkins and de Paula Julio, —Physical Chemistry, Oxford University Press, 8th Ed., (Indian Student Edition) (2009).
4. K. K. Rohatgi-Mukherjee, —Fundamental of Photochemistry, New Age International (P) Ltd., New Delhi, 1986
5. G.A. Ozin and A.C. Arsenault, —Nanochemistry: A Chemical Approach to Nanomaterials, RSC Publishing, 2005 Nanomaterials, B.Viswanathan, Alpha Science , ISBN: 9781842654941

WEB REFERENCES:

1. http://www.mhhe.com/engcs/compsci/forouzan/dcn/student/olc

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/103/108/103108100
2. https://nptel.ac.in/courses/121/106/121106014
3. https://nptel.ac.in/courses/104/105/104105039

21ES1101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know the basic programming constructs –data types, decision structures, and control structures in python
- To know how to use libraries for string manipulation
- To Use python data structures – Lists, Tuples and Dictionary
- To know the basic concepts of Object-Oriented Programming
- To learn about input/output with files in Python

UNIT - I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language); Python: Data types, variables, expressions, precedence of operators, algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi.

SUGGESTED ACTIVITIES:

- Developing Pseudo codes and flowcharts for real life activities such as railway ticket Booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic Operations
- Installing Python
- Simple programs on print statements, arithmetic operations

SUGGESTED EVALUATION METHODS:

- Quizzes on algorithm and basic python
- Assignments on illustrative problems
- Quizzes on simple python programs

UNIT - II CONTROL FLOW, STRINGS & FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; functions, function definition and use; Fruitful functions: return values, parameters and arguments, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module. Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

SUGGESTED ACTIVITIES:

- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions
- Developing simple applications like calculator, calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals

- Recursion vs. Iteration

SUGGESTED EVALUATION METHODS:

- Quizzes on strings.
- Assignments on illustrative problems.
- Quizzes on control flow and functions.

UNIT - III LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Lists as arrays. Illustrative programs: selection sort, insertion sort, merge sort, histogram.

SUGGESTED ACTIVITIES:

- Implementing python program using lists, tuples, sets for the following scenario
- Simple sorting techniques
- Student Examination Report
- Billing Scheme during shopping
- Implementing any application using List and Tuple data structures

SUGGESTED EVALUATION METHODS:

- Quizzes on list slices
- Assignments on illustrative problems
- Quizzes on tuples and dictionaries

UNIT -IV OBJECT ORIENTED PROGRAMMING WITH PYTHON 9

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data Modelling; persistent storage of objects – inheritance, polymorphism, operator overloading; abstract classes; exception handling, try block. Illustrative programs: demonstrate the concept of class and objects

SUGGESTED ACTIVITIES:

- Features of OOP.
- Persistent storage of objects
- Operators and its usage
- Simple programs using OOP concepts

SUGGESTED EVALUATION METHODS:

- Quizzes on basic OOP concepts
- Assignments on illustrative problems
- Quizzes on inheritance and exception handling

UNIT -V FILES, MODULES, PACKAGES 9

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

SUGGESTED ACTIVITIES:

- Developing modules using Python to handle files and apply various operations on files
- Usage of exceptions, multiple except blocks – for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions

SUGGESTED EVALUATION METHODS:

- Quizzes on basic file operations
- Assignments on illustrative problems
- Quizzes on packages and modules

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Develop algorithmic solutions to simple computational problems
- Write and execute simple Python programs
- Familiarize with python string handling techniques and user defined functions
- Represent compound data using Python lists, tuples and dictionaries
- Understand the concept of object oriented programming techniques
- Read and write data from/to files in Python Programs

TEXT BOOKS:

1. Reema Thareja, ``Problem Solving and Programming with Python'', 2nd edition, OXFORD University Press, New Delhi, 2019.(UNIT 1,2,3,4(Exception Handling) and 5).
2. Bill Lubanovic, —Introducing Python-Modern Computing in Simple Package‖, 2nd edition, O'REILLY, 2019.(UNIT 4(Object Oriented Programming)).

REFERENCES:

1. Steven F. Lott, –Modern Python Cookbook'', 2nd Edition, O'REILLY, 2020.
2. Ryan Marvin, Mark Ng'ang'a, Amos Omondi, —Python Fundamentals, Packt Publishing., 2018.
3. Paul J. Deitel, Python for Programmers, Pearson India Education Services Pvt. Ltd,2020.
4. Martin C. Brown, Python: The Complete Reference, McGraw Hill Education; Fourth edition, 2018.

WEB REFERENCES:

1. https://freecomputerbooks.com/An-Introduction-to-Python-Guido-van- Rossum. html#downloadLinks
2. http://marvin.cs.uidaho.edu/Teaching/CS515/pythonTutorial.pdf
3. https://greenteapress.com/thinkpython2/thinkpython2.pdf

ONLINE COURSES / RESOURCES:

1. https://docs.python.org/3/tutorial/
2. https://www.w3schools.com/python/
3. https://www.tutorialspoint.com/python/index.htm
4. https://www.javatpoint.com/python-tutorial=
5. https://nptel.ac.in/courses/

21ES1102	ENGINEERING GRAPHICS	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

- Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
- Drawing orthographic projections of lines and planes.
- Drawing orthographic projections of solids.
- Drawing development of the surfaces of objects
- Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination) 2

Importance of graphics in engineering applications – Use of drafting instruments. BIS conventions and specifications. Size, layout and folding of drawing sheets – Lettering and dimensioning. Introduction to drafting packages like CAD and demonstration of their use in engineering fields.

UNIT - I PLANE CURVES AND FREEHAND SKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices-Conics: Construction of Ellipse, Parabola and Hyperbola by eccentricity method – Construction of cycloid, Involutes of square, pentagon and circle – Drawing of tangents and normal to the above curves. Free Hand sketching-Orthographic projection – Orthographic views of simple three-Dimensional objects

UNIT - II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Orthographic projection- principles-Principle 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 eg 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..

UNIT - III PROJECTION OF SOLIDS 15

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to one principle planes by rotating object method and auxiliary plane method.

UNIT -IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of 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 solids and frustum and truncated solids – Prisms, pyramids cylinders and cones.

UNIT -V ISOMETRIC AND PERSPECTIVE PROJECTIONS 14

Principles of isometric projection – isometric scale –Isometric projections of simple solids and frustum 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.

TOTAL: 75 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Draw free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines and planes
- Draw orthographic projections of solids.
- Draw development of the surfaces of objects
- Draw isometric and perspective views of simple solids

TEXT BOOKS:

1. Natarajan, K. V., ―A text book of Engineering Graphics‖, 28th Ed., Dhanalakshmi Publishers, Chennai, 2015.
2. Venugopal, K. and Prabhu Raja, V., ―Engineering Graphics‖, New Age, 2008

REFERENCES:

1. Bhatt, N.D.,Panchal V M and Pramod R. Ingle, ―Engineering Drawing‖, Charotar Publishing House, 53rd Edition, 2014.
2. Parthasarathy, N. S. and Vela Murali, ―Engineering Drawing‖, Oxford University Press, 2015
3. Agrawal, B. and Agrawal C.M., –Engineering Drawing‖, Tata McGraw, N.Delhi, 2008.

WEB REFERENCES:

1. https://nptel.ac.in/courses/105/104/105104148/
2. https://www.youtube.com/channel/UCkCk0nvNyWhEOLge9JtDLDg

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/112/103/112103019/

21ES1111	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To write, test, and debug simple Python programs
- To implement Python programs with conditions and loops
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples, dictionaries.
- To use OOPS concepts in Python.
- To read and write data from/to files in Python.

LIST OF EXPERIMENTS

1. Basic Python Programs
2. Write programs to demonstrate different number data types in python
3. Develop python programs to demonstrate various conditional statements
4. Implement user defined functions using python
5. Develop python scripts to demonstrate functions
6. Develop python programs to perform various string operations like slicing, indexing &formatting
7. Develop python programs to perform operations on List & Tuple
8. Demonstrate the concept of Dictionary with python programs
9. Develop python codes to demonstrate concept of class and objects
10. Demonstrate OOPS concepts like inheritance and polymorphism with python programs
11. Demonstrate python codes to print try, except and finally block statements
12. Implement python programs to perform file operations
13. Implement python programs using modules and packages
14. Simulate bouncing ball using Pygame

Mini Project :Suggested Topics(but not limited to)

1. Dice roll simulator
2. Guess the number game
3. Sending emails using python
4. Random password generator
5. Alarm clock
6. URL shortener

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- To write, test, and debug simple Python programs
- To implement Python programs with conditions and loops
- To use functions for structuring Python programs
- To represent compound data using Python lists, tuples, dictionaries
- To use OOPS concepts in Python
- To read and write data from/to files in Python.

WEB REFERENCES:

1. https://www.programiz.com/python-programming/examples
2. https://www.geeksforgeeks.org/python-programming-examples/
3. https://beginnersbook.com/2018/02/python-programs/
4. https://www.javatpoint.com/python-programs
5. https://www.w3schools.com/python/python_examples.asp
6. https://www.sanfoundry.com/python-problems-solutions/

21BS1111	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids

LIST OF EXPERIMENTS
(Minimum of experiments to be conducted: 5 Experiments)

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

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Apply principles of elasticity, optics and thermal properties for engineering applications

TEXT BOOKS:

1. Ruby Das, C.S. Robinson, Rajesh Kumar, Prashant Kumar Sahu, A Textbook of Engineering Physics Practical, University Science Press, Delhi, II Edition (2016), ISBN 978-93-80386-86-7
2. Harnam Singh, Dr.P.S. Hemne, B.Sc., Practical Physics, S.Chand & Company Ltd, New Delhi, Edition 2011, ISBN 81-219-0469-2

WEB REFERENCES:

1. https://www.vlab.co.in/broad-area-physical-sciences
2. https://vlab.amrita.edu/?sub=1

CHEMISTRY LABORATORY

OBJECTIVES: To impart Knowledge on the following topics:

- To inculcate experimental skills to test basic understanding of water quality parameters such as, alkalinity, hardness, DO and chloride
- To induce the students to familiarize with electro analytical techniques such as pH metry, potentiometry and conductometry in the determination of aqueous solutions.

LIST OF EXPERIMENTS
(Minimum of experiments to be conducted: 5 Experiments)

1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in Water sample
2. Determination of total, temporary & permanent hardness of water by EDTA method
3. Determination of DO content of water sample by Winkler's method
4. Determination of chloride content of water sample by argentometric method
5. Estimation of copper content of the given solution by Iodometry
6. Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter
7. Estimation of iron content of the given solution using potentiometer
8. Determination of total, temporary & permanent hardness of water by EDTA method
9. Estimation of iron content of the water sample using spectrophotometer (1, 10- 26, Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer
12. Pseudo first order kinetics-ester hydrolysis
13. Corrosion experiment-weight loss method
14. Phase change in a solid

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO
- To quantitatively analyse the aqueous solution by electro analytical techniques

TEXT BOOKS:

1. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).

2. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

21HS1201	COMMUNICATIVE ENGLISH & LANGUAGE SKILLS LAB II INTEGRATED	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

- To develop linguistic and strategic competence in workplace context and to enhance language proficiency and thereby the employability of budding engineers and technologists.
- To improve the relevant language skills necessary for professional communication.
- To help learners to develop their listening skills, which will, enable them to listen to lectures and comprehend them by asking questions; seeking clarification and developing their speaking skills and to speak fluently in real contexts.
- To Introduce them to life skills, their importance in leading Personal & professional life, key concepts of business communication and Communicative skills.

UNIT - I INTERPERSONAL COMMUNICATION 9

Listening: Listening to Telephone Conversations.

Speaking: Role Play Exercises Based on Workplace Contexts, Introducing Oneself - PEP Talks.

Reading: Reading the Interview of an Achiever and Completing Exercises (Skimming, Scanning and Predicting).

Writing: Writing a Short Biography of an Achiever Based on Given Hints.

Grammar: Adjective, Sentence pattern.

Vocabulary Development: Idioms and Phrases

UNIT - II TECHNICAL COMMUNICATION 9

Listening: Listening to Talks/Lectures Both General and Technical and Summarizing the Main Points. Speaking: Participating in Debates ,TED Talks

Reading: Reading Technical Essays/ Articles and Answering Comprehension Questions

Writing: Summary Writing ,Minutes of the meeting

Grammar: Participle Forms, Relative Clauses

Vocabulary Development: Compound Words, Abbreviations and Acronyms

UNIT - III PROCESS DESCRIPTION 9

Listening: Listening to a Process Description and Drawing a Flowchart

Speaking: Participating in Group Discussions, Giving Instructions ,Presentation

Reading: Reading Instruction Manuals

Writing: Process Descriptions – Writing Instructions

Grammar: Use of Imperatives, Active and Passive Voice, Sequence Words

Vocabulary Development: Misspelt words , Homophones and Homonyms

UNIT -IV **REPORT WRITING** **9**

Listening: Listening to a Presentation and Completing Gap-Filling Exercises
Speaking: Making Formal Presentations
Reading: Reading and Interpreting Charts/Tables and diagrams
Writing: Interpreting Charts/Tables and Diagrams, Writing a Report
Grammar: Direct into Indirect Speech, Use of Phrases
Vocabulary Development: Reporting Words, Technical Jargon

UNIT -V **APPLYING FOR JOBS** **9**

Listening: Listening to a Job Interview and Completing Gap-Filling Exercises
Speaking: Mock Interview, Telephone Interviews, GD
Reading :Reading a Job Interview, SOP, Company Profile and Completing Comprehension Exercises
Writing: Job Applications and Resumes
Grammar: Conditional Clauses, Modal verbs
Vocabulary Development: Technical Vocabulary, Purpose Statement

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of the course student will be able to:

- Read and comprehend technical texts effortlessly.
- Write thoughts and insights of their own
- Recognize the need for life skills, apply them to different situations, the basic communication practices in different types of communication
- Gain confidence to communicate effectively in various situations to acquire employability skills
- Become an active listener of professional contexts

TEXT BOOKS:

1. Board of Editors. English for Engineers and Technologists Volume 2 Orient Black Swan Limited, 2020
2. Richards, C. Jack. Interchange, New Delhi: CUP, 2017

REFERENCES:

1. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2. Raman,Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice.Oxford University Press: New Delhi, 2014.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
4. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.

5. Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

WEB REFERENCES:

1. https://learnenglishteens.britishcouncil.org/exams/grammar-and-vocabulary-exams/word-formation
2. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018
3. http://xn--englishclub-ql3f.com/grammar/parts-of-speech.htm
4. https://www.edudose.com/english/grammar-degree-of-comparison-rules/

ONLINE COURSES / RESOURCES:

1. https://basicenglishspeaking.com/wh-questions/
2. https://agendaweb.org/verbs/modals-exercises.html
3. https://cdn.s3waas.gov.in/s347d1e990583c9c67424d369f3414728e/uploads/2018/02/2018031621.pdf
4. https://www.ego4u.com/en/cram-up/grammar/prepositions

LANGUAGE SKILLS LAB

LIST OF EXERCISES (MINIMUM OF EXERCISES TO BE CONDUCTED) 15

1. Listen to lectures - articulate a complete idea as opposed to producing fragmented utterances – Ted talks, Science Fiction – My fair lady
2. Listening to a process information – General Competitive Examinations, GRE
3. Listening for specific information: accuracy and fluency – BEC
4. Listening - following, responding to explanations, giving directions and instructions in academic and business contexts – IELTS, TOEFL
5. Listening to transcripts and answer to the questions
6. Listening: Read aloud in class and gap – filling
7. Listening: Recognizing and interpreting non - verbal cues
8. Listen first, speak second - Having the mindset of a listener
9. Speaking – sharing personal information - Self introduction
10. Speaking – Small talk or Pep Talk
11. Speaking – Group discussion, Visume –visual presentation of resume
12. Speaking – Presentation – Formal and Informal
13. Speaking – Mock interview
14. Speaking – FAQ'S on Job interview
15. Speaking : Simulations - (show and tell)
16. Speaking: News brief - Ripped from today's headlines.
17. Speaking: Who's telling the truth?
18. Speaking: JAM
19. Speaking: Debate
20. Speaking: Story Narration

TOTAL: 30 PERIODS

SOFTWARE REQUIRED:

1. Globarena

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford:2011.

2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.

2. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014.

3. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.

4. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

5. E. Suresh Kumar et al. Communication for Professional Success, Orient Blackswan: Hyderabad, 2015.

6. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.

SEMESTER II

21MA1202	LINEAR ALGEBRA & NUMERICAL METHODS	L	T	P	C
		3	1	0	4

OBJECTIVES: To impart Knowledge on the following topics:

- To test the consistency and solve system of linear equations by matrix and also by different numerical methods.
- To find the numerical solution of Eigen value problems by Numerical techniques and to perform matrix decomposition.
- To understand the basics of Groups, Rings, Vector spaces, Subspaces and Dimension of vector space.
- To apply the linear transformation concepts in Diagonalization of a matrix.
- To study Inner product and norms and apply it in Gram- Schmidt procedure and least square approximation.

UNIT - I SYSTEM OF SIMULTANEOUS LINEAR EQUATIONS 12

Basic definitions and properties of Matrices - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method.

UNIT - II EIGEN VALUE PROBLEMS AND MATRIX DECOMPOSITION 12

Eigen value Problems: Power method, Jacobi rotation method – Singular value decomposition – QR decomposition.

UNIT - III VECTOR SPACES 12

Basic Definitions of Groups, Rings (with simple examples) - Real and Complex fields - Vector spaces - Subspace - Linear space - Linear independent and Linear dependent-Spanning of a subspace- Basis and dimension.

UNIT -IV LINEAR TRANSFORMATION 12

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation, Diagonalization.

UNIT -V INNER PRODUCT SPACES 12

Inner product and norms - Properties –Orthogonal vectors and Orthonormal vectors - Gram Schmidt orthonormalization process - Least square approximation

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Demonstrate understanding of common matrices and numerical methods and how they are used to obtain approximate solutions to the linear system of equations.

- Decompose the matrix using different methods such as QR and singular value decomposition.
- Solve the problems using the concepts of vector spaces, Subspaces and linear transformation.
- Apply linear transformation to diagonalise a given matrix and hence to find the eigen values of the given matrix.
- Apply Gram-Schmidt's orthogonalization process to diagonalise a given matrix and to solve the given system of equations by least square approximations.

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, Linear Algebra, Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R, Numerical Methods, Brooks/Cole (Thomson Publications), New Delhi, 2002.
3. Richard Branson, Matrix Operations, Schaum's outline series, 1989.

REFERENCES:

1. Kumaresan S, Linear Algebra - A geometric approach, Prentice Hall of India, New Delhi, Reprint, 2010.
2. Strang G, Linear Algebra and its applications, Thomson (Brooks / Cole) New Delhi, 2005.
3. Gerald C.F. and Wheatley P.O, Applied Numerical Analysis, Pearson Educations, New Delhi, 2002.
4. Sundarapandian V, Numerical Linear Algebra, Prentice Hall of India, New Delhi, 2008.
5. Bernard Kolman, David R. Hill, Introductory Linear Algebra, Pearson Educations, New Delhi, First Reprint, 2009

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma38/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma44/preview
3. https://onlinecourses.nptel.ac.in/noc21_ma50/preview

21ES1201	BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENTS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To learn the concepts related with electrical circuits.
- To study the concept of electrical machines.
- To understand the utilization of electrical power.
- To understand the basics of electronic devices.
- To learn the applications of Op-Amp.
- To study the concepts of measurement and transducers.

UNIT - I BASIC ELECTRIC CIRCUITS 9

Current- Voltage- Power- Voltage Source – Current Source- Ohm's Law – KCL – KVL(Analysis with only independent source) – Resistors in series and parallel – Current Division – Voltage Division- Mesh analysis, nodal analysis, Phasors- RMS value of current and voltage – Active power- Apparent Power- Complex Power – Power Factor - Simple problems.

UNIT - II ELECTRICAL MACHINES 9

Construction and Working Principle of DC motor, Stepper Motor, BLDC motor, Transformer, Single phase induction motor - Capacitor start and Capacitor run motor.

UNIT - III UTILIZATION OF ELECTRICAL POWER 9

Principle of wind and solar energy systems. Electrical wiring - Domestic and Industrial Illumination - Fluorescent and LED lamps. Protection- Need for Earthing, fuses and circuit breakers -Energy tariff.

UNIT -IV BASICS OF ELECTRONICS 9

PN Junction-VI Characteristics of Diode, Zener diode, Transistors configurations – amplifiers. Op amps- Amplifiers, oscillator, rectifiers, differentiator, integrator, ADC, DAC. Regulated power supply using 7805 and 7905.

UNIT -V MEASUREMENTS AND TRANSDUCERS 9

Fundamentals of moving coil and moving iron meters, Transducers- classification- thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Smart sensors - Data acquisition systems.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Summarize the basic laws and concepts related to electrical circuits.
- Explain the construction and working of electrical machines.
- Discuss the utilization of electrical power.

- Discuss the basic concepts of electronics.
- Learn the applications of Op-Amp.
- Explain the concepts of measurement and transducers.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, McGraw Hill Education, 2014
2. Thomas L. Floyd, „Electronic Devices", 10th Edition, Pearson Education, 2018.
3. John Bird, “Electrical Circuit theory and technology”, Routledge, Fifth edition, 2013.

REFERENCES:

1. William Hayt, Jack Kemmerly, Steven Durbin and Jamie Phillips, :" Engineering Circuit Analysis", McGraw Hill, 2019.
2. Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, McGraw Hill, 2010.
3. A.K. Sawhney, Puneet Sawhney „A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, Edition 2011.
4. B.L.Theraja, A.K. Theraja, "A Text book on Electrical Technology Vol. III & IV", S. Chand publications, Edition 2014.

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/108/106/108106172/
2. https://nptel.ac.in/courses/108/102/108102146/
3. https://nptel.ac.in/courses/108/101/108101091/
4. https://nptel.ac.in/courses/108/105/108105153

21CB1201	FUNDAMENTALS OF COMPUTER SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To acquire knowledge to write algorithm and flowchart for problems
- To study and develop C programs using operators, Expressions and Control flow
- To learn the concept for functions and pointers
- To gather knowledge about structure and I/O in C
- To learn about processing of files
- To have an introductory knowledge about the UNIX

UNIT - I INTRODUCTION 9

Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C) Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart. An Overview of C - Form of a „C' program –The Library and Linking, Compiling a C Program.

SUGGESTED ACTIVITIES:

- Write an algorithm and Pseudocode for finding the greatest of two number, three numbers, GCD, Factorial.
- Draw the flowchart for the algorithms written for problems mentioned above.

SUGGESTED EVALUATION METHODS:

- Tutorials on algorithm, Pseudocode and flowchart.
- Evaluation of the written algorithm, Pseudocode and flowchart drawn

UNIT - II BASICS OF C PROGRAMMING 9

Basic Data Types, Modifying the Basic Types, Identifier Names, Variables, The Four C Scopes, Type Qualifiers, Storage Class Specifiers, Variable Initializations, Constants, Operators – Assignment Operators , Arithmetic Operators, Increment and Decrement Operators, Relational and Logical Operators, Bitwise Operators, The ? Operators, The & and *Pointer Operators, The Size Of Operator, Comma Operator, the Dot(.) and Arrow(->), The [] and () operators, Precedence **Expressions**- Order of Evaluation, Type conversion in Expressions, Casts, Spacing and Parentheses. **Statements** – Selection statements (Control Flow) –If, Nested ifs, The if-else-if Ladder, The ? Alternative, The Conditional Expressions, Switch, Nested Switch Statements. Iteration Statements (Looping statements) – for Loop, while loop, do-while. Jump Statements-return, goto, break, exit() function, continue . Expression statements, Block statements.

SUGGESTED ACTIVITIES:

- Implementing programs using data types, arithmetic operators and basic input/output Operations.
- Developing programs using if-else, do-while, while, for, switch, break, continue.

SUGGESTED EVALUATION METHODS:

- Tutorials on conditionals and loops.

- Evaluation of the programs implemented

UNIT - III FUNCTIONS, ARRAYS AND POINTERS 9

Functions:

General form of a function, Understanding the Scope of a function, Function Arguments, Command line arguments– argc and argv ,The return Statement, Recursion, Function Prototypes, Declaring variable length parameter Lists, The inline Keyword.Arrays and Pointers

Arrays : Single Dimension Arrays, Generating a Pointer to an Array, Passing Single - Dimension Arrays to Functions, Strings, Two Dimension Arrays, Arrays of strings, Multi Dimensional Arrays, Indexing Pointers, Array Initialization.

Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Initialization Pointers, Pointers to functions, C's Dynamic Allocation Functions. String operations-length, compare, copy, concatenate.

SUGGESTED ACTIVITIES:

- Write an application to perform operations like finding the maximum, minimum, total, average values using single dimensional integer and float arrays.
- Develop an application to perform matrix operations using multi-dimensional arrays
- Demonstration of C programs using pointers to variables, arrays, functions and using address arithmetic.
- Write an applications to find the string length , compare two strings, copy string and concatenate two strings.

SUGGESTED EVALUATION METHODS:

- Tutorials on arrays, pointers and functions.
- Valuation of the programs implemented

UNIT -IV STRUCTURES, INPUT AND OUTPUT 9

Structures, Unions, Enumerations and typedef

Accessing Structure Members, Structure Assignments, Array of structures, Passing Structures to Functions, Structure Pointers, Arrays and Structures within Structures, Unions, Bit-fields, Enumerations, type def .

Input and Output: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf, scanf,.

File I/O-Streams and Files, File System Basics, fread() and fwrite(), fseek and random access fprintf() and fscanf().

SUGGESTED ACTIVITIES:

- Implementing applications using Structures, Unions, Enumerations, typedef.
- Demonstrate program for formatting the console I/O
- Demonstration of real world applications using file operations.

SUGGESTED EVALUATION METHODS:

- Tutorials on file handling.

- Checking output of programs implemented.

UNIT -V INTRODUCTION TO UNIX 9

Unix Fundamentals , System Startup, Logging In and Out of Unix, Understanding Users and Groups, File System Concepts – File Systems Basics, Paths and Case, Navigating the File System, File Types, Links, File and Directory Permissions, Changing Permissions, Viewing Files, Creating, Modifying and Removing Files, Basic File System Management, Making File Systems Accessible, Editing Files with Vi

SUGGESTED ACTIVITIES:

- Demonstrate applications Creating, Modifying and Removing Files in UNIX.
- Write a command that will set the file permissions of the file “samplefile” to read, write, and execute for the owner of the file, and read and execute permissions for the group and for others.
- Demonstrate the working with Vi Editor.

SUGGESTED EVALUATION METHODS:

- Tutorials on UNIX.
- Checking output of programs implemented.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Ability to implement the algorithms and flow chart for solving Mathematical and Engineering problems
- Develop C programs for real world/technical application using basic constructs
- Explore the usage of arrays, pointers and functions in C.
- Implement Programs with structures and union in C.
- Design applications using sequential and random access file processing.
- Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures.

TEXT BOOKS:

1. Herbert Schildt, C: The Complete Reference, Fourth Edition, , McGraw Hill, 2017 (Unit 1,2,3,4)

2. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, and Paul Weinstein, Beginning Unix, Wiley Publishing, In, 2005 (Unit 5)

REFERENCES:

1. Reema Thareja, —Programming in C, Oxford University Press, Second Edition, 2016.

2. Kernighan, B.W and Ritchie,D.M, —The C Programming language, Second Edition, Pearson Education, 2006

3. B. Gottfried, Programming in C, Third Edition, Schaum Outline Series, 2017

4. Paul Deitel and Harvey Deitel, —C How to Program‖, Seventh edition, Pearson Publication.
5. Juneja, B. L and Anita Seth, —Programming in C, CENGAGE Learning India pvt. Ltd., 2011
6. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C‖, First Edition, Oxford University Press, 2009.

WEB REFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

ONLINE COURSES / RESOURCES:

1. https://www.programiz.com/c-programming
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.geeksforgeeks.org/c-programming-language/
5. https://en.wikibooks.org/wiki/C_Programming
6. https://www.cprogramming.com/tutorial/c-tutorial.html?inl=hp

21CB1202	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To learn the basic structure and operations of a computer.
- To learn various addressing modes , instruction formats and program control statements.
- To understand parallelism and multi-core processors.
- To learn about different memory and various ways of communication with I/O devices

UNIT - I DIGITAL FUNDAMENTALS 9

Digital Systems – Binary Numbers – Octal and Hexadecimal Conversions – Signed Binary Numbers Complements of numbers–Boolean Algebra and Logic Gates – K-Maps – Standard Forms – NAND and NOR Implementation

SUGGESTED ACTIVITIES:

- In-class activity - Number systems, problems in number conversion and complements
- Proofs and simplification of basic theorems and properties of Boolean algebra in Class
- Assignments on simplification of Boolean functions using 3 and 4 variable K-Map
- Study of various Logic gates with truth table

SUGGESTED EVALUATION METHODS:

- Checking the understanding of properties of Boolean algebra and K-Map
- Verifying the correctness of the activity.
- Quiz on logic gates

UNIT - II COMBINATIONAL AND SEQUENTIAL CIRCUITS 9

Combinational circuits – Binary Adder – Subtractor – ALU Design – Decoders – Encoders – Multiplexers – Introduction to Sequential Circuits – Flip-Flops – Registers and Counters

SUGGESTED ACTIVITIES:

- Applications of combinational circuits - activity in class. For example: Identifying the role of the combinational circuits in designing circuits like digital boards.
- Study of Binary adder, subtractor, Decoders, Encoders and Multiplexers
- Assignments on analysis of different sequential circuits

SUGGESTED EVALUATION METHODS:

- Group discussion on applications of combinational circuits.
- Quiz on Binary adder, subtractor, Decoders, Encoders and Multiplexers.

