R.M.K. ENGINEERING COLLEGE
(An Autonomous Institution)
B.TECH INFORMATION TECHNOLOGY
REGULATIONS – 2020
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics and Information Technology for the applications relevant to various streams of Engineering and Technology.

2. To enrich graduates with the core competencies necessary for applying knowledge of computers and telecommunications equipment to store, retrieve, transmit, manipulate and analyze data in the context of business enterprise.

3. To enable graduates to think logically, pursue lifelong learning and will have the capacity to understand technical issues related to computing systems and to design optimal solutions.

4. To enable graduates to develop hardware and software systems by understanding the importance of social, business and environmental needs in the human context.

5. To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills to solve real world problems and meet the diversified needs of industry, academia and research.

PROGRAM OUTCOMES (POs)

ENGINEERING GRADUATES WILL BE ABLE TO:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering

solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

1. To create, select, and apply appropriate techniques, resources, modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

2. To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	PROGRAMME OUTCOMES (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	2										2
PEO2	3	3	1	1								2
PEO3			3			1						3
PEO4			3		1	2	3	1				
PEO5				3				1	1	2	2	1

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

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

PROGRAM SPECIFIC OBJECTIVES (PSOs)	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PSO1	3	2			3				2	2		3
PSO2				3			3	3			3	2

Contribution 1: Reasonable 2:Significant 3:Strong

R.M.K. ENGINEERING COLLEGE
(An Autonomous Institution)
B.TECH INFORMATION TECHNOLOGY
REGULATIONS – 2020
CHOICE BASED CREDIT SYSTEM
I - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	20EL101	Communicative English and Life Skills	HS	2	2	0	0	2
2.	20MA101	Engineering Mathematics - I	BS	5	3	2	0	4
3.	20PH101	Physics for Computer Science and Information Technology	BS	3	3	0	0	3
4.	20CH101	Engineering Chemistry	BS	3	3	0	0	3
5.	20GE101	Problem Solving and C Programming	ES	3	3	0	0	3
6.	20EE102	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
LABORATORY COURSES								
7.	20PC111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
8.	20GE111	C Programming Laboratory	ES	4	0	0	4	2
9.	20EL111	Interpersonal Skills -Listening and Speaking Lab	HS	2	0	0	2	1
		Induction Program (Non-Credit Course)	MC	3 Weeks	-	-	-	-
			TOTAL	**29**	**17**	**2**	**10**	**23**

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	20EL201	Technical English	HS	2	2	0	0	2
2.	20MA201	Engineering Mathematics - II	BS	5	3	2	0	4
3.	20ME103	Computer Aided Engineering Graphics	ES	6	2	0	4	4
4.	20CH102	Environmental Science and Engineering	HS	3	3	0	0	3
5.	20CS201	Data Structures	PC	3	3	0	0	3
LAB INTEGRATED THEORY COURSE								
6.	20CS202	Python Programming	ES	5	3	0	2	4
LABORATORY COURSES								
7.	20EM111	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	20CS211	Data Structures Laboratory	PC	4	0	0	4	2
9.	20EL211	Advanced Reading and Writing Lab	HS	2	0	0	2	1
			TOTAL	**34**	**16**	**2**	**16**	**25**

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	20MA302	Discrete Mathematics	BS	5	3	2	0	4
2.	20IT301	Object Oriented Programming Principles	PC	3	3	0	0	3
3.	20CS404	Operating Systems	PC	3	3	0	0	3
4.	20CS402	Design and Analysis of Algorithms	PC	4	2	2	0	3
5.	20EC341	Analog and Digital Communication	PC	3	3	0	0	3
LAB INTEGRATED THEORY COURSE								
6.	20CS301	Digital Principles and System Design	ES	5	3	0	2	4
LABORATORY COURSES								
7.	20IT311	Object Oriented Programming Principles Laboratory	PC	4	0	0	4	2
8.	20CS412	Operating Systems Laboratory	PC	4	0	0	4	2
9.	20IT312	Mini Project – I	EEC	2	0	0	2	1
10	20CS313	Aptitude and Coding Skills – I	EEC	2	0	0	2	1
			TOTAL	**35**	**17**	**4**	**14**	**26**

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	20MA402	Probability and Statistics	BS	5	3	2	0	4
2.	20IT402	Web Technology - Foundation	PC	3	3	0	0	3
3.	20CS401	Computer Architecture	PC	3	3	0	0	3
4.	20IT403	Database Management Systems	PC	3	3	0	0	3
5.	20GE301	Universal Human Values 2: Understanding Harmony	HS	4	2	2	0	3
LAB INTEGRATED THEORY COURSE								
6.	20IT401	Software Engineering	PC	5	3	0	2	4
LABORATORY COURSES								
7.	20IT411	Web Technology Laboratory	PC	4	0	0	4	2
8.	20IT412	Database Management Systems Laboratory	PC	4	0	0	4	2
9.	20IT413	Internship	EEC	0	0	0	0	1
10.	20CS414	Aptitude and Coding Skills – II	EEC	2	0	0	2	1
			TOTAL	**33**	**17**	**4**	**12**	**26**

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	20CS501	Computer Networks	PC	3	3	0	0	3
2.	20IT502	Object Oriented Systems Design	PC	3	3	0	0	3
3.	20IT503	Big Data Analytics	PC	3	3	0	0	3
4.		Professional Elective - I	PE	3	3	0	0	3
LAB INTEGRATED THEORY COURSE								
5.	20IT501	Web Development Frameworks	PC	5	3	0	2	4
6.	20EC441	Microprocessors and Interfacing	PC	5	3	0	2	4
LABORATORY COURSES								
7.	20CS511	Networks Laboratory	PC	4	0	0	4	2
8.	20IT511	Object Oriented Systems Design Laboratory	PC	4	0	0	4	2
9.	20IT512	Big Data Analytics Laboratory	PC	4	0	0	4	2
10.	20CS512	Advanced Aptitude and Coding Skills – I	EEC	2	0	0	2	1
TOTAL				**36**	**18**	**0**	**18**	**27**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	20CS701	Cloud Computing	PC	3	3	0	0	3
2.	20IT601	Mobile Architecture and Development	PC	3	3	0	0	3
3.		Open Elective - I*	OE	3	3	0	0	3
4.		Professional Elective – II	PE	3	3	0	0	3
LAB INTEGRATED THEORY COURSES								
5.	20IT602	Artificial Intelligence and Machine Learning	PC	5	3	0	2	4
6.	20IT603	Cyber Security	PC	5	3	0	2	4
LABORATORY COURSES								
7.	20CS611	Mobile Application Development Laboratory	PC	4	0	0	4	2
8.	20CS711	Cloud Computing Laboratory	PC	4	0	0	4	2
9.	20IT611	Mini Project - II	EEC	2	0	0	2	1
10.	20CS614	Advanced Aptitude and Coding Skills – II	EEC	2	0	0	2	1
			TOTAL	**34**	**18**	**0**	**16**	**26**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.		Open Elective - II*	OE	3	3	0	0	3
2.		Professional Elective - III	PE	3	3	0	0	3
3.		Professional Elective - IV	PE	3	3	0	0	3
4.		Professional Elective - V	PE	3	3	0	0	3
5.	20IT928	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	6	0	0	6	3
LAB INTEGRATED THEORY COURSE								
6.	20IT701	Microservice Architecture	PC	5	3	0	2	4
LABORATORY COURSES								
7.	20IT711	Project Work - Phase I	EEC	4	0	0	4	2
8.	20IT712	Internship	EEC	0	0	0	0	1
			TOTAL	**27**	**15**	**0**	**12**	**22**

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
LABORATORY COURSES								
1.	20IT811	Project Work - Phase II	EEC	16	0	0	16	8
			TOTAL	**16**	**0**	**0**	**16**	**8**

* List of Courses Offered by Other Departments

TOTAL NO. OF CREDITS: 183

HUMANITIES AND SOCIAL SCIENCES (HS)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EL101	Communicative English and Life Skills	HS	2	2	0	0	2
2.	20EL111	Interpersonal Skills -Listening and Speaking Lab	HS	2	0	0	2	1
3.	20EL201	Technical English	HS	2	2	0	0	2
4.	20CH102	Environmental Science and Engineering	HS	3	3	0	0	3
5.	20EL211	Advanced Reading and Writing Lab	HS	2	0	0	2	1
6.	20GE301	Universal Human Values 2: Understanding Harmony	HS	4	2	2	0	3

BASIC SCIENCES (BS)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20MA101	Engineering Mathematics - I	BS	5	3	2	0	4
2.	20PH101	Physics for Computer Science and Information Technology	BS	3	3	0	0	3
3.	20CH101	Engineering Chemistry	BS	3	3	0	0	3
4.	20PC111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	20MA201	Engineering Mathematics II	BS	5	3	2	0	4
6.	20MA302	Discrete Mathematics	BS	5	3	2	0	4
7.	20MA402	Probability and Statistics	BS	5	3	2	0	4

ENGINEERING SCIENCES (ES)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20GE101	Problem Solving and C Programming	ES	3	3	0	0	3
2.	20EE102	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
3.	20GE111	C Programming Laboratory	ES	4	0	0	4	2
4.	20ME103	Computer Aided Engineering Graphics	ES	6	2	0	4	4
5.	20CS202	Python Programming (Lab Integrated Course)	ES	5	3	0	2	4
6.	20EM111	Engineering Practices Laboratory	ES	4	0	0	4	2
7.	20CS301	Digital Principles and System Design (Lab Integrated Course)	ES	5	3	0	2	4

PROFESSIONAL CORE (PC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20CS201	Data Structures	PC	3	3	0	0	3
2.	20CS211	Data Structures Laboratory	PC	4	0	0	4	2
3.	20CS404	Operating Systems	PC	3	3	0	0	3
4.	20IT301	Object Oriented Programming Principles	PC	3	3	0	0	3
5.	20EC341	Analog and Digital Communication	PC	3	3	0	0	3
6.	20CS402	Design and Analysis of Algorithms	PC	4	2	2	0	3
7.	20CS412	Operating Systems Laboratory	PC	4	0	0	4	2
8.	20IT311	Object Oriented Programming Principles Laboratory	PC	4	0	0	4	2
9.	20IT401	Software Engineering (Lab Integrated Course)	PC	5	3	0	2	4
10.	20IT402	Web Technology - Foundation	PC	3	3	0	0	3
11.	20CS401	Computer Architecture	PC	3	3	0	0	3
12.	20IT403	Database Management Systems	PC	3	3	0	0	3
13.	20IT411	Web Technology Laboratory	PC	4	0	0	4	2
14.	20IT412	Database Management System Laboratory	PC	4	0	0	4	2
15.	20IT501	Web Development Frameworks (Lab Integrated Course)	PC	5	3	0	2	4
16.	20CS501	Computer Networks	PC	3	3	0	0	3
17.	20EC441	Microprocessors and Interfacing (Lab Integrated Course)	PC	5	3	0	2	4
18.	20IT502	Object Oriented Systems Design	PC	3	3	0	0	3
19.	20IT503	Big Data Analytics	PC	3	3	0	0	3
20.	20IT512	Big Data Analytics Laboratory	PC	4	0	0	4	2
21.	20CS511	Networks Laboratory	PC	4	0	0	4	2
22.	20IT511	Object Oriented Systems Design Laboratory	PC	4	0	0	4	2
23.	20IT602	Artificial Intelligence and Machine Learning (Lab Integrated Course)	PC	5	3	0	2	4
24.	20CS701	Cloud Computing	PC	3	3	0	0	3
25.	20IT601	Mobile Architecture and Development	PC	3	3	0	0	3
26.	20IT603	Cyber Security (Lab Integrated Course)	PC	5	3	0	2	4
27.	20CS611	Mobile Application Development Laboratory	PC	4	0	0	4	2
28.	20CS711	Cloud Computing Laboratory	PC	4	0	0	4	2
29.	20IT701	Microservice Architecture (Lab Integrated Course)	PC	5	3	0	2	4

PROFESSIONAL ELECTIVES(PE)

ELECTIVE - I

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20MA501	Linear Algebra and Calculus	PE	3	3	0	0	3
2.	20IT902	Software Testing	PE	3	3	0	0	3
3.	20IT903	Graph Theory and Applications	PE	3	3	0	0	3
4.	20IT904	Digital Signal Processing	PE	3	3	0	0	3
5.	20IT905	Computer Graphics and Multimedia	PE	3	3	0	0	3
6.	20IT906	Information Storage and Management	PE	3	3	0	0	3
7.	20CS908	Agile Methodologies	PE	3	3	0	0	3
8.	20IT907	Intellectual Property Rights	PE	3	3	0	0	3
9.	20IT901	Design Thinking	PE	3	3	0	0	3
10.	20IT929	Google Cloud: Architecting with Google Compute Engine	PE	4	2	0	2	3

ELECTIVE - II

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20IT909	Advanced Java - JEE	PE	4	2	0	2	3
2.	20IT913	Wireless Adhoc and Sensor Networks	PE	3	3	0	0	3
3.	20IT910	Formal Languages and Automata Theory	PE	3	3	0	0	3
4.	20CS913	Internet of Things	PE	3	3	0	0	3
5.	20CS906	Software Project Management	PE	3	3	0	0	3
6.	20CS922	Service Oriented Architecture	PE	3	3	0	0	3
7.	20CS914	Embedded Systems	PE	3	3	0	0	3
8.	20IT919	Digital Image Processing	PE	3	3	0	0	3
9.	20AI901	Advanced Databases	PE	3	3	0	0	3

ELECTIVE - III

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20IT911	DevOps	PE	4	2	0	2	3
2	20CS907	Human Computer Interaction	PE	3	3	0	0	3
3	20IT912	C# and .Net Programming	PE	3	3	0	0	3
4	20AI701	Deep Learning Techniques	PE	3	3	0	0	3
5	20IT914	Foundation Skills in Integrated Product Development	PE	3	3	0	0	3
6	20IT915	Human Rights	PE	3	3	0	0	3
7	20IT916	API and Application Security and Design Patterns	PE	3	3	0	0	3
8	20IT917	Essence of Indian Traditional Knowledge	PE	3	3	0	0	3
9	20IT918	Principles of Compiler Design	PE	3	3	0	0	3

ELECTIVE - IV

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20IT921	Blockchain Technologies	PE	4	2	0	2	3
2	20CS910	Social Network Analysis	PE	3	3	0	0	3
3	20AI912	Soft Computing	PE	3	3	0	0	3
4	20CS919	Cyber Forensics	PE	3	3	0	0	3
5	20CS905	Computer Vision	PE	3	3	0	0	3
6	20IT920	Network Management	PE	3	3	0	0	3
7	20CE917	Professional Ethics in Engineering	PE	3	3	0	0	3
8	20CS921	Quantum Computing	PE	3	3	0	0	3
9	20CS602	Cryptography and Network Security	PE	3	3	0	0	3
10	20IT908	Liberal Arts	PE	3	3	0	0	3

ELECTIVE - V

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20IT922	Information Retrieval Techniques	PE	3	3	0	0	3
2	20IT923	Green Computing	PE	3	3	0	0	3
3	20AI702	Natural Language Processing	PE	3	3	0	0	3
4	20AI904	Speech Processing	PE	3	3	0	0	3
5	20IT924	Web Design and Management	PE	3	3	0	0	3
6	20IT925	Electronic Commerce	PE	3	3	0	0	3
7	20IT926	Fundamentals of Nano Science	PE	3	3	0	0	3
8	20IT927	Indian Constitution	PE	3	3	0	0	3
9	20CS901	Cyber Physical Systems	PE	3	3	0	0	3
10.	20CB404	Introduction to Innovation, IP Management and Entrepreneurship	PE	3	3	0	0	3

OPEN ELECTIVES

1. OPEN ELECTIVES (OE) OFFERED BY CIVIL ENGINEEIRNG DEPARTMENT TO OTHER DEPARTMENTS

SI. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20CE001	Climate Change and its Impact	OE	3	3	0	0	3
2	20CE002	Green Building Design	OE	3	3	0	0	3
3	20CE003	Geographic Information System	OE	3	3	0	0	3
4	20CE004	Air Pollution and Control Engineering	OE	3	3	0	0	3
5	20CE005	Waste Water Treatment	OE	3	3	0	0	3

2. OPEN ELECTIVES (OE) OFFERED BY COMPUTER SCIENCE AND ENGG. DEPT. TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20CS001	Python Programming	OE	3	3	0	0	3
2	20CS002	Software Engineering	OE	3	3	0	0	3
3	20CS003	Mobile Application Development	OE	3	3	0	0	3
4	20CS004	Database Management System	OE	3	3	0	0	3
5	20CS005	Internet of Things	OE	3	3	0	0	3
6	20CS006	Cloud Computing	OE	3	3	0	0	3
7	20CS007	Block Chain Technologies	OE	3	3	0	0	3
8	20CS008	Cyber Physical Systems	OE	3	3	0	0	3
9	20CS009	Web Security	OE	3	3	0	0	3
10	20CS010	Image Processing	OE	3	3	0	0	3
11	20CS011	Computer Vision	OE	3	3	0	0	3
12	20CS012	Human Computer Interaction	OE	3	3	0	0	3

3. OPEN ELECTIVES (OE) OFFERED BY ELECTRONICS AND COMMUNICATION ENGG. DEPT.TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20EC001	Sensors and Transducers	OE	3	3	0	0	3
2	20EC002	MATLAB Programming	OE	3	3	0	0	3
3	20EC003	Medical Electronics	OE	3	3	0	0	3
4	20EC004	Industrial IoT Applications	OE	3	3	0	0	3

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
5	20EC005	Introduction to Image Processing	OE	3	3	0	0	3
6	20EC006	Arduino for Engineers	OE	3	3	0	0	3
7	20EC007	Electronic Materials	OE	3	3	0	0	3
8	20EC008	Introduction to Embedded System	OE	3	3	0	0	3

4. OPEN ELECTIVES (OE) OFFERED BY ELECTRICAL AND ELECTRONICS ENGG. DEPT.TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20EE702	Conventional & Renewable Energy Systems	OE	3	3	0	0	3
2	20EE901	Electric Energy Utilization and Conservation	OE	3	3	0	0	3
3	20EE908	SMPS and UPS	OE	3	3	0	0	3
4	20EE910	Electric and Hybrid Vehicle	OE	3	3	0	0	3
5	20EE915	Smart Grid	OE	3	3	0	0	3
6	20EE918	Biomedical Instrumentation	OE	3	3	0	0	3
7	20EE922	Control of Electrical Drives	OE	3	3	0	0	3
8	20EE925	Energy Management and Auditing	OE	3	3	0	0	3
9	20EE928	Fiber Optics and Laser Instrumentation	OE	3	3	0	0	3

5. OPEN ELECTIVES (OE) OFFERED BY ELECTRONICS AND INSTRUMENTATION ENGG. DEPT.TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20EI301	Instrument Transducers	OE	3	3	0	0	3
2	20EI402	Industrial Instrumentation	OE	3	3	0	0	3
3	20EI701	Medical Instrumentation	OE	3	3	0	0	3
4	20EI702	Industrial Data Networks	OE	3	3	0	0	3
5	20EI903	Robotics and Automation	OE	3	3	0	0	3
6	20EI905	Electric Vehicle Control Systems	OE	3	3	0	0	3
7	20EI909	Introduction to Image and Video Processing	OE	3	3	0	0	3
8	20EI601	Factory Automation	OE	3	3	0	0	3

6. OPEN ELECTIVES (OE) OFFERED BY MECHANICAL ENGINEERING DEPARTMENT TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20ME001	Introduction to Nanotechnology	OE	3	3	0	0	3
2	20ME002	Design Thinking	OE	3	3	0	0	3
3	20ME003	Industrial Engineering and Operation Management	OE	3	3	0	0	3
4	20ME004	Composite Materials	OE	3	3	0	0	3
5	20ME005	Vehicle Styling and Design	OE	3	3	0	0	3
6	20ME006	Testing of Materials	OE	3	3	0	0	3

7	20ME007	Lean six sigma and Supply chain Management	OE	3	3	0	0	3
8	20ME008	Product Design and Development	OE	3	3	0	0	3

7. OPEN ELECTIVES (OE) OFFERED BY INFORMATION TECHNOLOGY DEPARTMENT TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20IT001	Operating Systems	OE	3	3	0	0	3
2	20IT002	Artificial Intelligence and Machine Learning	OE	3	3	0	0	3
3	20IT003	Cyber Security	OE	3	3	0	0	3
4	20IT004	Java Programming	OE	3	3	0	0	3
5	20IT005	Web Design and Development	OE	3	3	0	0	3

8. OPEN ELECTIVES (OE) OFFERED BY ARTIFICIAL INTELLIGENCE AND DATA SCIENCE DEPARTMENT TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20AI402	Data Analytics	OE	3	3	0	0	3
2	20AI502	Machine Learning	OE	3	3	0	0	3
3	20AI601	Business Analytics	OE	3	3	0	0	3
4	20AI701	Deep Learning Techniques	OE	3	3	0	0	3
5	20AI702	Natural Language Processing	OE	3	3	0	0	3

9. OPEN ELECTIVES (OE) OFFERED BY COMPUTER SCIENCE AND BUSINESS SYSTEMS DEPARTMENT TO OTHER DEPARTMENTS

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20CB001	Formal Language and Automata Theory	OE	3	3	0	0	3
2	20CB002	Compiler Design	OE	3	3	0	0	3
3	20CB003	Object Oriented Programming	OE	3	3	0	0	3
4	20CB004	Business Strategy	OE	3	3	0	0	3
5	20CB005	Design Thinking	OE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES(EEC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	20CS313	Aptitude and Coding Skills – I	EEC	2	0	0	2	1
2	20IT312	Mini Project - I	EEC	2	0	0	2	1
3	20IT413	Internship	EEC	0	0	0	0	1
4	20CS414	Aptitude and Coding Skills – II	EEC	2	0	0	2	1
5	20CS512	Advanced Aptitude and Coding Skills – I	EEC	2	0	0	2	1
6	20IT611	Mini Project - II	EEC	2	0	0	2	1
7	20CS614	Advanced Aptitude and Coding Skills – II	EEC	2	0	0	2	1
8	20IT928	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	6	0	0	6	3
9	20IT711	Project Work - Phase I	EEC	4	0	0	4	2
10	20IT712	Internship	EEC	0	0	0	0	1
11	20IT811	Project Work - Phase II	EEC	16	0	0	16	8

MANDATORY COURSE(MC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1		Induction Program (Non-Credit Course)	MC	3 Weeks	-	-	-	-

Summary

S.NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL	PERCENTAGE
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	3	6	-	3	-	-	-	-	12	6.56
2.	BS	12	4	4	4	-	-	-	-	24	13.11
3.	ES	8	10	4	-	-	-	-	-	22	12.02
4.	PC	-	5	16	17	23	18	4	-	83	45.36
5.	PE	-	-	-	-	3	3	9	-	15	8.19
6.	OE	-	-	-	-	-	3	3	-	6	3.28
7.	EEC	-	-	2	2	1	2	6	8	21	11.48
8.	MC	-	-	-	-	-	-	-	-	-	-
	Total	23	25	26	26	27	26	22	8	183	100

Recommended By Board of Studies	No.: 4	Date: 09.06.2022

SEMESTER I

20EL101	COMMUNICATIVE ENGLISH AND LIFE SKILLS	L	T	P	C
		2	0	0	2

OBJECTIVES: The Course will enable learners to:

- Strengthen their basic reading and writing skills.
- Comprehend listening contexts competently.
- Improve their speaking skills to speak fluently in real contexts.
- Develop vocabulary of a general kind and enhance their grammatical accuracy.

UNIT I COMMUNICATION BASICS 6

Listening - short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information. Reading- practice in skimming-scanning and predicting. Writing-completing sentences- developing hints-free writing – Everyday expressions- collocations. Life Skills- Overview of Life Skills: significance of life skills.

UNIT II COMMUNICATION INTERMEDIATE 6

Listening - telephonic conversations. **Speaking** – sharing information of a personal kind—greeting – taking leave. **Reading**–short comprehension passages -pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions) - **Writing** –paragraph writing- topic sentence- main ideas, short narrative descriptions using some suggested vocabulary and structures. **Life skills**– Self-awareness: definition, need for self-awareness; Coping with Stress and Emotions.

UNIT III COMMUNICATION VANTAGE 6

Listening – listening to longer texts and filling up the table - **Speaking**- asking about routine actions and expressing opinions. **Reading**- Long texts (cloze reading) - **Writing**- jumbled sentences - product description - use of reference words and discourse markers. Grammar –Tenses - phrasal verbs - Wh– Questions, yes or no questions and direct / indirect questions–countable &uncountable nouns – modal verbs. **Life skills** – Assertiveness vs Aggressiveness

UNIT IV SYNERGISTIC COMMUNICATION 6

Listening- listening to dialogues or conversations and completing exercises based on them - **Speaking**- speaking about oneself- speaking about one's friend –**Reading**- different types of texts- magazines -**Writing**- letter writing, informal or personal letters-e-mails-conventions of personal email - Language development - synonyms – antonyms. **Life Skills** – Problem Solving Techniques.

