M.I.E.T. ENGINEERING COLLEGE

(Autonomous)

Tiruchirappalli-620007

Curriculum & Syllabus

(Regulations 2024)



B.E. Computer Science and Engineering

M.I.E.T. ENGINEERING COLLEGE

(AUTONOMOUS)

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)
Accredited by NBA (CIVIL, CSE, ECE, EEE & MECH)
Accredited with 'A+' grade by NAAC
(An ISO 9001:2015 Certified Institution)
(Recognized by UGC under section 2(f) & 12(B) of UGC Act, 1956)
TRICHY - PUDUKKOTTAI MAIN ROAD, TRICHY - 620 007

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



CURRICULUM AND SYLLABUS

B.E. COMPUTER SCIENCE AND ENGINEERING
(Regulations 2024)

Vision

To attain excellence in Computer Science and Engineering field so as to address societal problems through active research, maintaining ethical standards.

Mission

- To empower with technical skills to solve the real time problems through interdisciplinary approach.
- Expose to international ethical practices.
- Provide personality development for an effective leader and individual member of a team.

Program Outcomes (POs)

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.

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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:** Recognise the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Educational Objectives (PEO)

1. To accomplish applications of current technologies and exhibit technical skills to develop and implement strategies for solutions in Computer Science and Engineering problems.
2. To inculcate high level of professionalism, ethical attitude, effective communication skills, team spirit, multidisciplinary approach to take on to the challenging environment in the IT industries.
3. To nurture leadership qualities, intellectual curiosity for social needs.

Program Specific Outcomes (PSO)

1. Ability to apply programming and interpersonal skills to implement various algorithms for complex engineering problems.
2. Ability to design effective solutions for real time problems of both industry and society using cutting edge technologies.

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Mapping of PEOs with POs & PSOs

PEOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	3	3	2	2	2	2	-	-	-	-	-	3	3	2
PEO2	3	3	3	3	2	-	-	-	2	1	2	3	3	3
PEO3	3	2	3	3	3	-	-	-	2	2	-	3	3	3

1-Low, 2-Medium, 3-High, '-' - No Correlation

CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS FOR SEMESTERS I TO VIII
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24IP1101	Induction Programme	-	-	-	-	-	0
2.	24HS1101	Professional English	HSMC	3	0	2	5	4
3.	24MU1101	Matrices and Calculus	BSC	3	1	0	4	4
4.	24PH1101	Engineering Physics	BSC	3	0	2	5	4
5.	24CY1101	Engineering Chemistry	BSC	3	0	2	5	4
6.	24GE1101	Problem Solving and Python Programming	ESC	3	0	2	5	4
7.	24GE1102	Heritage of Tamils - தமிழர் மரபு	HSMC	1	0	0	1	1
8.	24GE1201	Professional Development	ESC	0	0	4	4	2
			Total	**16**	**1**	**12**	**29**	**23**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24HS2101	Writing Skills for Professionals / Language Elective	HSMC	3	0	0	3	3
2.	24MU2101	Statistics and Numerical Methods	BSC	3	1	0	4	4
3.	24PH2101	Materials Science	BSC	3	0	0	3	3
4.	24GE2101	Engineering Graphics	ESC	2	0	4	6	4
5.	24GE2102	Fundamentals of Building and Mechanical Science	ESC	3	0	2	5	4
6.	24CS2101	Programming in C	PCC	3	0	2	5	4
7.	24GE2103	Tamils and Technology தமிழரும் தொழில்நுட்பமும்	HSMC	1	0	0	1	1
8.	24GE2201	Engineering Practice Laboratory	ESC	0	0	4	4	2
			Total	**18**	**1**	**12**	**31**	**23**

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SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24MU3104	Discrete Mathematics	BSC	3	1	0	4	4
2	24CS3101	Programming in Java	PCC	3	0	2	5	4
3	24IT3101	Computer Organization and Logic Design	PCC	3	0	0	3	3
4	24CS3102	Database Technologies	PCC	3	0	0	3	3
5	24CS3103	Data Structures and Algorithms	PCC	3	0	2	5	4
6	24CSPEXX	Professional Elective I	PEC	3	0	0	3	3
7	24MC31XX	Mandatory Course I	MC	1	0	0	1	0
8	24IT3201	Computer Organization and Logic Design Laboratory	PCC	0	0	3	3	1.5
9	24CS3201	Database Design Laboratory	PCC	0	0	3	3	1.5
			Total	**19**	**1**	**10**	**30**	**24**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CS4101	Core Concepts in Data Science	PCC	3	0	0	3	3
2	24CS4102	Theory of Computation	PCC	3	0	2	5	4
3	24EC4107	Microprocessors and Microcontrollers	ESC	3	0	2	5	4
4	24CS4103	Principles of Operating Systems	PCC	3	0	0	3	3
5	24CY4101	Environmental Science	BSC	2	0	0	2	2
6	24CSPEXX	Professional Elective II	PEC	3	0	0	3	3
7	24CS4201	Data Science Laboratory	PCC	0	0	3	3	1.5
8	24CS4202	Operating Systems Laboratory	PCC	0	0	3	3	1.5
9	24GE4201	Technical Seminar	EEC	0	0	2	2	1
			Total	**17**	**0**	**12**	**29**	**23**