- Verifying the correctness of the analysis of the given circuits

UNIT - III BASIC STRUCTURE OF A COMPUTER 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of the Computer Hardware, Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

SUGGESTED ACTIVITIES:

- In-class activity on performance evaluation.
- Flipped classroom – Evolution and types of computer systems, identification of benchmarks
- Analyze the ISA supported by the architectural simulator by running simple programs on the simulator
- Mapping and correlating a C code with its machine code

SUGGESTED EVALUATION METHODS:

- Mock test on problems for computer performance.
- Group discussion on activity four with assembly instruction, identifying the instruction type and encoding used in machine code.
- Quizzes on ISA

UNIT -IV PROCESSOR 9

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards

SUGGESTED ACTIVITIES:

- Flipped Classroom for analyzing data path in atleast two processors.
- Practical – Analyzing the data path on the standard simulator.
- Practical – Study of the pipelined implementation and analysis of various hazards.

SUGGESTED EVALUATION METHODS:

- Assignment on data path design.
- Group discussion on pipeline depth and stages.
- Quiz on class or automatic quizzes on the flipped classroom content

UNIT -V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel And Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA

SUGGESTED ACTIVITIES:

- Flipped classroom on memory hierarchy in at least two processors.
- Study hit/miss rates for various access patterns. Experiment with different replacement policies.

- Study of different types of cache mapping.

SUGGESTED EVALUATION METHODS:

- Mock test for problems on cache memory mapping, replacement policies.
- Quizzes on memory management in at least two processors

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Evaluate and simplify logic functions using Boolean Algebra and K-map
- Design and Analyze Combinational and Sequential Circuits
- Recognize and explain the functional units of computers
- Categorize various addressing modes , instruction formats and program control statements
- Discuss the implementation of processors and hazards
- Analyze memory , I/O devices and cache structure for processors

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, “Digital Design”, Fifth Edition, Pearson Education, 2013. (Unit 1,2)
2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Fifth Ed (Unit 3,4,5).

REFERENCES:

1. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012
3. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016
4. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2008

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1. https://www.brainkart.com/subject/Digital-Principles-and-System-Design_100
2. http://scitechpublications.com/shop/computer-information/digital-principles-and-system- design-2/
3. http://www.sasurieengg.com/e-course-material/I-year-E-course-material-II-sem/7.CS6201%20-DPSD.pdf

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ee39/preview
2. http://www.cs.iit.edu/~virgil/cs470/Book/
3. http://www.svecw.edu.in/Docs%5CITIIBTechIISemLecCOA.pdf

21CB1211	FUNDAMENTALS OF COMPUTER SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To develop programs in C using basic constructs.
- To develop applications in C using arrays.
- To develop applications in C using strings, pointers
- To develop applications in C using functions, structures
- To develop applications in C using file processing
- To build solutions for real world problems

LIST OF EXPERIMENTS

1. Algorithm and flowchart of small problems like GCD
    - Find the factorial of a number with and without recursion.
    - Find the sum of digits of a given number
    - Check whether the given string is palindrome or not
    - Check whether the given number is Armstrong number or not
2. Programs using I/O statements and expressions.
3. Programs using decision-making constructs
4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions
    - 5 if it is a perfect cube
    - 4 if it is a multiple of 4 and divisible by 6.
    - 3 if it is a prime number.
    - Sort the numbers based on the weight in the increasing order as shown below <10,its weight>,<36,its weight><89,its weight>
6. Populate an array with height of persons and find how many persons are above the average height.
7. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.
8. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
9. From a given paragraph perform the following using built-in functions:
    - Find the total number of words.
    - Capitalize the first word of each sentence.
    - Replace a given word with another word.
10. Programs using Pointers:
    - Program to create, initialize, assign and access a pointer variable.
    - Program to swap two numbers using pointers.
    - Program to change the value of constant integer using pointers.
    - Program to print a string using pointer.
    - Program to count vowels and consonants in a string using pointer.
    - Program to read array elements and print with addresses.
    - Program to print size of different types of pointer variables.

- Program to demonstrate example of double pointer (pointer to pointer).
- Program to demonstrate example of array of pointers.
- An Example of Null pointer in C
- Making a valid pointer as NULL pointer in C
- Modify value stored in other variable using pointer in C

11. Generate salary slip of employees using structures and pointers
12. Compute internal marks of students for five different subjects using structures and functions
13. Find the factorial of a number using Multi file program and user defined libraries
14. Substring matching / searching programs
    Search a string in the list of strings. To Check if the Substring is present in the given String
15. C program to read name and marks of n number of students from and store them in a file
16. C program to write all the members of an array of structures to a file using fwrite(). Read the array from the file and display on the screen

MINI PROJECT: (ONE PROJECT NEED TO BE DONE)

1. Bank management system
2. Library management system
3. Bus reservation system
4. Ticket booking system

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Develop the use of the C programming language to implement various algorithms.
- Acquire decision making and looping concepts in C.
- Develop C programs using Array and Pointers.
- Ability to define structures, functions in solving real world problem
- Design applications using sequential and random access file processing
- Able to interpret real world problems into software solutions in C.

TEXT BOOKS:

1. Herbert Schildt, C: The Complete Reference, Fourth Edition, , McGraw Hill, 2017

2. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, and Paul Weinstein, Beginning Unix, Wiley Publishing, In, 2005

3. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning

4. The C Programming Language by Brian Kernighan and Dennis Ritchie 2nd edition

REFERENCES:

1. K.C. John, "Mechanical workshop practice", Second edition, PHI learning Pvt Ltd, New Delhi
2. Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, (2007)

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1. https://www.programiz.com/C-programming/examples
2. https://www.geeksforgeeks.org/C-programming-examples/
3. https://beginnersbook.com/2018/02/C-programs/
4. https://www.javatpoint.com/C-programs
5. https://www.w3schools.com/C/C-examples.asp
6. https://www.includehelp.com/c-programs/c-programs-pointers-solved-examples.aspx

21ES1211	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

GROUP – A CIVIL & ELECTRICAL

I CIVIL ENGINEERING PRACTICES 15

Plumbing Work:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

Wood Work:

a) Introduction to Tools and Equipments.
b) Simple Planning and sawing practice.
c) Making Half Lap, Dovetail, Mortise and Tenon joints.

Wood Work Study:

a) Studying joints in door panels and wooden furniture.
b) Studying common industrial trusses using models.

II ELECTRICAL ENGINEERING PRACTICES: 15

a) Residential house wiring using switches, fuse, indicator, lamp and energy meter.
b) Fluorescent lamp wiring.
c) Stair case wiring
d) Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
e) Measurement of energy using single phase energy meter.
f) Measurement of resistance to earth of electrical equipment.

III MECHANICAL ENGINEERING PRACTICES 15

Basic Machining Work:

a) Introduction to Lathe machine, Tools and Equipments
b) Simple Turning and facing
c) Step turning
d) Simple Drilling and Tapping of flat plate

Welding Work:

a) Introduction to Arc welding, Tools and Equipments

b) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

Assembly Work:

a) Assembling a centrifugal pump.

b) Assembling an air conditioner.

Sheet Metal Work:

a) Demonstrating basic sheet metal operations

Foundry Work:

a) Demonstrating basic foundry operations

IV ELECTRONICS ENGINEERING PRACTICES 15

a) Study of Electronic components and equipments – Resistor, colour coding

b) Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.

c) Study of logic gates AND, OR, EX-OR and NOT.

d) Generation of Clock Signal.

e) Soldering practice – Components Devices and Circuits–Using general purpose PCB.

f) Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Connecting various basic pipe fittings and other components which are commonly used in household and to know about the various tools, Equipments and making different joints.
- To know the Lathe machine, Tools and Equipments with machining experiments and have knowledge about Arc welding, Tools and Equipments with making different joints
- To carry out basic home electrical works and appliances and measure the electrical quantities.
- To analyze the basic electronic circuits and to solder simple components on PCB and test simple electronic circuits.

TEXT BOOKS:

1. Jeyapoovan T., Saravanapandian M. & Pranitha S., “Engineering Practices Lab Manual”, Vikas Publishing House Pvt.Ltd, (006)

2. Kannaiah P. & Narayana K.L., “Manual on Workshop Practice”, Scitech Publications, (1999).

3. Jeyachandran K., Natarajan S. & Balasubramanian S., “A Primer on Engineering Practices Laboratory”, Anuradha Publications, (2007).

4. S. Gowri & T. Jeyapoovan, “Enginering Practices Lab Manual 5/E”, S. Chand Publishing, 2019

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1. K.C. John, "Mechanical workshop practice", Second edition, PHI learning Pvt Ltd, New Delhi
2. Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, (2007)

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2. https://nptel.ac.in/courses/112/107/112107084/

SEMESTER III

21MA1301	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

OBJECTIVES: To impart Knowledge on the following topics:

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

UNIT - I LOGIC AND PROOFS 12

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT - II COMBINATORICS 12

Mathematical induction – Strong induction and well ordering – The pigeonhole principle – Recurrence relations – Solving linear recurrence relations using generating functions – Inclusion and exclusion principle.

UNIT - III GRAPHS 12

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

UNIT -IV ALGEBRAIC STRUCTURES 12

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

UNIT -V LATTICES AND BOOLEAN ALGEBRA 12

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

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Explain the concept needed to test the logic of a program.
- Make use of counting principles.
- Identify the graphs and understand its properties.
- Apply the concepts and properties of algebraic structures.
- Determining Boolean functions and simplify expression using its properties.

- Construct Homomorphism and isomorphism Structures.

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 8thEdition, TataMcGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2019.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30thReprint, 2011.
3. Veerarajan. T, Discrete Mathematics: with graph theory and combinatorics, McGraw Hill Education (India) Pvt.Ltd. 2008.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4thEdition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rdEdition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

21CB1301	FUNDAMENTALS OF ECONOMICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To exemplify the demand curves of households and supply curves of firms with the principles.
- To differentiate Price ceilings, Price floors and compare income effects, substitute effects
- To analyze the Keynesian's process of multiplier theory in macro economics.
- To make the connections across disciplines and fields within economics
- Students will use data to describe the relationships among variables in order to analyze economic issues.

UNIT - I INTRODUCTION TO MICROECONOMICS 9

Introduction to Economics–Themes of Economics–Micro Vs Macro Economics-Demand curves and supply curves- Elasticity of Demand - Elasticity of Supply- Demand Curves of Households and firms**.**

UNIT - II WELFARE ANALYSIS 9

Consumers and Producers Surplus- Price Ceilings and Price Floors; Consumer Behavior – Axioms of Choice- Budget Constraints and Indifference Curves; Consumers Equilibrium Effects of a Price Change, Income and Substitution Effects Derivation of a Demand Curve.

UNIT - III PRODUCTION AND COST FUNCTION 9

Theory of Production- Production Function and Isoquants-Cost Minimization; Cost Curves-Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm under Perfect Competition; Monopoly and Monopolistic Competition.

UNIT -IV MACRO ECONOMICS 9

National Income and its Components - GNP, NNP, GDP, NDP Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector -Taxes and Subsidies; External Sector - Exports and Imports; Money -Definitions; Demand for Money Transaction and Speculative Demand; Supply of Money- Banks Credit Creation Multiplier; Integrating Money and Commodity Markets- IS, LM Model.

UNIT -V BUSINESS CYCLES AND STABILIZATION 9

Monetary and Fiscal Policy-Central Bank and the Government; the Classical Paradigm-Price and Wage Rigidities-Voluntary and Involuntary Unemployment.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Analyze the supporting of price, income and substitution effects in the consumers and producers surplus.
- Compare the equilibrium of a firm under perfect competition, monopoly and monopolistic competition.
- Study the concepts of demand for money and supply of money with appropriate model in macro-economic analysis.
- Examine and evaluate the problems of voluntary and involuntary unemployment.
- Study the economic models in domestic and global contexts to analyze individual decision making.
- Compare the prices and quantities are determined in product and factor market.

TEXT BOOKS:

1. Paul Anthony Samuelson, William D.Nordhaus, Economics, Nineteenth Edition,McGraw-Hill Education, 2010.
2. N.Gregory Mankiw, Principles of Macroeconomics, Seventh Edition, Cengage Learning, 2018.
3. Pindyck, Robert S and Daniel L.Rubinfeld, Micro Economics,Eighth Edition, 2013.

REFERENCES:

1. Dornbusch, Fischer and Startz, Macroeconomics, Tenth Edition, Tata Mcgraw Hill, 2012.
2. Hal R, Varia, Intermediate Microeconomics: A Modern Approach, Eighth Edition affiliated East-West Press, 2006.

21IT1301	DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

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

UNIT - I LINEAR DATA STRUCTURES – LIST 9

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

SUGGESTED ACTIVITIES:

- Developing and application(student's choice using all the linear data structure).

SUGGESTED EVALUATION METHODS:

- Programs and Demonstration on applications of linear data structures.
- Checking output of programs implemented.
- Assignments.

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- Job Scheduling- Josephus problem.

SUGGESTED ACTIVITIES:

- Demonstrating stack for Towers of Hanoi application.

SUGGESTED EVALUATION METHODS:

- Programs on applications of Stacks and Queues.
- Quiz on various topics of the unit.
- Assignments.

UNIT - III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – Representation of Trees- Binary Tree –Tree traversal– expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree –Trie - Heap – Applications of heap.

SUGGESTED ACTIVITIES:

- Solving expressions using expression trees by determining infix, prefix and postfix expressions.

- Developing any application using trees.

SUGGESTED EVALUATION METHODS:

- Programs using tree traversal and binary tree.
- Programs on binary search trees.
- Programs and Demonstration using AVL tree applications.
- Assignments.

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-Shortest path algorithms.

SUGGESTED ACTIVITIES:

- External learning- Applications of graphs.
- Practical- To choose and apply a suitable graph algorithm for solving a real time problem /scenario such as Network Routing.

SUGGESTED EVALUATION METHODS:

- Assignments on representation of graphs for a given problem.
- Quizzes on basics of graphs.
- Programs and Demonstration using application of graph and topological sort.

UNIT -V SEARCHING, SORTING AND HASHING TECHNIQUES 9

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

SUGGESTED ACTIVITIES:

- External learning- Applications of graphs.
- Practical-To choose and apply a suitable graph algorithm for solving a real time problem/scenario such as Network Routing.

SUGGESTED EVALUATION METHODS:

- Tutorials on external sorting.
- Tutorials on hashing.
- Check output of programs implemented.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Implement abstract datatypes for linear data structures.
- Apply the different linear data structures to problem solutions.
- Model problems as Tree problems and implement efficient Tree algorithms to solve them.

- Critically analyze the various sorting algorithms.
- Analyze the various searching and hashing algorithms.

TEXT BOOKS:

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

REFERENCES:

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

21IT1302	OPERATING SYSTEMS (LAB INTEGRATED)	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic concepts and functions of operating systems.
- To understand concepts of Processes
- 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

Computer System Overview- Instruction Execution, Interrupts, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Operating System Structure and Operations- System Calls, System Programs, Types of Kernels- OS Generation and System Boot- Processes – Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication.

SUGGESTED ACTIVITIES:

- Learn Computer System Overview.
- Understand Operating System overview.

SUGGESTED EVALUATION METHODS:

- Assignments.
- Quiz.

UNIT - II PROCESS MANAGEMENT 9

CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Process Synchronization – The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

SUGGESTED ACTIVITIES:

- Programs to implement CPU scheduling.
- Programs to detect and avoid deadlock.

SUGGESTED EVALUATION METHODS:

- Assignment /quiz.

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, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS examples.

SUGGESTED ACTIVITIES:

- Programs and Demonstration of Memory Allocation Techniques.
- Programs and Demonstration of Page replacement algorithm.

SUGGESTED EVALUATION METHODS:

- Assignment /Quiz.

UNIT -IV FILE SYSTEMS 9

File-System Interface – File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Simulation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management.

SUGGESTED ACTIVITIES:

- Implement File Allocation methods.
- Implement File Organization.

SUGGESTED EVALUATION METHODS:

- Assignments / quiz.

UNIT -V CASE STUDY 9

Linux System – Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS – iOS and Android – Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

SUGGESTED ACTIVITIES:

- Learn Linux System.
- Learn Mobile OS.

SUGGESTED EVALUATION METHODS:

- Assignments for CASE STUDY.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the basics of Operating System.
- Understand Process, Process scheduling, Process Synchronization, Deadlock.
- Learn the various memory management schemes.

- Understand File systems.
- Understand Linux OS.
- Understand Mobile OS like iOS and Android.

TEXT BOOKS:

1. AbrahamSilberschatz, Peter Baer Galvin and Greg Gagne, —Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, Operating Systems: Internals and Design Principles, 9 th Edition by Pearson.
3. Neil Smyth, —iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, —Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, AtulKahate, —Operating System, McGraw Hill Education, Third Edition, 2017.
3. Andrew S. Tanenbaum, —Modern Operating Systems,Fourth Edition, Pearson Education, 2016.
4. Gary Nutt, —Operating Systems, Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel,Paul J Deital,Davis R Choffnes —Operating System, Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, —Understanding the Linux kernel‖, 3rd edition, O‘Reilly,2005.

LABORATORY EXERCISES

1. Basic Unix commands.
2. System call using Unix.
3. CPU Scheduling Algorithms.
4. Simulation of Producer-Consumer Problem Using Semaphore.
5. Simulation of Shared Memory Using IPC.
6. Simulation of Deadlock Detection.
7. Simulation of Memory Allocation Techniques: First Fit, Best Fit And Worst Fit.
8. Simulation of Paging Techniques.
9. Simulation of Page Replacement Algorithms.
10. Simulation of File Organization Techniques.
11. Simulation of File Allocation Strategies.

PRACTICAL: 30 PERIODS

TOTAL : 75 PERIODS

21CS1401	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic concepts and the applications of database systems.
- To know the basics of SQL and construct queries using SQL.
- To learn the relational database design principles.
- To understand the basic issues of transaction processing and concurrency control.
- To familiar with database storage structures and access techniques.

UNIT - I DATABASE FUNDAMENTALS 9

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Components and Structure, Database Users and Administrator, History of Database Systems. Data models: ER model, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Enhanced E-R Model.

SUGGESTED ACTIVITIES:

- Developing ER diagrams for Banking application.
- Translating requirements into models
- Comparing various data models and views.

SUGGESTED EVALUATION METHODS:

- Quizzes on History of Database.
- Assignments on architecture of Database.
- Assignments on ER model.

UNIT - II RELATIONAL DATABASE 9

Relational Data Model - Concept of Relations, Schema-Instance distinction, Keys, Referential integrity and Foreign keys, Relational algebra operators, SQL - Introduction, Data Definition in SQL, Table, Key and Foreign key definitions, Update behaviours. Querying in SQL, Notion of aggregation, Aggregation functions Group by and Having clauses, Embedded SQL.

SUGGESTED ACTIVITIES:

- Simple SQL queries.
- Writing PL-SQL programs.

SUGGESTED EVALUATION METHODS:

- Quizzes on SQL commands.
- Assignments on SQL functions.
- Quizzes on control flow and functions.

UNIT - III DATABASE DESIGN 9

Schema Refinement and Normal Forms: Introduction to Schema Refinement, Functional Dependencies, Properties of Decompositions. Normalization: First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form – Multivalued Dependencies – Fourth Normal Form – Join Dependencies – Fifth Normal Form.

SUGGESTED ACTIVITIES:

- Writing Armstrong's Axioms.
- Developing Normal Forms for a requirement.
- Applying Decomposition and Functional Dependency.

SUGGESTED EVALUATION METHODS:

- Quizzes on Normalization theory.
- Assignments on Normal Forms.
- Case study.

UNIT -IV TRANSACTION MANAGEMENT 9

Transactions, Transaction Concept, ACID properties, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes. Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm.

SUGGESTED ACTIVITIES:

- Writing Transaction rules for a database.
- Comparing the efficiency of protocols.
- Understanding the importance of Recovery.

SUGGESTED EVALUATION METHODS:

- Quizzes on Transaction Management.
- Assignments on Protocols.
- Quizzes on Recovery.

UNIT -V IMPLEMENTATION TECHNIQUES AND NON-RELATIONAL MODEL 9

Data on External Storage – RAID- File Organizations – Indexing and Hashing -Trees – B+ tree and B- Tree index files. Hashing: Static – Dynamic. Query Processing and Query Optimization - Introduction to NoSQL & MongoDB: Advantages, Architecture, Data Models MongoDB Data types and CRUD Operations.

SUGGESTED ACTIVITIES:

- Applying RAID models.
- Writing queries for index.
- Comparing efficiency of Tree methods.
- Writing No-Sql Queries.

SUGGESTED EVALUATION METHODS:

- Quizzes on Tree concepts.
- Assignments on Indexing.
- Quizzes on Query Optimization.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Remember the Structure of a Database.
- Understand an Entity Relational Model for a database.
- Apply Relational and Non-Relational database concepts to design a database.
- Analyse the importance of normalization and functional dependencies in database design.
- Evaluate the working principles of indexing and hashing.
- Create a database design using both Relational and Non- Relational models.

TEXT BOOKS:

1. Database System Concepts, A.Silberschatz, Henry.F.Korth, S. Sudarshan, McGraw Hill India Private Limited, 7thedition.
2. MongoDB Complete Guide by Manu Sharma, BPB Publications, ISBN: 9789389898866, July 2021.

REFERENCES:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.

NPTEL COURSES:

1. https://onlinecourses.nptel.ac.in/noc18_cs15/preview.
2. http://nptel.ac.in/courses/106106093/.
3. http://nptel.ac.in/courses/106106095/.

NPTEL VIDEO COURSE:

1. https://www.youtube.com/watch?v=EUzsy3W4l0g
2. https://www.youtube.com/playlist?list=PL52484DF04A264E59

ONLINE COURSES / RESOURCES:

1. https://beginnersbook.com/2017/09/introduction-to-nosql/
2. https://www.w3schools.com/sql/

3. https://www.toptal.com/database/the-definitive-guide-to-nosql-databases
4. https://www.w3schools.in/mongodb/
5. https://www.coursera.org/lecture/introduction-to-nosql-databases/overview-of-nosql-IiIaX.

21IT1311	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To Understanding the importance of data structures, abstract data type, and their basic usability in different application.
- To implement linear and non-linear data structures.
- To understand the different operations of search trees.
- To implement graph traversal algorithms.
- To get familiarized to sorting and searching algorithms.

LIST OF EXPERIMENTS

1. Array implementation of Stack and Queue ADTs.
2. Array implementation of List ADT.
3. Linked list implementation of List, Stack and Queue ADTs
   - •Singly Linked list
   - •Circular Linked list
   - •Doubly Linked list
4. Applications of List, Stack and Queue ADTs
   - •Polynomial operations
   - •Infix to post fix
   - •Josephus problem
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Expression tree
9. Implementation of Tree
10. Implementation of Heaps using Priority Queues.
11. Graph representation and Traversal algorithms.
    - •Depth first search
    - •Breadth first search
12. Applications of Graphs
    - •Dijkstra algorithm
13. Implementation of searching and sorting algorithms.
14. Hashing–any two collision techniques.

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Write functions to implement linear and non-linear data structure operations.
- Suggest appropriate linear / non-linear data structure operations for solving a given problem.
- Appropriately use the linear / non-linear data structure operations for a given problem.

- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.
- Compare various kinds of searching and sorting techniques and hash tables and collision resolution Techniques.
- Compare various kinds of hash tables and collision resolution Techniques.

21CS1411	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- Learn to create and use a database.
- Be familiarized with a query language.
- Have hands on experience on DDL Commands.
- Have a good understanding of DML Commands and DCL Commands.
- Familiarize advanced SQL queries.
- Be exposed to different applications.

LIST OF EXPERIMENTS

Tools: Oracle SQL* Plus/No-SQL-MongoDB

1. Creation of tables for Salesman and Customer Relation with following structure:

   Salesman Relation:

salesman_id	name	city	commission

   Customer Relation:

customer_id	cust_name	city	grade	salesman_id

2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Set various constraints like Not Null, Primary Key, Foreign Key and Check constraints.
5. Creating relationship between the databases and retrieve records using joins for the below relations:

   Salesman Relation:

salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

   Customer Relation:

customer_id	cust_name	city	grade	salesman_id
3002	Nick Rimando	New York	100	5001
3007	Brad Davis	New York	200	5001
3005	Graham Zusi	London	300	5002
3004	Fabian	Paris	300	5006
3009	Geoff Cameron	Rome	100	5007
3003	Jozy	San Jose	300	5003

Execute the different types of Joins to find the output for the below:

1. From the following tables write a SQL query to find the salesperson and customer who reside in the same city. Return Salesman, cust_name and city
2. From the following tables write a SQL query to find those orders where the order amount exists between 500 and 2000. Return ord_no, purch_amt, cust_name, city.
3. From the following tables write a SQL query to find the salesperson(s) and the customer(s) he represents. Return Customer Name, city, Salesman, commission
4. From the following tables write a SQL query to find salespeople who received commissions of more than 12 percent from the company. Return Customer Name, customer city, Salesman, commission
5. Write a SQL statement to join the tables salesman, customer and orders so that the same column of each table appears once and only the relational rows are returned

6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
8. Creation of Procedures.
9. Creation of database triggers and functions.
10. Database Connectivity with Front End Tools (Java/Python).

Mini project:

- **a.** Inventory Control System
- **b.** Material Requirement Processing
- **c.** Hospital Management System
- **d.** Railway Reservation System
- **e.** Personal Information System
- **f.** Timetable Management System
- **g.** Hotel Management System

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the Syntax of SQL commands.
- Remember queries to retrieve records.
- Apply referential integrity constraints.
- Analyze the database design using constraints.
- Evaluate PL/SQL programs to implement triggers, functions, procedures and exceptions.
- Create front end tools to manipulate information from backend.

SEMESTER IV

21MA1407	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples 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.
- 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 RANDOM VARIABLES 12

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

UNIT - II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem for Independent Identically distributed random variable (without proof).

UNIT - III TESTING OF HYPOTHESIS 12

Statistical hypothesis - Large sample test based on Normal distribution for Proportion , single mean and difference of two means - Student's t test for single mean and difference of two means, F test for Variance. Chi-square tests for independence of attributes and goodness of fit.

UNIT -IV DESIGN OF EXPERIMENTS 12

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

UNIT -V STATISTICAL QUALITY CONTROL 12

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

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomenon.

- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
3. Veerarajan T, "Probability, Statistics and Random Processes with Queueing Theory", Mc Graw Hill, 4th Edition, 2018.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition.

21CB1401	DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS (LAB INTEGRATED)	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem.
- To get accustomed with various programming constructs such as divide-and-conquer, Dynamic Programming, Backtracking and Branch and Bound.
- To understand the limitations of Algorithmic power.
- To learn techniques for solving specific problems more efficiently and for analyzing space and time requirements.

UNIT - I INTRODUCTION 9

Notion of an Algorithm - Fundamentals of Algorithmic Problem Solving -Important Problem Types –Algorithm Design Technique- Fundamentals of the Analysis of Algorithmic Efficiency - Asymptotic Notations and their properties-Analysis Framework – Mathematical analysis for Recursive and Non-recursive algorithms-Randomized algorithms-Las Vegas and Monte Carlo types.

SUGGESTED ACTIVITIES:

- Discussion on role of algorithms in computer science.
- Design of simple problems
- Basic method of calculating time and space complexity
- Design of Induction proof for recursive and non-recursive algorithms.

SUGGESTED EVALUATION METHODS:

- Quizzes on Asymptotic Notations.
- Assignments on calculating time complexity using forward and Backward Approach.

UNIT - II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force - String Matching-KMP algorithm - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem – Assignment problem. Divide and Conquer Methodology - Binary Search - Merge sort - Quick sort – Randomized Quick Sort - Multiplication of Large Integers, Strassen’s Matrix Multiplication.

SUGGESTED ACTIVITIES:

- External Learning- Divide and Conquer based algorithms, Hackerrank divide and Conquer algorithms.
- Practical : Implementation of Binary Search and Merge Sort.
- To calculate time complexity using Master’s theorem.
- Design of Induction proofs for algorithm verification for Divide and Conquer Algorithms.

SUGGESTED EVALUATION METHODS:

- Quizzes on brute force methods.
- Assignments on Merge Sort and Multiplication of Large Integers.

UNIT - III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming - Principle of optimality - Computing a Binomial Coefficient – Floyd's algorithm - Multi stage graph - Optimal Binary Search Trees - Knapsack Problem. Greedy Technique - Container loading problem - Prim's algorithm and Kruskal's Algorithm - 0/1Knapsack problem - Huffman Trees.

SUGGESTED ACTIVITIES:

- External Learning- Dynamic Programming based algorithms like Longest common subsequence.
- Practical: Implementation of Optimal Binary Search Tree.
- External Learning- Greedy Techniques like Prim's and Kruskal's Algorithm.
- Practical: Implementation of Huffman Trees.