UNIT V COMMUNICATION HIGHER 6

Listening – listening to TED talks - **Speaking** – role play – **Reading**- Biographies – **Writing**- writing short essays (analytical & issue-based essays) – dialogue writing. **Life Skills**–Leadership & Decision making.

TOTAL: 30 PERIODS

OUTCOMES:

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

CO1: Read articles of a general kind in magazines and newspapers efficiently and identify different life skills.

CO2: Participate efficiently in informal conversations and develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.

CO3: Comprehend conversations and short talks delivered in English.

CO4: Write short essays of a general kind and personal letters and emails in English.

CO5: Develop vocabulary of a general kind by enriching their reading skills.

CO6: Use appropriate thinking and problem- solving techniques to solve new problems.

TEXT BOOKS:

1. Kumar, Suresh E and Sreehari,P. Communicative English. Orient Black Swan, 2007.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York:

Rutledge, 2011.
2. Dhanavel, S P. English and Soft Skills, Volume Two, Orient Black Swan, ISBN 978 93 528769142.
3. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1973. Print.
4. Larry James, The First Book of Life Skills; First Edition, Embassy Books, 2016.
5. Larsen, Kristine, Stephen Hawking: A Biography, Greenwood: Publishing Group, 2005.
6. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student 's Book & Workbook) Cambridge University Press, New Delhi: 2005.

20MA101	**ENGINEERING MATHEMATICS – I**	**L**	**T**	**P**	**C**
		3	**2**	**0**	**4**

OBJECTIVES:

The syllabus is designed to:

- Explain the concepts of matrix algebra.
- Make the students understand the idea of curvature, evolutes and envelopes.
- Impart the knowledge of functions of several variables.
- Introduce the concepts of Gamma and Beta integral.
- Develop an understanding on the basics of multiple integrals.

UNIT I MATRICES 9+6

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II APPLICATIONS OF DIFFERENTIAL CALCULUS 9+6

Curvature in Cartesian and Polar Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes (excluding Evolute as envelope of normals).

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+6

Limits – Continuity – Partial derivatives (excluding Euler's theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV GAMMA, BETA INTEGRALS AND APPLICATIONS 9+6

Gamma and Beta Integrals – Properties – Relation between Gamma and Beta functions, Evaluation of integrals using Gamma and Beta functions.

UNIT V MULTIPLE INTEGRALS 9+6

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.

TOTAL: 75 PERIODS

OUTCOMES:

After the successful completion of the course, the student will be able to:

CO1: Diagonalize a matrix by orthogonal transformation.

CO2: Determine the Evolute and Envelope of curves.

CO3: Examine the maxima and minima of function of several variables.

CO4: Apply Gamma and Beta integrals to evaluate improper integrals.

CO5: Evaluate the area and volume by using multiple integrals.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

REFERENCES:

1. M. K. Venkataraman, "Engineering Mathematics, Volume I", 4th Edition, The National Publication Company, Chennai, 2003.

2. Sivaramakrishna Dass, C. Vijayakumari, “Engineering Mathematics”, Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, ”Higher Engineering Mathematics”, S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, “Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

20PH101	PHYSICS FOR COMPUTER SCIENCE AND INFORMATION TECHNOLOGY (Common to B.E.(CSE) and B.Tech (ADS and IT))	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamental concepts of physics and apply this knowledge to scientific, engineering and technological problems.
- To make the students enrich basic knowledge in electronics and quantum concepts and apply the same in computing fields.

UNIT I LASER AND FIBRE OPTICS 9

Population of energy levels – Einstein’s A and B coefficients derivation -Resonant cavity - Optical amplification (qualitative) - Semiconductor lasers: homojunction and heterojunction- Engineering applications of lasers in data storage (qualitative).

Fibre optics: Principle, numerical aperture and acceptance angle -V-number - Types of optical fibres (Material, refractive index and mode) -Losses in optical fibre - Fibre optic communication- Fibre optic sensors (pressure and displacement).

UNIT II MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment - atomic magnetic moments - Origin of magnetic moments-

Magnetic permeability and susceptibility - Magnetic material classifications- Diamagnetism - Paramagnetism- Ferromagnetism -Antiferromagnetism- Ferrimagnetism - Ferromagnetism: Domain Theory- M versus H behaviour- Hard and soft magnetic materials - Examples and uses - Magnetic principle in computer data storage - Magnetic hard disc (GMR sensor)- Introduction to Spintronics.

UNIT III ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity expression - Wiedemann-Franz law - Success and failures of CFT- Particle in a three dimensional box - Degenerate states - Effect of temperature on Fermi function- Density of energy states and average energy of electron at 0 K - Energy bands in solids.

UNIT IV SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram -Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors- Band gap determination-Extrinsic semiconductors - n-type and p-type semiconductors (qualitative) - Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.

UNIT V INTRODUCTION TO NANO DEVICES AND QUANTUM COMPUTING 9

Introduction to nanomaterial -Electron density in bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterial- Tunneling: single electron phenomena and single electron transistor - Quantum dot laser. Quantum computing: Introduction - Differences between quantum and classical computation.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Know the principle, construction and working of lasers and their applications in fibre optic communication.

CO2: Understand the magnetic properties of materials and their specific applications in computer data storage.

CO3: Analyze the classical and quantum electron theories and energy band structures.

CO4: Evaluate the conducting properties of semiconductors and its applications in various devices.

CO5: Comprehend the knowledge on quantum confinement effects.

CO6: Apply optical, magnetic and conducting properties of materials, quantum concepts at the nanoscale in various applications.

TEXT BOOKS:

1. M.N. Avadhanulu and P.G. Kshirsagar, “A text book of Engineering Physics”, S. Chand and Company, New Delhi, 2014.
2. R.K. Gaur and S.L. Gupta, “Engineering Physics”, Dhanpat Rai Publications (P) Ltd., Eighth Edition., New Delhi, 2001.
3. A. Marikani, “Materials Science”, PHI Learning Private Limited, Eastern Economy Edition, 2017.
4. V. Rajendran, “Materials Science”, Tata McGraw-Hill, 2011.
5. R.A.Serway and J.W. Jewett, “Physics for Scientists and Engineers”, Ninth Edition., Cengage Learning, 2014.
6. C.Kittel, “Introduction to Solid State Physics”, 8thEdition., John Wiley & Sons, NJ, USA, 2005.
7. G.W.Hanson, “Fundamentals of Nanoelectronics”, Pearson Education, 2008.

REFERENCES:

1. D. Halliday, R. Resnick and J. Walker, “Fundamentals of Physics”, 9th Edition, John Wiley & sons, 2011.
2. R.P. Feynman, “The Feynman Lectures on Physics - Vol. I, II and III”, The New

Millennium Edition, 2012.

3. N.W. Aschroft and N.D.Mermin, “Solid State Physics”, Harcourt College Publishers, 1976.
4. S.O. Pillai, “Solid state physics”, New Age International, 2015.
5. M.A.Wahab, “Solid State Physics”, 3rd Edition, Narosa Publishing House Pvt. Ltd., 2015
6. N.Garciaand A.Damask, “Physics for Computer Science Students”, Springer-Verlag,2012.
7. B.Rogers, J. Adams and S.Pennathur,“Nanotechnology: Understanding Small System”, CRC Press, 2014.
8. C.P. Williams, “Explorations in Quantum Computing”, Springer-Verlag London, 2011.

20CH101	**ENGINEERING CHEMISTRY**	**L**	**T**	**P**	**C**
	(Common to CSE, EEE, ECE, EIE, IT, ADS)	**3**	**0**	**0**	**3**

OBJECTIVES:

The goal of this course is to achieve conceptual understanding of the applications of chemistry in engineering and technology. The syllabus is designed to:

- Understand the role of chemistry in everyday life.
- Develop an understanding of the basic concepts of electro chemistry and its applications.
- Learn the principles and generation of energy in different types of batteries, fuel cells, nuclear reactors, solar cells and windmills.
- Make them acquire basic knowledge of polymers, their classification and the applications of speciality polymers in engineering and technology.
- Understand the preparation, properties and applications of nanomaterials in various fields.

UNIT I CHEMISTRY IN EVERYDAY LIFE 8

Importance of chemistry in everyday life- food additives - types (colours, preservatives, flavours and sweeteners), effects - food adulteration – types of adulteration (intentional, incidental) - effects of food adulterants – cosmetics and personal care products (fairness creams, perfumes, deodorants, shampoos)- effects – beverages-classification – carbonated beverages – nutritive values and effects.

Water – impurities – industrial uses of water – hardness, external treatment (demineralization) – desalination (reverse osmosis).

UNIT II ELECTROCHEMISTRY 10

Introduction – terminology - conductance of electrolytes- specific conductance, equivalent conductance, molar conductance- factors affecting conductance- origin of electrode potential- single electrode potential, standard electrode potential- measurement of single electrode potential-reference electrodes (standard hydrogen electrode, calomel electrode) - electrochemical series, applications – measurement of EMF of the cell – Nernst equation (derivation), numerical problems.

Chemical sensors – principle of chemical sensors- breath analyzer and Clark oxygen analyzer.

UNIT III ENERGY STORAGE DEVICES AND ENERGY SOURCES 9

Batteries – primary battery (alkaline battery) - secondary battery (Pb-acid battery, Ni-metal hydride battery, Li-ion battery) - fuel cells (H_2-O_2 fuel cell).

Nuclear Energy –nuclear reactions – fission, fusion, differences, characteristics– nuclear chain reactions –light water nuclear reactor – breeder reactor.

Renewable energy sources- solar energy – thermal conversion (solar water heater and heat collector) - photovoltaic cell– wind energy.

UNIT IV POLYMERS 9

Introduction – monomer, functionality, degree of polymerization – classification based on sources and applications – effect of polymer structure on properties - types of polymerization (addition, condensation) - thermoplastic and thermosetting resins – preparation, properties and applications of Teflon, polyvinyl chloride, polycarbonate, Bakelite.

Special polymers - biodegradable polymers - properties and applications of

polycaprolactone, polyhydroxyalkanoate – properties and applications of electrically conducting polymers (poly aniline, polyvinylidene fluoride).

UNIT V NANOCHEMISTRY 9

Introduction – synthesis – top-down process (laser ablation, chemical vapour deposition), bottom-up process (precipitation, electrochemical deposition) – properties of nanomaterials – types (nanorods, nanowires, nanotubes-carbon nanotubes, nanocomposites).

Applications of carbon nanotubes – applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Illustrate the role of chemistry in everyday life and the industrial uses of water.

CO2: Construct electrochemical cells and to determine the cell potential.

CO3: Compare and analyse the different energy storage devices and to explain potential energy sources.

CO4: Classify different types of polymeric materials and to discuss their properties and applications.

CO5: Explain basic concepts of Nano chemistry and to enumerate the applications of nanomaterials in engineering and technology.

TEXT BOOKS:

1. P. C. Jain and Monika Jain, “Engineering Chemistry”, 17th edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2018.
2. Prasanta Rath, “Engineering Chemistry”, 1st edition, Cengage Learning India Pvt. Ltd., Delhi, 2015.

REFERENCES:

1. S. S. Dara and S. S. Umare, “A Textbook of Engineering Chemistry”, 12th edition, S. Chand & Company, New Delhi, 2010.

2. Kirpal Singh, “Chemistry in daily life”, 3rd edition, PHI Learning Pvt. Ltd., 2012.
3. J. C. Kuriacose and J. Rajaram, “Chemistry in Engineering and Technology”, Volume-1 & Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.
4. Geoffrey A. Ozin, Andre C. Arsenault, Ludovico Cademartiri, “Nanochemistry: A Chemical Approach to Nanomaterials”, 2nd edition, RSC publishers, 2015.
5. Prasanna Chandrasekhar, “Conducting polymers, fundamentals and applications - A Practical Approach”, 1st edition, Springer Science & Business Media, New York, 1999.

20GE101	PROBLEM SOLVING AND C PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students understand the fundamentals of problem solving using Algorithm and Flowchart
- To teach the basic programming constructs for solving simple problems
- To introduce the basic concepts of arrays and strings
- To acquaint the students about functions, pointers, structures and their relationship
- To impart knowledge on the concepts of file handling

UNIT I INTRODUCTION TO ALGORITHM AND C 9

Introduction to Computer System – Block diagram, Program Development Life Cycle

General problem Solving concepts: Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

Imperative languages: Introduction to imperative language, syntax and constructs of a specific language (ANSI C), Applications

Types, Operators: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Basic I/O using scanf, printf, Operators – Types, Precedence, Associativity, Proper variable naming and Hungarian Notation.

UNIT II CONTROL FLOW STATEMENTS 7

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and unstructured programming.

UNIT III ARRAYS AND FUNCTIONS 10

Arrays and Strings – Initialization, Declaration – One Dimensional and Two Dimensional arrays – Linear search, Binary Search, Matrix Operations (Addition and Subtraction)

Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.

UNIT IV STRUCTURES AND POINTERS 10

Basic Structures, Structures and Functions, Array of structures.

Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

Pointer of structures, Self-referential structures, Table look up, typedef, unions, Bit-fields

UNIT V FORMATTED I/O AND FILE PROCESSING 9

Formatted Output – fprintf, Formated Input – fscanf, Variable length argument list

Files - file access including FILE structure, fopen, fread, fwrite, stdin, sdtout and stderr, File Types – Text, Binary - Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems

CO2: Develop simple applications using basic constructs

CO3: Write programs using arrays and strings

CO4: Design and implement applications using functions, pointers and structures.

CO5: Design applications using sequential and random access file processing.

TEXT BOOKS:

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Pearson Education India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, " Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCES:

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018
2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. Yashavant Kanetkar, Let Us C, BPB Publications, 16th Edition, 2018.
4. Reema Thareja, "Programming in C", 2nd Edition, Oxford University Press, 2018.
5. Zed A. Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)", (Zed Shaw's Hard Way Series), 1st Edition, Addison- Wesley Professional, 2015.

20EE102	BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on fundamentals of electrical circuits and its analysis
- To interpret the basic principles of electrical machines and their performance
- To examine the different energy sources and protection methods
- To explore the different types of electronic circuits and its characteristics
- To acquire knowledge on the principles and operation of measuring instruments and transducers

UNIT I ELECTRICAL CIRCUITS ANALYSIS 9

Ohms Law, Kirchhoff's Law-power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- -star delta conversion.

UNIT II POWER SYSTEM 9

Power Generation -Thermal-Hydro-wind and solar. construction and working principle. Protection-need for earthing, fuses and circuit breakers. Energy Tariff calculation for domestic loads.

UNIT III ELECTRICAL MACHINES 9

DC Generator-Types, Construction, working principle, EMF equation, DC Motor-working Principle,- Three Phase Induction Motors- Types, Construction, working principle- Single Phase Induction Motors,–working Principle-Transformers-Types and construction, EMF equation-Basics of Stepper Motor- applications of various machines

UNIT IV ELECTRONIC CIRCUITS 9

PN Junction-VI Characteristics of Diode, Rectifier- zener diode, Transistors OPAMP-configuration, differentiator, integrator, ADC- Types, Successive approximation type, DAC- Types, Weighted resistor DAC and R-2R ladder type, Voltage regulator IC using LM 723,LM 317.

UNIT V ELECTRICAL MEASUREMENT 9

Characteristic of measurement-errors in measurement, torque in indicating instruments-moving coil and moving iron meters, Induction type Energy meter and Dynamometer watt meter. Transducers- classification-Thermocouple, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Analyse the electric circuits.

CO2: Classify the different types of electric machines and transformers

CO3: Study the different type of renewable sources and common domestic loads.

CO4: Acquire knowledge in basics of electronic circuits.

CO5: Describe the different types of measuring instruments and transducers

TEXT BOOKS:

1. S.K.Bhattacharya, Basic Electrical and Electronics Engineering, Pearson **(Covers Units 1,2,4 and 5)**
2. C L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New Age International**: Unit 3 except Domestic refrigerator and air conditioner - construction and working principle)**

REFERENCES:

1. S.B. Lal Seksena and Kaustuv Dasgupta, Fundaments of Electrical Engineering, Cambridge, 2016
2. B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson
4. John Bird, ―Electrical and Electronic Principles and Technology‖, Fourth Edition, Elsevier,
5. Mittle, Mittal, Basic Electrical Engineering‖, 2nd Edition, Tata McGraw-Hill Edition, 2016.
6. R.S Khurmi and J K Gupta, Textbook of Refrigeration and Air-conditioning (M.E.), S Chand& Co

20PC111	**PHYSICS AND CHEMISTRY LABORATORY**	**L**	**T**	**P**	**C**
	(Common to all Branches except CSBS)	**0**	**0**	**4**	**2**

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY

(Any five experiments to be conducted**)**

1. Determination of wavelength and velocity of ultrasonic waves by Ultrasonic Interferometer.
2. Determination of thermal conductivity of a poor conductor by LEE'S Disc method.

3. (i) Determination of wavelength and divergence angle of semiconductor laser source using diffraction grating.
   (ii) Determination of particle size by using diffraction of semiconductor laser beam.
   (iii) Analysis of Numerical aperture and acceptance angle of an optical fibre.

4. Determination of Young's Modulus of a beam by non-uniform bending method.
5. Determination of the moment of inertia of the disc and rigidity modulus of wire by Torsional pendulum.
6. Spectrometer - Determination of wavelength of Mercury Spectrum using diffraction grating.
7. Determination of thickness of wire by air wedge method.
8. Determination of Young's Modulus of a beam by Uniform bending method.
9. Determination of band gap of a semiconductor.

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, based on hands-on experience of the students, they will be able to

CO1: Use the ultrasonic interferometer and to determine the wavelength and velocity of ultrasonic waves of a liquid.

CO2: Examine the thermal conductivity of a bad conductor.

CO3: Determine the wavelength of mercury spectrum and also determine the wavelength of a laser source, particle size, divergence angle of semiconductor laser source using diffraction grating and to analyze the numerical aperture and acceptance angle of an optical fibre.

CO4: Examine the Young's modulus of a beam by uniform and non-uniform bending and to estimate the moment of inertia of the disc and rigidity modulus of wire by torsional pendulum.

CO5: Calculate the thickness of a thin wire by the interference pattern.

CO6: Determine the band gap of a semiconductor.

REFERENCES:

1. Physics laboratory manual, Department of Physics, R.M.K. Engineering College, 2019.
2. Wilson J.D. and Hernandez C.A., - Physics Laboratory Experiments, Houghton Mifflin Company, New York, 2005.

LIST OF EXPERIMENTS: CHEMISTRY LABORATORY

OBJECTIVES:

To make the students acquire practical skills through volumetric and instrumental analysis

1. Determination of total, temporary and permanent hardness of water by EDTA method.
2. Conductometric titration of strong acid vs. strong base.
3. Determination of strength of acids in a mixture using a conductivity meter.
4. Determination of strength of given hydrochloric acid using a pH meter.
5. Estimation of the iron content of the given solution using a potentiometer.
6. Estimation of the iron content of the water sample using a spectrophotometer (thiocyanate method).
7. Estimation of sodium present in water using a flame photometer.
8. Determination of the molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Determination of corrosion rate by weight loss method.
10. Determination of flash and fire point of a lubricating oil (Pensky Martens apparatus).
11. Determination of concentration of a given solution by constructing a galvanic cell.

TOTAL: 30 PERIODS

OUTCOMES:

Based on hands-on experience, students will be able to:

CO1: Analyse the given hard water sample and estimate different types of hardness present

CO2: Observe and analyse the change in conductivity of an acid(s) when added with base through conductometry.

CO3: Examine the change in pH when an acid is added with a base using pH meter.

CO4: Understand the redox reactions and its impact on emf values through potentiometry.

CO5: Determine the flash and fire point of an oil

CO6: Assess the corrosion rate of a given metal

CO7: Construct an electrochemical cell to determine the concentration of the given solution.

REFERENCES:

1. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, “Vogel’s
2. Quantitative Chemical Analysis”, 6th edition, Pearson Education Pvt. Ltd., 2009.

20GE111	C PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To make the students write simple programs using basic constructs
- To familiarize the concepts of strings, pointers, functions and structures
- To equip the students on the knowledge of file processing concepts

LIST OF EXPERIMENTS:

1. Constructing Flow charts using RAPTOR tools.
2. Programs using I/O statements and expression
3. Write a program to find whether the given line is horizontal or vertical.
4. Write a program to calculate the distance between two points p1(x1,y1), p2(x2,y2).
5. Write a program to calculate the force for the given mass and acceleration.
6. Write a program to calculate the Young’s modulus.
7. Write a program to calculate the type of solution based on its pH value.
8. Write a program to temperature conversion (Fahrenheit to Celsius and vice versa)
9. Programs using decision-making constructs.
10. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
11. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
12. Check whether a given number is Armstrong number or not?

13. Given a set of numbers like, 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>

14. Populate an array with height of persons and find how many persons are above the average height.
15. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.
16. Given a string —a$bcd./fg‖ find its reverse without changing the position of special characters.(Example input:a@gh%;j and output:j@hg%;a)
17. Convert the given decimal number into binary, octal and hexadecimal numbers using user-defined functions.
18. From a given paragraph perform the following using built-in functions:
    a. Find the total number of words.
    b. Capitalize the first word of each sentence.
    c. Replace a given word with another word.
19. Solve towers of Hanoi using recursion.
20. Sort the list of numbers using pass by reference.
21. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members:

    EID, Ename, Designation, DOB, DOJ, Basicpay

    Note that DOB and DOJ should be implemented using structure within structure.
22. Compute internal marks of students for five different subjects using structures and functions.
23. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
24. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
25. Mini project: Create a —Railway reservation system with the following modules

- Booking
- Availability checking
- Cancellation
- Prepare chart

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Write programs for simple applications making use of basic constructs, arrays and strings.

CO2: Develop programs involving functions, recursion, pointers, and structures.

CO3: Create applications using sequential and random access file processing.

TEXT BOOKS:

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Pearson Education India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, " Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCES:

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018
2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. Yashavant Kanetkar, Let Us C, BPB Publications, 16th Edition, 2018.
4. Reema Thareja, "Programming in C", 2nd Edition, Oxford University Press, 2018.
5. Zed A. Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)", (Zed Shaw's Hard Way Series), 1st Edition, Addison- Wesley Professional, 2015.

20EL111	**INTERPERSONAL SKILLS - LISTENING & SPEAKING LAB**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

OBJECTIVES:

The Course will enable learners to:

- Equip and strengthen the English language skills.
- Provide guidance and practice to engage in specific academic speaking activities and enhance writing skills with specific reference to technical writing (interview skills).
- Improve general and academic listening skills.
- Demonstrate their presentation skills competently.

UNIT I **6**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics - taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II **6**

Listen to a process information- give information, as part of a simple explanation – conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III **6**

Deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail.

UNIT IV **6**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and participating in conversations.

UNIT V **6**

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group

work.

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course Learners will be able to:

CO1: Listen and respond appropriately.

CO2: Participate in group discussions.

CO3: Make effective presentations.

CO4: Participate confidently and appropriately in conversations both formal and informal.

TEXT BOOKS:

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Dhanavel, S P. English and Soft Skills, Volume Two, Orient Black Swan, ISBN 978 93 528769142.

REFERENCES:

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014.
4. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

SEMESTER II

20EL201	TECHNICAL ENGLISH	L	T	P	C
		2	0	0	2

OBJECTIVES:

The Course prepares second semester Engineering and Technology students to:

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

UNIT I INTRODUCTION - TECHNICAL ENGLISH 6

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

UNIT II READING ANDSTUDY SKILLS 6

Listening- Listening to longer technical talks and completing exercises based on them-

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

UNIT III TECHNICAL WRITING AND GRAMMAR 6

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

UNIT IV REPORT WRITING 6

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations-**Reading** – reading for detailed comprehension- **Writing**- Report Writing (accident and survey) - minutes of a meeting - Vocabulary Development- finding suitable synonyms-paraphrasing-. Language Development-reported speech.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 6

Listening- TED talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– email etiquette- job application – cover letter –Résumé preparation (via email and hard copy)- Vocabulary Development- verbal analogies - Language Development- clauses- if conditionals.

TOTAL: 30 PERIODS

OUTCOMES:

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

CO1: Read technical texts and write area- specific texts effortlessly.

CO2: Listen and comprehend lectures and talks in their area of specialization successfully.

CO3: Speak appropriately and effectively in varied formal and informal contexts.

CO4: Write reports and winning job applications.