SUGGESTED EVALUATION METHODS:

- Tutorials on Floyd's Algorithm.
- Quizzes on Greedy algorithms.
- Assignments on Knapsack using Dynamic Programming method and Greedy method.

UNIT -IV ITERATIVE IMPROVEMENT AND BACKTRACKING 9

Iterative Improvement-The Maximum-Flow Problem-Stable marriage Problem-Backtracking -n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Graph Coloring Problem.

SUGGESTED ACTIVITIES:

- External Learning- Maximum-Flow Problem.
- External Learning- Backtracking Algorithms like N Queens Problem and Hamiltonian Circuit Problem.
- Practical : Implementation of subset sum problem.
- Practical : Implementation of Hamiltonian Circuit Problems.

SUGGESTED EVALUATION METHODS:

- Tutorials on Hamiltonian Circuit Problem.
- Quizzes on Backtracking algorithms.

UNIT -V P, NP CLASSES AND BRANCH AND BOUND 9

Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems-Branch and Bound- LIFO Search and FIFO search - Assignment problem - Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems - Travelling Salesman problem - Knapsack problem.

SUGGESTED ACTIVITIES:

- External Learning- NP Completeness.

- External Learning- Branch and Bound Algorithms like Knapsack Problem
- Practical : Implementation of Travelling Salesman Problem using Branch and Bound
- External Learning- Approximation Algorithms for NP-Hard Problems
- Practical : Implementation of Travelling Salesman Problem using Approximation Algorithms

SUGGESTED EVALUATION METHODS:

- Tutorials on NP-Hard Problems.
- Assignments on NP Completeness
- Quizzes on Knapsack Problems
- Assignments on Travelling Salesman Problem

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand different algorithmic design strategies.
- Articulate the process of problem solving and writing algorithms.
- Design and implementing the problems using algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking, Branch and Bound)and apply when an algorithmic design situation calls for it.
- Analyze the correctness of algorithms using inductive proofs and invariants
- Describe the classes P, NP,NP-Hard, NP Complete and appraise to prove that acertain problem is P,NP,BP-Hard, NP-Complete.
- Designing their theoretical knowledge in practice

TEXT BOOKS:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein,—Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
2. S.Sridhar, DESIGN AND ANALYSIS OF ALGORITHMS, First Edition, Oxford Edition, 2014
3. AnanyLevitin, —Introduction to the Design and Analysis of Algorithms‖, Third Edition,Pearson Education, 2012

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/C++, Second Edition, Universities Press, 2007.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, Reprint 2006.
3. Harsh Bhasin, —Algorithms Design and Analysis‖, Oxford university press, 2015.
4. http://nptel.ac.in/

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1. https://www.pdfdrive.com/design-analysis-of-algorithms-e33623281.html
2. https://www.pdfdrive.com/introduction-to-the-design-and-analysis-of-algorithms-2-vgloop-e17224696.html
3. https://www.pdfdrive.com/design-and-analysis-of-algorithms-tutorial-e60359577.html

ONLINE COURSES / RESOURCES:

1. https://www.javatpoint.com/dynamic-programming
2. https://www.simplilearn.com/tutorials/data-structure-tutorial/backtracking-algorithm
3. https://optimization.mccormick.northwestern.edu/index.php/Branch_and_bound_(BB)

SUGGESTIVE EXERCISES

1. Implementation and Time analysis of factorial and GCD program using iterative and recursive method.
2. Implementation and Time analysis of linear and binary search algorithm.
3. Implementation and Time analysis of sorting algorithms. Merge sort and Quicksort
4. Practice a knapsack problem using dynamic programming.
5. Implementation of Prim's and Kruskal's algorithm
6. Practice iterative improvement strategy for stable marriage problem.
7. Implement the n-Queens problem using backtracking
8. Demonstration of Graph Coloring using Backtracking
9. Demonstrate a Branch and Bound technique to solve knapsack problems
10. Demonstrate a Branch and Bound technique to solve TSP problems

TOTAL: 30 PERIODS

21IT1304	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand Object Oriented Programming concepts and basic characteristics 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.

UNIT - I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – Objects And Classes - Encapsulation- Inheritance -Polymorphism- OOP In Java –Fundamental Programming Structures In Java – Defining Classes In Java – Constructors, Methods -Access Specifiers - Static Members - Arrays , Packages – Defining Packages – Finding Packages And CLASSPATH -Importing Packages - Packages Types , Javadoc Comments .

SUGGESTED ACTIVITIES:

- Programs and Demonstration using simple Java programs Using Java Basic Constructs and Arrays.
- Understanding JVM.

SUGGESTED EVALUATION METHODS:

- Assignment problems
- Quizzes

UNIT - II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists– String Handling.

SUGGESTED ACTIVITIES:

- Programs and Demonstration of Java programs – use abstract classes, final methods and classes and interfaces.
- Programs and Demonstration of Java programs – using String class, ArrayList , Creating class and objects.
- Programs using Inheritance and Interfaces.

SUGGESTED EVALUATION METHODS:

- Assignment problems.
- Quizzes.

UNIT - III EXCEPTION HANDLING AND I/O 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, Standard IDE like NETBEANS / ECLIPSE.

SUGGESTED ACTIVITIES:

- Programs and Demonstration using exception handling and Streams using any standard IDE like NETBEANS / ECLIPSE
- Develop an application threading

SUGGESTED EVALUATION METHODS:

- Demonstration of real-world application using exception handling and Streams
- Assignments

UNIT -IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between 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 – Restrictions and Limitations.

SUGGESTED ACTIVITIES:

- Programs and Demonstration of java program using multithreading and Generic programming.

SUGGESTED EVALUATION METHODS:

- Assignment problems.
- Quizzes.

UNIT -V EVENT DRIVEN PROGRAMMING 9

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 - Introduction to Swing – layout management - Swing Components –Windows–Menus– Dialog Boxes- Study of Spring Framework , Hibernate Framework.

SUGGESTED ACTIVITIES:

- Programs and Demonstration using graphics programming and components
- Programs and Demonstration of Mouse, key events, creating interactive forms using AWT/Swing and adding functionality
- Understand AWT and SWING

SUGGESTED EVALUATION METHODS:

- Assignments

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Develop Java programs using OOP principle
2. Develop Java programs with the concepts inheritance and interfaces
3. Build Java applications using exceptions and I/O streams
4. Develop Java applications with threads and generics classes
5. Design and build simple Graphical User Interface.
6. Develop interactive Java programs using swings.

TEXT BOOKS:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
3. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000
4. Felipe Gutierrez , Introducing Spring Framework: A Primer 1st ed. Edition, Kindle Edition, 2014

21CS1303	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To understand the various software design methodologies, software testing, software process models
- To learn various testing and maintenance measures
- To understand the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects

UNIT - I SOFTWARE PROCESS MODELS 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Waterfall model – Spiral Model – V shaped model – RAD model – Iterative Model – Prototype model.

SUGGESTED ACTIVITIES:

- Analyze which process model is suitable for a particular project
- Analyze Agile compare with traditional process models
- Estimate activity durations and resources required for a particular project

SUGGESTED EVALUATION METHODS:

- Incremental model compares with Waterfall model
- Assignments on different process models
- Evaluate the software process model is suitable for software concerns in the present scenario.

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.

SUGGESTED ACTIVITIES:

- Gathering the requirements of the client – functional and non -functional requirements
- Prepare the Software Requirements Specification (SRS) of a particular project (e.g Railway reservation system, Airlines etc)
- Identify customer’s needs of a particular project
- Evaluate the system for feasibility (both technically and financially feasible)

SUGGESTED EVALUATION METHODS:

- Establish schedule and constraints for a particular project

- Create system definitions
- Perform economic and technical analysis

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.

SUGGESTED ACTIVITIES:

- Implementing architectural design of a particular software project
- Implementing Interface design of a particular software project
- Implementing Component design of a particular software project
- Implementing Database design of a particular software project

SUGGESTED EVALUATION METHODS:

- Evaluate Questionnaire method for software design
- Assignments on Heuristic evaluation methods applied in design of the software.
- Tabulate the tools used in software design

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 – Software Configuration Management.

SUGGESTED ACTIVITIES:

- Develop test cases for any software project
- Enumerate the tools available for software testing
- Enumerate the principles of software testing
- List out the principles of BPR

SUGGESTED EVALUATION METHODS:

- Assignments on test suite.
- Assignments on Black box testing for any software product.
- Assignments on Testing artifacts of a software project

UNIT -V PROJECT MANAGEMENT 9

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

SUGGESTED ACTIVITIES:

- How to estimate the size of the software product using LOC or other traditional methods
- Enumerate Earned Value Analysis for a particular project
- Draft the time frame of a particular project using Gantt chart
- Compare traditional process models with agile methods

SUGGESTED EVALUATION METHODS:

- How to fix the size of the software and evaluate the cost of the software project
- Determine the cost of the software project using COCOMO I & II Model
- How to predict the risk of a particular project
- Evaluate how the agile software process model is suitable for software concerns in the present scenario

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Identify the key activities in managing a software project.
2. Compare different process models.
3. Concepts of requirements engineering and Analysis Modelling.
4. Apply systematic procedure for software design and deployment.
5. Compare and contrast the various testing and maintenance.
6. Manage project schedule, estimate project cost and effort required.

TEXT BOOKS:

1. Roger S. Pressman, Bruce R.Maxim—Software Engineering – A Practitioner's Approach, Eight Edition, McGraw-Hill International Edition, 2015.
2. Ian Sommerville, —Software Engineering, 9th Edition, Pearson Education Asia, 2011.
3. Gene Kim, Jez Humble, Patrick Debois, and John Willis, The DevOps Handbook- How to Create World-Class Agility, Reliability, & Security in Technology Organizations, IT Revolution Press,2nd Edition,2016

REFERENCES:

1. Rajib Mall, —Fundamentals of Software Engineering, Third Edition, PHI Learning PrivateLimited,2009.
2. PankajJalote, —Software Engineering, A Precise Approach‖, Wiley India, 2010.
3. Kelkar S.A., —Software Engineering‖, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, —Software Engineering, Tata McGraw-Hill Publishing Company Limited,2007.

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2. http://nptel.ac.in/courses/106106093/

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ONLINE COURSES / RESOURCES:

1. https://www.geeksforgeeks.org/software-engineering-introduction-to-software-engineering/
2. https://www.w3schools.in/category/software-testing/
3. https://www.tutorialspoint.com/software_engineering/index.htm
4. https://www.javatpoint.com/software-engineering-tutorial
5. https://nptel.ac.in/courses/

21CS1403	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

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

UNIT - I INTRODUCTION AND PHYSICAL LAYER 9

Networks — Network Types — Protocol Layering — TCP/IP Protocol suite — OSI Model — Physical Layer: Performance — Transmission media — Switching .

SUGGESTED ACTIVITIES:

- Designing Network Topology
- Problems on Performance metrics

SUGGESTED EVALUATION METHODS:

- Quizzes on Performance metrics

UNIT - II DATA-LINK LAYER & MEDIA ACCESS 9

Introduction — Link-Layer Addressing — Data-Link Layer Protocols — HDLC — PPP — Media Access Control — Wired LANs: Ethernet — Wireless LANs: IEEE 802.11, Bluetooth, Zig bee.

SUGGESTED ACTIVITIES:

- Problems on Error correction and detection

SUGGESTED EVALUATION METHODS:

- Assignment - HDLC
- Quiz on Media access control

UNIT - III NETWORK LAYER 9

Introduction — Network Layer Protocols: IPV4 , ICMP, IPV6 — Unicast Routing Algorithms — Multicasting Basics .

SUGGESTED ACTIVITIES:

- Problems on IP Addressing- In class
- Problems in Distance Vector Routing , Link State Routing using simulator

SUGGESTED EVALUATION METHODS:

- Assignments on IP Addressing and Routing Protocols

UNIT -IV TRANSPORT LAYER 9

Introduction — Transport Layer Protocols — User Datagram Protocol — Transmission Control Protocol — SCTP.

SUGGESTED ACTIVITIES:

- Socket Programming on UDP
- Implementation of DNS using UDP

SUGGESTED EVALUATION METHODS:

- Quiz on UDP and TCP applications

UNIT -V APPLICATION LAYER 9

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

SUGGESTED ACTIVITIES:

- Seminar on WWW and HTTP

SUGGESTED EVALUATION METHODS:

- Implementation of HTTP using Socket Programming.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic layers and its functions in computer networks.
2. Evaluate the performance of a network.
3. Understand the basics of how data flows from one node to another.
4. Analyze and design routing algorithms.
5. Design protocols for various functions in the network.
6. Understand the working of various application layer protocols.

TEXT BOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2017(Reprint)

REFERENCES:

1. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013

WEB REFERENCES:

1. https://nptel.ac.in › noc › noc22 › SEM1 › noc22-cs1

ONLINE COURSES / RESOURCES:

1. Computer Network Tutorial – javatpoint
2. https://www.javatpoint.com › computer-network-tutorial
3. https://www.geeksforgeeks.org/computer-network-tutorials/ TCP/IP Tutorial and Technical
4. Overview, (IBM Redbook) – Download From
5. http://www.redbooks.ibm.com/abstracts/gg243376.html TCP/IP Guide, Charles M. Kozierok, Available Online
6. http://www.tcpipguide.com/
7. Request for Comments (RFC) - IETF – http://www.ietf.org/rfc.html

21IT1312	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, array list.
- To understand and apply the concepts of inheritance and polymorphism.
- To understand exception handling and file processing.
- To develop applications using generic programming and event handling.

LIST OF EXPERIMENTS

1. Write a java program that prints all real solutions to the quadratic equation ax2 +bx+c=0. Read in a, b, c and use the quadratic formula.
2. The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursive and non-recursive functions.
3. Write a java program for sorting a given list of names in ascending order
4. Write a program that prompts the user for an integer and then prints out all prime numbers up to that integer.
5. Write a Java program to Multiply two given matrices
6. Write a Java program that checks whether a given string is a palindrome or not
7. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial).
8. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
9. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and 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.
10. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
11. Write a program to perform string operations using Array List. Write functions for the following
    a. Append - add at end
    b. Insert – add at particular index
    c. Search
    d. List all string starts with given letter

12. 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.
13. Write a Java program to implement exception handling.
14. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
15. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
16. Write a java program that correct implements of producer consumer program using the concept of inter thread communication.
17. Write a java program to find the maximum value from the given type of elements using a generic function.
18. Write a java program that simulates a traffic light. The program lets the user select one of three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with “STOP “or “READY” or “GO” should appear above the buttons in selected color. Initially, there is no message shown.
19. Design a calculator using event-driven programming paradigm of Java using Scientific manipulations.
20. Develop a mini project for any application using Java concepts.

ADDITIONAL PROGRAMS:

21. Design a class to represent a Student details include the Student ID, Name of the Student, Branch, year, location and college. Assign initial values using constructor. Calculate average of marks of 6 subjects and calculate attendance percentage.
22. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism.
23. Write a program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
24. Write a java programs to find factorial of a number. User is allowed to enter a number into the text field whose factorial is to be determined. On pressing the button the value of the text field is firstly converted into integer and then processed to find its factorial. The result will get displayed in another text field.(Hint: use swings).

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

2. Develop and implement Java programs with array list, Strings.
3. Design applications using inheritance and polymorphism.
4. Develop and implement Java programs with exception handling and multithreading.
5. Design applications using file processing, generic programming.
6. Develop and implement Java programs using Event Handling.

21CS1412	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

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

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
   a) Echo client and echo server
   b) Chat
   c) File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code simulating ARP /RARP protocols.
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
7. Study of TCP/UDP performance using Simulation tool.
8. Simulation of Distance Vector/ Link State Routing algorithm.
9. Performance evaluation of Routing protocols using Simulation tool
10. Simulation of error correction code (like CRC).

TOTAL : 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Implement various protocols using TCP and UDP
2. Understand the programs using sockets.
3. Compare the performance of different transport layer protocols.
4. Use simulation tools to analyze the performance of various network protocols.
5. Analyze various routing algorithms.
6. Implement error correction codes.

SEMESTER V

21CB1501	STATISTICAL COMPUTING WITH R	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To expose the variables, expressions, control statements of R
- To use R programming for analysis of data and visualize outcome in the form of graphs, charts, statistical programming, computation, graphics, and modeling
- To develop and understand the modern computational statistical approaches and their applications to different datasets.
- To apply principles of data science to analyze various business problems.
- To learn various regression analysis implementation using R.

UNIT - I INTRODUCTION TO R 9

Introduction, History and overview of R, Basic features of R, elements and data structures, Sessions and Functions, Variables, Data Types, Advanced Data Structures – Lists, Matrices, Arrays, Factors ,Data Frames, Functions , Vectors , Atomic Vectors, Character vectors - Operations on the logical vectors, Classes - S3 Class , S4 Class , Reference Class., Data input/output, Data storage formats, Subsetting objects, Vectorization.

SUGGESTED ACTIVITIES:

- Analyze the concept of R programming.
- Understanding and differentiating the different types of data structures.

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment on different types of data structures

UNIT - II LOOPING, CONTROL STRUCTURES, FUNCTIONS AND RECURSION 9

R Programming, Arithmetic and Boolean Operators and values, Structures, Control Statements, Different types of loops: for(), while() ,repeat(), Pointers in R, Recursion, Scoping Rules, Loop functions, Array and Matrices

SUGGESTED ACTIVITIES:

- Analyze the concept of different looping.
- Developing applications based on functions

SUGGESTED EVALUATION METHODS:

- Programs on control structure and functions

- Assignment on looping and pointers

UNIT - III DATA MANIPULATION & FILE OPERATIONS 9

Math and Simulation in R, Functions, Math Function, Probability Calculation - Cumulative Sums and Products- Minima and Maxima- Data sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation. Reading and Writing Files - Programming in R - Creating the script file in R

SUGGESTED ACTIVITIES:

- Analyze the concept of data manipulation and file concepts using R
- Understanding the concept of linear algebra operations.

SUGGESTED EVALUATION METHODS:

- Quizzes
- Programs on math function.
- Assignments on file operations

UNIT -IV DATA VISUALISATION AND PROBABILITY DISTRIBUTION 9

Graphics, Creating Graphs, Customizing Graphs, lattice library- Visualization, Box plot, Histogram, Pareto charts, Pie graph, Line chart, Scatterplot, Developing graphs, Probability Distributions: Normal, Binomial, Poisson and Other Distributions.

SUGGESTED ACTIVITIES:

- Analyze the concept of different types of graphs.
- Understanding and differentiating the different probability distribution.

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment on different visualization techniques for various applications

UNIT -V STATISTICAL DATA ANALYSIS 9

Basic Statistics, Outlier, regression Analysis: Linear, Multiple, Logistic, Poisson, Survival Analysis, Nonlinear Models: Splines, Decision Tree, Random Forests, Support Vector Machine, Clustering, Correlation, Covariance, Statistical simulation, Advanced Data Analysis -T-Tests, R ANOVA-One way, Two way analysis.

SUGGESTED ACTIVITIES:

- Analyze the concept of statistical data analysis.
- Understanding the advanced data analysis.

SUGGESTED EVALUATION METHODS:

- Quizzes

- Assignment on statistical analysis

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. State the capabilities of R and declaring variables, data types, data structures and classes
2. Identify and implement appropriate control structures to solve problems.
3. Apply R programming for manipulation of datasets
4. Write functions in R to implement file operations
5. Produce various graphs and distribution plots using R
6. Apply well defined data analysis for different applications

TEXT BOOKS:

1. Norman Matloff, The Art of R Programming, Cengage Learning, ISBN: 9781593273842, No Starch Press, US-Publisher,2017
2. Larry Pace, Joshua Wiley, Beginning R -An Introduction to Statistical Programming, 2nd Edition, Apress, ISBN: 9781484203743, 2015

REFERENCES:

1. Mark Gardener, Beginning R -The Statistical Programming Language, John Wiley & Sons, Inc., ISBN: 9781118164303, 2012.
2. Chris Brunsdon, Lex Comber, An Introduction to R for Spatial Analysis and Mapping, 2nd Revised Edition, Sage Publications Ltd (UK), ISBN: 9781446272954, 2019
3. Jared P. Lander, R for Everyone Advanced Analytics and Graphics, 2nd Edition, AddisonWesley Professional PTG, ISBN: 9780134546926, 2017
4. Hamid Reza Pourghasemi, Spatial Modeling in GIS and R for Earth and Environmental Sciences, Elsevier (S&T), ISBN: 9780128152263, 2019
5. Michael J. Crawley, The R Book, 2nd Edition, Wiley-Blackwell, ISBN: 9780470973929, 2012

WEB REFERENCES:

1. https://campus.datacamp.com/courses/introduction-to-r-for-finance/vectors-and-matrices?ex=4
2. https://www.geeksforgeeks.org/graph-plotting-in-r-programming/
3. https://www.geeksforgeeks.org/r-charts-and-graphs/

21CB1502	SOFTWARE DESIGN WITH UML	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

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

UNIT - I UNIFIED PROCESS AND USE CASE DIAGRAMS 9

Introduction to OOAD with OO Basics - OO themes - Usefulness of OO Development - Unified Process – The three models in OOAD - UML diagrams – Use Case – Case study -The Next Gen POS system, Inception – Use case Modeling – Relating Use cases – include, extend and generalization – When to use Use-cases

SUGGESTED ACTIVITIES:

- Analyze the concept of modeling and mechanism involved in UML.
- Understanding and differentiating Unified Process from other approaches

SUGGESTED EVALUATION METHODS:

- Quizzes
- Create UML model for real time application.
- Assignments

UNIT - II STATIC UML DIAGRAMS 9

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

SUGGESTED ACTIVITIES:

- Creating design with static UML diagrams.
- Learn the different types of relationships in class diagram

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment on use case modeling

UNIT - III DYNAMIC AND ARCHITECTURAL MODELING UML DIAGRAMS 9

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

SUGGESTED ACTIVITIES:

- Analyze requirements to create dynamic diagrams
- Practical- To choose and apply a suitable design for solving a real time problem scenario

SUGGESTED EVALUATION METHODS:

- Tabulate the diagrams and its purpose.
- Discussion on various dynamic UML diagrams

UNIT -IV DESIGN PATTERNS AND ELEMENTS 9

Design Patterns: GRASP-Designing objects with responsibilities –Applying GoF design patterns- MVC Design Patterns — Creational Patterns, Structural Patterns, Behavioral Patterns, Design Elements: Architectural design elements - Interface design elements - Component level diagram elements - Deployment level design elements, Mapping design to code.

SUGGESTED ACTIVITIES:

- Design suitable pattern to develop software models
- Examine fundamental object-oriented analysis and design techniques.
- Apply design patterns for viewing a system as a set of procedures.

SUGGESTED EVALUATION METHODS:

- Pedagogical tools and techniques
- Prepare case studies for analyzing modeling techniques

UNIT -V AGILE METHODOLOGY 9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Applications of Agile - Agile Manifesto and Principles – Agile Project Management –Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

SUGGESTED ACTIVITIES:

- To test the software against its requirements specification
- Learning testing methodologies

SUGGESTED EVALUATION METHODS:

- Agile games

- Crossword puzzles

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of the course student will be able to:

1. Analyze, design, document the requirements through use case driven approach
2. Design Class and Object Diagrams to represent static aspects of a software systems.
3. Express software design with UML diagrams
4. Design structural and behavioural UML diagrams for various applications
5. Develop, explore the design patterns for various scenarios and applications.
6. Apply the concepts of Agile Methodology for deploying the code for software

TEXT BOOKS:

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

REFERENCES:

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

21CB1503	FUNDAMENTALS OF MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To familiarize fundamental management concepts and skills.
- To understand the history, evolution and growth of management concepts
- To learn the applications of different functions of Management
- To study the different issues and challenges faced by modern managers
- To enable students to use management principles to analyse complex managerial issues

UNIT - I INTRODUCTION TO MANAGEMENT 9

Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach-Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach. Management in Global environment.

UNIT - II PLANNING AND DECISION MAKING 9

General Framework for Planning -Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Goal Setting techniques. Decision making and Problem Solving -Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making.

UNIT - III ORGANIZATION AND HRM 9

Principles of Organization: Organizational Design &Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT -IV LEADING AND MOTIVATION 9

Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Leading Individuals and Groups; Team Motivation -Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories -Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT -V EMERGING CONCEPTS AND SKILL DEVELOPMEMT 9

Creativity-Innovation- Creativity and Innovation in Managerial Work ,Entrepreneurship, Technology Management- Management Information Systems (MIS), Productivity Problems-TQM, Kaizen, Six Sigma, 5S Concept, Use of computers and IT in Management Control-Work Applications, Ethics and Social Responsibility.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Define and explain the nature and scope of management, including its functions and key managerial roles.
2. Understand the importance of planning, decision making, and problem-solving in effective management.
3. Analyze the role of bounded rationality, cognitive biases, and other influences on decision making and problem solving.
4. Develop students' knowledge and skills in organizing, including organizational design, structures, culture, and change management.
5. Enable students to understand the different leadership styles and skills, and to develop their own leadership capabilities.
6. Introduce students to the concepts of creativity, innovation, and entrepreneurship, and to provide them with an understanding of technology management and the use of IT in management control.

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012
3. Management: Principles, Processes and Practices, Anil Bhat, Arya Kumar – Oxford University Press-, 2008.

21MA1502	OPERATIONS RESEARCH (Lab Integrated)	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method.
- Solve transportation and assignment problems.
- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems

UNIT - I LINEAR MODELS 9

The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm: Penalty Two-Phase, Big-M methods – Duality formulation-Sensitivity analysis(change in cost only).

UNIT - II BRANCH AND BOUNDED,TRANSPORTATION MODELS 9

Integer programming: Branch and bounded method -Transportation and Assignment Models –Travelling Salesman problem.

UNIT - III NETWORK MODELS 9

Networks models – Shortest route – Minimal spanning tree: Kruskal and Prim's algorithms –Project network CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT -IV QUEUEING MODELS 9

Queuing models - Queuing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Simulation: Monte-Carlo method.

UNIT -V DECISION MODELS 9

Decision models – Game theory – Two person zero sum games – Graphical solution-Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Individual/Group replacement.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Modeling with Graphical solution of Linear Programming problems
2. Solving LPP using simplex method.
3. Duality formation
4. Solving Integer Linear Programming
5. Solving Transportation problems
6. Solving Assignment problems
7. Solving Travelling Salesman problems
8. CPM and PERT scheduling
9. Queuing theory models – Single server model

10. Monte Carlo Method

PRACTICAL: 30 PERIODS
TOTAL : 75 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Formulate linear programming problem and solve using graphical method.
2. Solve LPP using simplex methods.
3. Formulate and solve transportation, assignment problems.
4. Solve project management problems.
5. Solve scheduling problems.
6. Solve game problems and replacement models.

TEXT BOOKS:

1. Hillier and Libeberman, “Operations Research”, Holden Day, 2005.
2. Taha H.A., “Operations Research”, Sixth Edition, Prentice Hall of India, 2003.
3. P.K.Gupta,D.S.Hirra and S.Kalavathy, "Introduction to Operations Research", Fourth edition,2002.
4. Veerarajan T, “Probability, Statistics and Random Processes with Queueing Theory”, McGraw Hill, 4th Edition, 2018.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., “Linear Programming and Network Flows”, John Wiley, 2009.
2. Budnick F.S., “Principles of Operations Research for Management”, Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., “Operations Research”, John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., “Operation Research for Management”, Wiley Eastern, 1994.
5. Tulsian and Pasdey V., “Quantitative Techniques”, Pearson Asia, 2002.
6. Sharma.J.K,"Operation Research",6th edition, Trinity publication.
7. Sundaresan.V,Ganapathysubramanian.K.S,Ganesan.K, "Resource Management Techniques"
8. Kalavathy.S,"Operation Research",2nd edition
9. Kandasamy,Thilagavathy,Gunavathy,"Probability and Queuing theory".

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1. https://www.amirajcollege.in/wp-content/uploads/2020/10/3151910-operations-research-theory-and-applications-by-j.-k.-sharma-z-lib.org_.pdf

21CS1503	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know about Chomsky hierarchy for organizing languages.
- To introduce concepts in automata theory and theory of computation.
- To identify different formal language classes and their relationships.
- To design grammars and recognizers for different formal languages.
- To understand undecidability and decide on languages that is undecidable.

UNIT - I FINITE AUTOMATA 9

Introduction to formal proof — Additional forms of Proof — Inductive Proofs- Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions – NFA to DFA conversion – Epsilon NFA to DFA conversion-. Applications and Limitation of FA.

SUGGESTED ACTIVITIES:

- Defining automata for different types of patterns.
- Tutorial Problem on Conversion of Epsilon NFA into DFA.

SUGGESTED EVALUATION METHODS:

- Quiz on Types of Finite Automata.
- Assignment on Equivalence of Deterministic and Nondeterministic Finite Automata.

UNIT - II REGULAR EXPRESSION AND REGULAR LANGUAGES 9

Definition - Operators of regular expression - Algebraic laws for Regular expressions– Equivalence of FA and Regular Expressions – Minimization of Finite Automata - Pumping Lemma for Regular Languages. Closure properties of Regular Languages / Sets.

SUGGESTED ACTIVITIES:

- Flipped Classroom - Regular expression for practical patterns.
- Problems based on Closure properties of Regular Language.

SUGGESTED EVALUATION METHODS:

- Quiz on Operators of regular expression.
- Tutorial Problem on Conversion of RE into Minimized DFA.

UNIT - III CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA 9

Context-Free Grammar (CFG) – Derivation Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Language of a Pushdown Automata – Equivalence of Pushdown Automata and CFG – Pumping Lemma for CFL – Ogden's lemma for CFL - Closure Properties of CFL- Deterministic Pushdown Automata.

SUGGESTED ACTIVITIES:

- Construction of CFG for practical programming.
- Problems based on Ambiguity grammar

SUGGESTED EVALUATION METHODS:

- Assignment on Simplification of CFGs.
- Quiz on Closure properties of CFL.
- Tutorial Problem on Normal forms for CFGs

UNIT -IV PROPERTIES OF CONTEXT-FREE LANGUAGES 9

Simplification of Context-free Grammar – Chomsky Normal Form – Greibach Normal Form - TURING MACHINES (TM) - Formal definition and behaviour, Languages of a TM - Turing Machine as a Computing Device and Language Acceptor - Techniques for TM.

SUGGESTED ACTIVITIES:

- Conversion of PDA from CFG and CFG from PDA
- Problems on Turing machines as language acceptors and computing devices.

SUGGESTED EVALUATION METHODS:

- Design a Push Down Automata
- Quiz on Techniques of Turing Machines

UNIT -V UNDECIDABILITY 9

Recursive and recursively enumerable languages - Halting problem - Introduction to Undecidability and Reducibility - Undecidable problems about TMs - Post correspondence problem (PCP) - Modified PCP -Applications: Programmed grammar.

SUGGESTED ACTIVITIES:

- Proofs - In Class
- Problems based on PCP, MPCP and conversions

SUGGESTED EVALUATION METHODS:

- Assignment on Halting Problem
- Quiz on Programmed grammar

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Construct finite automata, regular expression for any pattern.
2. Write context free grammar for any construct.
3. Build pushdown automata to recognise a context free language
4. Design Turing machines for any language.
5. Propose computation solutions using Turing Machine
6. Drive whether a problem is decidable or not

TEXT BOOKS:

1. John E. Hopcroft ,Rajeev Motwani, Jeffery D. Ullman, Introduction to Automata Theory, Languages and Computations, Third Edition, Pearson Education ,2009.
2. Kamala Krithivasan and R. Rama, Introduction to Formal Languages, Automata Theory and Computation, Pearson Education, Delhi, 2009.

REFERENCES:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd, 2003.
2. J. Martin, Introduction to Languages and the Theory of Computation, Third Edition, Tata McGraw Hill, New Delhi, 2003.
3. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning, 1997.

21CB1511	SOFTWARE DESIGN USING UML LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- Understand the object-oriented software development process.
- Design suitable pattern to develop software models.
- Analyze requirements to create requirements design model.
- Apply business modeling and modeling languages to design software.
- To improve the software design with design patterns.
- Develop correct and robust software deployment models

LIST OF EXPERIMENTS

15. Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.
16. Requirements Engineering
17. Writing Problem Statement
18. Writing Requirement Specification
    a. SRS
    b. Use Case
19. Planning Project with PERT Diagram
20. Designing Project
    - Use Case Diagrams
    - Interaction Diagrams
    - State chart Diagrams and Activity Diagrams
    - Class Diagrams
    - Package Diagrams
    - Component Diagrams and Deployment Diagrams

    Mapping Design to code Suggested Domains for Mini-Project:
    1. Passport automation Systems
    2. Stock Management Systems
    3. Online Reservation Systems
    4. Student Information Systems
    5. Software Personnel Management Systems
    6. Credit Card Management Systems
    7. Recruitment Systems
    8. Library Management Systems

HARDWARE REQUIREMENTS:

- Standard PC

HARDWARE REQUIREMENTS:

1. Windows 7 or higher
2. ArgoUML that supports UML 1.4 and higher

3. Selenium, JUnit or Apache JMeter

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Decide a suitable software model for a project

2. Describe how to model object-oriented languages.

3. Design a project business model.

4. Elicit requirements and design a user interface model

5. Create a deployment model.

6. Apply object-oriented design to develop software.

WEB REFERENCES:

1. https://sketchboard.io/uml-diagram-tool

2. https://online.visual-paradigm.com/app/diagrams/

3. www.jetbrains.com

4. https://creately.com/lp/er-diagram-tool-online/

21CB1512	R PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To expose the variables, expressions, control statements of R
- To use R programming for analysis of data and visualize outcome in the form of graphs and charts
- To develop and understand the modern computational statistical approaches and their applications to different datasets.
- To apply principles of data science to analyze various business problems.
- To use R software to carry out statistical computations
- To analyze the data using R

LIST OF EXPERIMENTS

1. Study of R and R Studio Installation
2. Basic R Programs.
    - To take input from the user (name and age) and display the values.
    - To create the system's idea of the current date with and without time
    - To read 5 subject marks from user and calculate total, average, grade and display the same.
3. Creation and manipulation of Vectors, Matrices, Arrays, Lists, Factors and Data Frames
4. Implement Control structures and Functions
5. Manipulation of math functions for finding mean, median, minimum and maximum value
6. Install of Packages and scripts for Importing and Exporting of Data
7. To generate random number from standard distributions.
8. Visualize Statistical Graphs using Scatter Plots, Box Plots, Whisker Plot and Histograms
9. Perform Data exploration and visualization techniques over a dataset.
10. Perform Data Query using SQL and R.
11. Create a data set and do statistical analysis on the data

Mini Project :Suggested Topics(but not limited to)

1. **Sentiment Analysis**
2. **Uber Data Analysis**
3. House Rate Prediction

PLATFORM NEEDED:

1. Systems with R, R Studio (Additional libraries required)

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Demonstrate how to install and configure RStudio.
2. Make use of different R Data Structures, Looping, Control structures to solve various applications.
3. Explore math functions for manipulation of datasets.
4. Perform file operations using R programming.
5. Create and visualize various graphs using R.
6. Analyze dataset using Statistical Tools available in R.

WEB REFERENCES:

1. https://www.programiz.com/R-programming/examples
2. https://www.geeksforgeeks.org/R-programming-examples/
3. https://www.w3schools.com/R/R_examples.asp
4. https://www.sanfoundry.com/R-problems-solutions/

SEMESTER VI

21CB1601	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To provide knowledge about management issues related to staffing, training, performance, compensation, human factors consideration and compliance with human resource requirements.
- To gain knowledge needed for success as a human resources professional.
- To develop the skills needed for a successful HR manager
- To implement the concepts learned in the workplace.

UNIT - I PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT 10

Evolution of human resource management – The importance of the human capital – Role of human resource manager – Challenges for human resource managers - trends in Human resource policies – Computer applications in human resource management – Emerging trends of HRM - Human resource accounting and audit.

UNIT - II HUMAN RESOURCE PLANNING AND RECRUITMENT 8

Importance of Human Resource Planning – Forecasting human resource requirement –matching supply and demand - Internal and External sources. Recruitment, Selection, Induction and Socialization.

UNIT - III TRAINING AND DEVELOPMENT 9

Types of training methods - purpose - benefits - resistance. Executive development programme – Common practices - Benefits – Self development – Knowledge management.

UNIT -IV EMPLOYEE ENGAGEMENT 9

Compensation plan – Reward – Motivation – Application of theories of motivation – Career management – Mentoring - Development of mentor – Protégé relationships- Job Satisfaction, Employee Engagement, Organizational Citizenship Behavior.

UNIT -V PERFORMANCE EVALUATION AND CONTROL 9

Method of performance evaluation – Feedback – Industry practices. Promotion, Demotion, Transfer and Separation – Implication of job change. The control process – Importance – Methods – Requirement of effective control systems.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the fundamental principles of human resource management and how they contribute to organizational success.
2. Analyze the role of human resource planning in organizational change and the impact of change on human resource planning strategies.

3. Understand the various sources of recruitment and selection, including internal and external sources.
4. Develop skills in identifying training and development needs, and creating effective training programs to address those needs.
5. Understand the importance of performance appraisal in the success of an organization.
6. Learn how to align human resource management with organizational strategy and goals, and how to measure the effectiveness of human resource management practices

TEXT BOOKS:

1. Human Resource Management, 8th Edition, K. Aswathappa, Tata McGraw Hill, 2017.
2. Dessler Human Resource Management, Pearson Education Limited, 14th Edition, 2015.

REFERENCES:

1. Decenzo and Robbins, Fundamentals of Human Resource Management, Wiley, 11th Edition, 2013.
2. Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy. Managing Human Resource. PHI Learning. 2012
3. Bernadin , Human Resource Management ,Tata Mcgraw Hill ,8th edition 2012.
4. Wayne Cascio, Managing Human Resource, McGraw Hill, 2007.
5. Ivancevich, Human Resource Management, McGraw Hill 2012.
6. Uday Kumar Haldar, Juthika Sarkar. Human Resource management. Oxford. 2012

21CS1602	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the various characteristics of intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To know about the various applications of AI
- To understand the need for machine learning and various algorithms in machine learning.

UNIT - I INTRODUCTION 9

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems-Search Strategies- Uninformed – Informed-BFS-Greedy best first search-A* search.

SUGGESTED ACTIVITIES:

- Developing PEAS description for agents
- Comparing Future of AI
- Different Approach in AI to Real Time Problems

SUGGESTED EVALUATION METHODS:

- Quiz on History of AI
- Learners to write a letter to self-keeping the future in context
- Assignment on Problem Solving Approach

UNIT - II PROBLEM SOLVING METHODS 9

Problem solving Methods – Heuristics - Iterative Deepening A*- RBFS – Memory Bounded A* – Local Search Algorithms and Optimization Problems - Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing –Min Max- Optimal Decisions in Games – Alpha Beta Pruning – Stochastic Games.

SUGGESTED ACTIVITIES:

- Participating in Game based activity
- Basic Structure of Decision Tree to students
- Searching Techniques for Problem Solving

SUGGESTED EVALUATION METHODS:

- Designing a decision tree based on the data given
- Quiz on Searching Techniques

- Students are divided into groups to find different solution for a particular problem and it can discussed in class

UNIT - III KNOWLEDGE REPRESENTATION AND AI APPLICATIONS 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering- AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot.

SUGGESTED ACTIVITIES:

- Installing Prolog.
- Game based activity for AI applications.
- Flowchart for Knowledge Representation.

SUGGESTED EVALUATION METHODS:

- Mystery Animal Game (based on Natural Language Processing).
- Assignment on Retrieval and Extraction techniques.
- Quiz on Simple Prolog Programming.

UNIT -IV MACHINE LEARNING AND SUPERVISED LEARNING ALGORITHMS 9

Introduction to Machine Learning (ML) - Essential concepts of ML –Learning a Class from Examples- Linear, Non-linear-Multi-class and Multi-label classification-Decision Trees- ID3-Classification and Regression Trees (CART)-Regression- Linear Regression-Multiple Linear Regression- Logistic Regression- Bayesian Classifier-Bayesian Network.

SUGGESTED ACTIVITIES:

- Developing a framework for real life activities such as decision tree.
- Developing algorithms for basic mathematical expressions using regression tree.
- Simple program on SVM classification

SUGGESTED EVALUATION METHODS:

- Quizzes on algorithm and basic python.
- Assignments on illustrative problems.
- Quizzes on simple python programs.

UNIT -V UNSUPERVISED LEARNING AND MACHINE LEARNING APPLICATIONS 9

Introduction to clustering, clustering algorithms - Self-Organizing Map - Expectation Maximization - Gaussian Mixture Models – Principal Component Analysis (PCA) - MACHINE LEARNING APPLICATIONS - Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection– Medical Diagnosis.

SUGGESTED ACTIVITIES:

- Developing a framework for real life activities such as clustering techniques.
- Application of clustering algorithms to datasets (UCI/Kaggle/Corel 10k).

SUGGESTED EVALUATION METHODS:

- Quizzes on clustering concepts.
- Assignments on Machine learning applications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem and efficiently solve them.
3. Understand the working of various informed and uninformed searching algorithms and different heuristics.
4. Understand the concept of knowledge representation.
5. Understand supervised and unsupervised learning algorithms.
6. Apply Machine learning algorithms for real world problems.

TEXT BOOKS:

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach, Prentice Hall, Fourth Edition, 2020 (Unit 1, 2, 3)
2. 2. Tom M. Mitchell, “Machine Learning”, Indian Edition, McGraw-Hill, 2017

REFERENCES:

1. Munesh Chandra Trivedi, “A Classical Approach to Artificial Intelligence”, Khanna Book Publishing, 2019.
2. Vinod Chandra S.S, AnandHareendran S, “Artificial Intelligence and Machine Learning”, PHI Learning, 2014.
3. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
4. Charu C. Aggarwal, “Data Classification Algorithms and Applications”, CRC Press, 2014.
5. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, 2nd Edition, CRC Press, 2015.

21CS1603	COMPILER DESIGN (Lab Integrated)	L	T	P	C
		3	0	2	4

OBJECTIVES: To impart Knowledge on the following topics:

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

UNIT - I INTRODUCTION TO COMPILERS 9

Phases of a compiler – Lexical Analysis – Role of Lexical Analyzer –Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA - Error Detection and Recovery – Lexical Phase Error Management.

SUGGESTED ACTIVITIES:

- Symbol Table Creation
- Develop a lexical analyzer to recognize a few patterns in C(Ex. identifiers, constants, comments, operators etc).
- Develop a lexical analyzer using lex tool.

SUGGESTED EVALUATION METHODS:

- Assignment on Structure of Compiler
- Assessment on Finite Automata
- Seminar in Lexical Analyzer

UNIT - II SYNTAX ANALYSIS 12

Context-Free Grammar (CFG) – Derivation Trees – Ambiguity in Grammars and Languages – Need and Role of the parser - Top Down Parsing - Recursive Descent Parser - Predictive Parser - LL(1) Parser-Shift Reduce Parser - LR Parser - LR (0)Item - Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer - Parser Generators -YACC.

SUGGESTED ACTIVITIES:

- Generate YACC specification for a few syntactic categories
- Using different parsing algorithms to develop the parsers for a given grammar.
- Implement an Arithmetic Calculator using LEX and YACC
- Design and implement a parser using LEX and YACC tools.

SUGGESTED EVALUATION METHODS:

- Assignments on CFG
- Group Work for Developing the Parsers

- Assessment on Error Handling

UNIT - III INTERMEDIATE CODE GENERATION 8

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Inherited and Synthesized Attributes - Syntax Directed Translation - Construction of Syntax Tree-Type Systems-Specification of a simple type checker.

Intermediate Languages: Three address code – Types of Three address code – Quadruple Triples, Three-address code for Declarations, Arrays, Loops, Back patching.

SUGGESTED ACTIVITIES:

- Develop a Code to generate abstract syntax tree.
- Generate three address codes for a simple program using LEX and YACC.
- Design a simple Type Checker.

SUGGESTED EVALUATION METHODS:

- Assignments on SDD.
- Quizzes on Three Address Code.
- Seminar in Type Checking.

UNIT -IV CODE OPTIMIZATION 8

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

SUGGESTED ACTIVITIES:

- Develop an Algorithm for control flow analysis and data flow analysis.
- Implementing simple code optimization techniques.
- Construction of DAG

SUGGESTED EVALUATION METHODS:

- Quizzes on Optimization
- Assignment on DAG
- Seminar in Basic Blocks

UNIT -V RUN-TIME ENVIRONMENT AND CODE GENERATION 8

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

SUGGESTED ACTIVITIES:

- Implement storage allocation strategies like (heap, stack, and static).
- Develop a Simple Code Generator.

SUGGESTED EVALUATION METHODS:

- Assignment on Storage Organization.
- Group work for developing Simple Code Generator.

- Assessment for issues in code Generation.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.). Create a symbol table, while recognizing identifiers.
2. Implement a Lexical Analyzer using Lex Tool
3. Implement an Arithmetic Calculator using LEX and YACC
4. Generate three address code for a simple program using LEX and YACC.
5. Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)
6. Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.

PRACTICAL :30 PERIODS

TOTAL: 75 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Design and implement a prototype compiler
2. Apply the various optimization techniques
3. Use the different compiler construction tools
4. Acquire knowledge in Syntax directed definition and Run time environment
5. Develop the various parsing techniques and different levels of translation
6. Build target code for backend compiler

TEXT BOOKS:

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

REFERENCES:

1. Des Watson,A Practical Approach to Compiler Construction- 2017.
2. Allen I. Holub, Compiler Design in C‖, Prentice-Hall Software Series, 2014
3. Randy Allen, Ken Kennedy, and Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
4. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
5. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
6. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.

21CB1602	DESIGN THINKING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To learn design thinking concepts and principles.
- To familiarize the different phases of design thinking.
- To recognize the importance of design thinking.
- To ideate and find solutions by applying various methods to different problems.
- To develop a prototype and perform testing.
- To design solution to solve problem related to business

UNIT - I INTRODUCTION 9

Introduction to Design Thinking-Design Thinking Approach-Fundamental Concepts-Why Design? - Four Questions, - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.

SUGGESTED ACTIVITIES:

- Understanding the design thinking concept.
- List out the principles and process of design thinking.

SUGGESTED EVALUATION METHODS:

- Develop a plan for a design thinking project.
- Assignments on divergent and convergent thinking.
- Analyze the process of design thinking

UNIT - II UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM 9

Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.

SUGGESTED ACTIVITIES:

- Identify customer's needs of a particular problem.
- Identify the point of view of the problem.

SUGGESTED EVALUATION METHODS:

- Evaluate Questionnaire method for problem analysis.
- Analyze the empathetic mapping.

UNIT - III IDEATION AND PROTOTYPING 9

Ideate Phase - Creative principles and Creative process-Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques. Storytelling in presenting ideas and prototypes.

SUGGESTED ACTIVITIES:

- Implementing the evaluation of ideas.
- Develop the prototype method and Lean startup method.

SUGGESTED EVALUATION METHODS:

- Analyze the visualization models and diagrams.
- Analyze the brainstorming and brain writing and mind mapping concepts.

UNIT -IV TESTING AND IMPLEMENTATION 9

Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking-Software Development using Scrum Framework-Scrum team – Sprints – Sprints planning-Metrics – Scrum tools.

SUGGESTED ACTIVITIES:

- Develop the test phase.
- Identify customer needs of particular problem.

SUGGESTED EVALUATION METHODS:

- Analyze the customer requirement and satisfaction.
- Implementing the agility for software development process.

UNIT -V FUTURE 9

The New Social Contract – Design Activism – Designing today and tomorrow-Design Thinking related to Science and art-Design Thinking in Business-Linking Design Thinking Solution to Business Challenges.

Case Study:

i) **2030 Schools Challenge**:

Concept: Design thinking is often presented without teaching content. This is very different. Learners get 30 minutes to choose a UN 2030 Goal (there are 17) that is relevant and meaningful to them, then they get into small groups. The group researches the goal quickly, by answering the questions: What does the world need to know about this goal and what can we do about it? The group then creates a short PSA (Public Service Announcement) and shares it widely with an authentic audience. It is fun, fast, and shows the power of design sprints to teach content and skills.

(ii) THE GIFT-GIVING PROJECT VIA STANFORD D-SCHOOL:

Concept: The Gift-Giving Project is 90-minute (plus debrief) fast-paced project through a full design cycle. Students pair up to interview each other, come to a point-of-view of how they might design for their partner, ideate, and prototype a new solution to “redesign the gift giving experience” for their partner.

SUGGESTED ACTIVITIES:

- Future of design thinking.
- Finding solution to solve problem related to business.

SUGGESTED EVALUATION METHODS:

- Analyze the design thinking solutions to meet our corporation.

- Assignments on linking solutions to challenges in business.

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of the course student will be able to:

1. Familiarize the key concepts of design thinking and its principles
2. Recognize the steps to empathize phases of Design Thinking
3. Illustrate the steps in the define phase of Design Thinking
4. Apply the ideation phase of Design Thinking
5. Develop and test a prototype created through a Design Thinking process
6. Identify the plan of Design thinking to solve problem related to business

TEXT BOOKS:

1. Müller-Roterberg, Christian, “Handbook of Design Thinking”, Amazon Digital Services LLC - KDP Print US, 2018. [Unit 1, 2, 3, 4]
2. Tim Brown, “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation”, Harper Collins Publisher, 2009. [Unit 5]

REFERENCES:

1. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, O'Reilly Media, 2017.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.

WEB REFERENCES:

1. http://ajjuliani.com/design-thinking-activities/
2. http://venturewell.org/class-exercises
3. http://www.mindtools.com/brainstm.html

21CS1612	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To study first-order predicate calculus, logical reasoning solving using Prolog language
- Explore the methods of implementing algorithms using Artificial Intelligence and illustrate Search Algorithms
- To study the applications of AI and agent based approach to AI
- Make use of data sets in implementing the Machine Learning algorithms
- To study different types of Machine Learning and Models

LIST OF EXPERIMENTS

ARTIFICIAL INTELLIGENCE

1. Write a program to implement simple Facts and Queries
2. Write a program to solve Monkey Banana Problem
3. Write a program to solve Tower of Hanoi
4. Write a program to solve 8 Puzzle Problem
5. Write a program to solve 4 Queens Problem
6. Write a program to solve Travelling Salesman Problem
7. Write a program to DFS and BF
8. Write a program to A* and AO* Algorithm

MACHINE LEARNING

The programs can be implemented in either JAVA or Python
Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students

1. Create a Linear Regression Model in Python using a randomly created data set.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
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.
4. 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.
5. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.

Mini Project : Suggested Topics (but not limited to)

1. Credit Risk Prediction
2. Disease detection

3. Inventory Demand Forecasting
4. Fake News Classification
5. Weather forecast

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the concept of Artificial Intelligence
2. Apply various search algorithms of Artificial Intelligence
3. Apply knowledge representation and reasoning techniques
4. Implement Machine Learning Algorithms
5. Apply appropriate datasets to the Machine Learning Algorithms
6. Identify and apply Machine Learning Algorithms to solve real world problems.

SEMESTER VII

21CB1701	INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To develop and strengthen innovation.
- To understand IP management.
- To understand entrepreneurial quality.
- To motivate in and to impart basic skills.
- To understanding to run a business efficiently and effectively

UNIT - I INTRODUCTION TO INNOVATION 9

Adoption of Innovations, Exploring Innovations, Idea generation, Developing innovative culture, Executing innovations, Innovation attributes and their adoption rate, Measuring and evaluation of innovation, Exploiting and renewing innovations, Managing innovations in organizations, Innovation portfolio.

UNIT - II INTRODUCTION TO IPR 9

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

UNIT - III REGISTRATION OF IPRs 9

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

UNIT -IV ENTREPRENEURSHIP 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur, Major Motives Influencing an Entrepreneur –Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management.

UNIT -V BUSINESS AND FINANCING 9

Small Enterprises – Characteristics, Ownership Structures – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal –Sources of Finance, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the importance of innovation for organizational success and growth in creating competitive advantage
2. Familiarize with the different forms of IP, including patents, trademarks, copyrights, trade secrets, and industrial designs.
3. Familiarize with the registration process for different forms of Intellectual Property
4. Understand the key concepts and principles of entrepreneurship
5. Understand the process of identifying and evaluating business opportunities, including market research and feasibility studies.
6. Familiarize with the principles and regulations of taxation, including income tax, excise duty, and sales tax.

TEXT BOOKS:

1. V. Sople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2010.
2. Khanka. S.S., “Entrepreneurial Development” S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
3. Dr.N.Venkateswaran ,” Entreprenuership Development” –STM 3 Publications,2017.

REFERENCES:

1. Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,”Intellectual Property Rights: Unleashing the Knowledge Economy”,McGraw Hill Education, 2011.
3. Hisrich R D, Peters M P, “Entrepreneurship” 8 th Edition, Tata McGraw-Hill, 2013.
4. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis” 2nd Edition Dream tech, 2005.

21CB1702	INFORMATION SECURITY AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of Information Security.
- To learn the basics of Cryptography and its algorithms.
- To understand the methods of public key encryption.
- To know the aspects of risk management and the information security policy.
- To acquire knowledge of various Security Technology.
- To learn about the concepts of Information Security Project Management.

UNIT - I INTRODUCTION 7

History - What is Information Security?, Critical Characteristics of Information, CNSS (Committee on National Security Systems) Security Model - Components of an Information System - Balancing Information Security and Access -The System Development Life Cycle(SDLC) -The Security SDLC.

SUGGESTED ACTIVITIES:

- Analyze the concept of Information security.
- Understanding the concept of security on System Development Life Cycle.

SUGGESTED EVALUATION METHODS

- Quizzes
- Assignment on Components of an Information System

UNIT - II OVERVIEW OF COMPUTER SECURITY 12

Overview: Computer Security concepts – Security attacks – Security services - Symmetric Cipher Model – Substitution Techniques. Block Ciphers and Data Encryption Standard(DES) - A DES example – Advanced Encryption Standard(AES) structure – AES Transformation functions – AES key expansion example - Public-key Cryptography - The RSA (Rivest–Shamir–Adleman) algorithm –Diffie Hellman key exchange.

SUGGESTED ACTIVITIES:

- Analyze the concept of symmetric cryptography algorithms.
- Understanding the asymmetric cryptography algorithms.

SUGGESTED EVALUATION METHODS

- Quizzes
- Assignment on Substitution Techniques
- Assignment on DES, AES, RSA and Diffie Hellman Key Exchange

UNIT -III SECURITY ANALYSIS 9

Risk Management: Introduction – Risk Identification - Risk Assessment – Risk Control Strategies – Selecting a Risk control strategy - Information Security Policy, Standards and Practices – The Information Security blueprint.

SUGGESTED ACTIVITIES:

- Analyze the concept of Risk management.
- Understanding and differentiating the Information Security Policies.

SUGGESTED EVALUATION METHODS

- Quizzes

UNIT -IV SECURITY TECHNOLOGY 9

Introduction ; Access Control : Identification, Authentication, Authorization, Accountability; Firewalls : Firewall Processing Modes, Firewalls Categorized by Generation, Firewalls Categorized by Structure, Firewall Architectures, Selecting the Right Firewall, Configuring and Managing Firewalls, Content Filters; Protecting Remote Connections : Remote Access, Virtual Private Networks (VPNs).

Intrusion Detection and Prevention Systems : IDPS Terminology, Why Use an IDPS? , Types of IDPS , IDPS Detection Methods , IDPS Response Behavior, Selecting IDPS Approaches and Products, Strengths and Limitations of IDPSs, Deployment and Implementation of an IDPS, Measuring the Effectiveness of IDPSs; Honeypots, Honeynets, and Padded Cell Systems : Trap-and-Trace Systems , Active Intrusion Prevention.

SUGGESTED ACTIVITIES:

- Discussion on various technology for security
- Understanding and differentiating the Information Security technologies.

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignments on Intrusion detection and prevention

UNIT -V INFORMATION SECURITY PROJECT MANAGEMENT 8

Introduction ; Information Security Project Management: Developing the project plan, project planning consideration, Scope consideration, The need for project Management; Technical Aspects of Implementation: Conversion strategies, The Bull's- Eye Model, To Outsource or not, Technology Governance and Change Control; Non-Technical Aspects of Implementation: The Culture of change management, Consideration of Organizational Change. Security Management Maintenance Models : The Security Maintenance Model, Monitoring the External Environment, Monitoring the Internal Environment, Planning and Risk Assessment, Vulnerability Assessment and Remediation

SUGGESTED ACTIVITIES:

- Analyze the concept of Security management.
- Understanding the building blocks of information security.

SUGGESTED EVALUATION METHODS

- Quizzes
- Assignment on Security Management and Maintenance

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Discuss the basics of information security
2. Understand the fundamentals of networks security, attacks, services and substitution techniques
3. Apply the different cryptographic algorithms for practical applications.
4. Demonstrate the aspects of Risk Management and Information Security Policy.
5. Design and implement new Technologies for security of Information
6. Analyze and develop project plan for Information Security Project Management and Maintenance

TEXT BOOKS:

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, Fourth Edition, 2012.
2. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 6th Edition, 2014.

REFERENCES:

1. Christo Paar and Jan Pelzl, “Understanding Cryptography: A Textbook for Students and Practitioners”, First Edition, Springer, 2010
2. Douglas R. Stinson,” Cryptography: Theory and Practice”, Third Edition, by, CRC Press, Taylor and Francis Group (Indian Edition),2006
3. MarjieT.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3 rd Edition, Prentice Hall, 2013.

WEB REFERENCES:

1. https://www.simplilearn.com/what-is-des-article/
2. https://www.techtarget.com/searchsecurity/definition/Advanced-Encryption-Standard
3. https://www.geeksforgeeks.org/implementation-diffie-hellman-algorithm/
4. https://www.checkpoint.com/cyber-hub/network-security/what-is-firewall/

21IT1502	WEB TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To comprehend and analyze the basic concepts of web programming and internet protocols.
- To understand the advanced features of Java language.
- To understand the essential client side technologies for web programming.
- To develop applications using database connectivity and server side programming in Java environment.
- To develop smart device based web application and deploy in different platforms.

UNIT - I WEB ESSENTIALS 9

Internet Overview - Fundamental computer network concepts - Web Protocols - URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website – Creating a Website – Fundamentals of Client-side and server-side scripting.