TEXT BOOKS:

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
2. Sudharshana.N.P and Saveetha C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES:

1. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
2. Herbert, A. J. The Structure of Technical English.Longman.1976.
3. Kumar, Suresh. E. Engineering English. Orient Black swan: Hyderabad,2015.
4. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007.
5. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.

20MA201	**ENGINEERING MATHEMATICS – II**	**L**	**T**	**P**	**C**
		3	**2**	**0**	**4**

OBJECTIVES:

The syllabus is designed to:

- Explain various techniques in solving ordinary differential equations.
- Make the students understand the concepts of vector differentiation and integration.
- Introduce the concepts of Laplace transforms and its applications.
- Develop an understanding on analytic function, conformal mapping and complex integration.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9+6

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+6

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (Statement only) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT III LAPLACE TRANSFORMS 9+6

Laplace transforms – Sufficient condition for existence – Transform of elementary functions - Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only) – Initial and final value theorems – Solution of linear ordinary differential equation of second order with constant coefficients using Laplace transformation techniques.

UNIT IV COMPLEX DIFFERENTIATION AND CONFORMAL MAPPING 9+6

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (Statement only) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: $w = z + k$, kz, $1/z$, z^2 and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+6

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Statement and applications of Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL: 75 PERIODS

OUTCOMES:

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

CO1: Solve the higher order linear differential equations

CO2: Determine the gradient of a scalar field, divergence and curl of a vector fields and interpret their physical meaning and evaluate line, surface and volume integrals by vector integration.

CO3: Apply Laplace Transforms method for solving linear ordinary differential equation.

CO4: Construct an analytic function and analyze conformal mapping.

CO5: Evaluate the real integrals using complex integration.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
3. T. Veerarajan, “Engineering Mathematics”, Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

REFERENCES:

1. M. K. Venkataraman, “Engineering Mathematics, Volume II”, 4th Edition, The National Publication Company, Chennai, 2003.
2. Sivaramakrishna Dass, C. Vijayakumari, “Engineering Mathematics”, Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, ”Higher Engineering Mathematics”, S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, “Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

20ME103	**COMPUTER AIDED ENGINEERING GRAPHICS**	**L**	**T**	**P**	**C**
	(Common to ADS, CE, CSE, ECE, EEE, EIE, ME and IT)	**2**	**0**	**4**	**4**

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.

- To expose them to existing national standards related to technical drawings.

UNIT I INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWING AND CAD COMMANDS 18

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 CAD commands- CAD user interface- coordinate systems, object selection methods, selection of units and precession. Sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer. Conversion of simple pictorial diagrams to orthographic view using CAD software

UNIT II PLANE CURVES 16

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT III PROJECTION OF POINTS, LINES AND PLANE SURFACES 18

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

UNIT IV PROJECTION OF SOLIDS AND PROJECTION OF SECTIONED SOLIDS 20

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method. Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

UNIT V DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTION 18

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones-combination of two solid objects in simple vertical positions.

TOTAL: 90 PERIODS

OUTCOMES:

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

CO1: Illustrate the fundamentals and standards of engineering drawing and apply the concepts of orthographic projections using CAD software.

CO2: Interpret and construct various plane curves.

CO3: Develop orthographic projections of points, lines and plane surfaces.

CO4: Make use of concepts in projection to draw projections of solids and interpret the concept in section of solids.

CO5: Interpret and visualize development of surfaces.

CO6: Interpret and visualize isometric projection of simple solids.

TEXT BOOKS:

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020.

2 Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 15th Edition, 2019.

REFERENCES:

1. Bhatt N.D. “Engineering Drawing”, Charotar Publishing House, 53rd edition 2019.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition, 2019.
3. Engineering Drawing Practice for Schools and Colleges BIS SP46:2003 (R2008), Published by Bureau of Indian Standards (BIS), 2008.
4. Parthasarathy. N.S and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2019.
5. Gopalakrishna. K.R., Engineering Drawing Vol 1 & 2, Subhas Publications, 27th

Edition, 2017.

20CH102	ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to all Branches except CSBS)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The goal of this course is to enlighten and sensitize the students on environmental conservation and social issues. The course is designed to:

- Appreciate the natural resources of environment, which are inherently created for supporting life.
- Learn scientific and technological solutions to current day pollution issues.
- Study the interrelationship between living organisms and environment
- Understand the integrated themes of biodiversity.
- Appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

UNIT I NATURAL RESOURCES 11

Introduction - scope and importance of environment – need for public awareness.

Forest resources- Use and over-exploitation, deforestation - timber extraction, mining, dams and their effects on forests and tribal people. **Water resources** - Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems. **Mineral resources**- Use and exploitation, environmental effects of extracting and using mineral resources. **Food resources**- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, salinity. **Energy resources** - Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. **Land resources**- Land as a resource, land degradation, soil erosion and desertification – role of an individual in conservation of natural resources - case studies.

UNIT II POLLUTION AND ITS MANAGEMENT 11

Pollution – causes, effects and control measures - Air pollution- Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - nuclear accidents and holocaust - role of an individual in prevention of pollution – case studies.

Waste management - causes, effects and control measures of municipal solid wastes, e- waste, plastic waste.

UNIT III ECOSYSTEMS AND BIODIVERSITY 9

Introduction to ecosystems – structure and function of an ecosystem – energy flow in the ecosystem - ecological succession – food chains, food webs and ecological pyramids - types, characteristic features, structure and functions of - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (lakes, oceans)

Introduction to biodiversity – types (genetic, species and ecosystem diversity) –values of biodiversity - threats to biodiversity - endangered and endemic species – conservation of biodiversity (in-situ and ex-situ conservation) - India as a mega-diversity nation – hot-spots of biodiversity in India

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

Sustainable development – sustainable development goals - water conservation, rain water harvesting, watershed management – resettlement and rehabilitation - consumerism and waste products, value education.

Disaster management- floods, drought, earthquake, tsunami, cyclone and landslides - case studies. **Environmental ethics**- issues and possible solutions – environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Introduction - population growth, variation among nations, population explosion, family welfare programme – women and child welfare - environment and human health – endemic/epidemic/pandemic, COVID – 19, HIV / AIDS– role of information technology in environment and human health – environmental impact assessment- case studies.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Illustrate the importance and conservation of natural resources.

CO2: Assess the impact of various pollutants and suggest appropriate pollution control

methods.

CO3: Explain the basic structure of ecosystem and the conservation of biodiversity.

CO4: Analyze the social issues related to environment and recommend suitable solutions.

CO5: Investigate the trends in population explosion and assess its impact.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik, “Perspectives in environmental studies”, New Age International, 6th edition, 2018.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2017.
3. Gilbert M. Masters, Wendell P. Ela “Introduction to Environmental Engineering and Science”, 3rd edition, Pearson Education, 2015.

REFERENCES:

1. William P. Cunningham and Mary Ann Cunningham, “Environmental Science: A Global Concern”, McGraw Hill, 14th edition, 2017.
2. G. Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India Pvt. Ltd., Delhi, 14th edition, 2014.
3. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press Pvt. Ltd., Hyderabad, 2nd edition, 2015.

20CS201	**DATA STRUCTURES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

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

UNIT I LINEAR DATA STRUCTURES – LIST 9

Algorithm analysis-What to analyze-running time calculations-Abstract Data Types (ADTs)

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

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Stack Model - Implementations: Array and Linked list - Applications - Balancing symbols - Evaluating arithmetic expressions - Conversion of Infix to postfix expression- Queue ADT – Queue Model - Implementations: Array and Linked list - Circular Queue – Priority Queue - deQueue – applications of queues

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree – Priority Queues – Applications of priority queues.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS 9

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

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Implement abstract data types for linear data structures.

CO2: Apply the appropriate linear data structures to solve problems.

CO3: Identify and use appropriate tree data structures in problem solving.

CO4: Choose appropriate Graph representations and solve real-world applications.

CO5: Critically analyze the various sorting and searching algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2016.
2. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2014.

REFERENCES:

1. Narasimha Karumanchi, “Data Structure and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles”, CareerMonk Publications, 2020.
2. Jean-Paul Tremblay and Paul Sorenson, “An Introduction to Data Structures with Application”, McGraw-Hill, 2017.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in Java”, Third Edition, Pearson Education, 2012.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.
5. Ellis Horowitz, Sartaj Sahni, Dinesh P Mehta, “Fundamentals of Data Structures in C++”, Second Edition, Silicon Press, 2007.

20CS202	PYTHON PROGRAMMING	L	T	P	C
	(Lab Integrated Theory Course)	3	0	2	4

OBJECTIVES:

- To understand and write simple Python programs.
- To write Python programs using functions and understand recursion
- To solve problems using Python data structures –- lists, tuples, dictionaries.
- To understand files, modules and packages in Python.
- To use Exceptions, Standard Libraries and IDE for application development.

UNIT I INTRODUCTION TO PYTHON 9+6

Introduction to Python programming – Arithmetic Operators - values and types - variables, expressions, statements – Functions – Conditionals and Recursion –Iteration

UNIT II FUNCTIONS 9+6

Fruitful functions: Return Values, Incremental Development, Composition, Boolean functions, Recursion, Example, Checking Types – Strings: len, Traversal with a for loop, String slices, Immutable, Searching, Looping and Counting, String Methods, in Operator, String Comparison – Case Study: Word Play.

UNIT III LISTS, DICTIONARIES, TUPLES 9+6

Lists: Sequence, Mutable, Traversing, Operations, list slices, list methods, Map, Filter and Reduce, Deleting elements, Lists and Strings, Objects and Values, Aliasing, List Arguments.

Dictionaries: Mapping, Collection of Counters, Looping and Dictionaries, Reverse Lookup, Dictionaries and Lists, Memos, Global Variables.

Tuples: Immutable, Tuple Assignment, Tuple as Return Values, Variable-length Argument Tuples, Lists and Tuples, dictionaries and Tuples, Sequences of Sequences. Case Study: Data Structure Selection.

UNIT IV FILES, MODULES, PACKAGES 9+6

Files: Persistence, Reading and Writing, Format Operator, Filenames and Paths, Catching Exceptions - Modules: Importing a module, Packages, Creating a module.

UNIT V EXCEPTIONS, LIBRARIES 9+6

Exception Handling – Built-in Exceptions – Application Development with Python: Integrated Development Environment, Python Standard Library.

LIST OF EXERCISES:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Operations on Tuples:
    a. finding repeated elements
    b. slice a tuple
    c. reverse a tuple

d. replace last value of a tuple

5. String manipulation

a. Get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself

b. Python function that takes a list of words and returns the length of the longest one

c. Python program to remove the characters which have odd index values of a given string

d. Python program to count the occurrences of each word in a given sentence.

e. Python program that accepts a comma separated sequence of words as input and prints the unique words in sorted form

f. Python function to reverses a string if it's length is a multiple of 4

6. List operations

a. Find the maximum of a list of numbers
b. Python program to remove duplicates from a list.
c. Python program to get the smallest number from a list.
d. Python program to print a specified list after removing the 0th, 4th and 5th elements.
e. Python program to print the numbers of a specified list after removing even numbers from it.
f. Python program to find the second smallest number in a list.

7. Linear search and Binary search
8. Selection sort, Insertion sort
9. Merge sort
10. First n prime numbers
11. Multiply matrices
12. Programs that take command line arguments (word count)
13. Find the most frequent words in a text read from a file
14. Simulate elliptical orbits in Pygame
15. Simulate bouncing ball using Pygame

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

CO1: Implement simple Python programs.

CO2: Develop Python programs using functions.

CO3: Represent and solve compound data using Python lists, tuples, dictionaries.

CO4: Implement and perform operations on files, modules and packages.

CO5: Apply Exceptions, Standard Libraries and IDE for application development.

TEXT BOOKS:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Martin C. Brown, Python: The Complete Reference, Mc-Graw Hill, (Unit 4 – Chapter 5, Unit 5 – Chapter 7, 17)

REFERENCES:

1. David Beazley, Brian K. Jones, Python Cookbook, O’Reilly , Third Edition, 2013.
2. Reema Thareja, “Problem Solving and Programming with Python”, 2nd Edition, Oxford University Press 2019.
3. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
7. Kenneth A. Lambert, —Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
8. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
9. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic

Programmers, LLC, 2013.

20EM111	ENGINEERING PRACTICES LABORATORY	L	T	P	C
	(Common to ADS, CE, CSE, ECE, ME and IT)	0	0	4	2

OBJECTIVES:

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 & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 15

Buildings:

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

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

(b) Study of pipe connections requirements for pumps and turbines.

(c) Preparation of plumbing line sketches for water supply and sewage works.

(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

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

(b) Hands-on-exercise:

Woodwork, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE 15

Welding:

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

(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning

(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:

(b) Model making – Trays and funnels.

(c) Different type of joints

Machine assembly practice:

(a) Study of centrifugal pump

(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting: Exercises – Preparation of square fitting and V – fitting models.

OUTCOMES:

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

CO1: Develop carpentry components and pipe connections including plumbing works.

CO2: Make use of welding equipments to join the structures

CO3: Analyse the basic machining operations

CO4: Develop the models using sheet metal works

CO5: Illustrate on centrifugal pump, Air conditioner, operations of smithy,

foundry and fittings

CO6: Fabricate carpentry components and pipe connections including plumbing works.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 15

1. Study of various safety measures in Electrical System
2. Draw and demonstrate the layout for a residential house wiring using energy meter, switches, fuse, indicator, LED lamp, fluorescent lamp with one of the lamps to be controlled by 2 different switches
3. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit (series and parallel circuit).
4. Measurement of energy using single phase energy meter for incandescent lamp and LED lamp.
5. Measurement of resistance to earth of an electrical equipment

IV ELECTRONICS ENGINEERING PRACTICE 15

1. Study of Electronic components (fixed and Variable):
    i. Resistor – Measurement of resistance using colour coding and digital multimeter.
    ii. Capacitor – Measurement of capacitance using identification code, LQR meter
    iii. Inductor – Measurement of inductance using colour coding and LQR meter
2. Study of Electronic equipment:
    i. Signal generation using AFO (sine, square, triangle for various frequency and amplitude ranges)
    ii. Measurement of amplitude, frequency, peak-peak, RMS, period, DC level of sine, square and triangle waveform using CRO and DSO.
    iii. Measurement of DC voltage and current using analog and digital meters
3. Study of Electronic accessories:
    i. Circuit connection using Breadboard and wires.

ii. Circuit connection using general purpose PCB by Soldering practice techniques.

4. Study of logic gates AND, OR, EX-OR and NOT.
5. Generation of Clock Signal.
6. Measurement of ripple factor of HWR and FWR.
7. Study of Iron box, fan and regulator (resistive and electronics type), emergency lamp, Power Tools: (a) Range Finder (b) Digital Live-wire detector

OUTCOMES:

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

CO1: Carry out simple wiring as per the layout given.

CO2: Measure various electrical parameters like voltage, current, power factor, power, energy, resistance to earth etc.

CO3: Calculate ripple factor for a waveform and use logic gates for simple applications

TOTAL: 60 PERIODS

(Part A:30 periods and Part B : 30 periods)

20CS211	**DATA STRUCTURES LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

OBJECTIVES:

- To implement the basic data structures for solving simple problems.
- 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 Manipulation
   a. Find k^{th} smallest element in an unsorted array
   b. Find the sub array with given sum
   c. Matrix manipulations – Addition, Subtraction, Multiplication

   d. Job Sequencing: Given an array of jobs where every job has a deadline and a profit. Profit can be earned only if the job is finished before the deadline. It is also given that every job takes a single unit of time, so the minimum possible deadline for any job is 1. How to maximize total profit if only one job can be scheduled at a time. Print the sequence of jobID order to maximize total profit.

2. String manipulations:
   a. Reversing a set of words and count the frequency of each letter in the string.
   b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
   c. Remove all the occurrences of string S2 in string S1 and print the remaining.
3. Pointers
   a. Manipulating two dimensional arrays using pointers.
   b. Print all permutations of a given string using pointers.
4. Dynamic Memory Allocation
   a. Find Largest Number.
   b. Print the list in reverse order.
5. Array implementation of List, Stack and Queue ADTs.
6. Linked list implementation of List, Stack and Queue ADTs.
7. Applications of List, Stack and Queue ADTs.
8. Implementation of Binary Trees and operations of Binary Trees.
9. Implementation of Binary Search Trees.
10. Implementation of AVL Trees.
11. Implementation of Heaps using Priority Queues.
12. Graph representation and Traversal algorithms.
13. Implement searching and sorting algorithms. Analyze and compare the time taken for various algorithms with best, average and worst case inputs.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Write functions to implement linear and non-linear data structure operations.

CO2: Suggest and use appropriate linear / non-linear data structure operations for solving a given problem.

CO3: Implement different operations of search trees.

CO4: Implement appropriate Graph representations and traversals to solve real-world applications.

CO5: Implement and analyze the various searching and sorting algorithms.

20EL211	ADVANCED READING AND WRITING	L	T	P	C
		0	0	2	1

OBJECTIVES:

The Course will enable learners to:

- Strengthen their reading skills.
- Enhance writing skills with specific reference to technical writing.
- Apply their critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I **6**

Reading - Strategies for effective reading - Writing -Write a descriptive paragraph - Predicting content using photos and title.

UNIT II **6**

Reading - Use of graphic organizers to review and aid comprehension. Writing - Write an opinion paragraph

UNIT III **6**

Reading - speed reading techniques - Writing - Elements of a good essay- Analytical Essay.

UNIT IV **6**

Reading - Genre and Organization of Ideas – Writing - Email writing - Job application

UNIT V **6**

Reading - Critical reading and thinking -Writing - letter of recommendation - Vision

statement

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course Learners will be able to:

CO1: Write different types of essays.

CO2: Write winning job applications.

CO3: Read and evaluate texts critically.

CO4: Display critical thinking in various professional contexts.

TEXT BOOKS:

1. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011.
2. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011.

REFERENCES:

1. Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.
2. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1973. Print.
3. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012.
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000.
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004.
6. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004.

SEMESTER III

20MA302 DISCRETE MATHEMATICS L T P C

3 2 0 4

OBJECTIVES:

The syllabus is designed to

- validate the arguments by using connectives and rules of inference.
- develop the knowledge on the basics of counting, solving recurrence relations.
- demonstrate the fundamentals of graphs.
- illustrate the functions, relations and group theory.
- familiarize the concepts of lattices and Boolean algebra.

UNIT I LOGIC AND PROOFS 15

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

UNIT II COMBINATORICS 15

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

UNIT III GRAPH THEORY 15

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

UNIT IV ALGEBRAIC STRUCTURES 15

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

UNIT V LATTICES AND BOOLEAN ALGEBRA 15

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

TOTAL: 75 PERIODS

OUTCOMES:

After the successful completion of the course, the students will be able to:

CO1: Examine the validity of the arguments.

CO2: Demonstrate various proof techniques and application of principles.

CO3: Apply graph theory techniques to solve real life problems.

CO4: Identify algebraic techniques to formulate and solve group theoretic problems.

CO5: Utilize the significance of lattices and Boolean algebra in computer science and engineering.

TEXT BOOKS:

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

REFERENCES:

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

OBJECTIVES:

- To understand and represent any given business problem statement in object-oriented notation.
- To have in depth knowledge on various Core Java API's and methods
- To become proficient in Hands on exercise, and able to show case smart programming using Java as Core platform
- To apply multithreaded programming using Java
- To understand JDBC

UNIT I INTRODUCTION 9

Description of the real world using the Objects Model - Classes, inheritance, interface, association, aggregation, composition with different aspect such as encapsulation, abstraction, polymorphism (static and runtime), access modifiers and multiple configurations - Quality software characteristics - Description of the Object Oriented Analysis process vs. the Structure Analysis Model

		L	T	P	C
20IT301	**OBJECT ORIENTED PROGRAMMING PRINCIPLES**	**3**	**0**	**0**	**3**

UNIT II JAVA BASICS 9

Core Java Introduction, Object Oriented Programming in Core Java, Data Types, Auto and Un Boxing, Data Type Promotion, Inner and nested Classes, Control Statements, Logical Operators, abstract, super, final, static keywords

UNIT III ARRAYS, COLLECTIONS AND EXCEPTION 9

Arrays – One and Multi-Dimensional, Cloning, Sorting, Hashing Technique, Purpose of equals and hashcode methods, Collections- List (ArrayList, LinkedList, Vector, Stack), Properties, Set(HashSet, TreeSet, LinkedHashSet), Map(Treemap, hashmap, treemap), Queue (Priority Queue, DeQueue), Iteration, Ordering using Comparable and Comparator, Generics – Compile Time Type Safety, Upper and Lower Bounded, and with wild cards.

Exception Handling – Checked and Un-Checked Exception, Custom Exception, Throws and Throw Keywords, Try-Catch-Finally, Try with Resources, Exception vs Runtime exception vs Throwable vs Error

UNIT IV MULTITHREADING AND IO 9

Concurrency and Parallelism Programing, Runnable, Threads approach, Threads Life Cycle, Fork and Join, wait, sleep, notify and yield. Executor Framework with Callable and Runnable options, Concurrent locks, Synchronized Collections (Concurrent Map, synchronized List, synchronized Map, synchronized Set, synchronizedSortedSet) Atomic data types (AtomicInteger, AtomicLong, AtomicIntegerArray), CountDownLatch ,Blocking Queue

Java IO – Files, Pipes, Streams, Byte and Char arrays, Readers and Writers, Input and Output Stream, Byte Array Input and Output, Buffer Input and output

UNIT V FUNCTIONAL PROGRAMMING AND LAMBDA 9

Functional Programming (vs Object Oriented), imperative and declarative programming, Pure Functions, Functional Composition, Side Effects, Immutable, Java Functions and Predicates, Arrow Functions, @Functional interface, Higher Order Functions

Streams API – Map, Filter, Reduce, Collect, Count, min and max Functions, Behavior as Parameterization, Seq and Parallel Streams, Converting a Array or File output as Streams

JDBC – DataSource, Configurations, Connection, Connection Pools, Driver Types, ResultSet, Prepared Statement, Named Parameter, Embedded SQL (Insert, Update, Delete, Join, union etc), ResultSet Navigation, Connection Close and Clean up

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design and develop various applications in Java using OOD and Principles

CO2: Implement a given problem statement by selecting the right choice of options in Core Java.

CO3: Accomplish efficient programming in Core Java

CO4: Design and develop real time applications to process high volume of data with consistency and atomicity

CO5: Develop applications to Connect to Database using available thin drivers, and performs DDL operations.

TEXT BOOKS:

1. Bernd Bruegge and Allen H Dutoit, “Object-Oriented Software Engineering Using UML, Patterns, and Java” Pearson ,3rd Edition, 2013.
2. Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft, “Java 8 in Action: Lambdas, Streams, and functional-style programming”, Manning Publications, 2015.
3. Sierra, Kathy, and Bert Bates. “Head First Java”, CA: O'Reilly, 2005

REFERENCES:

1. Schildt, Herbert, “Java: The Complete Reference”, McGraw-Hill Education, Eleventh Edition.
2. R. Nageswara Rao, “Core Java an Integrated Approach (Black Book)”, DT Editorial Services, 2016.

		L	T	P	C
20CS404	**OPERATING SYSTEMS**	**3**	**0**	**0**	**3**

OBJECTIVES:

- To explain the basic concepts of operating systems and process.
- To discuss threads and analyse various CPU scheduling algorithms.
- To describe the concept of process synchronization and deadlocks.
- To analyse various memory management schemes.
- To describe I/O management and file systems.

UNIT I INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES 9

Introduction to OS –Computer system organization - architecture – Resource management - Protection and Security – Virtualization - Operating System Structures - Services - User and Operating-System Interface - System Calls - System Services - Design and Implementation - Building and Booting an Operating System - Process Concept - Process Scheduling - Operations on Processes – Inter process

Communication - IPC in Shared-Memory Systems - IPC in Message-Passing Systems

UNIT II THREADS AND CPU SCHEDULING 9

Threads & Concurrency: Overview - Multicore Programming - Multithreading Models - Thread Libraries - Implicit Threading - Threading Issues - CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multi-Processor Scheduling - Real-Time CPU Scheduling

UNIT III PROCESS SYNCHRONISATION AND DEADLOCKS 9

Process Synchronization - The critical-section problem, Peterson's Solution - Synchronization hardware, Mutex locks, Semaphores, monitors, Liveness - Classic problems of synchronization – Bounded Buffer Problem - Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem. Deadlock - System model - Deadlock characterization, Methods for handling deadlocks - Deadlock prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlock.

UNIT IV MEMORY MANAGEMENT 9

Memory Management: Contiguous Memory Allocation - Paging - Structure of the Page Table – Swapping - Virtual Memory: Demand Paging – Copy-on write – Page Replacement – Allocation of frames – Thrashing Memory – Compression

UNIT V FILE MANAGEMENT 9

File Management: File Concept – Access Methods – Directory Structure – Protection - Memory-Mapped File - Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks - I/O Hardware: I/O devices, Device controllers, Direct Memory Access - Case Study-Linux.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Implement the basic concepts of operating systems and process.