SUGGESTED ACTIVITIES:

- Basics of internet protocol
- Creation of web site.

SUGGESTED EVALUATION METHODS:

- Assignment on different types of web browser
- Simple application development steps using all the above mentioned features

UNIT - II JAVA GUI, FILE STREAM AND CONCURRENCY 9

GUI Development using SWING – I/O Streams and Object Serialization – Generic Collections – Concurrency – Thread States and Life Cycles – Thread Synchronization – Java Networking.

SUGGESTED ACTIVITIES:

- Applet and frame based application development using Swing.
- File stream and object serialization on text and binary data.
- Thread priorities and synchronization based application development. · Simple networking programs like chat application.

SUGGESTED EVALUATION METHODS:

- Grading system to evaluate simple java exercises.
- Various GUI control based applet and frame applications with event handling.
- Application development based on I/O stream and thread manipulation.

9

UNIT - III CLIENT SIDE ESSENTIALS

Java Script Objects and Functions – JQuery – Accessing DOM Elements using Java Script and JQuery Objects – Java Script Event Handling – XML DOM – AJAX Enabled Rich Internet Applications with XML and JSON – Dynamic Access and Manipulation of Web Pages using Java Script and JQuery – Web Speech API – Speech Synthesis Markup Language.

SUGGESTED ACTIVITIES:

- Programming exercises on HTML forms with Java script and JQuery objects.
- XML and JSON based AJAX enabled rich Internet application.
- Program on Web speech API

SUGGESTED EVALUATION METHODS:

- Case studies on simple web site with HTML, Java script and JQuery objects.
- AJAX enabled web site realization.
- Java script based speech API implementation

UNIT -IV SERVER SIDE ESSENTIALS 9

Overview of Servlet – Life Cycle of Servlet – Servlet Configuration – Running Servlet with Database Connectivity – Servlet Support for Cookies – Session Tracking – Basics of JSP – Java Server Faces – Multi tier Application Architecture – MVC Architecture of JSF Apps – JSF Components – Session Tracking – Developing Dynamic Data Driven Websites.

SUGGESTED ACTIVITIES:

- Servlet programming with database connectivity and session tracking.
- JSF applications with database connectivity and session management.

SUGGESTED EVALUATION METHODS:

- Demonstration of simple web application using Servlet and JSF.
- Session management demos using Servlet and JSF

UNIT -V SERVERLESS AND MOBILE BASED WEB DEVELOPMENT 9

Node Programming Fundamentals – Asynchronous Programming Techniques – Sequencing Asynchronous Logic – Node JS – Global Objects – Event Listeners – J2ME Basics – MIDlet –Mobile Web Application Frameworks – Simple Android Based Development – Cloud Based Applications Deployment- AWS Lambda.

SUGGESTED ACTIVITIES:

- Asynchronous web application development.
- Android based mobile application development.
- Practical - Application deployment in web servers.

SUGGESTED EVALUATION METHODS:

- Evaluating asynchronous application development.
- Evaluation of online web hosting.
- Modular design factors like cohesion and coupling used to evaluate proper modules breakup

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Explain the basic concepts of web programming and internet protocols.
2. Develop GUI application by including I/O streams and threads.
3. Create web pages with proper client–side features.
4. Design dynamic web pages with server–side and other technologies.
5. Develop simple android based mobile application.

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, “Internet & World Wide Web - How to Program”, 5th edition, Pearson Education, 2015
2. Core and Advanced Java”, Black book,Dr.R.NageshwaraRao ,DreamTech Press, 2018.
3. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2011

REFERENCES:

1. Reto Meier, “Professional Android Application Development”, Wiley India Pvt Ltd, 2018.
2. Mike Cantelon, Marc Harter, TJ Holowaychuk and Nathan Rajlich, “Node.js in Action”, Manning Publications, 2017.

WEB REFERENCES:

1. https://books.google.co.in/books/about/Java_Programming.html?id=6CgrygEACAAJ&redir_esc=y
2. http://www.periodicooficial.oaxaca.gob.mx/files/2011/05/EXT02-2011-05-19.pdf
3. https://info340.github.io/client-side-development.html
4. https://www.zkoss.org/wiki/ZK_Component_Development_Essentials/Handling_Events/Server-side_Listeners
5. https://www.section.io/engineering-education/how-to-build-apps-with-serverless-architecture/

ONLINE COURSES / RESOURCES:

1. https://www.javatpoint.com/java-basics
2. https://www.geeksforgeeks.org/server-side-client-side-programming/
3. https://www.guvi.in/full-stack-development-course
4. https://www.coursera.org/courses?query=web%20technologies
5. https://www.coursera.org/lecture/aws-fundamentals-building-serverless-applications/introduction-to-serverless-computing-with-aws-lambda-part-1-Zy2lR.

21CB1711	INFORMATION SECURITY LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To grasp concepts in classical encryption and decryption techniques
- To implement the algorithms DES, AES and RSA
- To understand hashing, password cracking
- To learn penetration testing.
- To learn Intrusion Detection Systems.
- To grasp concepts in classical encryption and decryption techniques

LIST OF EXPERIMENTS

1. Analysis of security in Unix/Linux
2. Administration of users, password policies, privileges and roles
3. Perform encryption, decryption using the following substitution techniques
4. Ceaser cipher
5. Playfair cipher
6. Hill Cipher
7. Vigenere cipher
8. Apply DES algorithm for User Message Encryption.
9. Apply AES algorithm for URL Encryption.
10. Implement RSA Algorithm using HTML and JavaScript.
11. Implement the Diffie-Hellman Key Exchange algorithm.
12. Crack passwords using John the Ripper.
13. Demonstrate penetration testing using any tool (Metasploit or wireshark, etc).
14. Demonstrate intrusion detection system (IDS) using Snort or any other software.
15. Demonstrate OS fingerprinting using Nmap.

Mini Project :Suggested Topics(but not limited to)

1. Install and Configure Firewalls for a variety of options (iptables or pfsense)

HARDWARE:

1. Standalone desktops with Windows, Unix/Linux.

SOFTWARE:

1. C / C++ / Java or equivalent compiler
2. GnuPG, John the Ripper , Metasploit/ wireshark, Snort, N-Stalker or Equivalent , Nmap
3. C / C++ / Java or equivalent compiler

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Develop code for classical encryption techniques.
2. Build cryptosystems by applying symmetric algorithms.
3. Apply Public Key Encryption algorithms for practical problems.
4. Develop programs for password cracking
5. Implement penetration testing
6. Apply Intrusion Detection Systems

WEB REFERENCES:

1. https://www.javatpoint.com/
2. https://gist.github.com/
3. https://www.codeproject.com/
4. http://www.herongyang.com/Cryptography/

21IT1511	WEB TECHNOLOGIES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES: To impart Knowledge on the following topics:

- To develop simple Java programs using object orientation concepts.
- To program using files and threads for concurrent operations.
- To design attractive GUI using framework.
- To create dynamic web pages using CSS, JavaScript and AJAX.
- To develop mobile based web applications in cloud environment.

LIST OF EXPERIMENTS

1. Design the following static web pages required for an online book store web site.

HOME PAGE: The static home page must contain three frames.

LOGIN PAGE

CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.

REGISTRATION PAGE

2. Write JavaScript to validate the following fields of the Registration page.

- First Name (Name should contains alphabets and the length should not be less than 6 characters).
- Password (Password should not be less than 6 characters length).
- E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
- Mobile Number (Phone number should contain 10 digits only).
- Last Name and Address (should not be Empty).

3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS.

4. Simple GUI application development using applet and SWING.

5. Implement multithreaded program for concurrent operations.

6. Develop program to set priority and synchronize java threads.

7. Input and Output manipulation on files (Read/Write).

8. Java programs on generic and collections.

9. Client-Server network application using java sockets.

10. Dynamic web page creation using Javascript, Jquery and AJAX.

11. Develop servlet and JSF application with JDBC access.

12. Manage sessions in JSP using cookies.

13. Create simple Node Javascript functions for server.

14. Android application for location based service.

15. Develop Cloud based web application.

16. Web Based Mini Project

ADDITIONAL EXPERIMENTS:

1. Java Script form validation
2. Three Tier Application Using JSP and Databases for Online Exam
3. Program for web services
4. GPS Location Program
5. Cloud based application

TOTAL: 60 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Implement object oriented concepts using Java language.
2. Develop GUI application by including I/O streams and threads.
3. Create web pages with proper client-side features.
4. Design dynamic web pages with server-side and other technologies
5. Develop simple android based mobile application
6. Develop web applications in a cloud based environment

WEB REFERENCES:

1. https://beginnersbook.com/2013/03/multithreading-in-java/
2. https://www.cmi.ac.in/~madhavan/courses/pl2009/lecturenotes/lecture-notes/node51.html
3. https://www.programiz.com/java-programming/exception-handling
4. https://docs.oracle.com/javase/tutorial/java/IandI/abstract.html
5. https://examples.javacodegeeks.com/java-basics/generics/generic-method-example-in-java/
6. https://www.w3schools.com/java/java_arraylist.asp
7. https://www.guru99.com/jsp-cookies-handling.html

VERTICAL I: FULL STACK DEVELOPMENT

21IT1901	OPEN SOURCE TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Understand the difference between open-source software and commercial software.
- Understand the policies, licensing procedures and ethics of FOSS.
- Understand open-source philosophy, methodology and ecosystem.
- Awareness with Open-Source Technologies
- Knowledge to start, manage open-source projects.

UNIT - I INTRODUCTION 9

Introduction to Open-Source: Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

UNIT - II OPEN-SOURCE PRINCIPLES AND METHODOLOGY 9

Open-Source History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization - Licensing: What is a License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT - III OPEN SOURCE PROJECT 9

Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, Open-source Teaching, Open-source media.Collaboration: Community and Communication, Contributing to OpenSource Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of student’s choice.

UNIT -IV UNDERSTANDING OPEN-SOURCE ECOSYSTEM 9

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies.

UNIT -V OPEN SOURCE ETHICS & CASE STUDIES 9

Open Source Ethics – Open Vs Closed Source – Government – Ethics – Impact of Open source Technology – Shared Software – Shared Source. Example Projects: Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, wordpress, GCC, GDB, github, Free BSD, Open Solaris, Open Office. Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies. Study: Understanding the developmental models, licensing, mode of funding, commercial/non-commercial use.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Differentiate between Open Source and Proprietary software and Licensing.

2. Understand the policies, licensing procedures and ethics of FOSS

3. Build and modify one or more Free and Open Source Software packages.

4. Recognize the applications, benefits and features of Open-Source Technologies

5. Contribute software to and interact with Free and Open Source Software development projects.

6. Gain knowledge to start, manage open-source projects.

TEXT BOOKS:

1. Kailash Vadera, Bhavyesh Gandhi, “Open Source Technology”, Laxmi Publications Pvt Ltd 2012, 1st Edition.

2. Open Source Software, P.Rizwan Ahmed, Margham Publication, Chennai, 2015.

REFERENCES:

1. Fadi P. Deek and James A. M. McHugh, “Open Source: Technology and Policy”, Cambridge Universities Press 2009.

2. “Open-Source Technology”, Kailash Vadera&Bhavyesh Gandhi, University Science Press, Laxmi Publications, 2009

3. Unix Concepts and Applications by Sumitabha Das, Tata McGraw Hill Education, 2006

4. The official Ubuntu Book, 8th Edition

5. “Perspectives on Free and Open-Source Software”, Clay Shirky and Michael Cusumano, MIT press.

6. “Understanding Open Source and Free Software Licensing”, Andrew M. St. Laurent, O’Reilly Media.
7. “Open Source for the Enterprise”, Dan Woods, GautamGuliani, O’Reilly Media
8. Linux kernel Home: http://kernel.org4

WEB REFERENCES:

1. Linux kernel Home: http://kernel.org4
2. Open-Source Initiative: https://opensource.org/5
3. The Linux Foundation: http://www.linuxfoundation.org/
4. Wikipedia:https://en.wikipedia.org/7.https://en.wikipedia.org/wiki/Wikipedia:Contributing_to_Wikipedia8
5. GitHub: https://help.github.com/9.
6. The Linux Foundation: http://www.linuxfoundation.org/

21IT1902	APP DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access.

UNIT - I FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT 9

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design.

UNIT - II NATIVE APP DEVELOPMENT USING JAVA 9

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props.

UNIT - III HYBRID APP DEVELOPMENT 9

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova.

UNIT -IV CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE 9

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross- platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props.

UNIT -V NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS 9

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Develop Native applications with GUI Components.
2. Develop hybrid applications with basic event handling.
3. Implement cross-platform applications with location and data storage capabilities.
4. Implement cross platform applications with basic GUI and event handling.
5. Develop web applications with cloud database access.
6. To gain in-depth Knowledge of Popular Frameworks, Server, APIs

TEXT BOOKS:

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition, November 2021
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack

REFERENCES:

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition, 2018.
2. Native Mobile Development by Shaun Lewis, Mike Dunn, November 2019
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras, 2015
4. Apache Cordova 4 Programming, John M Wargo, 2015
5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition, 2019.

21CS1903	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloudservices
- Select appropriate structures for designing, deploying and running cloud-based services ina business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real worldproblems.

UNIT - I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, CloudService Deployment Models

UNIT - II CLOUD SERVICES STRATEGY 9

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture.

UNIT - III CLOUD SERVICE MANAGEMENT 9

Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service OperationsManagement.

UNIT -IV CLOUD SERVICE ECONOMICS 9

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models.

UNIT -V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand Cloud Service Management terminology, definition & concepts
2. Compare and contrast cloud service management with traditional IT service management
3. Build and automate business solutions using cloud technologies.
4. Identify strategies to reduce risk and eliminate issues associated with adoption of Cloud services
5. Select appropriate structures for designing, deploying and running cloud-based services in business environment
6. Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era byEnamul Haque, Enel Publications,2020.
2. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini,Zaigham Mohammad ,2013.
3. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour,2017.

REFERENCES:

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya,Christian Vechhiola, S. Thamarai Selvi

21IT1903	UI AND UX DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT - I FOUNDATIONS OF DESIGN 9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking -Brainstorming and Game storming - Observational Empathy.

UNIT - II FOUNDATIONS OF UI DESIGN 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles –Branding - Style Guides.

UNIT - III FOUNDATIONS OF UX DESIGN 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know aboutBusiness Goals.

UNIT -IV WIREFRAMING, PROTOTYPING AND TESTING 9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.

UNIT -V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the various Research Methods used in Design

2. Build UI for user Applications
3. Evaluate UX design of any product or application
4. Demonstrate UX Skills in product development
5. Implement Sketching principles
6. Create Wireframe and Prototype

TEXT BOOKS:

1. Joel Marsh, “UX for Beginners”, O’Reilly , 2022
2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services” O’Reilly 2021

REFERENCES:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3 rd Edition , O’Reilly2020
2. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
3. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, Third Edition, 2015

WEB REFERENCES:

1. https://www.nngroup.com/articles/
2. https://www.interaction-design.org/literature

21IT1904	SOFTWARE TESTING AND AUTOMATION	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

UNIT - I FOUNDATIONS OF SOFTWARE TESTING 9

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

UNIT - II TEST PLANNING 9

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting,Metrics and Statistics.

UNIT - III TEST DESIGN AND EXECUTION 9

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNIT -IV ADVANCED TESTING CONCEPTS 9

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

UNIT -V TEST AUTOMATION AND TOOLS 9

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic concepts of software testing and the need for software testing
2. Design Test planning and different activities involved in test planning
3. Design effective test cases that can uncover critical defects in the application
4. Focus on wide aspects of testing
5. Understand multiple facets of testing
6. Automate the software testing using Selenium and TestNG.

TEXT BOOKS:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - SecondEdition 2018.

REFERENCES:

1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition,2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
3. Paul C. Jorgensen, Software Testing: A Craftsman’s Approach, Fourth Edition, 2014, Taylor& Francis Group.
4. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing,2009, Pearson Education, Inc.
6. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.
7. Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing.

21IT1905	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight about Hacking techniques and Tools.

UNIT - I FUNDAMENTALS OF WEB APPLICATION SECURITY 9

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, SessionManagement-Input Validation.

UNIT - II SECURE DEVELOPMENT AND DEPLOYMENT 9

Web Applications Security - Security Testing, Security Incident Response Planning,The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM) .

UNIT - III SECURE API DEVELOPMENT 9

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT -IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerabilityscanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database- based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT -V HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understanding the basic concepts of web application security and the need for it
2. Be acquainted with the process for secure development and deployment of web applications
3. Acquire the skill to design and develop Secure Web Applications that use Secure APIs
4. Be able to get the importance of carrying out vulnerability assessment and penetration testing
5. Using the acquired knowledge into practice for testing the vulnerabilities and identifying threats.
6. Acquire the skill to think like a hacker and to use hackers tool sets

TEXT BOOKS:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw- Hill Companies.
3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

REFERENCES:

1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing,Inc.
2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & FrancisGroup, LLC.
3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

21IT1906	DEVOPS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercurial
- To understand the concepts of Continuous Integration/ Continuous Testing/ ContinuousDeployment)
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve realworld problems.

UNIT - I INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction to AWS, GCP, Azure - Version control systems: Git and Github - Gerrit Code review.

UNIT - II COMPILE AND BUILD USING MAVEN , GRADLE & ANT 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle – Introduction to ANT- Installation of ANT – Understand and Build using ANT.

UNIT - III CONTINUOUS INTEGRATION USING JENKINS 9

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT -IV CONFIGURATION MANAGEMENT USING ANSIBLE 9

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.

UNIT -V BUILDING DEVOPS PIPELINES USING AZURE 9

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file - Testing and Monitoring - Selenium, Jira, ELK

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand different actions performed through Version control tools like Git.
2. Understand the various installation procedure of SDK
3. Ability to Perform Automated Continuous Deployment
4. Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
5. Ability to do configuration management using Ansible
6. Understand to leverage Cloud-based DevOps tools using Azure DevOps

TEXT BOOKS:

1. Roberto Vormittag, “A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016.
2. Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014.

REFERENCES:

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
2. Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, FirstEdition, 2015.
3. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible forDevOps”, Second Edition, 2016.
4. Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, 2019.
5. https://www.jenkins.io/user-handbook.pdf
6. https://maven.apache.org/guides/getting-started/

21IT1907	PRINCIPLES OF PROGRAMMING LANGUAGES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

UNIT - I SYNTAX AND SEMANTICS 9

Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing.

UNIT - II DATA, DATA TYPES, AND BASIC STATEMENTS 9

Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection – primitive data types – strings – array types – associative arrays – record types – union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed mode assignments – control structures – selection – iterations – branching – guarded statements

UNIT - III SUBPROGRAMS AND IMPLEMENTATIONS 9

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping

UNIT -IV OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING 9

Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling.

UNIT -V FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES 9

Introduction to lambda calculus – fundamentals of functional programming languages– Programming with Scheme – Programming with ML– Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Describe syntax and semantics of programming languages
2. Explain data, data types, and basic statements of programming languages
3. Design and implement subprogram constructs
4. Apply object-oriented, concurrency, and event handling programming constructs and develop programs in Scheme, ML, and Prolog
5. Understand and adopt new programming languages
6. Applying the programming Languages in creating various applications

TEXT BOOKS:

1. Robert W. Sebesta, “Concepts of Programming Languages”, Twelfth Edition (GlobalEdition), Pearson, 2022.
2. Michael L. Scott, “Programming Language Pragmatics”, Fourth Edition, Elsevier, 2018.
3. R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, Prentice Hall, 2011.
4. Jeffrey D. Ullman, “Elements of ML programming”, Second Edition, Pearson, 1997.
5. W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, FifthEdition, Springer, 2003.

VERTICAL II: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

21CS1901	CLOUD TOOLS AND TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- To understand the architecture, infrastructure and delivery models of cloud computing
- To explore the roster of AWS services and illustrate the way to make applications in AWS
- To develop the cloud application using various programming model of Hadoop and Aneka

UNIT - I CLOUD PLATFORM ARCHITECTURE 9

Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges

UNIT - II VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE 9

Basics of Virtual Machines - Taxonomy of Virtual Machines - Virtualization – Management Virtualization –– Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization - Implementation levels of virtualization – Virtualization structure – Virtualization of CPU, Memory and I/O devices – Virtual clusters and Resource Management – Virtualization for data center automation

UNIT - III PAAS CLOUD PLATFORM 9

Windows Azure: Origin of Windows Azure, Features, The Fabric Controller – First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows Azure Storage Characteristics-Storage Services- REST API- Blops

UNIT -IV AWS CLOUD PLATFORM – IAAS 9

Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star - AWS Management Tools: Cloud Watch, AWS Auto Scaling, AWS control Tower, Cloud Formation, Cloud Trail, AWS License Manager.

UNIT -V PROGRAMMING MODEL 9

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster- Aneka: Cloud Application Platform, Thread Programming, Task Programming and Map-Reduce Programming in Aneka.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Employ the concepts of virtualization in the cloud computing
2. Identify the architecture, infrastructure and delivery models of cloud computing
3. Deploy practical virtualization solution
4. Develop the Cloud Application in AWS platform
5. Apply concepts to design Cloud Applications
6. Develop services using various Cloud computing programming models.

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. James Turnbull, “The Docker Book”, O’Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, “Cloud security. A Comprehensive Guide to Secure Cloud Computing”, Wiley Publishing, 2010.

REFERENCES:

1. Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2. Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019 3. Sriram Krishnan, Programming: Windows Azure, O’Reilly,2010
3. Sriram Krishnan, Programming: Windows Azure, O’Reilly,2010
4. Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing , MCGraw Hill Education (India) Pvt. Ltd., 2013.
5. Danielle Ruest, Nelson Ruest, —Virtualization: A Beginner's Guide, McGraw-Hill Osborne Media, 2009. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
6. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010
7. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
8. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

21CS1902 **VIRTUALIZATION**

L	T	P	C
3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIT - I INTRODUCTION TO VIRTUALIZATION 9

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors

UNIT - II SERVER AND DESKTOP VIRTUALIZATION 9

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform- Desktop Virtualization-Types of Desktop Virtualization

UNIT - III NETWORK VIRTUALIZATION 9

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization

UNIT -IV STORAGE VIRTUALIZATION 9

Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

UNIT -V VIRTUALIZATION TOOLS 9

VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM-Google Virtualization- Case study.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basics and types of Virtualization
2. Understand the Hypervisors and its types
3. Analyze the virtualization concepts for server and Desktop
4. Apply the Virtualization for real-world applications
5. Install & Configure the different VM platforms
6. Experiment with the VM with various software

TEXT BOOKS:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
3. David Marshall, Wade A. Reynolds, Dave McCrory , Advanced Server Virtualization: VMware and MicrosoftPlatform in the Virtual Data Center, Auerbach,2006
4. Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, APress, 2005.

REFERENCES:

1. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.

21CS1904	STORAGE TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT - I STORAGE SYSTEMS 9

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center.

UNIT - II INTELLIGENT STORAGE SYSTEMS AND RAID 9

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale- out storage Architecture- Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage.

UNIT - III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 9

FibreChannel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol,connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT -IV BACKUP, ARCHIVE AND REPLICATION 9

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT -V SECURING STORAGE INFRASTRUCTURE 9

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
2. Illustrate the usage of advanced intelligent storage systems and RAID
3. Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
4. Examine the different role in providing disaster recovery and remote replication technologies
5. Discuss the different backup and recovery strategies
6. Infer the security needs and security measures to be employed in information storage management

TEXT BOOKS:

1. EMC Corporation, Information Storage and Management, Wiley, India,2012.
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017.
3. Ulf Troppens,Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, Storage Networks Explained, Second Edition, Wiley, 2009

21CS1905	SITE RELIABILITY ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the organizational impact of introducing SRE
- To gain knowledge of how to develop service-level objectives from business objectives.
- To gain familiarity with incident and problem analysis.
- To explore the knowledge in the production system towards the monitoring of services.
- To gain insights into building incident management and scaling processes for better reliability and performance

UNIT - I INTRODUCTION 9

Introduction to Site Reliability Engineering (SRE) - Tenets of SRE - Production Environment – Hardware - Software Infrastructure- Development Environment - Sample Service - SRE and DevOps - Technology to support SRE - Google SRE model

UNIT - II PRINCIPLES OF SRE 9

Embracing Risk - Service Level Objectives - Monitoring Distributed Systems - Release Engineering – Simplicity - Minimal APIs

UNIT - III EFFECTIVE SRE MANAGEMENT AND PRACTICES 9

Practical Alerting from Time-Series Data - Being On-Call - Effective Troubleshooting - Emergency Response - Learn from the Past - Managing Incidents - Postmortem Culture: Learning from Failure - Tracking Outages - Testing for Reliability - Software Engineering in SRE

UNIT -IV LOAD BALANCING AND CRITICAL STATE MANAGEMENT 9

Load Balancing at the Frontend - Load Balancing in the Datacenter - Handling Overload - Addressing Cascading Failures - Managing Critical State: Distributed Consensus for Reliability - Distributed Periodic Scheduling with Cron - Data Processing Pipelines and Data Integrity

UNIT -V MANAGEMENT OF SRE 9

Accelerating SREs to On-Call and Beyond – Interrupts handling - Embedding an SRE to Recover from Operational Overload - Communication and Collaboration in SRE - Evolving SRE Engagement Model - Availability Table - Collection of Best Practices for Production Services - Example Incident State Document - Example Postmortem - Example Production Meeting Minutes

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the organizational impact of introducing SRE
2. Gain knowledge of how to develop service-level objectives from business objectives
3. Differentiate between service level agreement of user with organizational service level agreement
4. Become familiar with incident and problem analysis.
5. Become familiar with incident and problem analysis.
6. Confirm the scaling processes for better reliability and performance.

TEXT BOOKS:

1. Betsy Beyer, Chris Jones, Niall Richard Murphy, Jennifer Petoff, “Site Reliability Engineering”, O'Reilly Media, Inc., 2016
2. Heather Adkins, Betsy Beyer, Paul Blankinship, Ana Oprea, Piotr Lewandowski, Adam Stubblefield, “Building Secure & Reliable Systems”, 2020
3. Betsy Beyer, Niall Richard Murphy, David K. Rensin, Kent Kawahara and Stephen Thorne, “The Site Reliability Workbook”, 2018

REFERENCES:

1. Enterprise Roadmap to SRE – Google – Site Reliability Engineering - https://static.Googleusercontent.com media/sre.google/en//static/pdf/enterprise-roadmap-to-sre.pdf
2. Anatomy of an Incident - Google - Site Reliability Engineering - https://static.googleusercontent. com/media/sre.google/en//static/pdf/TrainingSiteReliabilityEngineers.pdf
3. Incident Metrics in SRE – Google – Site Reliability Engineering -https://static. googleusercontent.com/media/sre.google/en//static/pdf/IncidentMeticsInSre. pdf

21CS1906	STREAM PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Introduce Data Processing terminology, definition & concepts
- Define different types of Data Processing
- Explain the concepts of Real-time Data processing
- Select appropriate structures for designing and running real-time data services in a business environment
- Illustrate the benefits and drive the adoption of real-time data services to solve real world problems

UNIT - I FOUNDATIONS OF DATA SYSTEMS 9

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

UNIT - II REAL-TIME DATA PROCESSING 9

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage

UNIT - III DATA MODELS AND QUERY LANGUAGES 9

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many- to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT -IV EVENT PROCESSING WITH APACHE KAFKA 9

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API.

UNIT -V REAL-TIME PROCESSING USING SPARK STREAMING 9

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand data Processing terminology, definition & concepts
2. Understand the applicability and utility of different streaming algorithms.
3. Describe and apply current research trends in data-stream processing.
4. Analyze the suitability of stream mining algorithms for data stream systems.
5. Program and build stream processing systems, services and applications.
6. Solve problems in real-world applications that process data streams.

TEXT BOOKS:

1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication,2018
2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media,2017
3. Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing,2017

REFERENCES:

1. https://spark.apache.org/docs/latest/streaming-programming-guide.html
2. Kafka.apache.org

21CS1907	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT - I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT - II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key

UNIT - III ACCESS CONTROL AND IDENTITY MANAGEMENT 9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention

UNIT -IV CLOUD SECURITY DESIGN PATTERNS 9

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

UNIT -V MONITORING, AUDITING AND MANAGEMENT 9

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the cloud concepts and fundamentals.
2. Explain the security challenges in the cloud.
3. Define cloud policy and Identity and Access Management.
4. Design cloud security patterns
5. Understand various risks and audit and monitoring mechanisms in the cloud.
6. Define the various architectural and design considerations for security in the cloud.

TEXT BOOKS:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, “Cloud Computing:, Wiley 2013
2. Dave shackleford, “Virtualization Security, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, “Cloud Security and Privacy, OREILLY 2011

REFERENCES:

1. Mark C. Chu-Carroll “Code in the Cloud,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi,2013

VERTICAL III: EMERGING TECHNOLOGIES

21CS1908	AUGMENTED REALITY/VIRTUAL REALITY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT - I INTRODUCTION 9

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.

UNIT - II VR MODELING 9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT - III VR PROGRAMMING 9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT -IV APPLICATIONS 9

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.

UNIT -V AUGMENTED REALITY 9

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

1. Understand the basic concepts of AR and VR
2. Understand the tools and technologies related to AR/VR
3. Understand the graphical processing units and their architectures.
4. Know the working principle of AR/VR related Sensor devices
5. Design of various models using modeling techniques
6. Develop AR/VR applications in different domains

TEXT BOOKS:

1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018
2. Dieter Schmalstieg, Tobias Hollerer, “Augmented Reality: Principles & Practice”, Addison Wesley, 2016
3. John Vince, “Introduction to Virtual Reality”, Springer-Verlag, 2004.
4. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design”, Morgan Kaufmann, 2003.

21CS1915	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic concepts of Robotic Process Automation.
- To expose to the key RPA design and development strategies and methodologies.
- To learn the fundamental RPA logic and structure.
- To explore the Exception Handling, Debugging and Logging operations in RPA.
- To learn to deploy and Maintain the software bot.

UNIT - I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION 9

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.

UNIT - II AUTOMATION PROCESS ACTIVITIES 9

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

UNIT - III APP INTEGRATION, RECORDING AND SCRAPING 9

App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.

UNIT -IV EXCEPTION HANDLING AND CODE MANAGEMENT 9

Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.

UNIT -V DEPLOYMENT AND MAINTENANCE 9

Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open Source RPA, Future of RPA

TOTAL: 45 PERIODS

OUTCOMES: At the end of this course, the students will be able to

1. Understand the basic concepts of Robotic Process Automation.
2. Enunciate the key distinctions between RPA and existing automation techniques and platforms.
3. Use UiPath to design control flows and work flows for the target process
4. Implement recording, web scraping andprocess mining by automation
5. Use UIPath Studio to detect, and handle exceptions in automation processes
6. Implement and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and processes.

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, 2018.
2. Tom Taulli , “The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems”, Apress publications, 2020.

REFERENCES:

1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
3. A Gerardus Blokdyk, “Robotic Process Automation Rpa A Complete Guide “, 2020

21AD1918	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply autoencoders and generative models for suitable applications.

UNIT - I INTRODUCTION 9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks-Basic Models of Artificial Neural Network-Important Terminologies of ANNs-Supervised Learning Network.

UNIT - II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 9

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT - III THIRD-GENERATION NEURAL NETWORKS 9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT -IV DEEP FEEDFORWARD NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization-VC Dimension and Neural Nets.

UNIT -V RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders, LSTM networks.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Apply Convolution Neural Network for image processing.
2. Understand the basics of associative memory and unsupervised learning networks.
3. Apply CNN and its variants for suitable applications.
4. Analyze the key computations underlying deep learning
5. Use the key computations to build and train deepneural networks for various tasks.
6. Apply autoencoders and generative models for suitable applications.

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Francois Chollet, “Deep Learning with Python”, Second Edition, Manning Publications, 2021.

REFERENCES:

1. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow”, Oreilly, 2018.
2. Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.
3. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Springer International Publishing, 1st Edition, 2018.
4. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
5. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
6. Deep Learning with Python, François Chollet, Manning Shelter Island,2017.
7. S Rajasekaran, G A Vijayalakshmi Pai, “Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.
8. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
9. James A Freeman, David M S Kapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

21IT1915	CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To learn cybercrime and cyber law.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT - I INTRODUCTION 9

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT - II ATTACKS AND COUNTERMEASURES 9

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT - III RECONNAISSANCE 9

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT -IV INTRUSION DETECTION 9

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT -V INTRUSION PREVENTION 9

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL: 45 PERIODS

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

1. Explain the basics of cyber security, cyber crime and cyber law
2. Classify various types of attacks and learn the tools to launch the attacks
3. Apply various tools to perform information gathering
4. Apply intrusion techniques to detect intrusion
5. Apply intrusion prevention techniques to prevent intrusion
6. Design and explore the firewalls to defined networks

TEXT BOOKS:

1. Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021 (Unit 1)
2. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley Publishers, 2011
3. https://owasp.org/www-project-top-ten/

REFERENCES:

1. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013
2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy”, Elsevier, 2011
3. Kimberly Graves, “CEH Official Certified Ethical hacker Review Guide”, Wiley Publishers, 2007
4. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015
5. Georgia Weidman, “Penetration Testing: A Hands-On Introduction to Hacking”, No Starch Press, 2014 (Lab)

21CS1916	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT - I QUANTUM COMPUTING BASIC CONCEPTS 9

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Super positions

UNIT - II QUANTUM GATES AND CIRCUITS 9

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT - III QUANTUM ALGORITHMS 9

Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

UNIT -IV QUANTUM INFORMATION THEORY 9

Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels

UNIT -V QUANTUM CRYPTOGRAPHY 9

Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

TOTAL: 45 PERIODS

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

1. Understand the background of classical computing and quantum computing.
2. Gain knowledge about the basic hardware and mathematical models of quantum computation.
3. Understand the background of Quantum Mechanics.
4. Analyze the computation models
5. Model the circuits using quantum computation,environments and frameworks.
6. Understand the quantum operations such as noise and error–correction.

TEXT BOOKS:

1. Parag K Lala, Mc Graw Hill Education, “Quantum Computing, A Beginners Introduction”, First edition, 2020.
2. Michael A. Nielsen, Issac L. Chuang, “Quantum Computation and Quantum Information”, Tenth Edition, Cambridge University Press, 2010.
3. Chris Bernhardt, The MIT Press; Reprint edition, 2020, “Quantum Computingfor Everyone”.

REFERENCES:

1. Scott Aaronson, “Quantum Computing Since Democritus”, Cambridge University Press, 2013.
2. N. David Mermin, “Quantum Computer Science: An Introduction”, Cambridge University Press, 2007.

21IT1913	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT - I INTRODUCTION TO BLOCKCHAIN 9

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT - II BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT - III BITCOIN CONSENSUS 9

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT -IV HYPERLEDGER FABRIC & ETHEREUM 9

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT -V BLOCKCHAIN APPLICATIONS 9

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

TOTAL: 45 PERIODS

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

1. Understand emerging abstract models for Blockchain Technology
2. Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.

3. Understand the function of Blockchain as a method of securingdistributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
4. Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.
5. Apply security features in blockchain technologies.
6. Be familiar with existing and potential applications of blockchain technology

TEXT BOOKS:

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. 2.Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.

REFERENCES:

1. Daniel Drescher, “Blockchain Basics”, First Edition, Apress, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3. Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015
4. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing, 2018.
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

21CS1913	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT - I 3D GRAPHICS FOR GAME DESIGN 9

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

UNIT - II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

UNIT - III GAME ENGINE DESIGN 9

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding.

UNIT -IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

UNIT -V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.

TOTAL: 45 PERIODS

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

1. Explain the concepts of 2D and 3d Graphics
2. Understand the stages of game development
3. Design game design documents.
4. Implementation of gaming engines.

5. Survey gaming environments and frameworks.
6. Implement a simple game in Pygame.

TEXT BOOKS:

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley,2013.
2. David H. Eberly, “3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics”, Second Edition, CRC Press,2006.
3. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress,2007.

REFERENCES:

1. Paul Craven, “Python Arcade games”, Apress Publishers,2016.
2. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 2011.

21CS1917	3D PRINTING AND DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To discuss on basics of 3D printing
- To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To explain and illustrate laser technology
- To discuss the applications of 3D printing

UNIT - I INTRODUCTION 9

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNIT - II 3D PRINTING PRINCIPLES 9

Processes – Extrusion, Wire, Granular, Lamination, Photopolymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations;

UNIT - III INKJET TECHNOLOGY 9

Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continous jet, Mulitjet; Powder based fabrication – Colourjet.

UNIT -IV LASER TECHNOLOGY 9

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures;

UNIT -V INDUSTRIAL APPLICATIONS 9

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of this course, the students will be able to:

1. Outline and examine the basic concepts of 3D printing technology
2. Explain the principles of 3D printing technique
3. Outline 3D printing workflow
4. Explain and categorize the concepts and working principles of 3D printing using inkjet technique

5. Explain and categorize the working principles of 3D printing using laser technique
6. Explain various method for designing and modeling for industrial applications

TEXT BOOKS:

1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.

REFERENCES:

1. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010
2. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007
3. Joan Horvath, Mastering 3D Printing, APress, 2014

VERTICAL IV ARTIFICIAL INTELLIGENCE TECHNIQUES

21AD1923	KNOWLEDGE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

UNIT - I REASONING UNDER UNCERTAINTY 9

Introduction – Propositional Logic - Predicate logic - Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering.

UNIT - II METHODOLOGY AND MODELING 9

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios

UNIT - III ONTOLOGIES – DESIGN AND DEVELOPMENT 9

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.

UNIT -IV REASONIING WITH ONTOLOGIES AND RULES 9

Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNIT -V LEARNING AND RULE LEARNING 9

.Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definitionof Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Inference Systems - Case study : AHP Approach. Overview – Rule Generation and Analysis – Hypothesis Learning.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basics of Knowledge Engineering.
2. Understand different reasoning concepts related to uncertainty
3. Apply methodologies and modelling for Agent Design and Development.
4. Design and develop ontologies.
5. Apply reasoning with ontologies and rules.
6. Understand learning and rule learning.

TEXT BOOKS:

1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016.

REFERENCES:

1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning,Morgan Kaufmann, 2004.
2. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.
3. John F. Sowa: Knowledge Representation: Logical, Philosophical, and ComputationalFoundations, Brooks/Cole, Thomson Learning, 2000.
4. King , Knowledge Management and Organizational Learning , Springer, 2009.
5. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1stEdition,2001.

21AD1903	SOFT COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on humanexperience.
- To provide the mathematical background for carrying out the optimization associated withneural network learning
- To learn various evolutionary Algorithms.
- To become familiar with neural networks that can learn from available examples andgeneralize to form appropriate rules for inference systems.
- To introduce case studies utilizing the above and illustrate the Intelligent behavior ofprograms based on soft computing

UNIT - I INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC 9

Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, FuzzyInference Systems - Case study : AHP Approach.

UNIT - II NEURAL NETWORKS 9

Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks– CNN.

UNIT - III GENETIC ALGORITHMS 9

Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function– maximizing a function program - Case study: Job scheduling.

UNIT -IV NEURO FUZZY MODELING 9

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability- Two input sine function- three input non linear function.

UNIT -V APPLICATIONS 9

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction- Hybrid Approach.

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the fundamentals of fuzzy logic operators and inference mechanisms
2. Understand the mathematical background for carrying out the optimization associated with neural network learning

3. Understand neural network architecture for AI applications such as classification and clustering
4. Understand neural network architecture for AI applications such as classification and clustering
5. Learn the functionality of Genetic Algorithms in Optimization problems
6. Use hybrid techniques involving Neural networks and Fuzzy logic
7. Apply soft computing techniques in real world applications

TEXT BOOKS:

1. Sajang, J.-S. R., Sun, C.T., & Mizutani, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python Case Studies and Applications from the Industry, Apress, 2020

REFERENCES:

1. Roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications,1st Edition, McGraw Hill, 2018.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI,2003.
3. Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and GeneticAlgorithms, Pearson Education, 2013.
4. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India PvtLtd, 2019.
5. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, APProfessional, Boston, 1996.

21AD1919	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Understand natural language processing basics
- Apply classification algorithms to text documents
- Build question-answering and dialogue systems
- Develop a speech recognition system
- Develop a speech synthesizer

UNIT - I NATURAL LANGUAGE BASICS 9

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – FeatureEngineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model

UNIT - II TEXT CLASSIFICATION 9

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models.

UNIT - III QUESTION ANSWERING AND DIALOGUE SYSTEMS 9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -– evaluating dialogue systems.

UNIT -IV TEXT-TO-SPEECH SYNTHESIS 9

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTSsystems

UNIT -V AUTOMATIC SPEECH RECOGNITION 9

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems

OUTCOMES:

On successful completion of the course student will be able to:

1. Explain existing and emerging deep learning architectures for text and speech processing
2. Apply deep learning techniques for NLP tasks, language modelling and machine translation
3. Explain coreference and coherence for text processing
4. Build question-answering systems, chatbots and dialogue systems
5. Apply deep learning models for building speech recognition
6. Apply deep learning models for building text-to-speech systems

TEXT BOOKS:

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022.
2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python Case Studies and Applications from the Industry, Apress, 2020.

REFERENCES:

1. Dipanjan Sarkar, “Text Analytics with Python: A Practical Real-World approach to GainingActionable insights from your data”, APress,2018.
2. Tanveer Siddiqui, Tiwary U S, “Natural Language Processing and Information Retrieval”,Oxford University Press, 2008.
3. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, “Fundamentals of SpeechRecognition” 1st Edition, Pearson, 2009
4. Steve Steven Bird, Ewan Klein, and Edward Loper, “Natural language processing with Python”,O’REILLY.

21AD1924	OPTIMIZATION TECHNIQUES IN MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To formulate and solve linear programming problems
- To understand and analyze how to deal with changing data.
- To identify and interpret potential unintended effects in the project.
- To understand and define procedures to operationalize the machine learning model
- To maintain the applied machine learning model.

UNIT - I INTRODUCTION 9

What is optimization, Formulation of LPP, Solution of LPP: Simplex method, Basic Calculus for optimization: Limits and multivariate functions, Derivatives and linear approximations: Single variate functions and multivariate functions.

UNIT - II MACHINE LEARNING STRATEGY 9

ML readiness, Risk mitigation, Experimental mindset, Build/buy/partner, setting up a team, Understanding and communicating change.

UNIT - III RESPONSIBLE MACHINE LEARNING 9

AI for good and all, Positive feedback loops and negative feedback loops, Metric design and observing behaviours, Secondary effects of optimization, Regulatory concerns.

UNIT -IV MACHINE LEARNING IN PRODUCTION AND PLANNING 9

Integrating info systems, users break things, time and space complexity in production, when to retain the model- Logging ML model versioning, Knowledge transfer, Reporting performance to stakeholders.

UNIT -V CARE AND FEEDING OF MACHINE LEARNING MODEL 9

MLPL Recap, Post deployment challenges, QUAM monitoring and logging, QUAM Testing, QUAM maintenance, QUAM updating, Separating Datastack from Production, Dashboard Essentials and Metrics monitoring.

OUTCOMES:

On successful completion of the course student will be able to:

1. Formulate and solve linear programming problems
2. Understand and analyze how to deal with changing data.
3. Understand and interpret potential unintended effects in their project.
4. Understand and define procedures to operationalize the applied machine learning model.
5. Understand and define procedures to maintain the applied machine learning model.

6. Understand how to optimize the use of Machine Learning in real-life problems.

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.

2. Jeeva Jose, Introduction to Machine Learning, Khanna BookPublishing, 2020.

3. Optimization in Machine Learning and Applications, Suresh Chandra Satapathy, Anand J. Kulkarni, Springer, 2019.

REFERENCES:

1. Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill,2017.

2. Optimization for Machine Learning, Suvrit Sra, Sebastian Nowozin and Stephen J. Wright, MIT Press, 2011.

3. Algorithms for Optimization by Mykel J. Kochenderfer and Tim A. Wheeler, MIT Press, 2019.

4. Accelerated Optimization for Machine Learning: First-Order Algorithms by Cong Fang, Huan Li,and Zhouchen Lin, Springer, 2020.

21AD1916	GAME THEORY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate,including electronic trading markets.
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in 41odeIling applications.
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.
- To apply game theory in searching, auctioning and trading.

UNIT - I INTRODUCTION 9

Introduction — Making rational choices: basics of Games — strategy — preferences — payoffs — Mathematical basics — Game theory — Rational Choice — Basic solution concepts-non- cooperative versus cooperative games — Basic computational issues — finding equilibria and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).

UNIT - II GAMES WITH PERFECT INFORMATION 9

Games with Perfect Information — Strategic games — prisoner's dilemma, matching pennies - Nash equilibria —mixed strategy equilibrium — zero-sum games.

UNIT - III GAMES WITH IMPERFECT INFORMATION 9

Games with Imperfect Information — Bayesian Games — Motivational Examples — General Definitions — Information aspects — Illustrations — Extensive Games with Imperfect — Information — Strategies — Nash Equilibrium —Repeated Games — The Prisoner's Dilemma — Bargaining

UNIT -IV NON-COOPERATIVE GAME THEORY 9

Non-cooperative Game Theory — Self-interested agents — Games in normal form — Analyzing games: from optimality to equilibrium — Computing Solution Concepts of Normal — Form Games -Computing Nash equilibria of two-player, zero-sum games —Computing Nash equilibria of two- player, general- sum games — Identifying dominated strategies

UNIT -V MECHANISM DESIGN 9

Aggregating Preferences — Social Choice — Formal Model — Voting — Existence of social functions -Ranking systems — Protocols for Strategic Agents: Mechanism Design — Mechanism design withunrestricted preferences.

OUTCOMES:

On successful completion of the course student will be able to:

1. Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.

2. Formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in mmodeling applications.

3. Discuss the use of Nash Equilibrium for other problems.

4. Identify key strategic aspects and be able to connect them to appropriate theoretic concepts given a real world situation.

5. Identify some applications that need aspects of Bayesian Games.

6. Implement a typical Virtual Business scenario using Game theory.

TEXT BOOKS:

1. M. J. Osborne, An Introduction to Game Theory. Oxford University Press, 2012.

2. M. Machler, E. Solan, S. Zamir, Game Theory, Cambridge University Press, 2013.

3. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, Algorithmic Game Theory. Cambridge University Press, 2007.

4 A.Dixit and S. Skeath, Games of Strategy, Second Edition. W W Norton & Co Inc, 2004.

5 YoavShoham, Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic,and Logical Foundations, Cambridge University Press 2008.

REFERENCES:

1. Zhu Han, DusitNiyato, WalidSaad, TamerBasar and Are Hjorungnes, “Game Theory in Wireless and Communication Networks”, Cambridge University Press, 2012.

2. Y.Narahari, “Game Theory and Mechanism Design”, IISC Press, World Scientific.

3. William Spaniel, “Game Theory 101: The Complete Textbook”, CreateSpace IndependentPublishing, 2011.

21AD1917	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know the theoretical background of cognition.
- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition.

UNIT - I PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE 9

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing –Cognitive Neuroscience – Perception – Decision – Learning and Memory- Language Understanding and Processing.

UNIT - II COMPUTATIONAL INTELLIGENCE 9

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language-Vision.

UNIT - III PROBABILISTIC PROGRAMMING LANGUAGE 9

WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations –Enumeration.

UNIT -IV INFERENCE MODELS OF COGNITION 9

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence-Data Analysis – Algorithms for Inference.

UNIT -V LEARNING MODELS OF COGNITION 9

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models–Learning (Deep) Continuous Functions – Mixture Models.

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the underlying theory behind cognition.

2. Connect to the cognition elements to computational intelligence.

3. Explore probabilistic programming language.

4. Implement mathematical functions through WebPPL.

5. Develop applications using cognitive inference model.

6. Develop applications using cognitive learning model.

TEXT BOOKS:

1. Vijay V Raghavan,Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016.

2. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big DataAnalytics, Wiley Publications, 2015

3. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences",The MITPress, 1999.

4 Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind,Cambridge University Press 2020

REFERENCES:

1. Noah D. Goodman, Andreas Stuhlmuller, "The Design and Implementation of ProbabilisticProgramming Languages", Electronic version of book, https://dippl.org/.

2. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic Models of Cognition", Second Edition, 2016, https://probmods.org/.

21AD1907	ETHICS AND AI	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the need for ensuring ethics in AI
- To understand ethical issues with the development of AI agents
- To apply the ethical considerations in different AI applications
- To evaluate the relation of ethics with nature
- To overcome the risk for Human rights and other fundamental values
- To understand ethics in all AI applications

UNIT - I INTRODUCTION TO ETHICS OF AI 9

Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities, Ethics of AI and big data.

UNIT - II FRAMEWORK AND MODELS 9

AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral.

UNIT - III CONCEPTS AND ISSUES 9

Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder, Trust and Transparency.

UNIT -IV PERSPECTIVES AND APPROACHES 9

Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents, Deep learning values.

UNIT -V CASES AND APPLICATION 9

Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics, Chatbots.

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the ethical issues in the development of AI agents

2. Learn the ethical considerations of AI with perspectives on ethical values

3. Apply the ethical policies in AI based applications and Robot development

4. To implement the AI concepts to societal problems by adapting the legal concepts by
securing fundamental rights
5. Overcome the evil genesis in the concepts of AI.
6. To apply ethics in all AI applications

TEXT BOOKS:

1. Paula Boddington, “Towards a Code of Ethics for Artificial Intelligence”, Springer, 2017
2. Markus D. Dubber, Frank Pasquale, Sunit Das, “The Oxford Handbook of Ethic of AI”, Oxford University Press Edited book, 2020.

REFERENCES:

1. S. Matthew Liao, “Ethics of Artificial Intelligence”, Oxford University Press Edited Book, 2020
2. N. Bostrom and E. Yudkowsky. “The ethics of artificial intelligence”. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
3. Wallach, W., & Allen, C, “Moral machines: ceaching robots right from wrong”, Oxford University Press, 2008.

VERTICAL V MANAGEMENT

21CB1901	CUSTOMER RELATION MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To Learn the fundamentals of strategic and operational of CRM
- To understand operational methods of CRM
- To understand different analytical methods of CRM to enhance customer experience.
- To Learn the fundamentals of analytical CRM
- To Understand and apply the elements and tools of CRM to manage customer portfolios

UNIT - I UNDERSTANDING CUSTOMER RELATIONSHIPS 9

CRM definition and constituencies, understanding and misunderstanding CRM, the social CRM fit, commercial contexts, the third sector- not-for-profit, CRM models. Relationship quality, customer lifetime value, relationships with customers and suppliers.

UNIT - II STRATEGIC CRM 9

Customer portfolio management (CPM) - Customer portfolio, basic disciplines of CPM, CPM in B2B context, CPM models, tools for CPM, strategically significant customers, seven core customermanagement strategies.

UNIT - III OPERATIONAL CRM 9

Sales force automation (SFA) – SFA and its ecosystem, SFA software functionality, SFA adaptation. Marketing automation (MA) – definition of MA, benefits and software applications. Service Automation (SA) –customer service definition, modelling service quality, software for SA, benefits of SA.

UNIT -IV ANALYTICAL CRM 9

Customer database management –corporate customer data, structured and uunstructured data, developing a customer database, data – integration, warehousing and marts in the CRM context,knowledge management, Analytics for – CRM strategy and tactics, customer lifecycle, structured and unstructured data, Big data analytics in CRM, analytical insights.

UNIT -V MANAGING CUSTOMER EXPERIENCE AND VALUE 9

Understanding Value and when do customers experience value, Modelling customer- perceived value, Sources of customer value, Value through the marketing mix, Customization for customer value. Understanding customer experience and concepts, how to manage customer experience, CRM vs CEM, Use of CRM software in CEM.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Define and explain the concept of customer relationship management (CRM), to build and maintain relationships with customers.
- Define and explain the concept of customer lifetime value (CLV), by measuring long- term value of customers to a business.
- Define and explain the concept of customer portfolio management in driving customer-centric strategies.
- Measure the effectiveness of sales and service automation tools, to continuously improve sales and service processes.
- Design and implement data collection processes that are optimized for analytical CRM, including identifying and capturing key customer data fields.
- Map the customer journey to design an effective customer experience that meets customer needs and expectations.

TEXT BOOKS:

1. Buttle Francis and Maklan Stan, Customer Relationship Management – Concepts and Technologies, Special Indian edition, Fourth edition, Routledge, 2019.

2. Gerardus Blokdyk, Customer Relationship Management – A complete guide 2020 edition,5starcooks, 2019.

REFERENCES:

1. Henry Assael, Consumer Behavior, Cengage Learning, 6th Edition, 2008

2. Kumar, Customer Relationship Management - A Database Approach, Wiley India, 2012.

3. Kumar and Werner Reinartz, Customer Relationship Management, Concept, Strategy and Tools, Springer 2018.

4. Zikmund, Customer Relationship Management, Wiley 2012

5. G. Shainesh, J. Jagdish N Seth. Customer Relationship Management : EmergingConcepts, Tools and Application, McGraw Hill Education, 2017.

21AD1920	BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for Analytics.
- To apply analytics for different functions of a business

UNIT - I INTRODUCTION TO BUSINESS ANALYTICS 9

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration.

UNIT - II BUSINESS INTELLIGENCE 9

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence – OLAP – Analytic functions**.**

UNIT - III BUSINESS FORECASTING 9

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models –Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.

UNIT -IV HR & SUPPLY CHAIN ANALYTICS 9

Human Resources – Planning and Recruitment – Training and Development - Supply chain network. Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain Applying HR Analytics to make a prediction of the demand for hourly employees for a year..

UNIT -V MARKETING & SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Explain the real world business problems and model with analytical solutions.
- Explain the real world business problems and model with analytical solutions.
- Identify the business processes for extracting Business Intelligence

- Apply predictive analytics for business fore-casting
- Apply analytics for supply chain and logistics management
- Use analytics for marketing and sales.

TEXT BOOKS:

1. R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017.
2. N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley,2016.
3. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016.
4. VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.
5. Mahadevan B, "Operations Management -Theory and Practice",3rd Edition, Pearson Education,2018.

21CB1902	FINANCIAL MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the fundamental concepts of financial management
- To understand valuation of securities.
- To analyse operating and financial leverages.
- To comprehend and apply the concepts of capital budgeting.
- To understand cash management

UNIT - I INTRODUCTION 9

Introduction: Introduction to Financial Management - Goals of the firm – Financial Environments Time Value of Money: Simple and Compound Interest Rates, Amortization, Computing more that once a year, Annuity Factor.

UNIT - II VALUATION OF SECURITIES 9

Valuation of Securities: Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM. Risk & Return: Defining Risk and Return, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM).

UNIT - III OPERATING & FINANCIAL LEVERAGE 9

Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study. Cost of Capital: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Costof Capital 4L.

UNIT -IV CAPITAL BUDGETING 9

Capital Budgeting: The Capital Budgeting Concept & Process - Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods. Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix),Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

UNIT -V CASH MANAGEMENT 9

Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down, Cash payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring. Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the role and importance of financial management and environment in the success of an organization.
- Apply valuation of securities and calculate the risk & return in portfolio management
- Understand the concepts of operating and financial leverage and their importance in financial decision-making.
- Understand the impact of capital budgeting decisions on financial performance and shareholder value.
- Apply the concept of working capital and its importance in financial decision-making.
- Learn about different types of cash inflows and outflows, including operating activities, investing activities, and financing activities.

TEXT BOOKS:

1. M.Y. Khan and P.K.Jain Financial management, Text, Problems and cases Tata McGrawHill, 8th edition, 2017.
2. I M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 11th edition, 2018

REFERENCES:

1. Chandra, Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill, 2007.
2. Srivastava, Misra: Financial Management, OUP, 2011.
3. Van Horne and Wachowicz : Fundamentals of Financial Management, Prentice Hall/ Pearson Education.
4. Financial Management: Theory & Practice: by Brigham and Ernhardt, 14th edition, Cengage, 2015.

21CB1903	SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce the student to the notion of a game, its solutions concepts, and other basic
- To understand the importance of supply chain management
- To learn decisions in supply chain management for gaining competitive advantage
- To design supply chain networks to enhance supply chain performance
- To plan demand based on inventory and supply
- To understanding the role of logistics in supply chain performance

UNIT - I INTRODUCTION 9

Supply Chain – Fundamentals, Evolution, Role in Economy, Importance, Decision Phases Enablers & Drivers of Supply Chain Performance; Supply chain strategy; Supply chain performance Measures.

UNIT - II SUPPLY CHAIN NETWORK 9

Distribution Network Design – Role in supply chain, Influencing factors, design options, Online sales and distribution network, Distribution Strategies; Network Design in supply chain Role, influencing factors, framework for network design, Impact of uncertainty on Network Design.

UNIT - III PLANNING DEMAND, INVENTORY AND SUPPLY 9

Managing supply chain cycle inventory and safety inventory - Uncertainty in the supply chain, Analyzing impact of supply chain redesign on the inventory, Risk Pooling, Managing inventory for short life-cycle products, Pricing and Revenue Management.

UNIT -IV LOGISTICS 9

Transportation – Role, Modes and their characteristics, infrastructure and policies, transport documentation, design options, trade-offs in transportation design, intermodal transportation. Logistics outsourcing – catalysts, benefits, value proposition. 3PL, 4PL,5PL, 6PL.

UNIT -V SUPPLY CHAIN INNOVATIONS 9

. Supply Chain Integration, SC process restructuring, IT in Supply Chain; Agile Supply chains Legible supply chain, Green Supply Chain, Reverse Supply chain; Supply chain technology trends AI, Internet of Things, roboticprocess automation, immersive technologies, Supply Chain Management in Government.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the concept of supply chain management and its importance in business operations.
- Learn decisions in supply chain management for gaining competitive advantage
- Understand the basic concepts of distribution network design in the context of supply chain management.
- Familiar about various types of inventories which includes cycle and safety inventory
- Understand the role of logistics in supply chain performance
- Gain Knowledge of emerging technologies and trends in supply chain innovation, such as blockchain, artificial intelligence, and the Internet of Things (IoT).

TEXT BOOKS:

1. Sunil Chopra, Peter Meindl, Supply Chain Management – Strategy Planning and Operation, Pearson Education, Sixth Edition, 2016.
2. Altekar, Rahul V.; Supply Chain Management: Concepts and Cases; Abhishek Pattnaik- A3JUPFIUV225R4 ,2012 .