CO2: Analyse various CPU scheduling algorithms and thread mechanism.

CO3: Implement the concepts of process synchronization and deadlocks

CO4: Design various memory management schemes to given situation

CO5: Implement various I/O and file management techniques.

TEXT BOOK:

1. Silberschatz Abraham, Greg Gagne, Peter B. Galvin. “Operating System Concepts”, Tenth Edition, Wiley, 2018.

REFERENCES:

1. William Stallings, Operating Systems – Internals and Design Principles, Pearson Education, New Delhi, 2018.
2. Achyut S.Godbole, Atul Kahate, Operating Systems‖, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating System", 4 th Edition, PHI Learning, New Delhi, 2018.

		L	T	P	C
20CS402	**DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE, IT and ADS)**	**2**	**2**	**0**	**3**

OBJECTIVES:

- To critically analyse the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy technique for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems.

UNIT I INTRODUCTION 8+3

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types –Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical

analysis for Recursive and Non-recursive algorithms – Visualization.

UNIT II BRUTE FORCE AND DIVIDE AND CONQUER 10+3

Brute Force – Computing a^n – String Matching - 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 – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems - Decrease and Conquer Method: Josephus Problem-Transform and Conquer Method: Presorting

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 11+3

Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees - Longest common subsequence - Matrix-chain multiplication – Travelling Salesperson Problem – Knapsack Problem and Memory functions. Greedy Technique – Prim‘s algorithm and Kruskal’s Algorithm – 0/1 Knapsack problem - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 7+3

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9+3

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems. Backtracking – N-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. 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.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Analyze the efficiency of recursive and non-recursive algorithms mathematically

CO2: Analyze the efficiency of brute force, divide and conquer, decrease and conquer,

Transform and conquer algorithmic techniques

CO3: Implement and analyse the problems using dynamic programming and greedy technique algorithmic techniques.

CO4: Solve the problems using iterative improvement technique for optimization.

CO5: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound technique.

TEXT BOOKS:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.
2. Harsh Bhasin, Algorithms Design and Analysis, Oxford university press, 2016.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
4. http://nptel.ac.in/

20EC341	**ANALOG AND DIGITAL COMMUNICATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES

- To classify different types of Analog Modulation techniques, their principles.
- To infer the Principles of Data and Pulse Communication Systems.
- To understand and learn various digital communication techniques.
- To analyze and calculate the source and Error control coding.
- To illustrate and gain knowledge on multi-user radio communication.

UNIT I ANALOG COMMUNICATION 9

Introduction to Communication Systems, Modulation and its Types, Need for Modulation, Theory of Amplitude Modulation, Evolution and Description of SSB Techniques, Theory of Frequency and Phase Modulation, Comparison of Analog Communication Systems (AM – FM – PM).

.

UNIT II PULSE AND DATA COMMUNICATION 9

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

Data Communication:History of Data Communication, Standards Organizations for Data Communication, Data Communication Circuits, Data Communication Codes, Basics of Serial and Parallel Interfaces.

UNIT III DIGITAL COMMUNICATION 9

Amplitude Shift Keying (ASK),Frequency Shift Keying (FSK),Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying(QPSK),Quadrature Amplitude Modulation (QAM) ,8 QAM, 16 QAM,Bandwidth Efficiency,Comparison of various Digital Communication System (ASK – FSK – PSK– QAM).

UNIT IV SOURCE AND ERROR CONTROL CODING 9

Entropy, Source Encoding Theorem, Shannon Fano Coding, Huffman Coding, Mutual Information, Channel Capacity, Error Control Coding, Linear Block Codes, Cyclic Codes, ARQ Techniques.

UNIT V MULTI-USER RADIO COMMUNICATION 9

Global System for Mobile Communications (GSM), Code Division Multiple Access (CDMA),Cellular Concept and Frequency Reuse,Channel Assignment and Handover Techniques, OFDM,Overview of Multiple Access Schemes, Principles of Satellite Technology.

TOTAL: 45 Periods

OUTCOMES:

Upon completion of the course, the student should be able to:

CO1: Analyze the different types of Analog Communication Systems.

CO2: Familiarize with Data Communication Techniques.

CO3: Explore the different types of Pulse Communication Techniques.

CO4: Analyze the various types of Digital Communication Schemes.

CO5: Solve Source Coding and Error Control Coding problems.

CO6: Apply the Principles of Multi-User Radio Communication.

TEXT BOOKS:

1. Wayne Tomasi, Electronic Communication Systems- Fundamental through Advanced, 5th Edition, Pearson Education, 2008.
2. Rappaport T.S, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education , 2010.

REFERENCES:

1. H.Taub, D L Schilling and G Saha, Principles of Communication, 4th Edition, Pearson Education, 2017.
2. B. P.Lathi,Zhi Ding Modern Analog and Digital Communication Systems, 4th Edition, Oxford University Press, 2017.
3. Simon Haykin,Micheal Moher, Communication Systems, 5th Edition, John Wiley & Sons, 2012.
4. Blake, Electronic Communication Systems, Thomson Delmar Publications, 2012.
5. Martin S.Roden, Analog and Digital Communication System, 5th Edition, Prentice Hall of India, 2003.

NPTEL LINK: https://nptel.ac.in/courses/117/101/117101051/

		L	T	P	C
20CS301	**DIGITAL PRINCIPLES AND SYSTEM DESIGN (Lab Integrated Course)**	**3**	**0**	**2**	**4**

OBJECTIVES:

- To design and implement digital circuits using simplified Boolean functions
- To analyze, design and implement combinational circuits
- To analyze, design and implement synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To develop HDL code for combinational and sequential circuits

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9 + 6 = 15

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

UNIT II COMBINATIONAL LOGIC 9 + 6 = 15

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9 + 6 = 15

Sequential Circuits - Storage Elements: Latches, Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9 + 6 = 15

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

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9 + 6 = 15

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

LIST OF EXERCISES:

1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for code converters.
3. Design and implement Half/Full Adder and Subtractor.
4. Design and implement combinational circuits using MSI devices:
   - 4 – bit binary adder / subtractor
   - Application using multiplexers
5. Design and implement shift-registers.
6. Design and implement synchronous counters.
7. Coding combinational circuits using HDL.
9. Coding sequential circuits using HDL.

TOTAL: 45 +30 = 75 PERIODS

OUTCOMES:

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

CO1: Design and implement digital circuits using simplified Boolean functions

CO2: Analyze, design and implement combinational circuits

CO3: Analyze, design and implement synchronous and asynchronous sequential circuits

CO4: Understand Programmable Logic Devices

CO5: Develop HDL code for combinational and sequential circuits

TEXT BOOK:

1. M. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2018.

REFERENCES:

1. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
2. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Seventh Edition, CENGAGE Learning, 2014
3. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
4. Donald D. Givone, “Digital Principles and Design”,Tata Mc Graw Hill, 2007.

20IT311	OBJECT ORIENTED PROGRAMMING PRINCIPLES LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To build software development skills using Java for real-world applications.
- To understand and apply the concepts of classes, object, inheritance, polymorphism.
- To develop database applications.

LIST OF EXPERIMENTS:

1. Implementation of an Application (such as Library Management System) using Classes, Objects, Constructors, Destructors and String Handling.
2. Implementation of an Application such as Student Information System using Inheritance, Virtual Functions and Abstract Classes.
3. Develop a Java application using class and objects 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). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:
    - First 100 units - Rs. 1 per unit
    - 101-200 units - Rs. 2.50 per unit
    - 201
    - -500 units - Rs. 4 per unit

- > 501 units - Rs. 6 per unit

  If the type of the EB connection is commercial, calculate the amount to be paid as follows:
- First 100 units - Rs. 2 per unit
- 101-200 units - Rs. 4.50 per unit
- 201 -500 units - Rs. 6 per unit
- 501 units - Rs. 7 per unit 2.

4. 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.
5. 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
6. 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.
7. Write a Java program to implement user defined exception handling.
8. 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.
9. 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.
10. Write a Java program to find the maximum value from the given type of elements using a generic function.
11. Develop Java database 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.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

CO2: Develop and implement Java programs with arraylist and exception handling.

CO3: Develop and implement Java programs with inheritance and polymorphism.

CO4: Design applications using file processing, generic programming and multithreaded programming.

CO5: Develop real-world applications using OOP Concepts.

		L	T	P	C
20CS412	**OPERATING SYSTEMS LABORATORY**	**0**	**0**	**4**	**2**

OBJECTIVES:

- To practice system calls and shell programming
- To implement various CPU scheduling algorithms
- To build inter process communication deadlock detection and avoidance algorithms.
- To design page replacement and disk scheduling algorithms
- To implement file allocation strategies

LIST OF EXERCISES:

1. Basic Unix file system commands such as ls, cd, mkdir, rmdir, cp, rm, mv, more, lpr, man, grep, sed, etc.

2. Shell Programming

3. Programs for Unix System Calls.

   a. Write a program to fetch the below information; Name of the operating system, Current release level, Current version level, Total usable main memory size, Available memory size, Amount of shared memory, Memory used by buffers, Total swap space size, and Swap space still available.
   b. Use system calls to imitate the action of UNIX command "ls" with option -a, and -li command
   c. Use system calls to imitate the action of UNIX command "cp" or "dir" with a couple of options
   d. Implement process life cycle: Use the system calls fork(), exec(), wait(), waitpid(), exit(0), abort() and kill().

4. Write a program to implement the following actions using pthreads

   a) Create a thread in a program and called Parent thread, this parent thread creates another thread (Child thread) to print out the numbers from 1 to 20. The Parent thread waits till the child thread finishes
   b) Create a thread in the main program, this program passes the 'count' as an argument to that thread function and this created thread function has to print your name 'count' times

5. Process Synchronization using Semaphores. A shared data has to be accessed by two categories of processes namely A and B. Satisfy the following constraints to access the data without any data loss.

   (i) When a process A1 is accessing the database another process of the same category is permitted.
   (ii) When a process B1 is accessing the database neither process A1 nor another process B2 is permitted.
   (iii) When a process A1 is accessing the database process B1 should not be

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Practice system calls and shell programming

CO2: Implement various CPU scheduling algorithms

CO3: Build inter process communication deadlock detection and avoidance algorithms.

CO4: Design page replacement and disk scheduling algorithms

CO5: Implement file allocation strategies

		L	T	P	C
20CS313	**APTITUDE AND CODING SKILLS – I (Common to All Branches)**	**0**	**0**	**2**	**1**

OBJECTIVES:

- To develop vocabulary for effective communication and reading skills.
- To build the logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.

List of Exercises:

1. **English – Phase I**

   Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering
2. **Logical Reasoning – Phase I**

   Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency
3. **Quantitative Ability - Phase I**

   Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest,

20IT403	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
	(Common to CSE and IT)	3	0	0	3

OBJECTIVES

- To understand the basic concepts of Data modeling and Database Systems.
- To understand SQL and effective relational database design concepts.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To understand efficient data querying and updates, with needed configuration
- To learn how to efficiently design and implement various database objects and entities

UNIT I DATABASE CONCEPTS 9

Concept of Database and Overview of DBMS - Characteristics of databases, Database Language, Types of DBMS architecture – Three-Schema Architecture -Introductions to data models types- ER Model- ER Diagrams Extended ER Diagram reducing ER to table Applications: ER model of University Database Application.

SQL fundamentals Views - Integrity Procedures, Functions, Cursor and Triggers Embedded SQL Dynamic SQL

UNIT II DATABASE DESIGN 9

Design a DB for Car Insurance Company - Draw ER diagram and convert ER model to relational schema. Evaluating data model quality - The relational Model Schema Keys- Relational Algebra Domain Relational Calculus- Tuple Relational Calculus - Fundamental operations. Relational Database Design and Querying Undesirable Properties of Relations Functional Dependency: Closures- Single Valued Dependency Single valued Normalization (1NF, 2NF 3NF and BCNF) - Desirable properties of Decompositions 4NF - 5NF De-normalization

UNIT III TRANSACTIONS 9

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

UNIT IV DATA STORAGE AND QUERYING 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Overview of physical storage structure- stable storage, failure classification -log based recovery, deferred database modification, check-pointing-File Structures:-Index structures-Primary, Secondary and clustering indices. Single and multilevel indexing.

Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation

UNIT V ADAVNCED TOPICS 9

Distributed database Implementation Concurrent transactions - Concurrency control Lock based Time stamping-Validation based. NoSQL, NoSQL Categories - Designing an enterprise database system - Client Server database

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Implement SQL and effective relational database design concepts.

CO2: Map ER model to Relational model to perform database design effectively

CO3: Compare and contrast various indexing strategies in different database systems

CO4: Implement queries using normalization criteria and optimization techniques

CO5: Analyze how advanced databases differ from traditional databases.

CO6: Design and deploy an efficient and scalable data storage node for varied kind of application requirements

TEXT BOOKS:

1. Elmasri R. and S. Navathe, “Fundamentals of Database Systems”, Pearson Education, 7th Edition, 2016.
2. Abraham Silberschatz, Henry F.Korth, “Database System Concepts”, Tata McGraw

Hill , 7th Edition, 2021.

3. Elmasri R. and S. Navathe, “Database Systems: Models, Languages, Design and Application Programming”, Pearson Education, 2013.

REFERENCES:

1. Raghu Ramakrishnan, Gehrke “Database Management Systems”, MCGraw Hill, 3rd Edition 2014.
2. Plunkett T., B. Macdonald, “Oracle Big Data Hand Book” , McGraw Hill, First Edition, 2013
3. Gupta G K , “Database Management Systems” , Tata McGraw Hill Education Private Limited, New Delhi, 2011.
4. C. J. Date, A.Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2015.
5. Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi, Oracle NoSQL Database: Real-Time Big Data Management for the Enterprise, McGraw Hill Professional, 2013.
6. Thomas Connolly, Carolyn Begg, “ Database Systems: A Practical Approach to Design, Implementation and Management”, Pearson , 6th Edition, 2015.

20GE301	**UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY**	**L**	**T**	**P**	**C**
		2	**2**	**0**	**3**

OBJECTIVES:

The objective of the course is fourfold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures (2 lecture hours) and 14 practice sessions (2 Tutorial hour) in 5 Units:

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT 2: Understanding Harmony in the Human Being – Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. 'Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order-from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance innature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems.
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

READINGS:

TEXTBOOK:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,
New Delhi, 2010

REFERENCES:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful-E. F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India – by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom – Maulana Abdul Kalam Azad

12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland (English)

OUTCOMES:

By the end of the course, students

CO1: Would become more aware of themselves, and their surroundings (family, society, nature);

CO2: Would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: Would have better critical ability.

CO4: Would become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5: Would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

20IT411	**WEB TECHNOLOGY LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

OBJECTIVES:

- To develop UI using HTML5 and CSS3
- To design interactive web pages using Scripting languages.
- To learn jQuery.

LIST OF EXPERIMENTS:

1. Develop an Wallet Application, that has following feature set
   - Login and Logout
   - Wallet
     - Add money to wallet
     - Spend money from wallet
     - Wallet transaction list
   - Services
     - Pay Mobile Bills – Post/Pre Paid bills
     - Pay Utility Bills
     - Pay Corp/Water Taxes

- Pay via QR Code

2. The above application has to be Responsive, ES6 has to be used, jQuery model to manipulate the DOM structure, Object Oriented Programming model
3. Employ NodeJS to execute the above web application.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Design simple web pages using markup languages like HTML and XHTML.

CO2: Develop dynamic web pages using DHTML and java script that is easy to navigate and use.

CO3: Implement server side web pages that have to process request from client-side web pages.

CO4: Design and develop interactive and dynamic web pages using jQuery tool.

CO5: Design and develop event driven web servers using NodeJS.

20IT412	DATABASE MANAGEMENT SYSTEMS LABORATORY (Common to CSE and IT)	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To be familiar with the use of a front-end tool
- To understand design and implementation of typical database applications

LIST OF EXPERIMENTS:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms

4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications anyone from the following list
    a) Inventory Management for a EMart Grocery Shop
    b) Society Financial Management
    c) Cop Friendly App – Eseva
    d) Property Management – eMall
    e) Star Small and Medium Banking and Finance

- Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
- Apply Normalization rules in designing the tables in scope.
- Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
- Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
- Ability to showcase ACID Properties with sample queries with appropriate settings

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Apply typical data definitions and manipulation commands.

CO2: Design applications to test Nested and Join Queries

CO3: Implement simple applications that use Views

CO4: Implement applications that require a Front-end Tool

CO5: Critically analyze the use of Tables, Views, Functions and Procedures.

		L	T	P	C
20CS414	**APTITUDE AND CODING SKILLS – II (Common to All Branches)**	**0**	**0**	**2**	**1**

OBJECTIVES:

- To develop advanced vocabulary for effective communication and reading skills.
- To build an enhanced level of logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.
- To apply data structures and algorithms in problem solving.

List of Exercises:

1. **English – Phase II**

   Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering
2. **Logical Reasoning – Phase II**

   Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency
3. **Quantitative Ability - Phase II**

   Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability
4. **Automata Fix – Phase II**

   Logical, Compilation and Code reuse

5. **Automata - Phase II**

   Data Structure Concepts: Array and Matrices, Linked list, String processing and manipulation, Stack/Queue, Sorting and Searching

   Advanced Design and Analysis Techniques: Greedy Algorithms, Minimum Spanning Trees, String Matching, Divide and Conquer, Computational Geometry

TOTAL: 30 PERIODS

OUTCOMES:

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

CO1: Develop advanced vocabulary for effective communication and reading skills.

CO2: Build an enhanced level of logical reasoning and quantitative skills.

CO3: Develop error correction and debugging skills in programming.

CO4: Apply data structures and algorithms in problem solving.

SEMESTER V

		L	T	P	C
20IT502	**OBJECT ORIENTED SYSTEMS DESIGN**	**3**	**0**	**0**	**3**

OBJECTIVE:

The Course will enable learners to:

- To understand and differentiate Unified Process from other approaches.
- To design with static UML diagrams.
- To design with the UML dynamic and implementation diagrams.
- To improve the software design with design patterns.
- To understand how OO Programming practice will help to build a manageable and extendable application.
- To understand the various semantics in Object Oriented such as Classes, Interface, Polymorphism, Association (Aggregation & Composition)

UNIT I UNIFIED PROCESS AND USE CASE DIAGRAMS 9

Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use

Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases –include, extend and generalization – When to use Use-cases

UNIT II STATIC UML DIAGRAMS 9

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

UNIT III DYNAMIC AND IMPLEMENTATION UML DIAGRAMS 9

Dynamic Diagrams – UML interaction diagrams - System sequence diagram Collaboration diagram – When to use Communication Diagrams – Relationship between sequence diagrams and use cases - State machine diagram and Modelling –When to use State Diagrams - Activity diagram (swim lane approach) – When to use activity diagrams

Implementation Diagrams - UML package diagram - When to use package diagrams -Component and Deployment Diagrams – When to use Component and Deployment diagrams

UNIT IV DESIGN PATTERNS 9

Design Patters – SOLID Principle – Standard Architecture Principles - Java Blue Print Patterns – Structural. Behavioral and Creational Patterns – Reference Implementations

UNIT V OOSD IMPLEMENTION 9

Object Oriented Programming –- OOP Concepts in Java - Fundamental Programming- Classes -Constructors, methods -access specifiers – static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages – JavaDoc comments

Inheritance – constructors in sub classes- abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface – Object cloning -inner classes, Immutability, Clone and Deep Clone

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design a problem statement using OOD

CO2: Transform a given business requirement into Object Oriented Design using UML Modeling

CO3: Implement Static diagrams and Dynamic modeling using UML Modeling.

CO4: To build an extendable and scalable solution using Design patterns.

CO5: Represent Business relationship using classes and objects entrepreneurship.

CO6: To apply instances of inheritance, polymorphism, association, and contracts based interface etc

TEXT BOOKS:

1. Brett D. McLaughlin, David West, Gary Pollice,"Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D: Paperback – 1 January 2011
2. Kathy Sierra, Bert Bates, Head First Java: A Brain-Friendly Guide, 2Nd Edition (Covers Java 5.0) Paperback – 1 January 2009
3. Richard Warburton, Java 8 Lambdas: Pragmatic Functional Programming 1st Edition, Kindle Edition
4. Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft, Java 8 in Action: Lambdas, Streams, and functional-style programming Paperback – Import, 28 August 2014

20IT503	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the Big Data Platform and its Use cases

- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs

UNIT I INTRODUCTION TO BIG DATA 9

Data Science – Fundamentals and Components –Types of Digital Data – Classification of Digital Data – Introduction to Big Data – Characteristics of Data – Evolution of Big Data – Big Data Analytics – Classification of Analytics – Top Challenges Facing Big Data – Importance of Big Data Analytics.

UNIT II DESCRIPTIVE ANALYTICS USING STATISTICS 9

Mean, Median and Mode – Standard Deviation and Variance – Probability – Probability Density Function – Percentiles and Moments – Correlation and Covariance – Conditional Probability – Bayes' Theorem – Introduction to Univariate, Bivariate and Multivariate Analysis – Dimensionality Reduction using Principal Component Analysis (PCA) and LDA.

UNIT III PREDICTIVE MODELING AND MACHINE LEARNING 9

Linear Regression – Polynomial Regression – Multivariate Regression –Bias/Variance Trade Off – K Fold Cross Validation – Data Cleaning and Normalization – Cleaning Web Log Data – Normalizing Numerical Data – Detecting Outliers – Introduction to Supervised And Unsupervised Learning – Reinforcement Learning – Dealing with Real World Data – Machine Learning Algorithms –Clustering.

UNIT IV BIG DATA HADOOP FRAMEWORK 9

Introducing Hadoop –Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Introduction to NoSQL: CAP theorem – MongoDB: RDBMS Vs MongoDB – Mongo DB Database Model – Data Types and Sharding – Introduction to Hive – Hive Architecture – Hive Query Language (HQL).

UNIT V PYTHON AND R PROGRAMMING 9

Python Introduction – Data types - Arithmetic - control flow – Functions - args - Strings – Lists – Tuples – sets – Dictionaries Case study: Using R, Python, Hadoop, Spark and Reporting tools to understand and Analyze the Real world Data sources in the following domain- financial, Insurance, Healthcare in Iris, UCI datasets.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Identify Big Data and its Business Implications.

CO2: List the components of Hadoop and Hadoop Eco-System

CO3: Access and Process Data on Distributed File System

CO4: Manage Job Execution in Hadoop Environment

CO5: Develop Big Data Solutions using Hadoop Eco System

TEXTBOOKS:

1. EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley Publishers, 2015. (Chapter 1 and Chapter 10)
2. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, Second Edition, 2014. (Chapter 2 ,3, 4 , 6 and 9)
3. An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics) Hardcover – 2017

REFERENCES:

1. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
2. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
3. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

20IT501	WEB DEVELOPMENT FRAMEWORKS	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand web semantics and related tools and framework
- Able to get hands on latest JS based web frameworks
- To develop a scalable and responsive web application
- To develop an industry ready application web enterprise feature

UNIT I INTRODUCTION 9+6

An Introduction to HTML5 – Tags, Link, Images, Forms, Label, Sections, Media, Structure, CSS3 – inline, internal, Box Model, Targeting Elements, Flex Model, Responsive and Fluid Layout, Media Queries-- An introduction to JavaScript (ES6) – Data Types – Conditionals and Loops – Functions – Classes and Objects – Inbuilt Methods – Arrays – Regular Expressions – Arrow Functions – Debugging in browsers – JS HTML DOM – JS Browser BOM – Introduction to AJAX and JSON – JS vs JQuery – Why JS Frameworks – Scope and Function Context - Closures - JavaScript Design Pattern.

UNIT II WEB FRAMEWORK (ANGULAR) – I 9+6

TypeScript – Static Typing, User Defined Data Types, Lambda Expression and Functional Programming, String, Number, Boolean, Union, Tuple, Object Oriented Programming – Inheritance, Interface, Access Modifiers, Let vs Var, Arrays, Generics, Duck Typing, Any/Unknown, TS Config.

UNIT III WEB FRAMEWORK (ANGULAR) – II 9+6

Introduction to Single Page Application (SPA) and Angular Architecture, SPA's Components and Templates, Interpolation and 2 way data binding, Modules, Forms (Template/Reactive), Promise and Observable, CLI Features, i18n, Workspace Structure

UNIT IV WEB FRAMEWORK (ANGULAR) – III 9+6

Service Definition and Injection, Routes and Navigation, Data Integrity enablement, Flux/Redux, Security, Pipes and Directives, Behavior Subject, Logging and Exceptions handling, Performance Engineering, Unit Testing using Jasmine and Karma, Responsive

Web design using Bootstrap and MD.