REFERENCES:

1. Janat Shah, Supply Chain Management – Text and Cases, Pearson Education,2hd edition ,2016.
2. Ballou Ronald H,Business Logistics and Supply Chain Management, Pearson Education, 5th Edition, 2007.

		L	T	P	C
21CB1904	**IT PROJECT MANAGEMENT**	**3**	**0**	**0**	**3**

OBJECTIVES: To impart Knowledge on the following topics:

- To learn the concepts of managing IT projects.
- To learn more about planning
- To understand resource allocation, control, and completion
- To learn software quality management
- To understand budgeting and scheduling

UNIT - I INTRODUCTION TO PROJECT MANAGEMENT 9

Project Management – Definition –Goal - Lifecycles. Project Selection Methods. Project Portfolio Process – Project Formulation. Project Manager – Roles-Responsibilities and Selection – Project Teams, Project support activities, Types of project organizations.

UNIT - II PLANNING AND BUDGETING 9

The Planning Process – Work Break down Structure – Role of Multidisciplinary teams, Critical path analysis. Budget the Project – Methods. Cost Estimating and Improvement. Budget uncertainty and risk management.

UNIT - III SCHEDULING & RESOURCE ALLOCATION 9

PERT & CPM Networks - Crashing – Project Uncertainty and Risk Management – Simulation – Gantt Charts – Expediting a project – Resource loading and leveling. Allocating scarce resources - Goldratt's Critical Chain,Case Study .

UNIT -IV CONTROL AND COMPLETION 9

The Plan-Monitor-Control cycle – Data Collecting and reporting – Project Control – Designing thecontrol system. Project Evaluation, Earned Value Analysis, Auditing and Termination, Risk Management, – Conflict – Origin & Consequences. Managing conflict – Team methods for resolving conflict

UNIT -V SOFTWARE QUALITY MANAGEMENT 9

Product quality and software quality, Software metrics , quality management systems, principles and features, System quality specification and measurement, Process and product quality approaches, Quality assurance and quality control, project audit and quality audit, Methods of enhancing quality: the different types of testing, inspections, reviews, standards, Management and control of testing

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic concepts of project management and the project lifecycle.
2. Familiarity with various project planning and budgeting techniques.
3. Familiarize about the importance of project scheduling and resource allocation in the project management process.
4. Develop and implement a project control plan that aligns with project objectives and constraints.
5. Understand the nature of conflict in project management and the impact it can have on project outcomes.
6. Ability to design and implement a software quality management plan, including software testing, quality assurance, and quality control.

TEXT BOOKS:

1. Jack R.Meredith, Samuel J.Mentel Jr. Project Management - A Managerial Approach, John Wiley & Sons , Inc.,7th edition, 2010

REFERENCES:

1. Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 2005.
2. John M. Nicholas, Project Management for Business and Technology - Principles and Practice,Second Edition, Pearson Education, 2006.
3. Hughes B, Project Management for IT-related Projects. BCS Publications, 2012.
4. Gido and Clements, Successful Project Management, Second Edition, Thomson Learning,2003.
5. Harvey Maylor, Project Management, Third Edition, Pearson Education, 2006.

		L	T	P	C
21CB1905	**ENTREPRENEURSHIP DEVELOPMENT**	**3**	**0**	**0**	**3**

OBJECTIVES: To impart Knowledge on the following topics:

- To equip and develop the learners entrepreneurial skills and qualities essential to undertakebusiness.
- To impart the learners entrepreneurial competencies needed for managing business efficientlyand effectively.

UNIT - I ENTREPRENEURAL COMPETENCE 9

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful Entrepreneurs – Knowledge and Skills of an Entrepreneur.

UNIT - II ENTREPRENEURAL ENVIRONMENT 9

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations.

UNIT - III BUSINESS PLAN PREPARATION 9

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital Budgeting- Project Profile Preparation - Matching Entrepreneur with theProject - Feasibility Report Preparation and Evaluation Criteria.

UNIT -IV LAUNCHING OF SMALL BUSINESS 9

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Finance and Human Resource Mobilisation - Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Venture capital, Start-ups.

UNIT -V MANAGEMENT OF SMALL BUSINESS 9

Monitoring and Evaluation of Business - Business Sickness - Prevention and Rehabilitation of Business Units - Effective Management of small Business - Case Studies.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understanding the key concepts and principles of entrepreneurship, including the entrepreneurial mindset, creativity, and innovation.
2. Identify and evaluate opportunities in the entrepreneurial environment, including market trends, industry analysis, and competitive landscape.
3. Understanding the role of government policies and regulations in promoting entrepreneurial development and growth.
4. Prepare business plans and undertake feasible projects
5. Develop their business ventures successfully**.**
6. Develop and implement a preventive plan for a business unit, including risk assessment, contingency planning, and resource allocation.

TEXT BOOKS:

1. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi,2016.
2. R.D.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2018.

REFERENCES:

1. Rajeev Roy ,Entrepreneurship, Oxford University Press, 2nd Edition, 2011.
2. Donald F Kuratko,T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning,2012.
3. Dr. Vasant Desai, “Small Scale Industries and Entrepreneurship”, HPH,2006.
4. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews,Tata McGraw-Hill, 8th edition ,2017.

		L	T	P	C
21CB1906	**BUSINESS STRATEGY MANAGEMENT**	**3**	**0**	**0**	**3**

OBJECTIVES: To impart Knowledge on the following topics:

- Determine the concept and process of strategic management.
- Analyze the internal and external environment.
- Formulation of strategies, implementation and evaluation of strategies.
- The course will cover case studies and latest business events

UNIT - I INTRODUCTION TO STRATEGIC MANAGEMENT 9

Importance of Strategic Management - Vision and Objectives - Schools of thought in strategic management - Strategy Content, Process, and Practice - Fit Concept and Configuration perspective in Strategic Management.

UNIT - II INTERNAL ENVIRONMENT OF FIRM- RECOGNIZING A FIRM'S INTELLECTUAL ASSETS 9

Core Competence as the Root of Competitive Advantage - Sources of Sustained Competitive Advantage - Business Processes and Capabilities-based Approach to Strategy.

UNIT - III EXTERNAL ENVIRONMENTS OF FIRM- COMPETITIVE STRATEGY 9

Five Forces of Industry Attractiveness that Shape Strategy - The concept of Strategic Groups, and Industry Life Cycle - Generic Strategies - Generic Strategies and the Value Chain.

UNIT -IV CORPORATE STRATEGY AND GROWTH STRATEGIES 9

The Motive for Diversification - Related and Unrelated Diversification - Business Portfolio analysis Expansion, Integration and Diversification - Strategic Alliances, Joint Ventures, and Mergers & Acquisitions Ventures, and Mergers & Acquisitions.

UNIT -V STRATEGY IMPLEMENTATION: STRUCTURE AND SYSTEMS 9

The 7S Framework - Strategic Control and Corporate Governance - New Business Models and strategies for Internet Economy – Strategic Management in the current scenario of a globalized economy.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Become familiar with both internal and external environment. They would also become familiar with corporate and growth strategies, appreciate implementation of such strategies

2. Learn the fundamental concepts of strategic management to analyse business situations and apply these concepts to solve business problems.

3. Understand the fundamental principles of and interrelationships among business functions such as: R&D, production, marketing, finance, and HR and information technology.

4. Apply the inter-relationships of business to individuals, other organizations, government and society.

5. Analyze complex, unstructured qualitative and quantitative problems, using appropriate tools.

6. Enhances the cognitive knowledge about various strategic issues and development of new business models.

TEXT BOOKS:

1. Robert M. Grant, Contemporary Strategic Management, Blackwell, 7th Edition,2012.

2. D N Dwivedi, Managerial Economics, 8th Edition, Vikas Publishing House, 2018.

REFERENCES:

1. Richard Rumelt, Competitive Advantage, 2011.

2. Kazmi, Azhar, Business Policy and Strategic Management, Third Edition, Tata McGrawhill, New Delhi, 2008.

21CB1907	BEHAVIORAL ECONOMICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To introduce students to the fundamental principles and theories of Behavioral Economics, including the challenges and limitations of traditional economic models
- To help students to develop critical thinking skills and analytical tools for assessing the validity and relevance of behavioral economics research and applications in different contexts.
- To foster skills in designing and conducting behavioural experiments to test economic hypotheses and theories, as well as analyzing and interpreting experimental data.
- To encourage students to think creatively and independently, and to generate their own research questions and hypotheses in the field of behavioral economics.

UNIT - I INTRODUCTION 9

Origin, scope and importance of behavioural economics; Decision-making theories Neo-classical economics – rationality assumption, optimization Origin of Behavioural economics – Bounded Rationality, Rationality in Psychology and Economics by H. Simon Duel System theory, Prospect theory

UNIT - II BEHAVIOURAL ECONOMICS OF RISK, UNCERTAINTY AND AMBIGUITY 9

Heuristics and biases in judgement and decision making – Biases programme-Representativeness, Availability, Anchoring and adjustment, mental accounting Biases: Overconfidence, Confirmation bias, Framing, Status Quo Bias, Endowment Bias, Self-Control Bias Fallacies: conjunction and disjunction fallacies, gambler's fallacies

UNIT - III BEHAVIOURAL TIME DISCOUNTING 9

Evidence on temporal human choice – discounted utility model, exponential discounted utility model and its anomalies; Behavioural models of time discounting – sign and magnitude effects, common difference effect, attribute-based models, reference time theory; Some applications of present-biased preferences.

UNIT -IV STRATEGIC INTERACTION 9

Evidence on strategic human choice; Different models of behavioural game theory; Some applications of behavioural game theory; Modelling social preferences – inequality-aversion models, reciprocity models, etc.

UNIT -V APPLICATIONS OF BEHAVIOURAL ECONOMICS 9

Introduction to Behavioural Labour Economics, Behavioral Finance Taxation and the contribution of Behavioural Economics Choice architecture: The role of nudging Public Policies: Psychological and social perspectives on policy in the area of Poverty, Health, Climate Change.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Become familiar with selected important contributions to behavioral economics.
2. Understand the concept and significance of heuristics and biases in decision- making.
3. Recognize and avoid fallacies in argumentation and reasoning, including the use of logical frameworks and evidence-based arguments.
4. Familiarize with the key theoretical frameworks and empirical findings in behavioral economics that relate to time discounting.
5. Understand the basic concepts of game theory and how it relates to strategic interaction.
6. Design and conduct experiments to test hypotheses related to behavioral economics application.

TEXT BOOKS:

1. Nick Wilkinson; Matthias Klaes (2012), An Introduction to Behavioral Economics, 2nd Edition, Palgrave Macmillan.
2. Colin F. Camerer, George Loewenstein, Matthew Rabin (ed.) (2004), Advances in Behavioral Economics, Princeton University Press**.**

REFERENCES:

1. Altman, Morris (ed.), Handbook of Contemporary Behavioral Economics, M.E. Sharpe, New York, 2006.
2. Wilkinson, Nick and Matthias Klaes, An Introduction to Behavioral Economics, 2nd edition, Palgrave Macmillan, 2012.
3. Angner, Eric, A Course in Behavioral Economics, Palgrave Macmillan, 2016.
4. Dhami, Sanjit, The Foundations of Behavioral Economics, Oxford University Press, 2016.
5. Nermend, Kesra and Malgorzata Latuszynska (eds.), Problems, Methods and Tools in Experimental and Behavioral Economics, Springer, 2017.
6. Cartwright, Edward, Behavioral Economics, 3rd edition, Routledge, 2018.
7. Corr, Philip and Anke Plagnol, Behavioral Economics: The Basics, Routledge, 2019.
8. Abdukadirov, Sherzod (eds.), Nudge Theory in Action: Behavioral Design in Policy and Markets, Palgrave Macmillan, 2016.

VERTICAL VI MARKETING

		L	T	P	C
21CB1908	FINANCIAL ANALYTICS	3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand modern analytical tools that specifically target finance applications.
- To understand different management aspects
- To learn financial analysis for decision making
- To understand human resource management
- To learn different business strategy

UNIT - I CORPORATE FINANCE ANALYSIS 9

Basic corporate financial predictive modelling- Project analysis- cash flow analysis- cost ofcapital, Financial Break even modelling, Capital Budget model-Payback, NPV, IRR.

UNIT - II FINANCIAL MARKET ANALYSIS 9

Estimation and prediction of risk and return (bond investment and stock investment) –Timeseries-examining nature of data, Value at risk

UNIT - III PORTFOLIO ANALYSIS 9

Portfolio Analysis – capital asset pricing model, Sharpe ratio, Option pricing models- binomial model for options, Black Scholes model and Option implied volatility.

UNIT -IV TECHNICAL ANALYSIS 9

Prediction using charts and fundamentals – RSI, ROC, MACD, moving average and candle charts, simulating trading strategies. Prediction of share prices.

UNIT -V CONTROLLING 9

Credit Risk analysis- Data processing, Decision trees, logistic regression and evaluating credit risk model.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basic concepts of predictive modeling and how it applies to corporate finance.
2. Understand the concept of risk and return and their relationship in investment management.
3. Ability to identify and evaluate investment opportunities and construct a diversified investment portfolio
4. Understanding of the role of implied volatility in option pricing, and the use of option prices to infer the implied volatility.
5. Familiarize with different types of charts and technical indicators used in technical analysis
6. Understand the concept of credit risk and its importance in lending and investing decisions.

TEXT BOOKS:

1. Financial analytics with R by Mark J. Bennett, Dirk L. Hugen, Cambridge university press,2016
2. Haskell Financial Data Modeling and Predictive Analytics Paperback – Import, 25 Oct 2013 by Pavel Ryzhov.

REFERENCES:

1. Quantitative Financial Analytics: The Path To Investment Profits Paperback –Import, 11 Sep 2017 by Edward E Williams (Author), John A Dobelman.
2. Python for Finance - Paperback – Import, 30 Jun 2017 by Yuxing Yan (Author).
3. Mastering Python for Finance Paperback – Import, 29 Apr 2015 by James Ma Weiming.

21AD1902	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system.
- To learn collaborative filtering

UNIT - I INTRODUCTION 9

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

UNIT - II CONTENT-BASED RECOMMENDATION SYSTEMS 9

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT - III COLLABORATIVE FILTERING 9

A systematic approach, Nearest-neighbour collaborative filtering (CF), user-based and item-based CF, components of neighbourhood methods (rating normalization, similarity weight computation and neighbourhood selection)

UNIT -IV ATTACK-RESISTANT RECOMMENDER SYSTEMS 9

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack –Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

UNIT -V EVALUATING RECOMMENDER SYSTEMS 9

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design Design Issues – Accuracy metrics – Limitations of Evaluation measures

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the basic concepts of recommender systems.
- Implement machine-learning and data-mining algorithms in recommender systems data sets.
- Implement Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
- Design and implement a simple recommender system.
- Learn about advanced topics of recommender systems.
- Learn about advanced topics of recommender systems applications

TEXT BOOKS:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.

2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.

3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 1st edition,Springer (2011),

4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rdedition, Cambridge University Press, 2020.

		L	T	P	C
21CS1911	**DIGITAL MARKETING**	**3**	**0**	**0**	**3**

OBJECTIVES: To impart Knowledge on the following topics:

- To examine and explore the role and importance of digital marketing in today's rapidlychanging business environment.
- Focuses on how digital marketing can be utilized by organizations and how itseffectiveness can be measured.

UNIT - I INTRODUCTION TO ONLINE MARKET 9

Online Market space- Digital Marketing Strategy- Components - Opportunities for building BrandWebsite - Planning and Creation - Content Marketing.

UNIT - II SEARCH ENGINE OPTIMISATION 9

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement.

UNIT - III E- MAIL MARKETING 9

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximising email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.

UNIT -IV SOCIAL MEDIA MARKETING 9

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT -V DIGITAL TRANSFORMATION 9

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing- Case Study.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
2. Know the key elements of a digital marketing strategy.
3. Focuses on how digital marketing can be utilized by organizations
4. Study how the effectiveness of a digital marketing campaign can be measured
5. Understand social media marketing
6. Demonstrate advanced practical skills in common digital marketing tools such as SEO,SEM, Social media and Blogs

TEXT BOOKS:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition, 2017; ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press, 2015, ISBN-10:0199455449
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition, 2017; ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
4. Ryan, D.,2014, Understanding Digital Marketing: Marketing Strategies for Engaging theDigital Generation, Kogan Page Limited,2014.
5. Barker, Barker, Bormann and Neher, Social Media Marketing: A Strategic Approach,2ESouth-Western ,Cengage Learning,2017.
6. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education,2015.

21CB1909	ENTERPRISE SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand enterprise security in today's world.
- To learn how to evaluate business processes related to risk management
- To learn business continuity
- To understand auditing and security issues in software development.

UNIT - I INTRODUCTION 9

Developing a Secure Foundation-threat and vulnerabilities-Security Categorization Applied to Information Types & Information Systems-Minimum Security Requirements-Infrastructure Security Model Components-Systems Security Categorization-Business Impact Analysis-Risk Management

UNIT - II PLANNING, MANAGEMENT AND MONITORING 9

Phases of Security-Focused Configuration Management-Security Configuration Management Plan-Baseline Identification-Roles and Responsibilities-Measurements-Configuration Audits-Types of Plans-Continuous Monitoring Strategy-Continuous Monitoring Program-Monitoring and Assessment Frequencies.

UNIT - III SECURITY ARCHITECTURE 9

The Meaning of Security - Measuring and Prioritizing Business Risk-Empowering the Customers- Protecting Relationships and Leveraging Trust-The Meaning of Architecture-Information Systems Architecture-Enterprise Security Architecture-Security Architecture Model-The SABSA Model- Contextual and Conceptual Security Architecture.

UNIT -IV SECURITY POLICY,OPERATIONAL RISK AND ASSURANCE MANAGEMENT 9

Structuring the Content of a Security Policy-Policy Hierarchy and Architecture-Policy Principles- Types of Security Policies-Complexity of Operational Risk Management-Approaches to Risk Assessment-Risk Mitigation-Risk Financing-Assurance of Operational Continuity-Security Audits- Functional & Penetration Testing.

UNIT -V SECURITY ADMINISTRATION, OPERATIONS AND VALIDATION 9

Introduction-Managing the People-Managing Physical and Environmental Security-Managing ICT Operations and Support-Access Control Management-Compliance Management-Security-Specific Operations- Managed Security Services-Product Evaluation and Selection

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Design appropriate security architecture with an understanding of the technology
2. Evaluate the current state of the system's security configuration, identifying vulnerabilities and risks and assessing the effectiveness of existing controls.
3. Understand the concepts, principles, and best practices of Enterprise Security Architecture and Security Architecture Model.
4. Understand the concepts and principles of security policies, operational risk, and assurance management.
5. Understand the concepts and principles of risk assessment, risk mitigation, risk financing, and assurance of operational continuity.
6. Develop and implement security policies, procedures, and guidelines related to people and physical/environmental security.

TEXT BOOKS:

1. James A. Scholz, Enterprise Architecture and Information Assurance Developing a SecureFoundation, CRC Press, 2013.(UNIT –I &II)
2. John Sherwood, Andrew Clark, David Lynas, Enterprise Security Architecture A Business-Driven Approach, CRC Press, 2005. (UNIT-III,IV and V)

REFERENCES:

1. John R.Vacca, Computer and Information Security Handbook, Second Edition, Elsevier 2013.
2. Michael E. Whitman, Herbert J. Mattord, Principal of Information Security, Fourth Edition,Cengage Learning, 2012.

21CB1910	CONVERSATIONAL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Enable attendees to acquire knowledge on chatbots and its terminologies
- Work with ML Concepts and different algorithms to build custom ML Model
- Better understand on Conversational experiences and provide better customer experiences

UNIT - I FUNDAMENTALS OF CONVERSATIONAL SYSTEMS 9

Introduction: Overview, Case studies, Explanation about different modes of engagement for a human being, History and impact of AI. Underlying technologies: Natural Language Processing, Artificial Intelligence and Machine Learning, NLG, Speech-To-Text, Text-To-Speech, Computer Vision etc. Introduction to Top players in Market — Google, MS, Amazon &Market trends. Messaging Platforms (Facebook, WhatsApp) and Smart speakers — Alexa, Google Home and other new channels. Ethical and Legal Considerations in AI Overview.

UNIT - II FOUNDATIONAL BLOCKS FOR PROGRAMMING AND NATURAL LANGUAGE PROCESSING 9

Introduction: Brief history, Basic Concepts, Phases of NLP, Application of chat bots etc. General chatbot architecture, Basic concepts in chatbots: Intents, Entities, Utterances, Variables and Slots, Fulfillment. Lexical Knowledge Networks (WordNet, Verbnet, PropBank, etc). Lexical Analysis, Part-of-Speech Tagging, Parsing/Syntactic analysis, Semantic Analysis, Word Sense Disambiguation. Information Extraction, Sentiment Analysis.

UNIT - III BUILDING A CHAT BOT / CONVERSATIONAL AI SYSTEMS 9

Fundamentals of Conversational Systems (NLU, DM and NLG) - Chatbot framework & Architecture, Conversational Flow & Design, Intent Classification (ML and DL based techniques), Dialogue Management Strategies, Natural Language Generation. UX design, APIs and SDKs, Usage of Conversational Design Tools. Introduction to popular chatbot frameworks –Introduction to Testing Frameworks - Security & Compliance — Data Management, Storage, GDPR, PCI.

UNIT -IV ROLE OF ML/AI IN CONVERSATIONAL TECHNOLOGIES AND CONTACT CENTERS 9

Brief Understanding on how Conversational Systems uses ML technologies in ASR, NLP, Advanced Dialog management, Language Translation, Emotion/Sentiment Analysis, Information extraction ,etc. to effectively converse, Introduction to Contact centers — Impact & Terminologies.

UNIT -V CONVERSATIONAL ANALYTICS AND FUTURE 9

Conversation Analytics : The need of it - Introduction to Conversational Metrics - Summary, Robots and Sensory Applications overview - XR Technologies in Conversational Systems , XR- Commerce - Future technologies and market innovations overview.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Gain a solid understanding of conversational systems and how they work, their applications, and the various technologies that enable them.
2. Understand the basic concepts and principles of programming and natural language processing
3. Help learners to identify key concepts and ideas in a text, and understand how they are related to one another.
4. Design and build a basic chat bot using popular chat bot development frameworks and tools.
5. Understand the basics of Machine Learning (ML) and Artificial Intelligence (AI) and how they are used in Conversational Technologies and Contact Centers.
6. Build a real time working conversational system for social domain that can intelligently process inputs and generate relevant replies.

TEXT BOOKS:

1. Michael McTear, “Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots”, Second Edition, Moran and Claypool Publishers, 2020.
2. Cathy Pearl, “Designing Voice User Interfaces: Principles of Conversational Experiences”,O’REILLY, 2016.

21CB1911	SOCIAL TEXT AND MEDIA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic issues and types of social text and media mining
- Familiarize the learners with the concept of social text and media analytics and understand its significance.
- Familiarize the learners with the tools of social, text and media analytics.
- Enable the learners to develop skills required for analyzing the effectiveness of social, text and media for business purposes
- To know the applications in real time systems.

UNIT - I INTRODUCTION TO SOCIAL MEDIA ANALYSIS 9

Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas. Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization.

UNIT - II OVERVIEW OF TEXT MINING AND DATA MINING 9

Overview of text mining- Definition- NLP, Approaches to Text mining-Introduction to Data Mining Systems –– Process – Data Mining Techniques -Issues – Applications - Data Pre-processing –Mining Web data – Social Network Analysis.

UNIT - III TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION EXTRACTION 9

Information retrieval and text mining - Text Clustering, Text Classification, Information extraction, Text Summarization Techniques – Text Analytics in Social – Media.

UNIT -IV WEB ANALYTICS TOOLS 9

Click stream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis. Do a case study on Google analytics.

UNIT -V MARKETING RESEARCH & TRENDS IN MARKET 9

Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the basics of social media and its impact on businesses and society.
2. Apply data mining and text mining techniques to solve real-world problems
3. Design and implement text mining application extraction using relevant algorithms and tools.
4. Learn the basic concepts and principles of web analytics tools by identifying ways to improve website performance and business outcomes.
5. Understand the basic concepts and techniques used in natural language processing and micro-text analysis.
6. Create and execute social media campaigns that aligns with business goals.

TEXT BOOKS:

1. Marshall Sponder, Social Media Analytics, McGraw Hill ,2014
2. Charu C. Aggarwal ,ChengXiang Zhai**,** Mining Text Data, Springer; 2012

REFERENCES:

1. Matthew Ganis, Avinash Kohirkar , Social Media Analytics: Techniques and Insights forExtracting Business Value Out of Social Media, Pearson, 2016.
2. Jim Sterne, Social Media Metrics: How to Measure and Optimize Your MarketingInvestment, Wiley, 2010.
3. Oliver Blanchard ,Social Media ROI: Managing and Measuring Social Media Efforts in YourOrganization (Que Biz-Tech), 2019
4. Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”, Springer, paperback 2010
5. Ronen Feldman, James Sanger -“ The Text Mining Handbook: Advanced Approaches inAnalyzing Unstructured Data”, Springer, paperback 2010.
6. Tracy L. Tuten, Michael R. Solomon, Social Media Marketing , Sage, 2016.

21CB1912	MARKETING RESEARCH AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the changing business environment and the fundamental premiseunderlying market driven strategies.
- To identify the indicators of management thoughts and practices.
- To analyze the nature of consumer buying behaviour
- To understanding the marketing research
- To new trends in the arena of marketing

UNIT - I INTRODUCTION 9

Defining Marketing − Core concepts in Marketing – Evolution of Marketing − Marketing Planning Process − Scanning Business environment: Internal and External − Value chain − Core Competencies – PESTEL − SWOT Analysis − Marketing interface with other functional areas —- Marketing in global environment – International Marketing − Rural Marketing − Prospects and Challenges.

UNIT - II MARKETING STRATEGY 9

Marketing strategy formulations – Key Drivers of Marketing Strategies - Strategies for Industrial Marketing – Consumer Marketing − Services marketing – Competition Analysis − Analysis of consumer and industrial markets − Influence of Economic and Behavioral Factors − Strategic Marketing Mixcomponents.

UNIT - III MARKETING MIX DECISIONS 9

Product planning and development – Product life cycle – New product Development and Management – Defining Market Segmentation – Targeting and Positioning − Brand Positioning and Differentiation – Channel Management – Managing Integrated Marketing Channels − Managing Retailing, Wholesaling and Logistics.

UNIT -IV BUYER BEHAVIOUR 9

Understanding Industrial and Consumer Buyer Behaviour − Influencing factors – Buyer Behaviour Models – Online buyer behaviour − Building and measuring customer satisfaction – Customer relationships management – Customer acquisition, Retaining, Defection − Creating Long Term Loyalty Relationships.

UNIT -V MARKETING RESEARCH & TRENDS IN MARKET 9

Marketing Information System – Marketing Research Process – Concepts and applications: Product – Advertising – Promotion – Consumer Behaviour – Retail research – Customer driven organizations - Cause related marketing − Ethics in marketing – Online marketing trends - socialmedia and digital marketing.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand the historical development of marketing as a discipline, including key figures and milestones in the field.
2. Understand what marketing strategy is and how it differs from other types of business strategies.
3. Understand the product planning and development process
4. Develop and implement an integrated marketing channel strategy that leverages different channels to reach target audiences effectively.
5. Analyze buyer behavior data to identify patterns and trends in consumer behavior, and apply the different models to explain these patterns.
6. Understand the marketing research and new trends in the arena of marketing.

TEXT BOOKS:

1. Philip. T. Kotler and Kevin Lane Keller, Marketing Management, Prentice Hall India, 15th Edition, 2017
2. KS Chandrasekar, “Marketing management-Text and Cases”, Tata McGraw Hill Education, 2012.

REFERENCES:

1. Lamb, Hair, Sharma, Mc Daniel– Marketing – An Innovative approach to learning and teaching- A south Asian perspective, Cengage Learning, 2012.
2. Paul Baines, Chris Fill, Kelly Page, Marketing, Asian edition, Oxford University Press,5th edition, 2019.
3. Ramasamy, V.S, Namakumari,S, Marketing Management: GlobaL Perspective Indian Context, Macmillan Education, New Delhi, 6th edition, 2018.
4. NAG, Marketing successfully- A Professional Perspective, Macmillan 2008.
5. Micheal R.Czinkota, Masaaki Kotabe, Marketing Management, Vikas Thomson Learning, 2nd edition 2006.

21CB1913	RISK ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To develop a basic understanding of risk assessment and its role within the risk management process.
- To understand risk assessment and its role within the risk management process.
- To differentiate between risk assessment and risk management.
- To develop a basic understanding of how to conduct and evaluate an uncertainty analysisfor a risk assessment

UNIT - I INTRODUCTION 9

Introduction, Fundamentals of Risk- Risk Planning, Assessment and Management Process and the Systems Approach-Types of Risk Assessment- Risk, Hazard, Performance and EngineeringRisk Assessment.

UNIT - II RISK IDENTIFICATION 9

Risk Identification- Historical data, comparative analysis, and checklist- Taxonomy based, risk breakdown structure, HHM, SWOT, root cause analysis, influence diagram - Expert/ user/ xdzfzrs5stakeholder-based elicitation (Delphi, brainstorming, interview), Scenario-based, experience based, objective-based analysis.