UNIT V NODEJS (SERVER SIDE) WITH SERVER SIDE 9+6

NodeJS Introduction and Installation, YARN Integration, Imports and Modules, ExpressJS, JWT/OAUTH2.0 based security, Routes and Middleware, DB Integration – Config – Reactive DB Operations – CRUD, Exception Handling, Transaction Management, Logging and Audit, Deployment.

TOTAL: 45+30 = 75 PERIODS

OUTCOMES:

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

CO1: Personalize web pages using text formatting, graphics, audio, and video.

CO2: Hands on knowledge on Typescript

CO3: Able to develop a web application using latest Angular Framework

CO4: Apply various Angular features including directives, components, and services.

CO5: Able to develop data driven back end API using NodeJS as the core platforms.

LIST OF EXERCISES

Prerequisite:

Develop the Wire Frame mock up with Layout, Functional Details, Responsive ness (fluid layout), UX, Friendly Error Description, support for locale, the solution should employ

1. Java Script (with DOM Manipulation, Field Validations, AJAX Calls where required, Mathematical Calculations, Decision Support etc)
2. CSS3 for Styling
3. HTML5 for presentation
4. Custom Web Fonts for UX Experience
5. Usage of Frameworks like BootStrap, Bulma, Material Design for Responsive Layout

Software Installation:

- NodeJS
- Angular Cli installation (v13)
- Chrome / FIreFox Browsers (latest)
- Responsive using Media Queries & Bootstrap
- Material Design based Apps

Use Cases:

Use Case 1: Retail banking Application

Modules

- Login and Logout
- Bean Creation
- Funds Transfer
- Funds Transfer Status

Additional Feature set:

- Workspace Based Design (Employ Angular Workspace and Libraries)
- Responsive Layout using Media Queries and Bootstrap
- Componentization
- Back End Integration using Promise and Observable
- Behavior Subject for Intra component communication

Use Case 2: Library Management

Modules

- Login and Logout
- Browsing the Book Catalogue
- Student Can able to lend books
- Student can able to return the books
- Admin Can able to add Books, remove damaged books, add users
- Payment of Late / Subscription Fees

Use Case 3: Student Management

Modules

- Login and Logout
- Admin to Add Students, Departments
- Admin to assign Students to a department and Semester
- Admin to upload Student Marks
- Student can able to view the details, marks sheet
- Student can able to mark attendance for today's date.

TEXTBOOKS

1. Sukesh Marla, "A Journey to Angular Development Paperback ", BPB Publications.
2. Yakov Fain Anton Moiseev, "Angular Development with TypeScript", 2nd Edition.

REFERENCES

1. Doguhan Uluca, "Angular 6 for Enterprise-Ready Web Applications: Deliver production-ready and cloud-scale Angular web apps", 1st Edition, Kindle Edition.
2. Adam Freeman, "Pro AngularJS (Expert's Voice in Web Development) Paperback", 7 April 2014.
3. Nate Murray, Felipe Coury, Ari Lerner, Carlos Taborda, "ng-book: The Complete Guide to Angular", 2018.
4. https://www.edureka.co/blog/angular-tutorial/
5. https://www.javatpoint.com/angular-7-tutorial

20EC441	MICROPROCESSORS AND INTERFACING	L	T	P	C
		3	0	2	4

OBJECTIVES:

1. To acquire knowledge of 8086 microprocessor.
2. To summarize the design aspects of I/O and Memory Interfacing circuits.
3. To interface microprocessors with supporting chips.
4. To explain the Architecture of 8051 microcontroller.
5. To demonstrate a microcontroller based system

UNIT I 8086 MICROPROCESSOR 9+6

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming.

UNIT II 8086 SYSTEM BUS STRUCTURE 9+6

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to 8087– Architecture, Instruction set and ALP Programming.

UNIT III I/O INTERFACING 9+6

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller.

UNIT IV MICROCONTROLLER 9+6

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

UNIT V INTERFACING MICROCONTROLLER 9+6

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC Comparison of Microprocessor, Microcontroller, PIC and ARM processors

LIST OF EXPERIMENTS:

8086 Programs

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion and decimal arithmetic.
4. Sorting and searching

8051 Experiments

5. Basic arithmetic and Logical operations
6. Square and Cube program

7. Find 2‘s complement of a number
8. Unpacked BCD to ASCII

Interfacing Experiments of 8086 and 8051

9. Traffic light controller
10. Key board and Display - 8279
11. Programmable Timer - 8253/8254
12. Programmable peripheral Interface - 8255
13. A/D and D/A interface
14. Stepper motor control
15. Serial Communication between two kits

TOTAL: 45 THEORY +30 PRACTICAL=75 PERIODS

OUTCOMES:

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

CO1: Acquire knowledge of basic architecture, operation, programming of microprocessor 8086.

CO2: Summarize the design of basic and multiprocessor systems and their bus timings.

CO3: Design the 8086 interfaces with memory, I/O and other peripheral chips.

CO4: Describe the basic architecture and programming of microcontroller 8051.

CO5:Apply programming concepts to implement microcontroller interfaces for different applications.

CO6: Design and construct Microprocessor and Microcontroller based systems.

TEXTBOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, 2nd Edition, Pearson, 2015.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, 2nd Edition, Pearson Education, 2011.

REFERENCES:

1. DoughlasV.Hall, Microprocessors and Interfacing, Programming and Hardware,

TMH,2012.

2. A.K.Ray,K.M.Bhurchandi, Advanced Microprocessors and Peripherals 3rd Edition, Tata McGraw Hill, 2012.
3. Barry B Bray, The Intel Microprocessor 8086/8088,80186,80286,80386 and 80486 – Architecture, Programming and Interfacing, 8th Edition, PHI, 2011.
4. Mohamed Rafiquazzaman, Microprocessor and Microcomputer based System Design, 2nd Edition, Universal Book Stall, 1995.
5. Kenneth J Ayala, The 8051 Microcontroller Architecture, Programming and Applications, 3rd Edition, Penram International, 2005.

NPTEL LINK: https://nptel.ac.in/courses/108/105/108105102/

20IT511	OBJECT ORIENTED SYSTEMS DESIGN LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand business problem statement in object-oriented notation.
- Be exposed to the UML Diagrams
- To build a manageable and extendable application.
- To understand the various semantics in Object Oriented such as Classes, Interface, Polymorphism, Association (Aggregation and Composition)

LIST OF EXPERIMENTS:

To develop a mini-project by using the following Use Cases listed below.

1. Use Case 1

   POS (Point of Sale) Terminal

   Features to be handled:-

   1. Order Entry,
   2. Item Management and Categorization,
   3. Tax Calculation,

4. Payment Mode, Payment Status, User Management

2. Use Case 2

   Hotel Room Management

   Features to be handled:-

   1. Rooms type and Category
   2. Check in and Check Out
   3. Room occupation Status
   4. Room Service Request
   5. Guests Management and allocation Room
   6. Billing Calculation, User management

3. Use Case 3

   Banking Portal

   1. Funds Transfer within Same Bank, Intra Bank
   2. Forex Conversion
   3. Bene Management
   4. Customer and Accounts Management
   5. Funds Transfer Transaction Status

4. Use Case 4

   Mobile Phone Service Center

   1. Mobile Phone Parts Management
   2. Mobile Phone Models
   3. Service Request Registration
   4. Service Request Status Check
   5. Service Request Engineer Allocation
   6. Payment
   7. Customer Management

TOTAL: 60 PERIODS

OUTCOMES

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

CO1: Develop and implement simple applications that make use of classes, packages and interfaces.

CO2: Develop and implement the above application using exception handling.

CO3: Develop and implement above application with inheritance and polymorphism.

CO4: Develop real-world applications using OOP Concepts.

20IT512	BIG DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

1. To understand the Big Data Platform and its Use cases
2. To an overview of Apache Hadoop
3. To understand HDFS Concepts and Interfacing with HDFS
4. To Understand Map Reduce Jobs
5. To understand design and implementation of Big Data applications

LIST OF EXPERIMENTS:

Software

- Hadoop
- Hive and Hbase
- Apache Spark

Dataset:-

- Mock Data
- Connecting with Data generators (like Social Apps, Application Logs, custom data generators etc)

PREREQUISITES:

- Installation of Hadoop Framework, it‘s components and study the HADOOP ecosystem.
- Write a program to implement word count program using Map Reduce
- Write a program to implement Matrix multiplication using Map-Reduce
- Install and configure MongoDB/ Cassandra/HBase/Hypertable to execute NoSQL

commands.

- Implementing DGIM algorithm using any Programming Language
- Implement Bloom Filter using any programming language
- Implement and Perform HIVE for data analysis of twitter data, chat data, weblog analysis.
- Implement K-Means Clustering algorithm using Map-Reduce.

USE CASES:

- Real Time Traffic Control using Big Data
- Medical Insurance Fraud Detection
- Data Warehouse Design for an E-Commerce Site
- Credit Card Anomalies Detection
- Disease Prediction Based on Symptoms
- Real Time Application Server Logs Analysis

The details of the use cases will be provided to the students through lab manual.

TOTAL: 60 PERIODS

OUTCOMES:

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

CO1: Identify the key issues in big data management and experiment with Hadoop framework.

CO2: Develop problem solving and critical thinking skills in fundamental enable techniques like Hadoop and MapReduce.

CO3: Construct and Explain with structure and unstructured data by using NoSQL commands.

CO4: Analyze the algorithms of big data analytics in various applications like recommender systems, social media applications.

SEMESTER VI

20IT601	MOBILE ARCHITECTURE AND DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Explain Android Architecture and various mobile platforms
- Develop Android application with basic building blocks
- Familiarize in the Graphics and Multimedia used for Android application development
- Test the developed app and publishing for users
- Explain the development of app for iOS and Windows platform

UNIT I GETTING STARTED WITH MOBILITY 9

Mobility landscape- Mobile platform- Mobile apps development, Overview of Android platform-setting up the mobile app development environment along with an emulator- case study on Mobile app development

UNIT II BUILDING BLOCKS OF MOBILE APPS 9

App user interface designing – mobile UI resources (Layout, UI elements, Drawable, Menu), Activity- states and life cycle, interaction amongst activities-App functionality beyond user interface - Threads, Async task, Services – states and lifecycle, Notifications, Broadcast receivers, Telephony and SMS, network and security

UNIT III SPRUCING UP MOBILE APPS AND TESTING 9

Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record location awareness- native hardware access (sensors such as accelerometer and gyroscope)

Debugging mobile apps- App Test procedure - test automation of mobile apps- JUnit for Android - Versioning, signing and packaging mobile apps, distributing apps on mobile market place

UNIT IV CROSS PLATFORM APP DEVELOPMENT - I 9

Introduction cross platform development -XAMARIN – XMAL – XMARIN FORMS – XAMARIN. IOS – XAMARIN.WINDOWS

UNIT V CROSS PLATFORM APP DEVELOPMENT - II 9

Develop a Web application using Angular and try converting the same into mobile using native-script framework

TOTAL: 45 PERIODS

Hands On

- Setting up android and android emulator
- Creating UI element – Layout
- Creating UI element – Button
- Creating UI element - Menu
- Demonstrating Thread
- Demonstrating Services
- Creating Animation view and canvas
- Listing the sensors used in mobile phone

- Creating .apk file and publishing
- Creating simple application using XAMARIN
- Creating simple Angular application using native-script

OUTCOMES:

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

CO1: Able to understand the mobile internals and able to understand its ecosystem

CO2: Able to develop application specific to mobile with offline support, local database, VPN connectivity

CO3: Hands on experience on industry facing frameworks such as Xamarin and NativeScript

TEXTBOOKS:

1. Anubhav Pradhan, Anil V Deshpande" Composing Mobile Apps Learn|Explore|Apply using Andriod", Wiley Publications 1st Edition 2014.
2. Xamarin Studio for Android Programming: A C# Cook book by Mathieu Nayrolles

20IT602	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

OBJECTIVES

- Understand the concept of Artificial Intelligence
- Familiarize with Knowledge based AI systems and approaches
- Apply the aspect of Probabilistic approach to AI
- Identify the Neural Networks and NLP in designing AI models
- Recognize the concepts of Machine Learning and its deterministic tools

UNIT I PROBLEM SOLVING AND SEARCH STARTEGIES 9+6

Introduction: What Is AI, the Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art. Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, And The

Structure of Agents. Solving Problems by Searching: Problem-Solving Agents, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. Beyond Classical Search: Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions and Partial Observations, Online Search Agents and Unknown Environments. Constraint Satisfaction Problems: Definition, Constraint Propagation, Backtracking Search, Local Search, The Structure of Problems.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING 9+6

Logical Agents: Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic. FirstOrder Logic: Syntax and Semantics, Knowledge Engineering in FOL, Inference in First-Order Logic, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Planning: Definition, Algorithms, Planning Graphs, Hierarchical Planning, Multi-agent Planning. Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

UNIT III LEARNING 9+6

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks. Applications: Human computer interaction (HCI), Knowledge management technologies, AI for customer relationship management, Expert systems, Data mining, text mining, and Web mining, Other current topics.

UNIT IV FUNDAMENTALS OF MACHINE LEARNING 9+6

Motivation for Machine Learning, Applications, Machine Learning, Learning associations, Classification, Regression, The Origin of machine learning, Uses and abuses of machine learning, Success cases, How do machines learn, Abstraction and knowledge representation, Generalization, Factors to be considered, Assessing the success of learning, Metrics for evaluation of classification method, Steps to apply machine learning

to data, Machine learning process, Input data and ML algorithm, Classification of machine learning algorithms, General ML architecture, Group of algorithms, Reinforcement learning, Supervised learning, Unsupervised learning, Semi-Supervised learning, Algorithms, Ensemble learning, Matching data to an appropriate algorithm.

UNIT V MACHINE LEARNING AND TYPES 9+6

Supervised Learning, Regression, Linear regression, Multiple linear regression, A multiple regression analysis, The analysis of variance for multiple regression, Examples for multiple regression, Overfitting, Detecting overfit models: Cross validation, Cross validation: The ideal procedure, Parameter estimation, Logistic regression, Decision trees: Background, Decision trees, Decision trees for credit card promotion, An algorithm for building decision trees, Attribute selection measure: Information gain, Entropy, Decision Tree: Weekend example, Occam's Razor, Converting a tree to rules, Unsupervised learning, Semi Supervised learning, Clustering, K – means clustering, Automated discovery, Reinforcement learning, Multi-Armed Bandit algorithms, Influence diagrams, Risk modelling, Sensitivity analysis, Casual learning.

TOTAL: 45 THEORY +30 PRACTICAL=75 PERIODS

LIST OF EXCERCISES

Use Cases

Case Study 1: Churn Analysis and Prediction (Survival Modelling)

Cox-proportional models

Churn Prediction

Case Study 2: Credit card Fraud Analysis

Imbalanced Data

Neural Network

Case study 3: Sentiment Analysis or Topic Mining from New York Times

Similarity measures (Cosine Similarity, Chi-Square, N Grams)

Part-of-Speech Tagging

Stemming and Chunking

Case Study 4: Sales Funnel Analysis

A/B testing

Campaign effectiveness, Web page layout effectiveness

Scoring and Ranking

Case Study 5: Recommendation Systems and Collaborative filtering

User based

Item Based

Singular value decomposition–based recommenders

Case Study 6: Customer Segmentation and Value

Segmentation Strategies

Lifetime Value

Case Study 7: Portfolio Risk Conformance

Risk Profiling

Portfolio Optimization

Case Study 8: Uber Alternative Routing

Graph Construction

Route Optimization

OUTCOMES

On Completion of the course, the students should be able to:

CO1: Build a model using AI and ML, and able to predict based on various events

CO2: Demonstrate the working knowledge on tools and frameworks

CO3: Demonstrate knowledge of reasoning and knowledge representation for solving real world problems

CO4: Ability to demonstrate the design of intelligent computational techniques.

CO5: Apply AI and machine learning algorithms to solve real world problems

CO6: Implement problem-solving skills using the acquired knowledge in the areas of, reasoning, natural language understanding, computer vision, automatic

programming and machine learning.

TEXTBOOKS:

1. Introduction to Artificial Intelligence and Machine Learning (IBM ICE Publications).
2. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education / Prentice Hall of India, 2010.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill, 2010.

REFERENCES:

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

20IT603	**CYBER SECURITY**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

OBJECTIVES:

- To provide the knowledge on foundations and vulnerabilities of Cyber Security
- To introduce symmetric and Asymmetric Cryptography and message authentication techniques
- To create awareness on cyber laws and forensics.
- To deliver insights on Ethical Hacking and various attacks.

UNIT I FOUNDATIONS OF CYBER SECURITY CONCEPTS 9+6

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits - Cyber Security Vulnerabilities: Internet Security, Cloud Computing and Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness.

UNIT II CRYPTOGRAPHY 9+6

Cryptography: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.

UNIT III CYBER LAWS 9+6

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013

UNIT IV FORENSICS 9+6

Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations.

UNIT V INTRODUCTION TO ETHICAL HACKING 9+6

LINUX and Networking, Doxing, Website/ IP information Gathering, Network Mapping o Google Hacking, d Discovering IP Range and Open Port, Identifying Target Operating System and Services, Secure Bypassing Firewalls while Scanning, Understanding Wireless Networks , Deauthentication attack, Fragmentation Attacks, Chop Chop attack, Fake authentication ,Evil Twin Attack, Cafe-latte attack, Reveal Hidden SSID's, WPA and WPA2 wireless password, hacking techniques, Cracking Wireless Passwords using Rainbow tables, Brute force techniques

TOTAL: 45 + 30 = 75 PERIODS

LAB EXCERCISES:

1. Implement Confidentiality and Authentication using RSA
2. Implement the Signature Scheme - Digital Signature Standard
3. Implement the following algorithms - DES, Diffie Hellman Algorithm
4. Demonstrate Intrusion Detection System (IDS) using any tool (snort or any other s/w)
5. How to Recover Deleted Files using Forensics Tools

6. Hiding and extract any text files behind an image file/ Audio file.
7. Cracking Wireless Passwords using Rainbow tables
8. Investigations on Email Crime.
9. Study of sniffing
10. Study of Fake authentication

OUTCOMES:

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

CO1: Discuss the foundations of Cyber Security Concepts.

CO2: Identify the vulnerabilities in the given Information system.

CO3: Demonstrate the cryptography techniques.

CO4: Interpret Cyber law and Forensics

CO5: Discriminate ethical hacking techniques

TEXTBOOK:

1. William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education, 2017.

REFERENCES:

1. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi, 2017.
2. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning, 2019.
3. Gupta Sarika, “Information and Cyber Security”, Khanna Publishing House, Delhi.
4. https://www.eckovation.com/course/ethical-hacking-and-cyber-security
5. https://nptel.ac.in/courses/106105217/

SEMESTER VII

20IT701	MICROSERVICE ARCHITECTURE	L	T	P	C
		3	0	2	4

OBJECTIVES

- To understand the Microservice Architecture.
- To understand the Microservice Design and pattern.
- To understand the JEE Framework.
- To understand the Microservice Implementation.
- To understand the usage of Docker with Microservices.

UNIT I INTRODUCTION TO MICROSERVICE 9+6

Introduction to Microservice and how it differs from Distributing Computing, Understand the current Monolithic Architecture Design and its advantage and pit falls, Places of Usage, Feature Set, Pros and Cons.

Introduction, Qualities of Microservice Architecture, Place of Usage, Points to be taken care, Core JEE and Microservice Patterns, Pros and Cons.

Rest - Introduction, JAX-RS, Restful frameworks, Security in Rest, Spring Boot - Rest

Controller, Error Handler, Validation, Rest API Client.

UNIT II MICROSERVICES DESIGN 9+6

Messaging - Introduction to Messaging based Integration, Places of Usage, Pub Sub Model, P2P Integration, Request and Reply Model, Exception Handling and Dead Letter Channel, Transaction Support.

Design Patterns-Decompose by business capability, Decompose by subdomain, Database per Service, Shared database, Saga, API Composition, CQRS, Domain event, Event sourcing, Strangler Application, Anti-corruption layer, Consumer-driven contract test, Consumer-side contract test, Multiple service instances per host, Service instance per host, Service instance per VM, Service instance per Container, Serverless deployment, Service deployment platform.

UNIT III JEE FRAMEWORK 9+6

Maven Build framework - Why Maven and Features, Goal, Profile, Life Cycle, Parent-Child, Plugins.

Introduction to Spring Framework, Spring Core - IOC, DI, Life Cycle, Autowire, Parent/Child. Spring Boot - MVC, REST Controller, Global Error Handling, HTTP Response Code, URI Patterns and HTTP Verbs. Spring AOP, Spring Configuration, Spring JPA - Entity Mapping, Association Mapping, Inheritance Mapping, JPA/Hibernate, @Query, Join Query, Pagination, CRUD Operation.

UNIT IV MICROSERVICE IMPLEMENTATION 9+6

Eureka Service Registry Configuration and Setup.

Spring Cloud Ribbon - Client-Side LB. Spring Cloud Config - Centralized Versioned Configuration. Spring Feign Client - Declarative REST Client. Spring Boot - Spring Configuration (Eureka, Port, JPA cfgs). Spring RestController, Feign Rest Client, Spring Hystrix Fault Tolerant, Fall Back Implementation, Hystrix Configuration, Hystrix Dashboard. Spring Cloud Bus - Dynamic Configuration Changes.

UNIT V MICROSERVICE SECURITY AND INTEGRATIONS 9+6

Integration with Spring MS Components, RabMQ Exchanges/Queue. API Gateway Pattern, Spring Cloud Gateway, Caching Options, Redirection, Security, Integrating with

Service Registry. Sleuth, Zipkin and Spring Admin.

Docker Containers - Image, Containers, Linking, Volume, Networks, Logs, K8, Apache Kafka - Producers, Consumers, Queries, Streaming, Case Study - Project Execution using Microservice

TOTAL: 45 + 30 = 75 PERIODS

OUTCOMES:

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

CO1: Understand the need and Architecture of Microservices.

CO2: Design applications and understand Microservice pattern.

CO3: Understand Spring Boot and learn its application.

CO4: Understand Eureka and Configure Spring Cloud.

CO5: Design Applications using Docker Microservices.

LIST OF EXERCISES

Microservice Implementation for the following use cases

Use Cases:

1. Star Small and Medium Banking and Finance
2. Inventory Management for a EMart Grocery Shop
3. Society Financial Management
4. Cop Friendly App - ESeva
5. Property Management - eMall

Details of use cases will be provided to the students through Lab Manual.

TEXTBOOKS:

1. Microservices: Flexible Software Architecture by Eberhard Wolff, 2016.
2. Microservice Patterns and Best Practices: Explore patterns like CQRS and event sourcing to create scalable, maintainable, and testable Microservices by Vinicius Feitosa Pacheco, 2018
3. Microservices with Spring Boot and Spring Cloud: Build resilient and scalable microservices using Spring Cloud, Istio, and Kubernetes, 2nd Edition by Magnus Larsson, 2021.

REFERENCES:

1. Building Microservices: Designing Fine-Grained Systems by Sam Newman, Second Edition, 2021.
2. Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy Java microservices using Spring Cloud, Istio, and Kubernetes, by Magnus Larsson, 2019
3. Essentials of Microservices Architecture: Paradigms, Applications, and Techniques, 1st Edition, Kindle Edition by Chellammal Surianarayanan, Gopinath Ganapathy, Raj Pethuru .

20IT928	PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP	L	T	P	C
		0	0	6	3

OBJECTIVES:

- To empower students with overall Professional and Technical skills required to solve a real world problem.
- To mentor the students to approach a solution through various stages of Ideation, Research, Design Thinking, workflows, architecture and building a prototype in keeping with the end-user and client needs.
- To provide experiential learning to enhance the Entrepreneurship and employability skills of the students.

This course is a four months immersive program to keep up with the industry demand and to have critical thinking, team based project experience and timely delivery of modules in a project that solves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learning is introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. **This is an EEC category course offered as**

an elective, under the type, "Experiential Project Based Learning".

Highlights of this course:

- Students undergo training on emerging technologies
- Students develop solutions for real-world use cases
- Students work with mentors to learn and use industry best practices
- Students access and use Self-Learning courses on various technologies, approaches and methodologies.
- Collaborate in teams with other students working on the same topic
- Have a dedicated mentor to guide

OUTCOMES:

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

- Upskill in emerging technologies and apply to real industry-level use cases
- Understand agile development process
- Develop career readiness competencies, Team Skills / Leadership qualities
- Develop Time management, Project management skills and Communication Skills
- Use Critical Thinking for Innovative Problem Solving
- Develop entrepreneurship skills to independently work on products

The course will involve 40-50 hours of technical training, and 40-50 hours of project development. The activities involved in the project along with duration are given in Table 1.