UNIT - III RISK ASSESSMENT 9

Preliminary Hazard Analysis (PHA), Hazards and Operability Analysis (HAZOP) - Job Safety Analysis (JSA) - Failure Modes and Effects Analysis (FMEA)- Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Decision Trees- Cause-Consequence Analysis (CCA).

UNIT -IV RISK PRIORITIZATION & TREATMENT 9

Risk Probability and Impact Assessment, Risk Index and Risk Ranking - − Risk Matrix, EV Analysis, Sensitivity and Tradeoff Analysis, Modeling and Simulation- Risk Attitude and Risk Tolerance, As Low As Reasonably Practicable (ALARP)- Avoidance, Separation, Reduction, Transfer, Acceptance- Detection, Control, Response and Recovery- Performance Monitoring.

UNIT -V SPECIAL TOPICS AND APPLICATION 9

ISO3100, Quality and Reliability- Supply Chain Risk Management- Project Risk Management- Positive Risk/ Opportunities Management- Risk and TOC.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Identify and assess risks, including analyzing the likelihood and impact of different risks, and determining appropriate risk mitigation strategies
2. Effectively use different risk identification tools and techniques to identify and assess potential risks.
3. Learn and apply different risk assessment methodologies
4. Understand the principles of risk prioritization and treatment and their role in risk management
5. Understand the concepts of risk attitude and risk tolerance and their role in risk management
6. Understand the principles and benefits of ISO 3100 risk management framework

TEXT BOOKS:

1. Marvin Rausand Stein Haugen , Risk Assessment: Theory, Methods, and Applications,iley, 2020.

REFERENCES:

1. Mohammad Modarres , Risk Analysis in Engineering Techniques, Tools, and Trends, CRCPress, 2006.

OPEN ELECTIVE – I

21CE1010	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT - I INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT - II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT - III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT - IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

UNIT - V INDOOR AIR QUALITY MANAGEMENT 9

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards – Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipment's.
- Ability to ensure quality, control and preventive measures.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

REFERENCES:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering", New Age International(P) Limited Publishers,2006.

21CE1001	ENERGY CONSERVATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To impart knowledge on the principle of Energy Conversion and Management
- To provide details of Energy Conservation, Energy Management &. Audit.
- To impart knowledge on the principle of Energy Conversion and Management

UNIT - I **ENERGY SCENARIO AND ENERGY CONSERVATION ACT 2001** **9**

Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future.Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act 2003, Integrated energy policy, National action plan on climate change, ECBC code for Building Construction.

UNIT - II **FINANCIAL MANAGEMENT, ENERGY MONITORING AND TARGETING** **9**

Investment-need, financial analysis techniques simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs).Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)

UNIT - III **ENERGY MANAGEMENT & AUDIT** **9**

Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering.

UNIT - IV **ENERGY EFFICIENCY IN THERMAL UTILITIES AND SYSTEMS** **9**

Boilers: Types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities. Boiler efficiency calculation, evaporation ratio and efficiency for coal, oil and gas. Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation.

Steam System: Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, condensate and flash steam recovery system, identifying opportunities for energy savings. Steam utilization, Performance assessment of

steam system, thermo- compressor, steam pipe insulation, condensate pumping, steam dryers.
Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential.

UNIT - V ENERGY AND ENVIRONMENT, AIR POLLUTION, CLIMATE CHANGE **9**

United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM – Bachat Lamp Yojna and industry; Prototype Carbon Fund (PCF).

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- To summarized the energy conservation scenario, energy and environment, air pollution, climate change, and various acts and policy for the energy conservation.
- To infer the concept of financial management, energy monitoring and targeting.
- . To apply the knowledge of energy audit for the energy management and operation of energy audit instruments.
- To analyze the energy saving area and improvement in efficiency of various thermal utilities and systems.
- To evaluate the net present worth in financial management and performance assessment of various thermal utilities and systems.

TEXT BOOKS:

1. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Inter science publication.
2. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press

REFERENCES:

1. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press.
2. Bureau of Energy Efficiency Reference book: No.1, 2, 3, 4.
3. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation edited by E J Wilson and D Gerard, Blackwell Publishing

21GE1004	HOSPITAL WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Understand the hazardous materials used in
- Understand various waste disposal procedures and management.
- Understand the various facility guidelines of administrative area safety and control of hazardous energy
- Understand the inputs of healthcare immunizations and medication safety.

UNIT - I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS **9**

Healthcare Hazard Control: Introduction, Hazard Control, Hazard Control Management and responsibilities, Hazard Analysis, Hazard Control and Correction, Personal Protective Equipment, Hazard Control Committees and System Safety. Understanding Accidents: Accident Causation Theories, Human Factors, Accident Deviation Models, Accident Reporting, Accident Investigations, Accident Analysis, Organizational Functions That Support Accident Prevention, Workers' Compensation.

UNIT - II BIOMEDICAL WASTE MANAGEMENT **9**

Biomedical Waste Management : Types of wastes, major and minor sources of biomedical waste, Categories and Classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labelling, waste handling, collection, storage and transportation, treatment and disposal.

UNIT - III HAZARDOUS MATERIALS **9**

Hazardous Materials : Hazardous Substance Safety, OSHA Hazard Communication Standard, DOT Hazardous Material Regulations, Healthcare Hazardous Materials, Medical Gas Systems, Hazardous Waste Operations and Emergency Response Standard, Respiratory Protection.

UNIT - IV FACILITY SAFETY **9**

Facility Safety : Introduction, Facility Guidelines: Institute, Administrative Area Safety, Slip, Trip, and Fall Prevention, Safety Signs, Colours, and Marking Requirements, Tool Safety, Machine Guarding, Compressed Air Safety, Electrical Safety, Control of Hazardous Energy, Landscape and Grounds Maintenance, Fleet and Vehicle Safety.

UNIT - V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY **9**

Healthcare Immunizations, Centres for Disease Control and Prevention, Disinfectants , Antiseptics, OSHA Blood borne Pathogens Standard and Healthcare Opportunistic Infections. Patient Safety: An Organizational Function, Errors and Adverse Events,

Safety Cultures, Patient-Centred Healthcare

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Analyse various hazards, accidents and its control.
- Design waste disposal procedures for different biomedical wastes.
- Categorize different biomedical wastes based on its properties.
- Outline the Hazardous safety and its Healthcare hazardous Material regulations.
- Design different safety facility in hospitals.
- Propose various regulations and safety norms.

TEXT BOOKS:

1. Tweedy, James T., Healthcare
2. Anantpreet Singh, SukhjitKaur, Biomedical Waste Disposal, Jaypee Brothers Medical Publishers (P) Ltd (2012).
3. Solid and Hazardous Waste Management, Second Edition by M.N. Rao (Author), Razia Sultana (Author)-BS Publications.
4. Infectious and Medical Waste Management By Peter A. Reinhardt –CRC Press.

REFERENCES:

1. R.C.Goyal, “Hospital Administration and Human Resource Management”, PHI – Fourth Edition,2006
2. J. Landrum, “Medical Waste Management and disposal”, Elsevier, 1991

21CY1001	INDUSTRIAL NANOTECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To learn about basis of nanomaterial science.
- To learn about preparation of nanomaterials.
- To learn about characterizations of nanomaterials.
- To learn about applications of nanomaterials in medicine and engineering

UNIT - I INTRODUCTION OF NANOTECHNOLOGY 9

Origin of nanoscale Science and Technology - Implications for Physics, Chemistry, Biology and Engineering - Classifications of nanostructured materials- nanoparticles- quantum dots, nanowires- ultra-thinfilms - multilayered materials. Effects of nanoscale materials on physicochemical, mechanical, electronic and optical properties.

UNIT - II PREPARATION METHODS 9

Bottom-up synthesis and top-down approach - co-precipitation, sol-gel method, electro deposition, self-assembly, sputtering, mechanical ball milling and vapour phase deposition.

UNIT - III CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique (XRD), Scanning Electron Microscope (SEM) - environmental techniques - Transmission Electron Microscopy including high-resolution imaging (HRTEM), Surface Analysis techniques - Atomic Force Microscope (AFM), Scanning Probe Microscope (SPM), Scanning Tunneling microscope (STM) and Nano indentation

UNIT - IV NANOTECHNOLOGY IN MEDICINE 9

Nano biotechnology: Nano-probes in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bio-imaging, Quantum dots for cancer treatment nanorobotics for surgery - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS) for healthcare - nano-crystalline silver for bacterial inhibition.

UNIT - V NANOTECHNOLOGY IN ENGINEERING 9

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip. Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery. Sensors – Classification, Types of sensors, properties, biosensors, nanosensors, nanobiosensors. Nanotoxicity.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Familiarize about the science of nanomaterial's.
- Demonstrate the preparation of nanomaterial's
- Develop the knowledge in characteristic nanomaterial.
- Understand about the role of nanotechnology in the field of medicine.
- Understand applications of nanoscience in technology.
- Understand applications of nanoscience in sensors.

TEXT BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.
3. Christof M. Niemeyer, Chad A. Mirkin, Nanobiotechnology, Concepts, Applications

REFERENCES:

1. G Timp, "Nanotechnology", AIP press/Springer, 1999.
2. Malsch, Neelina H, (et), Biomedical Nanotechnology, Washington, DC; CRC Press, 2005
3. AkhleshLakhtakia,"The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.
4. Hocine Yahia Shape Memory Implants, Springer Verlag, 2000.

21EE1003	LOGIC AND DISTRIBUTED CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To give an introductory knowledge about PLC and the programming languages.
- To give basic knowledge in the architecture and local control unit of distributed control system.
- To give basic knowledge about Computer Controlled Systems
- To give adequate information in the interfaces used in DCS.

UNIT-I PLC & SCADA 9

PLC: Evolutions of PLCs – Programmable Controllers – Architecture, I/O modules – Comparative study of Industrial PLCs. SCADA: Remote terminal units- Master station - Communication architectures

UNIT-II BASICS OF PLC PROGRAMMING(LADDER) 9

Basics of PLC programming – Ladder Logic – Relay type instructions – Timer/Counter instructions – Program control instructions – Data manipulation and math instructions – Programming Examples .

UNIT-III PLC PROGRAMMING (OTHER LANGUAGES) 9

Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process Examples.

UNIT-IV DISTRIBUTED CONTROL SYSTEM 9

DCS: Evolution & types – Hardware architecture – Field control station – Interfacing of conventional and smart field devices (HART and FF enabled) with DCS Controller – Communication modules – Operator and Engineering Human interface stations – Study of any one DCS available in market.

UNIT-V ADVANCED TOPICS IN AUTOMATION 9

Introduction to Networked Control systems – Plant wide control – Internet of things – Cloud based Automation – OLE for Process Control – Safety PLC – Case studies: PLC - SCADA – DCS

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand components such as PLC, SCADA, DCS,I/O modules and field devices of an industrial automation system.
- Develop the program using PLC for industrial applications.

- Program a PLC using ladder logic .
- Describe the functionality of SCADA.
- Understand the systems used in distributed control systems.

TEXTBOOKS:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2010.
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986.
3. D. Popovic and V.P.Bhatkar,' Distributed computer control for industrial Automation' Marcel Dekker, Inc., Newyork ,1990.

REFERENCES:

1. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
2. Hughes, T.A., "Programmable Logic Controllers: Resources for Measurements and Control Series", 3rd Edition, ISA Press, 2004.
3. McMillan, G.K., "Process/Industrial Instrument and Controls Handbook", 5thEdition, McGraw- Hill handbook, New York, 1999.

21EC1011	TELEHEALTH TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To know telecommunication basics and practices
- Learn the key principles for telemedicine and health.
- Understand telemedical technology.
- Know telemedical standards, mobile telemedicine and it applications.

UNIT-I TELEMEDICINE AND HEALTH 9

History and Evolution of telemedicine, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine

UNIT-II TELEMEDICAL TECHNOLOGY 9

Principles of Multimedia - Text, Audio, Video, data, Data communications and networks, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications Communication infrastructure for telemedicine – LAN and WAN technology. Satellite communication, Mobile communication.

UNIT-III TELEMEDICAL STANDARDS 9

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series Video Conferencing, Security and confidentiality of medical records, Cyber laws related to telemedicine.

UNIT-IV MOBILE TELEMEDICINE 9

Tele radiology: Image Acquisition system Display system, Tele pathology, Medical information storage and management for telemedicine- patient information, medical history, test reports, medical images, Hospital information system.

UNIT-V TELEMEDICAL APPLICATIONS 9

Telemedicine – health education and self-care. • Introduction to robotics surgery, Telesurgery. Telecardiology, Teleoncology, Telemedicine in neurosciences, Business aspects - Project planning and costing, Usage of telemedicine.

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Apply multimedia technologies in telemedicine
- Explain protocols behind encryption techniques for secure transmission of data
- Apply telehealth in healthcare

TEXTBOOKS:

1. Norris, A.C. Essentials of Telemedicine and Telecare, Wiley, 2002
2. Wootton, R., Craig, J., Patterson, V. (Eds.), Introduction to Telemedicine. Royal Society of Medicine Press Ltd, Taylor and Francis 2006 Wiley 1999 (unit-3,4&5)

REFERENCES:

1. OCarroll, P.W., Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), Public Health Informatics and Information Systems, Springer, 2003.
2. Ferrer-Roca, O., Sosa – Iudicissa, M. (Eds.), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54, 2002.
3. Simpson, W. Video over IP. A practical guide to technology and applications. Focal Press Elsevier, 2006.
4. Bemmel, J.H. van, Musen, M.A. (Eds.) Handbook of Medical Informatics. Heidelberg, Germany: Springer, 1997
5. Mohan Bansal ” Medical Informatics”, Tata McGraw-Hill, 2004.

OPEN ELECTIVE – II

21EE1001	BASIC CIRCUIT THEORY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- 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 circuit
- To educate on obtaining the transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits
- To introduce electric circuits and its analysis

UNIT - I BASIC CIRCUITS ANALYSIS CABLES 9

Resistive elements – Ohm's Law Resistors in series and parallel circuits – Kirchhoff's laws – Mesh current and node voltage - methods of analysis.

UNIT - II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT - III TRANSIENT RESPONSE ANALYSIS 9

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT - IV THREE PHASE CIRCUITS 9

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits..

UNIT - V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Ability to comprehend the basics of circuit analysis.
- Ability of solve electrical circuits using theorems
- Ability to analyze the transient response
- Able to comprehend the three phase circuits
- Able to understand coupled circuits

TEXT BOOKS:

1. William H. HaytJr, 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
4. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

REFERENCES:

1. Chakrabarti A, “Circuits Theory (Analysis and synthesis), DhanpathRai& Sons, New Delhi, 1999.
2. Jegatheesan, R., “Analysis of Electric Circuits,” McGraw Hill, 2015.
3. Joseph A. Edminister, MahmoodNahri, “Electric circuits”, Schaum’s series, McGrawHill, 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.

21CY1002	ENERGY TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To gain knowledge about different energy sources
- To attain knowledge in energy conservation

UNIT - I ENERGY 9

Introduction to energy – Global energy scene – Indian energy scene - Units of energy, conversion factors, general classification of energy, energy crisis, environmental aspects of energy utilisation, energy alternatives.

UNIT - II CONVENTIONAL ENERGY 9

Conventional energy resources, Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants, efficiency, merits and demerits of the above power plants, combustion processes, fluidized bed combustion.

UNIT - III NON-CONVENTIONAL ENERGY 9

Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, application of nano technology in solar energy conversion, energy plantations. Wind energy, types of windmills, wind electric power generation, wind power in India, economics of wind farm, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy, hydrogen energy.

UNIT - IV BIOMASS ENERGY 9

Biomass origin - Resources – Biomass estimation. Thermochemical conversion – Biological conversion, Chemical conversion – Hydrolysis & hydrogenation, solvolysis, biocrude, biodiesel power generation gasifier, biogas, bioCNG, integrated gasification.

UNIT - V ENERGY CONSERVATION 9

Energy conservation - Act; Energy management definition, importance, duties and responsibilities; Energy audit – need, Types methodology, reports, instruments. Benchmalcing and energy performance, material and energy balance, thermal energy management – waste to energy conservation technologies (plastic to petrol).

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Become intellectual in energy studies
- Understand conventional Energy sources.
- Understand the concept of various non-conventional energy resources
- Attain knowledge in biomass sources and develop design parameters for equipments to be used in chemical process industries
- Understand energy conservation in process industries

TEXT BOOKS:

1. Rao, S. and Parulekar, B.B., Energy Technology, Khanna Publishers, 2005.
2. Rai, G.D., Non-conventional Energy Sources, Khanna Publishers, New Delhi, 1984.
3. Nagpal, G.R., Power Plant Engineering, Khanna Publishers, 2008.
4. Energy Management, Paul W.O'Callaghan McGraw – Hill, 1993
5. Khan B.H. Non-Conventional Energy Resources, The McGraw Hills, 2nd Edition 2016.

REFERENCES:

1. NejatVezirog, Alternate Energy Sources, IT, McGraw Hill, New York.
2. El. Wakil, Power Plant Technology, Tata McGraw Hill, New York, 2002.
3. Sukhatme. S.P., Solar Enery - Thermal Collection and Storage, Tata McGraw hill, New Delhi, 1981
4. . Handbook of Energy Audit by 7th edition Albert Thumann, P.E., C.E.M & William J Younger C.E.M, Faiment Press 2008
5. John W Twidell and Tony D Weir Renewable Energy Resources, Taylor and Francis, 2nd Edition 2006.

21EC1004	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LCD and other Opto-electronic devices.

UNIT-I SEMICONDUCTOR DIODE 9

PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT-II BIPOLAR JUNCTION TRANSISTORS 9

N PN -PNP - Operations-Early effect-Current equations – Input and Output characteristics of CE, CB, CC - h-parameter model, Ebers Moll Model, Multi Emitter Transistor.

UNIT-III FIELD EFFECT TRANSISTORS 9

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D- MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

UNIT-IV SPECIAL SEMICONDUCTOR DEVICES 9

M Metal-Semiconductor Junction- MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Zener diode-Varactor diode - Gallium Arsenide device, LDR.

UNIT-V POWER DEVICES AND DISPLAY DEVICES 9

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS, LCD, Photo transistor, Opto Coupler, CCD.

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Explain the V-I characteristics of semiconductor diode.
- Classify the configurations of BJT and understand its equivalence circuits.
- Understand the drain – transfer characteristics of FET.
- Illustrate the characteristics of special semiconductor devices.
- Outline the concepts of power devices.
- Outline the concepts of display devices.

TEXTBOOKS:

1. Donald A Neaman, —Semiconductor Physics and Devices‖, Fourth Edition, Tata McGrawHill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, —Electronic Devices and circuits‖, Third Edition, Tata McGraw- Hill, 2008.

REFERENCES:

1. Robert Boylestad and Louis Nashelsky, —Electron Devices and Circuit Theory Pearson Prentice Hall, 10th edition, July 2008.
2. R.S.Sedha, — A Text Book of Applied Electronics S.Chand Publications, 2006.
3. Yang, —Fundamentals of Semiconductor devices, McGraw Hill International Edition,1978.

21CE1009	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects.

UNIT-I INTRODUCTION 9

Impacts of Development on Environment – Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework.

UNIT-II ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT-III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing- Environmental Clearance

UNIT-IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis

UNIT-V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants.

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Carry out scoping and screening of developmental projects for environmental and social assessments
- 2. Explain different methodologies for environmental impact prediction and assessment
- 3. Plan environmental impact assessments and environmental management plans
- 4. Evaluate environmental impact assessment reports

TEXTBOOKS:

1. Canter, R.L, “Environmental impact Assessment “, 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, “Environmental Impact Assessment for Developing Countries in Asia”, Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, RikiTherivel “Methods of Environmental Impact Assessment”, Routledge Publishers,2009.

REFERENCES:

1. Becker H. A., Frank Vanclay,“The International handbook of social impact assessment” conceptual and methodological advances, Edward Elgar Publishing,2003.
2. Barry Sadler and Mary McCabe, “Environmental Impact Assessment Training Resource Manual”, United Nations Environment Programme,2002.
3. Judith Petts, “Handbook of Environmental Impact Assessment Vol. I and II”, Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

21GE1003	HOSPITAL MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the fundamentals of hospital administration and management
- To know the market related research process
- 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 - Role of hospital administration – Hospital system – Need for scientific planning and design of hospitals

UNIT-II HUMAN RESOURCE MANAGEMENT IN HOSPITAL 9

Principles of HRM – Functions of HRM – Profile of HRD Manager – Human Resource Inventory – Manpower Planning – Significance – Importance of HR Planning – Factors influencing HR Planning Process – Job Analysis

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 Performance Appraisals: Techniques & Practices

UNIT-IV SUPPORTIVE SERVICES 9

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services –Transportation services – Mortuary services – Hospital security services

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 – Challenges of e-health – electronic medical records

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Explain the principles of Hospital administration
- Identify the importance of Human resource management
- List various marketing research techniques
- Identify Information management systems and its uses
- Explain the principles of Hospital administration

TEXTBOOKS:

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
3. Stephen P. Robbins and Mary Coulter, Management (Prentice Hall of India Pvt. Ltd., New Delhi)
4. J.E. Park and K. Park, Textbook of Preventive and Social Medicine (M/S BanarsidasBhanot Publishers, Jabalpur)
5. Elaine La Monica, Management in Health Care (Macmillan Press Ltd, London) References
6. B.M. Sakharkar, Principles of Hospital Administration and Planning (Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi)

REFERENCES:

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.

	MEDICAL ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To gain knowledge about the various physiological parameters both electrical and non-electrical and the methods of recording and also the method of transmitting these parameters
- To study about the various assist devices used in the hospitals
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT-I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT-II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT-III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems.

UNIT-IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT-V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Telemedicine, Insulin Pumps, Radio pill, Endomicroscopy, Brain machine interface, Lab on a chip.

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Know the human body electro- physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
- Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies, and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

TEXTBOOKS:

1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, New Delhi, 2003.

REFERENCES:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, “Medical Instrumentation Application and Design”, 3rd Edition, Wiley India Edition, 2007
3. Joseph J.Carr and John M.Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2004

21EC1006	SIGNALS AND SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the basic properties of signals.
- To analyze the basic systems using properties.
- To analyze the characteristics of continuous time signals in the Fourier and Laplace domain
- To analyze LTI – Continuous time systems in Time domain and Frequency domain
- To analyze the characteristics of Discrete time signals in the Fourier and Z transform domain
- To analyze LTI - Discrete time systems in Time domain and Frequency domain

UNIT- I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids_Classificationofsignals – Continuous time (CT) and Discrete Time (DT) signals, Periodic &Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT- II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier Series for periodic signals -Analysis of Continuous Time Signals using Fourier Transform – Inverse FT -Properties of FT, CT analysis using Laplace Transform- Unilateral LT and Bilateral LT- Inverse LT- Properties of Unilateral LT.

UNIT- III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Impulse response - convolution integrals – Graphical method - Properties of convolution integral- Overall impulse response for interconnected systems - Fourier and Laplace transforms in Analysis of CT systems - Solving of Differential Equation.

UNIT- IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband signal sampling -Analysis of Discrete Time Signals using Discrete Time Fourier Transform (DTFT)- Inverse DTFT–Properties of DTFT- Analysis of Discrete Time Signals using Z-Transform – Inverse Z-Transform - Properties of Z-Transform.

UNIT- V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Impulse response – Convolution sum –Graphical method - Properties of Discrete Convolution- Overall iimpulse response for interconnected systems -Solving of Difference equations- Solution of Difference equation using DTFT- solution of difference equation using Z-transform.

TOTAL:45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand the basics of signals and its classifications
- Analyze the basic systems and its classifications
- Determine the frequency Response for Deterministic signal and also analyze in S-domain
- Apply the Fourier and Laplace Transform for the analysis of LTI -Continuous Time systems
- Analyze the Characteristics of DT signals by using DTFT and Z-transform
- Apply the Fourier and Z- Transform for the analysis of LTI –Discrete Time systems

TEXTBOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”,Pearson,2015.
2. S. Haykin and B. Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2007.

REFERENCES:

1. B.P.Lathi,“Principles of Linear Systems and Signals”,Second Edition,Oxford,2009.
2. R.E.Zeimer,W.H.Tranter and R.D.Fannin,“Signals &Systems-Continuous and Discrete”,Pearson,2007.
3. John Alan Stuller,“An Introduction to SignalsandSystems”,Thomson,2007.

21ME1006	SYSTEMS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Illustrate the life cycle phases and framework for systems engineering.
- Describe about systems engineering process.
- Apply ergonomic and system dynamic models for evaluation of alternatives.
- Create knowledge on Reliability, Markov and Time series models for analysis f alternatives.
- Describe about decision assessment methods in systems engineering.

UNIT-I INTRODUCTION 9

Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT-II SYSTEMS ENGINEERING PROCESSES 9

Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

UNIT-III ANALYSIS OF ALTERNATIVES - I 9

Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure.

UNIT-IV ANALYSIS OF ALTERNATIVES – II 9

Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models

UNIT-V DECISION ASSESSMENT 9

Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Be able to recognize life cycle phases in systems engineering.
- Apply steps in systems engineering process for large scale problems.
- Able to develop system dynamic models for analyzing alternatives.
- Gain ability to evaluate alternatives in large scale problems.
- Be able Attain confidence in assessment and arrive decisions for complex problems.

TEXTBOOKS:

1. Andrew P. Sage, James E. Armstrong Jr. “Introduction to Systems Engineering”, John Wiley and Sons, Inc, 2000.
2. Alexander Kossiakoff, Steven M. Biemer, Samuel J. Seymour, David A. Flanigan "Systems Engineering Principles and Practice", 3rd Edition

REFERENCES:

1. Andrew P.Sage, “Systems Engineering”, John Wiley & Sons, 1992.
2. Andrew P.Sage, William B.Rouse, “Hand book of Systems Engineering and Management”, John Wiley & Sons, 1999.

21CY1003	WASTE WATER TREATMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To provide basic under standings about the requirements of water, its preliminary treatment
- To give the students a broad understanding of all issues related to the analysis and design of water supply and wastewater disposal systems.

UNIT-I WATER AS A RESOURCE, ITS QUALITY & PARAMETERS 9

Water sources- water quantity- maintenance of water cycle- impurities in water- effects of impurities in water- water quality parameters- physical, chemical & biological. Characteristics of potable water- wastewater effluent standards -water quality indices. Need for water and wastewater treatment - associated environmental laws- drinking water and wastewater discharge standards, water reuse and recycling concepts.

UNIT-II INDUSTRIAL WATER TREATMENT 9

Filtration – size and shape characteristics of filtering media – sand filters hydraulics of filtration – design considerations – radial, up flow, high rate and multimedia filters, pressure filter. Water softening – lime soda, zeolite and demineralization processes-industrial water treatment for boilers.

UNIT-III CONVENTIONAL TREATMENT METHODS 9

Taste and odour control – adsorption – activated carbon treatment – removal of color – iron and manganese removal – aeration, oxidation, ion exchange and other methods – effects of fluorides – fluoridation and de fluoridation –desalination - conventional activated sludge process and its modifications – trickling filter, bio-towers and rotating biological contactors-corrosion prevention and control – factors influencing corrosion – Lange Lier index – corrosion control measures.

UNIT-IV WASTE WATER TREATMENT 9

Description and design of wastewater collection system- Quantity and quality of wastewater- wastewater treatment plant layout and related issues- Sewage and waste water treatments systems: A. Primary treatment methods - B. Secondary treatment methods and - C. Tertiary treatment methods. Equalization neutralization – screening and grid removal – sedimentation – oil separation gas stripping of volatile organics – biological oxidation – lagoons and stabilization basins – aerated lagoons - Chemical oxidation - types of reactors and reactors analysis

UNIT-V DOMESTIC WASTE WATER TREATMENT METHODS & RECENT TRENDS 9

Water purification systems in natural systems - Rate of water supplies for urban and rural systems. Unit operations and processes, treatment flow-diagrams for different sources of water. Water supply norms -Advanced water treatment, Automation in Water Supply and Smart Water Supply Systems, Package treatment units, implications of 24x7 supply, Water Economics & Pricing and application of nano materials package treatment units

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

- Understand water quality standards and parameters
- Understand the principles and operation of water treatment systems
- Attain knowledge about the conventional treatment methods used in water
- Analyze the various planning & design of waste water collection & conveyance and treatment systems.
- Understand the need for advanced water treatment with automation in treatment, water economics and patented material

TEXTBOOKS:

1. Metcalf and Eddy, “Wastewater Engineering”, 4th ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., “Industrial Water Pollution Control”, 2nd Edn., McGraw Hill Inc., 1989.

REFERENCES:

1. S.P. Mahajan, “Pollution control in process industries”, 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
2. M. Lancaster, “Green Chemistry: An Introductory Text”, 2nd edition, RSC publishing, 2010.
3. C.S. Rao, “Environmental Pollution Control Engineering”, New Age International, 2007.
4. Water Supply and Pollution Control. Authors: Warren Viessman Jr. and Mark J. Hammer. 7th Edition 2005. Publisher: Pearson Education
5. Wastewater Microbiology, 2nd Edition. Wiley-Liss; 2nd edition (February 16, 1999)