TABLE 1: ACTIVITIES

Activity Name	Activity Description	Time (weeks)
Choosing a Project	Selecting a project from the list of projects categorized various technologies and business domains	2
Team Formation	Students shall form a team of 4 Members before enrolling to a project. Team members shall distribute the project activities among themselves.	1

Hands on Training	Students will be provided with hands-on trainingon selected technology in which they are going to develop the project.	2
Project Development	Project shall be developed in agile mode. The status of the project shall be updated to the mentors via appropriate platform	6
Code submission, Project Doc and Demo	Project deliverables must include the working code, project document and demonstration video. All the project deliverables are to be uploaded to cloud based repository such as GitHub.	3
Mentor Review and Approval	Mentor will be reviewing the project deliverablesas per the milestone schedule and the feedback will be provided to the team.	1
Evaluation and scoring	Evaluators will be assigned to the team to evaluate the project deliverables, and the scoring will be provided based on the evaluationmetrics	1
TOTAL		**16 WEEKS**

PROFESSIONAL ELECTIVES

20IT902	**SOFTWARE TESTING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To learn the criteria for test cases.
- To learn the design of test cases.
- To understand test management and test automation techniques
- To apply test metrics and measurements.

UNIT I INTRODUCTION 9

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design –Defect Examples- Developer/Tester Support of Developing a Defect Repository.

UNIT II TEST CASE DESIGN STRATEGIES 9

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing – Requirements based testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Additional White box testing approaches- Evaluating Test Adequacy Criteria.

UNIT III LEVELS OF TESTING 9

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing the documentation – Website testing.

UNIT IV TEST MANAGEMENT 9

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- .The Technical Training Program.

UNIT V TEST AUTOMATION 9

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design test cases suitable for a software development for different domains.

CO2: Identify suitable tests to be carried out.

CO3: Prepare test planning based on the document.

CO4: Document test plans and test cases designed.

CO5: Use automatic testing tools.

CO6**:** Develop and validate a test plan.

TEXTBOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, “Practical Software Testing”, Springer International Edition, 2003
2. Edward Kit,” Software Testing in the Real World – Improving the Process”, Pearson Education, 1995
3. Boris Beizer,” Software Testing Techniques” – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, “Foundations of Software Testing _ Fundamental Algorithms and Techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008

20IT903	**GRAPH THEORY AND APPLICATIONS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I **9**

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II **9**

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration- Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT III **9**

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV **9**

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V **9**

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students should be able to

CO1: Understand the basic concepts of graphs, and different types of graphs

CO2: Understand the properties, theorems and be able to prove theorems.

CO3: Apply suitable graph model and algorithm for solving applications.

TEXTBOOKS:

1. Narsingh Deo, “Graph Theory with applications to Engineering and Computer Science”, 11th Reprint, Prentice-Hall of India, 2014.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016.

REFERENCES

1. Bondy, J. A. and Murty, U.S.R., “Graph Theory with Applications", North Holland Publication, 2008.
2. West, D. B., “Introduction to Graph Theory”, Pearson Education, 2011.
3. John Clark, Derek Allan Holton, “A First Look at Graph Theory”, World Scientific Publishing Company, 1991
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill , 2007.
6. Douglas B. West, “Introduction to Graph Theory “, 2nd Edition, Prentice-Hall of India, 2012.

20IT904	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of discrete time signals, systems and their classifications.
- To analyze the discrete time signals in both time and frequency domain.
- To design lowpass digital IIR filters according to predefined specifications based on analog filter theory and analog-to-digital filter transformation.
- To design Linear phase digital FIR filters using Fourier method, window technique
- To realize the concept and usage of DSP in various engineering fields.

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS 9

Introduction to DSP – Basic elements of DSP– Sampling of Continuous time signals– Representation, Operation and Classification of Discrete Time Signal–Classification of Discrete Time Systems–Discrete Convolution: Linear and Circular–Correlation.

UNIT II ANALYSIS OF LTI DISCRETE TIME SIGNALS AND SYSTEMS 9

Analysis of LTI Discrete Time Systems using DFT–Properties of DFT–Inverse DFT–

Analysis of LTI Discrete Time Systems using FFT Algorithms– Inverse DFT using FFT Algorithm.

UNIT III INFINITE IMPULSE RESPONSE FILTERS 9

Frequency response of Analog and Digital IIR filters–Realization of IIR filter–Design of analog low pass filter–Analog to Digital filter Transformation using Bilinear Transformation and Impulse Invariant method–Design of digital IIR filters (LPF, HPF, BPF, and BRF) using various transformation techniques

.

UNIT IV FINITE IMPULSE RESPONSE FILTERS 9

Linear Phase FIR filter–Phase delay–Group delay–Realization of FIR filter–Design of Causal and Non-causal FIR filters (LPF, HPF, BPF and BRF) using Window method (Rectangular, Hamming window, Hanning window) –Frequency Sampling Technique

UNIT V APPLICATIONS OF DSP 9

Multi-rate Signal Processing: Decimation, Interpolation, Spectrum of the sampled signal – Processing of Audio and Radar signal.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Perform mathematical operations on signals.

CO2: Understand the sampling theorem and perform sampling on continuous-time signals to get discrete time signal by applying advanced knowledge of the sampling theory.

CO3: Transform the time domain signal into frequency domain signal and vice-versa.

CO4: Apply the relevant theoretical knowledge to design the digital IIR/FIR filters for the given analog specifications.

TEXTBOOK:

1. John G. Proakis and Dimitris G.Manolakis, “Digital Signal Processing –

Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES

1. Richard G. Lyons, "Understanding Digital Signal Processing". Second Edition, Pearson Education.
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.
3. Emmanuel C.Ifeachor, and Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
4. William D. Stanley, "Digital Signal Processing", Second Edition, Reston Publications.
5. Nagoor Kani, "Digital signal Processing", Tata McGraw-Hill Education Private Limited, Second Edition, 2017.
6. S.Salivahanan, A.Vallavaraj and G.Gnanapriya, "Digital Signal Processing", Tata McGraw-Hill Education Private Limited, Second Edition, 2010

20IT905	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop an understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
- To become familiar with various software programs used in the creation and implementation of multi- media
- To appreciate the importance of technical ability and creativity within design practice.
- To gain knowledge about graphics hardware devices and software used.
- To understand the two-dimensional graphics and their transformations.
- To understand the three-dimensional graphics and their transformations.
- To appreciate illumination and color models
- To become familiar with understand clipping techniques
- To become familiar with Blender Graphics

UNIT I ILLUMINATION AND COLOR MODELS 9

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection. Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT II TWO-DIMENSIONAL GRAPHICS 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III THREE-DIMENSIONAL GRAPHICS 9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces - B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING 9

Multimedia basics − Multimedia applications − Multimedia system architecture − Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards − Multimedia databases. Compression and decompression − Data and file format standards − Multimedia I/O technologies − Digital voice and audio − Video image and animation − Full motion video − Storage and retrieval technologies

UNIT V HYPERMEDIA 9

Multimedia authoring and user interface - Hypermedia messaging -Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems.

CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modeling – Shading and Textures

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design two dimensional and three dimensiona graphics.

CO2: Apply two dimensional and three dimensiona transformations.

CO3: Apply Illumination and color models.

CO4: Apply clipping techniques to graphics.

CO5: Understood Different types of Multimedia File Format

CO6: Design Basic 3D Scenes using Blender

TEXTBOOKS:

1. Donald Hearn and Pauline Baker M, “Computer Graphics", Prentice Hall, New Delhi, 2007 [UNIT I – III]
2. Andleigh, P. K and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003. [UNIT IV, V]
3. https://www.blender.org/support/tutorials/

20IT906	INFORMATION STORAGE AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic components of Storage System Environment.

- To understand the Storage Area Network Characteristics and Components.
- To examine emerging technologies including IP-SAN.
- To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- To understand the local and remote replication technologies.

UNIT I STORAGE SYSTEMS 9

Introduction to Information Storage and Management: Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle. Storage System Environment: Components of the Host. RAID: Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares. Intelligent Storage System: Components, Intelligent Storage Array.

UNIT II STORAGE NETWORKING TECHNOLOGIES 9

Direct-Attached Storage and Introduction to SCSI: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, SCSI Command Model. Storage Area Networks: Fiber Channel, SAN Evolution, SAN Components, Fiber Channel Connectivity, Fiber Channel Ports, Fiber Channel Architecture, Zoning, Fiber Channel Login Types, Fiber Channel Topologies. Network Attached Storage: Benefits of NAS, NAS File I/Components of NAS, NAS Implementations, NAS-Implementations, NAS File Sharing Protocols, NAS I/O Operations.

UNIT III ADVANCED STORAGE NETWORKING AND VIRTUALIZATION 9

IP SAN: iSCSI, FCIP. Content-Addressed Storage: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples. Storage Virtualization: Forms of Virtualization, NIA Storage Virtualization Taxonomy, Storage Virtualization Configurations, Storage Virtualization Challenges, Types of Storage Virtualization.

UNIT IV BUSINESS CONTINUITY 9

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. Backup

and Recovery: Backup Purpose, Considerations, Granularity, Recovery Considerations, Backup Methods and Process, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies.

UNIT V REPLICATION 9

Local Replication: Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface. Remote Replication: Modes of Remote Replication and its Technologies, Network Infrastructure.

TOTAL: 45 PERIODS

OUTCOMES:

On Successful completion of the course, Students will be able to

CO1: Understand the logical and physical components of a Storage infrastructure.

CO2: Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.

CO3: Understand the various forms and types of Storage Virtualization.

CO4: Describe the different role in providing disaster recovery and business continuity capabilities.

CO5: Distinguish different remote replication technologies.

TEXTBOOK:

1. EMC Corporation, Information Storage and Management, Wiley, India Second Edition 2012

REFERENCES

1. Robert Spalding, “Storage Networks: The Complete Reference “, Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001
3. Meeta Gupta, Storage Area Networks Fundamentals, Pearson Education Limited, 2002.

20IT907	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

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

UNIT II REGISTRATION OF IPRs 10

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

UNIT III AGREEMENTS AND LEGISLATIONS 10

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

UNIT IV DIGITAL PRODUCTS AND LAW 9

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

UNIT V ENFORCEMENT OF IPRs 7

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

TOTAL: 45 PERIODS

OUTCOME:

CO1: Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXTBOOKS:

1. Vinod.V. Sople, Managing Intellectual Property, Prentice Hall of India Pvt Ltd, Fourth Edition, 2014.
2. Intellectual Property Rights and Copy Rights, Ess Ess Publications.

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. Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

20IT901	DESIGN THINKING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To identify the importance of design patterns
- To categorize and analyse the different aspects of how the objects interact with each other and with physical components of the design solutions.
- To interpret the insight into design thinking with graphical interfaces to provide dynamism in transformations of a design product or a solution

UNIT I INTRODUCTION 9

Introduction to Design patterns: Describing design pattern, Design problems, Design problems solved by design patterns, Selection of a design pattern, Usage of design patterns. The catalog of design pattern: Creational pattern, Structural pattern, Behavioural pattern, Class and object communication. Case Study: Designing a document editor.

UNIT II PATTERNS 9

Gang-of-Patterns – Creational – Structural – Behavioral, Enterprise Application Integration Patterns, Micro Service Patterns, Scalable UI Design Patterns, High Volume Processing

Patterns

UNIT III OVERVIEW OF DESIGN THINKING 9

Defining design thinking, needs, requirements. Stages in design thinking: Preliminary immersion, Reframing, Exploratory Research, Desk Research In-depth immersion. Interviews, Cultural Probes, Generative Sessions, A day in the Life, Shadowing.

UNIT IV ANALYSIS AND SYNTHESIS 9

Analysis and Synthesis: Insight Cards, Affinity diagram, Conceptual Map, Guiding criteria, Personas, Empathy Map, User's journey, Blueprint.

UNIT V IDEATION 9

Ideation: Brainstorming, Co-creation workshop, Idea menu, Decision matrix. Prototyping: Paper prototyping, volumetric model, Staging, Storyboard, Service prototyping

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Summarize the various design patterns and its purpose

CO2: Analyse the various behavioral aspects of design pattern to be solved

CO3: Discriminate the importance of dynamic responsibility in evaluating the standard design patterns by invoking object-oriented concepts.

CO4: Evaluate the different pattern interactions between various physical components and the user, managing a design solution through visual representations and simulation models.

CO5: Illustrate different transformations of a product or a service through brainstorming and incremental approach.

.

TEXTBOOKS:

1. Enrich Gamma, Richard Helm, Ralp Johnson and John Vissides, "Design Patterns: Elements of Reusable Object Oriented Software", Pearson, 1st Edition, 2015.
2. Maurício Vianna, Ysmar Vianna, Brenda Lucena and Beatriz Russo," Design Thinking: Business innovation", MJV Technologies and Innovation Press, 2011.

20IT929	GOOGLE CLOUD: ARCHITECTING WITH GOOGLE COMPUTE ENGINE	L	T	P	C
		2	0	2	3

OBJECTIVES:

- Learn about Google Cloud and how to interact with the Google Cloud Console and Cloud Shell.
- Create VPC networks and other networking objects.
- Understand virtual machines
- Create virtual machines using Compute Engine.

UNIT I GOOGLE CLOUD PLATFORM FUNDAMENTALS 9

Google Cloud Platform Fundamentals: Core Infrastructure Introducing Google Cloud Platform - The Google Cloud Platform resource hierarchy - Identity and Access Management (IAM) - Interacting with Google Cloud Platform - Cloud Marketplace – **Networking:** Virtual Private Cloud (VPC) Network - Compute Engine - Important VPC capabilities - **Storage:** Cloud Storage - Cloud Bigtable - Cloud SQL and Cloud Spanner - Cloud Datastore - Comparing Storage Options – **Containers** – Kubernetes - Kubernetes Engine – **AppEngine:** Introduction to App Engine - App Engine Standard Environment - App Engine Flexible Environment - Cloud Endpoints and Apigee Edge - Development in the Cloud - Deployment: Infrastructure as code – Monitoring: Proactive instrumentation - Google Cloud Big Data Platform - Google Cloud Machine Learning Platform.

UNIT II ESSENTIAL CLOUD INFRASTRUCTURE - FOUNDATION 9

Essential Cloud Infrastructure: Foundation: Introduction to GCP - Virtual Networking - Common Network Designs - Compute Engine - Working with Virtual Machines. **Core Services:** Introduction to core services - Cloud Identity and Access Management - Cloud Storage - Cloud SQL - Cloud Spanner and Datastore - Cloud Bigtable - Resource Management - **Monitoring:** Stack driver – Logging - Error Reporting - Tracing and Debugging.

UNIT III ESSENTIAL CLOUD INFRASTRUCTURE – CORE SERVICES 9

Essential Cloud Infrastructure: Core Services: Identity and Access management-Organization-Roles- Custom roles- Members- Service Accounts-Cloud IAM- Resource Manager-Quotas-Labels-Billing-Billing Administration.

UNIT IV ELASTIC CLOUD INFRASTRUCTURE 9

Elastic Cloud Infrastructure: Scaling and Automation: Introduction to Elastic Cloud Infrastructure - Cloud VPN - Cloud Interconnect and Peering - Sharing VPC Networks - Managed instance groups – Load balancing: HTTP(S) load balancing - SSL/TCP - Proxy load balancing - Network load balancing - Internal load balancing - Choosing a load balancer - Deployment Manager - GCP Marketplace - Managed Services.

UNIT V RELIABLE CLOUD INFRASTRUCTURE 9

Reliable Cloud Infrastructure: Design and Process: Defining the service - Business-logic layer - Data layer design - Presentation layer - Design for Resiliency - Scalability and Disaster Recovery - **Design for Security:** Cloud security - Network access control and firewalls - Protections against Denial of Service - Resource sharing and Isolation - Data encryption and key management - Identity access and auditing - Capacity planning and cost optimization – Deployment - Monitoring and alerting - Incident response.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Recognize the purpose of various compute services such as Compute Engine, Kubernetes Engine, App Engine and Cloud Functions.

CO2: Explore the fundamental components of GCP's Virtual Private Cloud.

CO3: Manage and examine billing of Google Cloud resources

CO4: Explore various load balancing services and construct an HTTP load balancer with auto scaling.

CO5: Identity various steps involved in designing a solution using layered and iterative approach.

TEXTBOOK:

1. Sosinsky B., “Cloud computing bible”, John Wiley and Sons, 2011.

REFERENCES:

1. Dinkar Sitaram, Geetha Manjunat, “Moving to the Cloud: Developing Apps in the New World of Cloud Computing”, Elsevier, 2012.
2. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGraw Hill, 2010.
3. https://www.coursera.org/specializations/gcp-architecture
4. https://cloud.google.com/docs/

20IT909	ADVANCED JAVA - JEE	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To learn the fundamentals of JEE concepts and usage of build tools like Maven.
- To acquire knowledge on core technologies like IOC, DI and AOP.
- To develop and deploy application in frameworks like Spring, Spring MVC and Building REST Services with spring MVC
- To understand Logging process, ORM framework and build secure applications using JWT and OAUTH

UNIT I INTRODUCTION TO JAKARTA ENTERPRISE EDITION (FORMERLY CALLED AS JAVA EE) 6

Java EE 8 Platform Overview - Distributed Multi tiered Applications- Web and Business Components-Java EE Containers – services & types - Java EE Application Assembly and Deployment – Packaging Applications, Java EE modules - Getting Started with Web applications Model View Controller (MVC) 2 Architecture and Packaging – Web application deployment descriptor (web.xml file) - Web Application Archive (*.WAR file), Java Archive (*.JAR), Enterprise Application archive (*.EAR). Build Tools: Maven, Configuration, Archetype, Local Maven Repository and Mvn Repository, Dependency

Plugins.

UNIT II CORE TECHNOLOGIES AND FRAMEWORKS 7

Introduction to Spring Core, Spring Architecture, Bean Container, Inversion of Control, IOC Container, Bean Definition, Bean Scope, Bean Life Cycle, Dependency Injection-Constructor Injection and property Injection, Auto-wiring, Aspect Object Programming (AOP), Spring MVC, Building a REST services with spring, using http calls (GET, POST, PUT, etc) with annotations: Controller, Rest Controller, Get Mapping, Post Mapping, Put Mapping and Delete Mapping, Error handling for REST, Logging with Log4J. Case Study: Performing CURD operation using spring MVC and RESTFUL services. Introduction to Tools:

UNIT III DATA PERSISTENCE 5

Object/Relation Mapping using Simple JDBC Integration with native SQL commands, JNDI(Java Naming and Directory Interface), JNDI Data source Configuration, Application Deployment in Tomcat with JNDI.

UNIT IV HIBERNATE 6

Introduction, Integrating and configuring Hibernate, understanding connection pool, ORM Architecture, Spring Data, JPA vs Hibernate, JPA annotations, Entity Manager, Entity Relationships – Many To One Relation, One To Many Relation, One To One Relation and Many To Many Relation. Building a sample application using JPA.

UNIT V WEB SECURITY FRAMEWORK 6

JSON Web Token (JWT), JWT structure and configuration. OAUTH2, Architecture, Authentication grant, Obtaining Access Token, Accessing a protected resource, OAuth Registry, Extensibility. Case Study: Develop a Spring based application with JWT-OAUTH2.

TOTAL: 30+30 = 60 PERIODS

OUTCOMES:

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

CO1: Understand the concepts of JEE and build tools like maven.

CO2: Apply core Technologies in real world application

CO3: Demonstrate real world application in different frameworks like spring and spring MVC

CO4: Apply logging process and spring security in real world applications

LIST OF EXERCISES

Prerequisites:

1. Developing simple application in Maven.
2. Implement Spring IOC.
3. Implement Spring JDBC.
4. Create a web application using Spring MVC.
5. Implement Data Persistence using JPA and Hibernate.
6. Creating RESTFUL services and Test using Postman or SoapUI
7. Usage of Java Naming and Directory Interface
8. Implement Logging using Log4j.
9. Implement Spring Security using JWT and OAUTH2

Use Cases:

1. Star Small and Medium Banking and Finance
2. Inventory Management for a EMart Grocery Shop
3. Society Financial Management
4. Cop Friendly App - ESeva
5. Property Management - eMall

Details of use cases will be provided to the students through Lab Manual.

TEXTBOOKS:

1. Kogent Learning Solutions Inc.,"Java Server Programming Java EE7 (J2EE 1.7): Black Book", Dream Tech Press, 2014.
2. Jim Keogh, “J2EE: The Complete Reference”, McGraw Hill, 2002
3. Geoffroy Warin, “Mastering Spring MVC 4”, Packt Publishing, 2015

REFERENCES:

1. Christian Bauer, Gavin King, and Gary Gregory, “Java Persistence with Hibernate”, Second Edition, Manning publication, 2015
2. Joseph B.Ottinger, Jeff LinWood, Dave Minter, “ Beginning Hibernate: for Hibernate 5”, 4th Edition, Apress, 2016
3. Laurentiu Spilca, “Spring Security in Action, Manning Publication, 2020
4. https://www.baeldung.com/rest-with-spring-series
5. https://www.coursera.org/courses?query=spring%20framework
6. https://www.gangboard.com/spring-and-hibernate-courses
7. https://www.progress.com/tutorials/jdbc/understanding-jta
8. https://www.ibm.com/developerworks/library/j-jndi/index.html

20IT913	WIRELESS ADHOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about the issues and challenges in the design of wireless ad hoc networks.
- To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

UNIT I MAC AND ROUTING IN AD HOC NETWORKS 9

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple-Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Ad hoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing

Protocols

UNIT II TRANSPORT AND QOS IN AD HOC NETWORKS 9

TCP"s challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model

UNIT III MAC AND ROUTING IN WIRELESS SENSOR NETWORKS 9

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention-Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zigbee – Topology Control – Routing Protocols

UNIT IV TRANSPORT AND QOS IN WIRELESS SENSOR NETWORKS 9

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples

UNIT V SECURITY IN AD HOC AND SENSOR NETWORKS 9

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Interpret the concept of MAC and routing in ad hoc networks

CO2: Identify different issues in wireless ad hoc and sensor networks.

CO3: Analyze protocols developed for ad hoc and sensor networks.

CO4: Demonstrate the concept of transport and QoS in wireless sensor networks.

CO5: Identify and understand security issues in ad hoc and sensor networks.

TEXTBOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, First Edition 2006
2. Holger Karl, Andreas Willing, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Inc., 2005.

REFERENCES:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, “Ad Hoc Mobile Wireless Networks”, Auerbach Publications, 2008.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition)”, World Scientific Publishing, 2011.
3. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks Theory and Practice”, John Wiley and Sons, 2010
4. Xiang-Yang Li , **“**Wireless Ad Hoc and Sensor Networks: Theory and Applications”, 1227th edition, Cambridge university Press, 2008

20IT910	**FORMAL LANGUAGES AND AUTOMATA THEORY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- Understand the Chomsky language hierarchy, to construct automata for anygiven pattern and find its equivalent regular expressions.
- Design CFG for any given language and prove its equivalence
- Design CSG for any given language and prove its equivalence
- Understand the need for Turing machines and their capability
- Understand undecidable problems

UNIT I AUTOMATA FUNDAMENTALS REGULAR EXPRESSION AND LANGUAGES AND FINITE AUTOMATA 9

Introduction: Alphabet - languages and grammars - productions and derivation-

Chomsky hierarchy of languages - Regular expressions and languages - deterministic finite automata (DFA) and equivalence with regular expressions - nondeterministic finite automata (NFA) and equivalence with DFA - regular grammars and equivalence with finite automata - properties of regular languages - Kleene's theorem - pumping lemma for regular languages - Myhill-Nerode theorem and its uses - minimization of finite automata.

UNIT II CONTEXT- FREE LANGUAGES AND PUSHDOWN AUTOMATA 9

Context-free grammars (CFG) and languages (CFL) - Chomsky and Greibach normal forms - nondeterministic pushdown automata (PDA) and equivalence with CFG - parse trees - ambiguity in CFG - pumping lemma for context-free languages - deterministic pushdown automata - closure properties of CFLs.

UNIT III CONTEXT- SENSITIVE LANGUAGES 9

Context-sensitive grammars (CSG) and languages - linear bounded automata and equivalence with CSG.

UNIT IV TURING MACHINES 9

The basic model for Turing machines (TM) - Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties- variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs - unrestricted grammars and equivalence with Turing machines - TMs as enumerators.

UNIT V UNDECIDABILITY AND COMPLEXITY 9

Undecidability: Church-Turing thesis - universal Turing machine - the universal and diagonalization languages - reduction between languages and Rice s theorem - undecidable problems about languages.

Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines - P and NP - NP- completeness - Cook's Theorem - other NP -Complete problems.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Construct automata, regular expression for any pattern

CO2: Write Context free grammar for any construct

CO3: Design Turing machines for any language.

CO4: Propose computation solutions using Turing machines.

CO5: Derive whether a problem is decidable or not.

TEXTBOOKS:

1. Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, 2008.
2. Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou, 2010.

REFERENCES:

1. Automata and Computability, Dexter C. Kozen.
2. Introduction to the Theory of Computation, Michael Sipser.
3. Introduction to Languages and the Theory of Computation, John Martin.
4. Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and D. S. Johnson.

20IT911	**DEVOPS**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

OBJECTIVES:

- Understand the concepts of DevOps and the issues it resolves
- Learn the DevOps tools set
- Learn to Develop automation using Maven
- Understand Continuous Delivery and Continuous Deployment
- Understand Docker Containerization

UNIT I INTRODUCTION 6+6

What Is DevOps, Architecture, Life Cycle, Workflow and Principles, Tools, CI, CD and CD Pipelines Linux Introduction, Basic Commands, Scripting

UNIT II TOOLS SET 6+6

Maven Build Management, Goals, Profiles, Plugins, LifeCycles, Configuration, Parent/Child - SCM Tools - GitHub, Init, CheckIn, Merge, Pull, Push, Local and Remote Repo, Pull Request, Tagging Strategy - Unit Testing - Unit Testing scropts - Artifact Repository - Release Management aligned Repos, Private and Public Repos Monitoring - Tools like nagios to assist in monitoring and managing the deployed instances

UNIT III TESTING AUTOMATION 6+6

Maven with Unit / Integration / Performance Testing - Report Generation and Configuration

UNIT IV DEPLOYMENT AND MONITORING - DOCKER 6+6

Docker Introduction, Images, Containers, Docker Hub, Links, Volume, Network, Interactive Sessions - K8 - Single and Cluster Mode, Secrets, Persistence Volume and Claim, Replica Factor, Services, Pods, Deployments, logs, Kubernetes

UNIT V DEPLOYMENT AND MONITORING - JENKINS 6+6

SonarQube integration with Project and Jenkins

Jenkins - Setup and Configuration, Jobs - Continuous Integration, Continuous Delivery and Continuous Deployment Configuration

TOTAL: 30+30 = 60 PERIODS

OUTCOMES:

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

CO1: Understand the concept of DevOps Architecture.

CO2: Apply the DevOps Tools in real time applications.

CO3: Build Maven with Unit, Integration and Performance Testing

CO4: Deploy and monitor using Docker

CO5: Deploy and monitor using Jenkins

LAB EXCERCISES:

Prerequisite:

Develop a Sample Spring Boot Project with following aspects

REST API End Points

- Ex Funds Transfer Service
- Query Fund Transfer Status

Junit Test Cases

Selenium Test Cases

DockerFile

Scripts for Docker Image and Container Cleanup / Creation

Maven Pom file with Docker integrations

Software Installation: -

- Java 8
- Maven Latest
- VS Code / Eclipse STS
- Jenkins
- SonarQube
- Docker and Kubernetes
- Git Client
- Nagios Network Mentoring Tool

Reference https://docs.semaphoreci.com/examples/java-spring-continuous-integration/

Exercise 1:

- Install Jenkins
- Configure Jenkins for Maven, Java, GitHub,SonarQube and SonarScanner
- Setup Continuous Integration on Jenkins for the above said project and show case the build stability in the form of
    - Build Stability
    - Test Case Success / Regression
    - Code Quality Check using SonarQube

Points to be observed:

- Build Stability
- Finger Prints
- Test Case Results
- Workspace
- Application Logs
- Jenkins Pre / Post Actions
- Email Notifications
- Sonar Qube Report Analysis

Exercise 2:

- Install Groovy
- Create a Pipelines in Jenkins which will perform following steps
    - Configure Java/Maven/Private Repo
    - Git Clone of the above said project
    - Maven Build
    - Maven Test
    - Sonar Scanner (if quality if OK then proceed, else exit with error message)
    - Repo Setup and Install Libraries in the Repo
    - Docker Clean Containers
    - Docker Clean Images
    - Docker Build
    - Docker Run Container

Points to be observed: -

- Build Stability
- Finger Prints
- Test Case Results
- Workspace
- Application Logs
- Jenkins Pre / Post Actions
- Email Notifications

- Sonar Qube Report Analysis
- Time Taken for each Steps
- Process Refinement

REFERENCES:

1. Jennifer Davis and Ryn Daniels, Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale, First Edition, O'Reilly Publications.
2. Gene Kim, Patrick Debois et al., The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, IT Revolution Press; Illustrated edition, 2016.

20IT912	C# AND .NET PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

UNIT I C# LANGUAGE BASICS 9

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

UNIT II C# ADVANCED FEATURES 9

Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and

Pointers - Errors and Exceptions - Reflection

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION 9

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

UNIT IV WINDOW BASED APPLICATIONS, WCF AND WWF 9

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

UNIT V .NET FRAMEWORK AND COMPACT FRAMEWORK 9

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Write various applications using C# Language in the .NET Framework.

CO2: Develop distributed applications using .NET Framework.

CO3: Create mobile applications using .NET compact Framework.

TEXTBOOKS:

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

REFERENCES:

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, —Programming C# 4.0, O‘Reilly,

Fourth Edition, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
3. Andy Wigley, Daniel Moth, Peter Foot, —Mobile Development Handbook, Microsoft Press, 2011.

20IT914	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision – Social Trends – Technical Trends- Economical Trends – Environmental Trends – Political/Policy Trends – Introduction to Product Development Methodologies and Management – Overview of Products and Services – Types of Product Development – Overview of Product Development methodologies – Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering – Types of Requirements – Requirement Engineering – traceability Matrix and Analysis – Requirement Management – System Design and Modeling – Introduction to System Modeling – System Optimization – System Specification – Sub-System Design – Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization – Industrial Design and User Interface Design – Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines – Concept Screening & Evaluation – Detailed Design – Component Design and Verification – Mechanical, Electronics and Software Subsystems – High Level Design/Low Level Design of S/W Program – Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping – Introduction to Rapid Prototyping and Rapid Manufacturing – System Integration, Testing, Certification and Documentation.

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages – Introduction to Product Validation processes and stages – Product Testing Standards and Certification – Product Documentation – Sustenance -Maintenance and Repair – Enhancements – Product EoL – Obsolescence Management – Configuration Management – EoL Disposal.

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry – Engineering Services Industry – Product Development in Industry versus Academia –The IPD Essentials – Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems – Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs – Intellectual Property Rights and Confidentiality – Security and Configuration Management.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Define, formulate and analyze a problem

CO2: Solve specific problems independently or as part of a team

CO3: Gain knowledge of the Innovation & Product Development process in the Business Context

CO4: Work independently as well as in teams

CO5: Manage a project from start to finish

TEXTBOOKS:

1. Karl T Ulrich and Stephen D Eppinger, “Product Design and Development”, Tata McGraw Hill, Fifth Edition, 2011.
2. John W Newstorm and Keith Davis, “Organizational Behavior”, Tata McGraw Hill, Eleventh Edition, 2005.

REFERENCES:

1. Hiriyappa B,- Corporate Strategy Managing the Business, Author House, 2013.
2. Peter F Drucker, People and Performance Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, —Enterprise Resource Planning – Concepts, Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, “Human Factors in Engineering and Design”, McGraw Hill Education, Seventh Edition, 2013.

20IT915	HUMAN RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights

UNIT II **9**

Evolution of the concept of Human Rights - Magana carta – Geneva Convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees

UNIT V **9**

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

TOTAL: 45 PERIODS

OUTCOME:

CO1: Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

20IT916 API AND APPLICATION SECURITY AND DESIGN PATTERNS **L T P C**

3 0 0 3

OBJECTIVES:

- To understand what is an API, APIs classification and types, Technology specific APIs, API Tools.
- To acquire knowledge on REST, SOAP, RPC, Message APIs, Security APIs etc.
- To Understand various ways of applying application security, tools and frameworks
- To understand the Design patterns, GOF, Blue Print patterns and principles.

UNIT I INTRODUCTION TO API 9

What is API - API Design Principles, Types of APIs, Web APIs, REST APIs, SOAP APIs, Message APIs, RPCs, API Standards.

UNIT II API TOOLS AND TECHNOLOGIES 9

API Architecture, Building and using APIs, Exposing APIs, API Integration, API Documentation, API Clients, Securing APIs, Best Practices, API governance, API management and testing tools.

UNIT III APPLICATION SECURITY 9

Application Security Frameworks, Authentication and Authorization, Network Firewall, Cross Site Scripting., LDAP, Spring Security, OAuth, JWT, SAML, SSO, HTTPS, Digital Certificates.

UNIT IV DESIGN PATTERNS 9

Architecture, Enterprise Architecture, Various Architecture Design pattern, Patterns History, Design Patterns Principles, Standards, Benefits.

UNIT V GOF AND BLUE PRINT PATTERNS 9

Creational Structural and Behavioural patterns, Modern Java EE Patterns, Core J2EE Patterns.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design and Develop APIs for various types of services using different technologies

CO2: Should able to design and develop different types of Application security components based on various business needs.

CO3: Should able to develop the application components using the appropriate design patterns (where, when, how and why) Interpret Cyber law and Forensics

TEXTBOOKS:

1. Brenda Jin, Saurabh Sahni and Amir Shevat, “Designing Web APIs: Building APIs That Developers Love”, 1st Edition.
2. Mehdi Medjaoui, Erik Wilde, Ronnie Mitra, Mike Amundsen, “Continuous API Management: Making the Right Decisions in an Evolving Landscape”, 1st Edition.
3. Mark Masse, “REST API Design Rulebook: Designing Consistent RESTful Web Service Interfaces”, 1st Edition.
4. “Java Message Service API Tutorial and Reference: Messaging for the J2EE Platform 1st Edition‟ by Mark Hapner, Rich Burridge, Rahul Sharma, Joseph Fialli, Kim Haase.
5. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, “Head First Design Patterns: A Brain-Friendly Guide” - 10th Anniversary Edition (Covers Java 8) Paperback – 2016.
6. Martin Fowler, “Patterns of Enterprise Application Architecture: Pattern Enterprise. Application Architecture”.
7. Deepak Alur, Dan Malks, John Crupi , “Core J2EE Patterns: Best Practices and Design Strategies” (2nd Edition).
8. https://spring.io/projects/
9. https://any-api.com/
10. http://www.corej2eepatterns.com/

20IT917	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
- Make the students understand the traditional knowledge and analyze it and apply it to their day-to-day life

UNIT I INTRODUCTION TO TRADITIONAL KNOWLEDGE 9

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT II PROTECTION OF TRADITIONAL KNOWLEDGE 9

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III LEGAL FRAMEWORK AND TK 9

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFRAct); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT IV TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY 9

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT V TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS 9

Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

OUTCOME:

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

CO1: Illustrate the concepts of Indian traditional knowledge.

CO2: Apply the concept of protection of traditional knowledge.

CO3: Analyze the legal framework and traditional knowledge.

CO4: Interpret the concept of traditional knowledge and intellectual property.

CO5: Analyse and apply traditional knowledge to their day-to-day life.

TEXTBOOK:

1. Amit Jha, Traditional Knowledge System in India, Atlantic publishers, 2002

REFERENCE:

1. Kapil Kapoor, Michel Danino, Knowledge Traditions and Practices of India, Central Board of Secondary Education, 2012.

20IT918	PRINCIPLES OF COMPILER DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES

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

UNIT I INTRODUCTION TO COMPILERS 9

Compilers, Analysis of the Source Program, the Phases of a Compiler, Cousins of the Compiler, the Grouping of Phases, Compiler-Construction Tools, Translators-Compilation and Interpretation, A simple one-pass compiler

UNIT II LEXICAL ANALYSIS 9

Need and role of lexical analyzer-Lexical errors, Input Buffering - Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata, From a Regular Expression to an NFA, Design of a Lexical Analyzer Generator

UNIT III SYNTAX ANALYSIS 9

Need and role of the parser- Context Free Grammars-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, YACC Design of a syntax analyzer for a sample language

UNIT IV SYNTAX DIRECTED TRANSLATION AND TYPE CHECKING 9

Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S Attributed Definitions, L-Attributed Definitions, Top down Translation, Bottom-Up Evaluation of Inherited Attributes, Forms of intermediate code -Translation of Assignment, Boolean Expression and Control statements - Back patching type systems- Specification of a simple type checker - equivalence of type expressions – type Conversions

UNIT V RUN-TIME ENVIRONMENT AND ERROR HANDLING 9

Source language issues-Storage organization-Storage allocation-parameter passing-Symbol tables-Dynamic storage allocation-Storage allocation in FORTRAN, Error handling and recovery in different phases Principal sources of Optimization – DAG -Optimization of basic blocks-Global data flow analysis - Efficient data flow algorithms -Issues in design of a code generator-a simple code generator algorithm

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Select appropriate grammar for the implementation of compiler phases

CO2: Design a lexical analyzer

CO3: Design a simple parser

CO4: Design and implement techniques used for optimization by a compiler.

CO5: Write a very simple code generator

TEXTBOOKS:

1. Alfred V.Aho, Ravi Sethi and Jeffrey D.Ullman, "Compilers – Principles, Techniques and Tools", second edition, Pearson Education, New Delhi, 2008.
2. Raghavan V, “Principles of Compiler Design”, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2009

REFERENCES:

1. Dhamdhere D M, "Compiler Construction Principles and Practice", second edition, Macmillan India Ltd., New Delhi, 2001.
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", McGraw Hill, New Delhi, 2001.
3. Dick Grone, Henri E Bal, Ceriel J H Jacobs and Koen G Langendoen, “Modern Compiler Design”, John Wiley, New Delhi, 2000.

20IT921	BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To understand how blockchain systems (mainly Bitcoin and Ethereum) work
- To securely interact with them
- To design, build, and deploy smart contracts and distributed applications,
- To integrate ideas from blockchain technology into their own projects.

UNIT I INTRODUCTION 6+6

What is BlockChain, Types of Block Chain, What is Distributed Ledgers, Consensus Algorithm, Blocks, Transaction, Double spending etc Hashing Techniques, Block Hashing, Distributed Ledgers vs Centralised Controls Ledgers. What is BitCoin, how it works, public ledgers, Miners roles, Pros and Cons.

UNIT II CONSENSUS ALGORITHMS 6+6

Consensus Algorithms - Proof of Work, Proof of Stake, practical Byzantine Fault Tolerance (pBFT), Istanbul Byzantine Fault Tolerant, Proof of Burn, Proof of Capacity, Proof of Elapsed Time Understanding between Permissioned vs Permission less Block Chain platforms - Data privacy - Authorization - Multi Partner Setup - Private Channels.

UNIT III ETHEREUM AND SOLIDITY 6+6

Solidity Introduction and Installation, Strings, Variables, Struct, Enums, Map, Events, Conversions, Ether Units, Payable, View, Pure Functions, Address, Functions, Function Modifiers, Fall back Function, Math and Crypto Functions, Object Oriented and Error Handling Understanding on EVM, Remix, Gas/Gas-limit, Accounts, Address, Ethereum Value.

UNIT IV ETHEREUMS DAAPS DEVELOPMENT 6+6

Installation of NodeJS -- Truffle suite -- Ganache -- Metamask -- Visual Studio Code Edition -- Solidity Compiler -- React Web Application Design and Development of Web3 Apps using Daap Applications using Solidity on Ethereum Platform.

UNIT V REACT BASED WEB APPLICATION 6+6

The solution will have React based web application as front end, which will communicate with deployed Smart Contracts via Web3js package. Use Case - Academics, Financial Domain, Life Science Domain.

TOTAL: 30+30 = 60 PERIODS

OUTCOMES:

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

CO1 : Describe the basic concepts and technology used for blockchain

CO2 : Illustrate the concepts of Bitcoin and their usage

CO3 : Describe the concepts of Consensus Algorithm

CO4 : Implement Ethereum blockchain contract.

CO5 : Implement web3 apps using Solidity on Ethereum Platform

CO6 : Use smart contract in real world applications

LAB EXCERCISES:

Prerequisite:

Knowledge on Block Chain

Distributed Ledger

Consensus Algorithms – PoW, PoS, Raft , BFT / IBFT etc

Permission vs Non Permissioned BC Frameworks

React Framework

Web3 Library Package

Blockchain Framework: - Ethereum

Software Installation:-

- NodeJS
- Truffle
- Ganache
- VS Code Editor / Remix (online ide or offline IDE)
- Solidity Compiler
- Meta Mask
- React
- Web3

Exercise 1:

Develop a Pet Shop Platform, which buys and sells different set of Pets using ETH currencies.

The pet owner can able to declare availability of the Pet(s) with expected cost

The buyer who has enough money can able to claim and purchase the pet

The balance gets debited from Buyer account and gets credited to Owner Account

The pet owner can able to query on who owns the pet, and current eth balance

Payload Validation during Sell and Buy actions

Web Interface to the Contract deployed in Eth blockchain via web3 js interface

Exercise 2:

Develop a Learning Management System, where Block Chain is used to store and maintain the learnings the candidates has completed/ongoing.

As part of the process, the following attributes/entities will be captured as part of Learning

- Learning Catalogues
- Student details
- Learning Management
    - Student ID
    - Learning ID
    - Status – completed/on going / planned / delayed
    - Completion date
    - Manager ID

The learner can able to view the available courses and details

The learner can be able to enroll to a course

The learner can be able to delist from a course

The learner can able to go-through the course

The status of the learning gets updated accordingly

The admin can able to view the learners details for a given student / given course / between a date range

The admin can able to manage the student details

The admin can able to manage the Learning Catalogues details

Web Interface using React and Web3

Exercise 3:

Funds Transfer Service

Customer – will have customer details like First Name, Last Name, list of mapped

bank accounts w balance
Bene – will have first name, last name, email, bene account

Setting up the Customer of a given bank, with Accounts details, and with available Balance (in the form of eth)
Setting up the Bene (who will receive the money or eth from the customer)
The owner can transfer money from one account to another bene
Money in the form of Eth gets debited from the customer's account and gets credited to Bene account
Ability to view the customer & Bene balance

Web Interface using React and Web3

TEXTBOOKS:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
2. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands On Approach", VPT, 2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, "Mastering Bitcoin", O"Reilly, 2014.
3. Roger Wattenhofer, "The Science of the Blockchain" Create Space Independent Publishing, 2016.
4. Alex Leverington, "Ethereum Programming" Packt Publishing, 2017.

20IT919	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based

segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.

CO2: Operate on images using the techniques of smoothing, sharpening and enhancement.

CO3: Understand the restoration concepts and filtering techniques.

CO4: Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

TEXTBOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing', 3rd Edition, Pearson Education, 2011
2. Anil K. Jain, ‘Fundamentals of Digital Image Processing’, Pearson, 2003.

REFERENCES:

1. Kenneth R. Castleman, ‘Digital Image Processing’, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, ‘Digital Image Processing using MATLAB’, Pearson Education, Inc., 2011.
3. D,E. Dudgeon and RM. Mersereau, ‘Multidimensional Digital Signal Processing’, Prentice Hall Professional Technical Reference, 1990

4. William K. Pratt, 'Digital Image Processing', John Wiley, New York, 2002
5. Milan Sonka et al 'Image processing, analysis and machine vision', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

20IT920	NETWORK MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Learn definitions of network analysis, architecture, and design and the importance of network analysis
- study about different types of requirements from the user, application, device and network component
- learn how to identify and characterize traffic flows
- learn several concepts about network design process
- Learn about SNMP

UNIT I A SYSTEM APPROACH TO NETWORK DESIGN AND REQUIREMENT ANALYSIS 9

Introduction-Network Service and Service based networks- Systems and services-characterizing the services. Requirement Analysis: Concepts – Background – User Requirements- Application Requirements- Host Requirements-Network Requirements – Requirement Analysis: Guidelines – Requirements gathering and listing- Developing service metrics to measure performance – Characterizing behavior- developing performance threshold – Distinguish between service performance levels.

UNIT II FLOW ANALYSIS 9

Individual and Composite Flows – Critical Flows - Identifying and developing flows – Data sources and sinks – Flow models- Flow prioritization – Flow specification algorithms – Example Applications of Flow Analysis

UNIT III LOGICAL DESIGN 9

Background- Establishing design goals- Developing criteria for technology evolution-Making technology choices for design-case study- Shared Medium- Switching and

Routing: Comparison and contrast- Switching- Routing-Hybrid Routing/Switching Mechanisms – Applying Interconnection Mechanism to Design – Integrating Network management and security into the Design- Defining Network Management- Designing with manageable resources- Network Management Architecture- Security- Security mechanism- Examples- Network Management and security plans- Case study.

UNIT IV NETWORK DESIGN: PHYSICAL, ADDRESSING AND ROUTING 9

Design Concepts – Design Process - Network Layout – Design Traceability – Design Metrics –Logical Network Design – Topology Design – Bridging, Switching and Routing Protocols- Physical Network Design – Selecting Technologies and Devices for Campus and Enterprise Networks – Optimizing Network Design

UNIT V NETWORK MANAGEMENT AND SNMP PROTOCOL MODEL 9

Network and System management, Network management system platform; Current SNMP Broadband and TMN management, Network management standards SNMPV1, SNMPV2 system architecture, SNMPV2, structure of management information SNMPV2 – MIB – SNMPV2 protocol, SNMPV3-Architecture, Application, MIB, security user based security model, access control RMON

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

CO1: Gather, derive, define and validate real requirements for the specified network.

CO2: Understand different types of requirements from the user, application, device and network component

CO3: Develop traceability between requirements, architecture decisions, and design decisions

CO4: Implement how and where addressing and routing, security, network management, and performance are required in the network.

CO5: Use SNMPv1, v2 and v3 protocols.

TEXTBOOKS:

1. James.D.McCabe, “Practical Computer Network Analysis and Design”, 1st Edition,

Morgan Kaufaman, 1997

2. Mani Subramanian, “Network Management – Principles & Practice” – 2nd Edition Prentice Hall, 2012

REFERENCES:

1. Network Analysis, Architecture, and Design By James D. McCabe, Morgan Kaufmann, Third Edition, 2007.ISBN-13: 978-0123704801
2. Computer Networks: A Systems Approach by Larry L. Peterson, Bruce S. Davie - 2007, Elsevier Inc Top-down Network Design: [a Systems Analysis Approach to Enterprise Network Design]
3. Priscilla Oppenheimer, Cisco Press, 3rd Edition, ISBN-13: 978-1-58720- 283-4 ISBN-10: 1- 58720-283-2
4. J.Radz,”Fundamentals of Computer Network Analysis and Engineering: Basic Approaches for Solving Problems in the Networked Computing Environment”, Universe, 2005.
5. Mark Newman, “Networks: An Introduction”,Kindle Edition,2010.
6. Laura Chappel and Gerald Combs, “Wireshark 101: Essential Skills for Network Analysis”,Kindle Edition,2013.
7. William Stallings., “SNMP, SNMP2, SNMP3 and RMON1 and 2”, Pearson Education, 2004 Daw Sudira, “Network Management”, Sonali Publications, 2004.

20CE917	**PROFESSIONAL ETHICS IN ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To familiarize with Engineering Ethics and Human Values.
- To impart knowledge on codes of ethics, safety, responsibilities and rights of engineers.
- To create awareness on global issues related to environmental ethics, computer ethics, weapons development and corporate social responsibility.

UNIT I HUMAN VALUES 9

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

UNIT II ENGINEERING ETHICS 9

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

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 8

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law - The Challenger Case Study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 10

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Case Studies: Chernobyl and Bhopal Disasters - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 Summarize the importance of human values in work place.

CO2 Discuss the senses of engineering ethics, moral dilemmas, moral autonomy and uses of ethical theories.

CO3 Describe the role of engineers as responsible experimenters and necessity of codes of ethics in engineering.

CO4 Explain safety, risk, responsibilities and rights in the society.

CO5 Analyze the global issues related to environmental ethics, computer ethics, weapons development and the role of engineers as expert witnesses and advisors.

CO6 Apply ethics in society and discuss the ethical issues related to engineering.

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2014.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2013.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2012.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2018.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2012.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

20IT908	**LIBERAL ARTS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To understand the principles of liberal arts.
- To illustrate and gain knowledge on fundamental principles of Social Psychology.
- To apply knowledge of philosophical perspectives and to solve philosophical problems and issues.
- To understand Cultural Studies theory and methodology

- To acquire knowledge in the field of dramatics, performing arts and public speaking.

UNIT I PRINCIPLES OF LIBERAL ARTS 9

Definition of Liberal Art's nature, scope and significance - The Ancient Greek and Indian concept of Liberal Art's - Greek centers of learning like Athens, Sparta and Gurukul in Ancient India - Changing Profiles of Liberal Arts education - Benefits of Liberal Arts education - Future trends and challenges of Liberal Arts.

UNIT II SOCIAL PSYCHOLOGY 9

Introduction to social psychology - Major theoretical perspectives such as Sociocultural Perspective, Evolutionary Perspective, Learning Perspective, Cognitive Perspective; Social psychology in India – Self and Attitude - Social psychology in everyday life: Application in different areas such as personal and workplace relationships, social behavior on the internet, mental health, and law.

UNIT III INTRODUCTION TO PHILOSOPHY 9

Definition, Nature, Scope and Relevance of philosophy - Relation between Philosophy and Science – Idealism – Realism - Theories of the Origin of knowledge – Categories of Knowledge

UNIT IV CULTURAL STUDIES 9

Concept of Culture: Meaning and Definition - Introduction to Cultural Studies: definition, aim, scope, methodology - Popular Culture: Meaning, Nature and definition - Rise of popular culture - Mass culture, popular culture and high culture - Popular culture in India - Digital culture and ethics.

UNIT V DRAMATICS, PERFORMING ARTS AND PUBLIC SPEAKING 9

Concept of performing arts - Definition, nature, scope and significance of dramatics - Concept of theatre in Indian culture - Classical plays and their presentation in the open theatre - Role of director in the development of play - Acting as an art and science - Relationship between Indian theatre and new electronic media such as OTT, TV and Cinema - Public speaking as an art and its preparation - Drama and Theatre's role in South India.

OUTCOMES

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

CO1: Demonstrate the ability to state the principles of liberal arts.

CO2: Demonstrate the ability to state the fundamental principles of Social Psychology.

CO3: Apply knowledge of philosophical perspectives, logic, and critical reasoning to develop his or her own opinions regarding philosophical problems and issues.

CO4: Apply Cultural Studies theory and methodology to a range of cultural situations and practices from popular culture.

CO5: Demonstrate a fair understanding of dramatics, performing arts and public speaking.

REFERENCES:

1. Baron, R.A., & Branscombe, N. R. (2012). Social Psychology. NJ: Pearson.
2. Deb, S., Gireesan, A., & Prabhavalkar, P. (2019). Social psychology in everyday life New Delhi, Sage Publications.
3. Hogg, M. A. & Vaughan, G. M. (2018). Social psychology (8th ed.). Essex: Pearson Education Limited.
4. Hogg, M. A. & Cooper, J. (Eds.) (2003). The Sage handbook of social psychology. London: Sage Publications.
5. Misra, G. (Ed.). 1990. Applied social psychology in India. New Delhi: Sage Publications.
6. Pandey J. (Ed.) 1988. Psychology in India: The state-of-the-art: Basic and Applied Social Psychology. Vol. 2. New Delhi: Sage Publications.
7. Pandey, J. & Singh P. (2005). Social psychology in India: Social roots and development. International Journal of Psychology, 40, 239-253.

20IT922	**INFORMATION RETRIEVAL TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations.
- To learn different techniques of recommender system.

UNIT I INTRODUCTION 9

Information Retrieval – Early Developments – The IR Problem – The User‘s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT II MODELING AND RETRIEVAL EVALUATION 9

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT IV WEB RETRIEVAL AND WEB CRAWLING 9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix

factorization models – Neighborhood models.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Use an open source search engine framework and explore its capabilities

CO2: Apply appropriate method of classification or clustering.

CO3: Design and implement innovative features in a search engine.

CO4: Design and implement a recommender system.

TEXTBOOKS:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, “Recommender Systems Handbook”, First Edition, 2011.

REFERENCES:

1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

20IT923	**GREEN COMPUTING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To learn the fundamentals of Green Computing.
- To analyze the Green computing Grid Framework.
- To understand the issues related with Green compliance.
- To study and develop various case studies.

UNIT I FUNDAMENTALS 9

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II GREEN ASSETS AND MODELING 9

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III GRID FRAMEWORK 9

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework

UNIT IV GREEN COMPLIANCE 9

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V CASE STUDIES 9

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.

CO2: Enhance the skill in energy saving practices in their use of hardware.

CO3: Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.

CO4: Understand the ways to minimize equipment disposal requirements

TEXTBOOKS:

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, “Green Home Computing for Dummies”, August 2012.

REFERENCES

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shroff/IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”, Lulu.com, 2008
4. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press

20IT924	WEB DESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development
- To learn the web project management and maintenance process
- To Design a Website with HTML, JS, CSS / CMS - Word press

UNIT I WEB DESIGN - HTML MARKUP FOR STRUCTURE 9

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II CSS AND JAVASCRIPT 9

CSS - Formatting text - Colors and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Javascript - Using Java Script

UNIT III RESPONSIVE WEB DESIGN 9

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design

UNIT IV WEB PROJECT MANAGEMENT 9

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development , Communication, Documentation - QA and testing -Deployment - Support and operations

UNIT V PROJECT CASE STUDY 9

Using HTML, CSS, JS or using Opensource CMS like Word press, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design Website using HTML CSS and JS

CO2: Design Responsive Sites

CO3: Manage, Maintain and Support Web Apps

TEXTBOOKS:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition, 2012
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress, 2011

REFERENCES:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development",
3. John Wiley and Sons, edition 2014
4. Uttam K. Roy "Web Technologies" Oxford University Press, 13th impression, 2017
5. Wordpress - http://www.wpbeginner.com/category/wp-tutorials/

20IT925	ELECTRONIC COMMERCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Learn the E-Commerce Platform and its concepts
- To Understand the Technology, infrastructure and Business in E-Commerce
- To Understand the Security and Challenges in E-Commerce
- To Build an Own E-Commerce using Open Source Frameworks

UNIT I INTRODUCTION TO E-COMMERCE AND TECHNOLOGY INFRASTRUCTURE 9

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II BUILDING AN E-COMMERCE WEBSITE, MOBILE SITE AND APPS 9

Systematic approach to build an E-Commerce: Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App

UNIT III COMMERCE SECURITY AND PAYMENT SYSTEMS 9

E-Commerce Security Environment – Security threats in E-Commerce – Technology

Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems

UNIT IV BUSINESS CONCEPTS IN E-COMMERCE 9

Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce

UNIT V PROJECT CASE STUDY 9

Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project: Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

CO1: Design Website using HTML CSS and JS

CO2: Design Responsive Sites

CO3: Manage, Maintain and Support Web Apps

TEXTBOOK:

1. Kenneth C.Laudon, Carol Guercio Traver “E-Commerce”, Pearson, 10th Edition, 2016

REFERENCES

1. http://docs.opencart.com/
2. http://devdocs.magento.com/
3. http://doc.prestashop.com/display/PS15/Developer+tutorials
4. Robbert Ravensbergen, “Building E-Commerce Solutions with WooCommerce”, PACKT, 2nd Edition

20IT926	FUNDAMENTALS OF NANO SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION 8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nano wires-ultra-thin films-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only)

UNIT II GENERAL METHODS OF PREPARATION 9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS 12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT IV CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis

techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation.

UNIT V APPLICATIONS 9

Nano InfoTech: Information storage- nano computer, molecular switch, super chip, nano crystal, Nano biotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nano particles for sun barrier products - In Photostat, printing, solar cell, battery.

TOTAL : 45 PERIODS

OUTCOMES:

CO1: Will familiarize about the science of nano materials

CO2: Will demonstrate the preparation of nano materials

CO3: Will develop knowledge in characteristic nanomaterial

TEXTBOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1998.
2. N John Dinardo, “Nanoscale Charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES:

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia,“The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

20IT927	INDIAN CONSTITUTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To have some knowledge about Indian Constitution.
- To understand the concept of fundamental rights
- To learn about Lok Sabha and Rajya Sabha
- To have some knowledge about Legislative Assembly and Legislative Council
- To learn about Local Self Government

UNIT I INTRODUCTION 9

Meaning and Importance of Constitution - Preamble and Salient Features of the Constitution.

UNIT II FUNDAMENTAL RIGHTS 9

Fundamental Rights, Right to Equality, Right to Freedom, Right against exploitation, Right to freedom of religion, Cultural and Educational Rights, Right to Constitutional Remedies and Duties, Directive Principles of State Policy.

UNIT III LOK SABHA AND RAJYA SABHA 9

Union Government – Lok Sabha and Rajya Sabha Composition, Powers and functions: The President, The Prime Minister and Supreme Court: Role Position and Powers/ functions.

UNIT IV LEGISLATIVE ASSEMBLY AND LEGISLATIVE COUNCIL 9

State Government - Legislative Assembly and Legislative Council: Composition,Powers and functions: The Governor, Chief Minister and High Court: Role, Position and Powers/ functions.

9

Local self-Government, Panchayat Raj System in India; Election Commission; Public Service Commissions, Role, powers and function

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Interpret the knowledge on Indian Constitution.

CO2: Demonstrate the knowledge gained through fundamental rights concept.

CO3: Relate the concept of Lok Sabha and Rajya Sabha.

CO4: Illustrate the concept of Legislative Assembly and Legislative Council.

CO5: Analyze the concept of Local Self Government.

TEXTBOOK:

1. M V Pylee, An Introduction to The Constitution of India, Vikas Publishing House Pvt. Ltd., 5th Edition.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, 19th Edition Reprint 2009.
2. Sharma, Brij Kishore, “Introduction to the Constitution of India”, Prentice Hall of India, 7th Edition, 2015.

20CB404	INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Develop mindsets to pursue entrepreneurship.
- Understand the basics of Innovation and Entrepreneurship
- Create, protect, assetize and commercialize intellectual property
- Identify and discover market needs
- Manage an innovation program
- Understand opportunities and challenges for entrepreneurs through Startup Models

Innovation Types of Innovation Incremental, disruptive, Lifecycle of Innovation (idea, literature survey, PoT, PoC, etc.) , Challenges in Innovation (time, cost, data, infrastructure, etc.)

UNIT II IPR 9

Types of IPR (patents, copyrights, trademarks, GI, etc.) Lifecycle of IP (creation, protection, assetization, commercialization), Balancing IP Risks and Rewards (Right Access and Right Use of Open Source and 3rd party products, technology transfer and licensing)

UNIT III ENTREPRENEURSHIP 9

Opportunity Identification in Technology Entrepreneurship (customer pain points, competitive context) Market Research, Segmentation and Sizing Product Positioning, Pricing, and Go-To-Market Strategy IP Valuation (methods, examples, limitations)

UNIT IV TYPES OF STARTUP BUSINESS MODEL 9

Startup Business Models (fund raising, market segments, channels, etc.) Co- innovation and Open Innovation (academia, startups, corporates) Technology Innovation: Two Case Studies

UNIT V PROCESSES IN STARTUP BUSINESS MODEL 9

Innovation, Incubation and Entrepreneurship in Corporate Context Technology-driven Social Innovation and Entrepreneurship Manage Innovation, IP and Entrepreneurship Programs – Processes, Governance and Tools

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Understand the basics of Innovation and Entrepreneurship

CO2: Manage an innovation program

CO3: Create, protect, assetize and commercialize intellectual property

CO4: Understand opportunities and challenges for entrepreneurs

CO5: Developing mindsets to pursue entrepreneurship.

CO6: Identify and discover market needs

TEXTBOOK:

1. Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth Navi Radjou,Jaideep Prabhu, Simone Ahuja , John Wiley & Sons

REFERENCES:

1. Identifying Entrepreneurial Opportunities: Cognition and Categorization in Nascent Entrepreneurs, Matthew J. Karlesky
2. http://www.businessdictionary.com/definition/entrepreneurship
3. https://www.infoentrepreneurs.org/en/guides/use-innovation-to-grow-your-business/
4. http://sourcesofinsight.com/innovation-life-cycle/
5. https://www.investottawa.ca/
6. https://www.Lead-innovation.com

OPEN ELECTIVES

		L	T	P	C
20IT001	**OPERATING SYSTEMS**	**3**	**0**	**0**	**3**

OBJECTIVES:

- To explain the basic concepts of operating systems and process.
- To discuss threads and analyse various CPU scheduling algorithms.
- To describe the concept of process synchronization and deadlocks.
- To analyse various memory management schemes.
- To describe I/O management and file systems.

UNIT I INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES 9

Introduction to OS –Computer system organization - architecture – Resource management - Protection and Security – Virtualization - Operating System Structures - Services - User and Operating-System Interface - System Calls - System Services - Design and Implementation - Building and Booting an Operating System - Process Concept - Process Scheduling - Operations on Processes – Inter process Communication - IPC in Shared-Memory Systems - IPC in Message-Passing Systems

UNIT II THREADS AND CPU SCHEDULING 9

Threads & Concurrency: Overview - Multicore Programming - Multithreading Models - Thread Libraries - Implicit Threading - Threading Issues - CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multi-Processor Scheduling - Real-Time CPU Scheduling

UNIT III PROCESS SYNCHRONISATION AND DEADLOCKS 9

Process Synchronization - The critical-section problem, Peterson's Solution - Synchronization hardware, Mutex locks, Semaphores, monitors, Liveness - Classic problems of synchronization – Bounded Buffer Problem - Reader's & Writer Problem, Dinning Philosopher Problem, Barber's shop problem. Deadlock - System model - Deadlock characterization, Methods for handling deadlocks - Deadlock prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlock.

UNIT IV MEMORY MANAGEMENT 9

Memory Management: Contiguous Memory Allocation - Paging - Structure of the Page Table – Swapping - Virtual Memory: Demand Paging – Copy-on write – Page Replacement – Allocation of frames – Thrashing Memory – Compression

UNIT V FILE MANAGEMENT 9

File Management: File Concept – Access Methods – Directory Structure – Protection - Memory-Mapped File - Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks - I/O Hardware: I/O devices, Device controllers, Direct Memory Access - Case Study-Linux.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Implement the basic concepts of operating systems and process.

CO2: Analyse various CPU scheduling algorithms and thread mechanism.

CO3: Implement the concepts of process synchronization and deadlocks.

CO4: Design various memory management schemes to given situation

CO5: Implement various I/O and file management techniques.

TEXTBOOK:

1. Silberschatz Abraham, Greg Gagne, Peter B. Galvin. “Operating System Concepts”, Tenth Edition, Wiley, 2018.

REFERENCES:

1. William Stallings, Operating Systems – Internals and Design Principles, Pearson Education, New Delhi, 2018.
2. Achyut S.Godbole, Atul Kahate, Operating Systems, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating System", 4th Edition, PHI Learning, New Delhi, 2018.

20IT002	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES

- Understand the concept of Artificial Intelligence
- Familiarize with Knowledge based AI systems and approaches
- Apply the aspect of Probabilistic approach to AI
- Identify the Neural Networks and NLP in designing AI models
- Recognize the concepts of Machine Learning and its deterministic tools

UNIT I PROBLEM SOLVING AND SEARCH STARTEGIES 9

Introduction: What Is AI, the Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art. Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, And The Structure of Agents. Solving Problems by Searching: Problem-Solving Agents, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions. Beyond Classical Search: Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions and Partial Observations, Online Search Agents and Unknown Environments. Constraint Satisfaction Problems: Definition, Constraint Propagation, Backtracking Search, Local Search, The Structure of Problems.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING 9

Logical Agents: Knowledge-Based Agents, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic. FirstOrder Logic: Syntax and Semantics, Knowledge Engineering in FOL, Inference in First-Order Logic, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Planning: Definition, Algorithms, Planning Graphs, Hierarchical Planning, Multi-agent Planning. Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

UNIT III LEARNING 9

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks. Applications: Human computer interaction (HCI), Knowledge management technologies, AI for customer relationship management, Expert systems, Data mining, text mining, and Web mining, Other current topics.

UNIT IV FUNDAMENTALS OF MACHINE LEARNING 9

Motivation for Machine Learning, Applications, Machine Learning, Learning associations,

Classification, Regression, The Origin of machine learning, Uses and abuses of machine learning, Success cases, How do machines learn, Abstraction and knowledge representation, Generalization, Factors to be considered, Assessing the success of learning, Metrics for evaluation of classification method, Steps to apply machine learning to data, Machine learning process, Input data and ML algorithm, Classification of machine learning algorithms, General ML architecture, Group of algorithms, Reinforcement learning, Supervised learning, Unsupervised learning, Semi-Supervised learning, Algorithms, Ensemble learning, Matching data to an appropriate algorithm.

UNIT V MACHINE LEARNING AND TYPES 9

Supervised Learning, Regression, Linear regression, Multiple linear regression, A multiple regression analysis, The analysis of variance for multiple regression, Examples for multiple regression, Overfitting, Detecting overfit models: Cross validation, Cross validation: The ideal procedure, Parameter estimation, Logistic regression, Decision trees: Background, Decision trees, Decision trees for credit card promotion, An algorithm for building decision trees, Attribute selection measure: Information gain, Entropy, Decision Tree: Weekend example, Occam's Razor, Converting a tree to rules, Unsupervised learning, Semi Supervised learning, Clustering, K – means clustering, Automated discovery, Reinforcement learning, Multi-Armed Bandit algorithms, Influence diagrams, Risk modelling, Sensitivity analysis, Casual learning.

TOTAL: 45 PERIODS

OUTCOMES

On Completion of the course, the students should be able to:

CO1: Build a model using AI and ML, and able to predict based on various events

CO2: Demonstrate the working knowledge on tools and frameworks

CO3: Demonstrate knowledge of reasoning and knowledge representation for solving real world problems

CO4: Ability to demonstrate the design of intelligent computational techniques.

CO5: Apply AI and machine learning algorithms to solve real world problems

CO6: Implement problem-solving skills using the acquired knowledge in the areas of, reasoning, natural language understanding, computer vision, automatic programming and machine learning.

TEXTBOOKS:

1. Introduction to Artificial Intelligence and Machine Learning (IBM ICE Publications).
2. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Pearson Education / Prentice Hall of India, 2010.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill, 2010.

REFERENCES:

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

20IT003	CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide the knowledge on foundations and vulnerabilities of Cyber Security
- To introduce symmetric and Asymmetric Cryptography and message authentication techniques
- To create awareness on cyber laws and forensics.
- To deliver insights on Ethical Hacking and various attacks.

UNIT I FOUNDATIONS OF CYBER SECURITY CONCEPTS 9

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits - Cyber Security Vulnerabilities: Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness.

UNIT II CRYPTOGRAPHY 9

Cryptography: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric

key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.

UNIT III CYBER LAWS 9

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013

UNIT IV FORENSICS 9

Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations.

UNIT V INTRODUCTION TO ETHICAL HACKING 9

LINUX and Networking, Doxing, Website/ IP information Gathering, Network Mapping o Google Hacking, d Discovering IP Range and Open Port, Identifying Target Operating System and Services, Secure Bypassing Firewalls while Scanning, Understanding Wireless Networks, Deauthentication attack, Fragmentation Attacks, Chop Chop attack, Fake authentication ,Evil Twin Attack, Cafe-latte attack, Reveal Hidden SSID's, WPA and WPA2 wireless password, hacking techniques, Cracking Wireless Passwords using Rainbow tables, Brute force techniques

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Discuss the foundations of Cyber Security Concepts.

CO2: Identify the vulnerabilities in the given Information system.

CO3: Demonstrate the cryptography techniques.

CO4: Interpret Cyber law and Forensics

CO5: Discriminate ethical hacking techniques

TEXTBOOK:

1. William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education, March 2017.

REFERENCES:

1. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi, 2017.
2. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning, 2019.
3. Gupta Sarika, “Information and Cyber Security”, Khanna Publishing House, Delhi.
4. https://www.eckovation.com/course/ethical-hacking-and-cyber-security
5. https://nptel.ac.in/courses/106105217/

20IT004	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand and represent any given business problem statement in object-oriented notation.
- To have in depth knowledge on various Core Java API’s and methods
- To become proficient in Hands on exercise, and able to show case smart programming using Java as Core platform
- To apply multithreaded programming using Java
- To understand JDBC

UNIT I INTRODUCTION 9

Description of the real world using the Objects Model - Classes, inheritance, interface, association, aggregation, composition with different aspect such as encapsulation, abstraction, polymorphism (static and runtime), access modifiers and multiple configurations - Quality software characteristics - Description of the Object Oriented Analysis process vs. the Structure Analysis Model

UNIT II JAVA BASICS 9

Core Java Introduction, Object Oriented Programming in Core Java, Data Types, Auto and Un Boxing, Data Type Promotion, Inner and nested Classes, Control Statements, Logical Operators, abstract, super, final, static keywords

UNIT III ARRAYS, COLLECTIONS AND EXCEPTION 9

Arrays – One and Multi-Dimensional, Cloning, Sorting, Hashing Technique, Purpose of equals and hashcode methods, Collections- List (ArrayList, LinkedList, Vector, Stack), Properties, Set(HashSet, TreeSet, LinkedHashSet), Map(Treemap, hashmap, treemap), Queue (Priority Queue, DeQueue), Iteration, Ordering using Comparable and Comparator, Generics – Compile Time Type Safety, Upper and Lower Bounded, and with wild cards.

Exception Handling – Checked and Un-Checked Exception, Custom Exception, Throws and Throw Keywords, Try-Catch-Finally, Try with Resources, Exception vs Runtime exception vs Throwable vs Error

UNIT IV MULTITHREADING AND IO 9

Concurrency and Parallelism Programing, Runnable, Threads approach, Threads Life Cycle, Fork and Join, wait, sleep, notify and yield. Executor Framework with Callable and Runnable options, Concurrent locks, Synchronized Collections (Concurrent Map, synchronized List, synchronized Map, synchronized Set, synchronizedSortedSet) Atomic data types (AtomicInteger, AtomicLong, AtomicIntegerArray), CountDownLatch ,Blocking Queue

Java IO – Files, Pipes, Streams, Byte and Char arrays, Readers and Writers, Input and Output Stream, Byte Array Input and Output, Buffer Input and output

UNIT V FUNCTIONAL PROGRAMMING AND LAMBDA 9

Functional Programming (vs Object Oriented), imperative and declarative programming, Pure Functions, Functional Composition, Side Effects, Immutable, Java Functions and Predicates, Arrow Functions, @Functional interface, Higher Order Functions

Streams API – Map, Filter, Reduce, Collect, Count, min and max Functions, Behavior as Parameterization, Seq and Parallel Streams, Converting a Array or File output as Streams

JDBC – DataSource, Configurations, Connection, Connection Pools, Driver Types,

ResultSet, Prepared Statement, Named Parameter, Embedded SQL (Insert, Update, Delete, Join, union etc), ResultSet Navigation, Connection Close and Clean up

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design and develop various applications in Java using OOD and Principles

CO2: Implement a given problem statement by selecting the right choice of options in Core Java.

CO3: Accomplish efficient programming in Core Java

CO4: Design and develop real time applications to process high volume of data with consistency and atomicity

CO5: Develop applications to Connect to Database using available thin drivers, and performs DDL operations.

TEXTBOOKS:

1. Bernd Bruegge and Allen H Dutoit, “Object-Oriented Software Engineering Using UML, Patterns, and Java” Pearson ,3rd Edition, 2013.
2. Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft, “Java 8 in Action: Lambdas, Streams, and functional-style programming”, Manning Publications, 2015.
3. Sierra, Kathy, and Bert Bates. “Head First Java”, CA: O'Reilly, 2005.

REFERENCES:

1. Schildt, Herbert, “Java: The Complete Reference”, McGraw-Hill Education, Eleventh Edition.
2. R. Nageswara Rao, “Core Java an Integrated Approach (Black Book)”, DT Editorial Services, 2016.

20IT005	WEB DESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development

- To learn the web project management and maintenance process
- To Design a Website with HTML, JS, CSS / CMS - Word press

UNIT I WEB DESIGN - HTML MARKUP FOR STRUCTURE 9

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II CSS AND JAVASCRIPT 9

CSS - Formatting text - Colors and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Javascript - Using Java Script

UNIT III RESPONSIVE WEB DESIGN 9

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design

UNIT IV WEB PROJECT MANAGEMENT 9

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development , Communication, Documentation - QA and testing -Deployment - Support and operations

UNIT V PROJECT CASE STUDY 9

Using HTML, CSS, JS or using Opensource CMS like Word press, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design Website using HTML

CO2: Design Website using CSS and JS

CO3: Design Responsive Sites

CO4: Manage, Maintain and Support Web Apps

CO5: Design and develop Website having advanced UI

TEXTBOOKS:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition, 2012.
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015.
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress, 2011.

REFERENCES

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, Edition 2014.
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development", John Wiley and Sons, Edition 2014.
3. Uttam K. Roy "Web Technologies" Oxford University Press, 13th impression, 2017.
4. Wordpress - http://www.wpbeginner.com/category/wp-tutorials/

Recommended By Board of Studies	No.: 4	Date: 09.06.2022