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SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CS5101	Compiler Design	PCC	3	0	2	5	4
2	24CS5102	Artificial Intelligence and Machine learning	PCC	3	0	2	5	4
3	24CS5103	Internet and Web Programming	PCC	3	0	0	3	3
4	24CS5105	Network Architecture and Cryptography	PCC	3	0	0	3	3
5	24CEPEXX	Professional Elective III	PEC	3	0	0	3	3
6	24MC51XX	Mandatory Course II	MC	1	0	0	1	0
7	24CS5201	Internet and Web Programming Laboratory	PCC	0	0	3	3	1.5
8	24CS5202	Network Laboratory	PCC	0	0	3	3	1.5
9	24GE5201	Building Communication Skills Laboratory	EEC	-	-	2	2	1
			Total	**16**	**0**	**12**	**28**	**21**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CS6101	Principles of IoT Communication	PCC	3	0	2	5	4
2	24CS6102	Software Engineering	PCC	3	0	0	3	3
3	24IT5102	Full Stack Web Development	PCC	3	0	0	3	3
4	24CSPEXX	Professional Elective IV	PEC	3	0	0	3	3
5	24CSPEXX	Professional Elective V	PEC	3	0	0	3	3
6	24OXIXXX	Open Elective I	OEC	3	0	2	5	4
7	24CS6201	Software Engineering Laboratory	PCC	0	0	3	3	1.5
8	24IT5202	Full Stack Web Development Laboratory	PCC	0	0	3	3	1.5
9	24PD6201	NCC/NSS/NSO*#	-	2	0	0	2	2*#
			Total	**20**	**0**	**10**	**30**	**23**

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*# **Guidelines for evaluation is provided in detail in regulations / Syllabus.**
The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24HS7101	Professional Ethics in Engineering	HSMC	2	0	0	2	2
2	24CSPEXX	Professional Elective VI	PEC	3	0	0	3	3
3	24CSPEXX	Professional Elective VII	PEC	3	0	2	5	4
4	24CSPEXX	Professional Elective VIII	PEC	3	0	2	5	4
5	24OXTXXX	Open Elective II	OEC	3	0	0	3	3
6	24OXTXXX	Open Elective III	OEC	3	0	0	3	3
7	24CS7501	Mini Project	EEC	0	0	4	4	2
8	24IS7201	Internship##	EEC	-	-	-	-	1
9	24CA7201	Case Study***	EEC	-	-	-	-	1
			Total	**17**	**0**	**8**	**25**	**23**

Students should undergo internship for a period of 2- 4 weeks during 6th Semester vacation.

*** **Students should perform case study during 6th Semester Vacation.**

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CS8501	Project Work	EEC	0	0	20	20	10
			Total	**0**	**0**	**20**	**20**	**10**

BASIC SCIENCE COURSE (BSC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24MU1101	Matrices and Calculus	BSC	3	1	0	4	4
2.	24PH1101	Engineering Physics	BSC	3	0	2	5	4
3.	24CY1101	Engineering Chemistry	BSC	3	0	2	5	4
4.	24MU2101	Statistics and Numerical Methods	BSC	3	1	0	4	4
5.	24PH2101	Material Science	BSC	3	0	0	3	3
6.	24MU3104	Discrete Mathematics	BSC	3	1	0	4	4
7.	24CY4101	Environmental Science	BSC	2	0	0	2	2
							Total	**25**

ENGINEERING SCIENCE COURSES (ESC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24GE1101	Problem Solving and Python Programming	ESC	3	0	2	5	4
2.	24GE1201	Professional Development	ESC	0	0	4	4	2
3.	24GE2101	Engineering Graphics	ESC	2	0	4	6	4
4.	24GE2102	Fundamentals of Building and Mechanical Sciences	ESC	3	0	2	5	4
4.	24GE2201	Engineering Practice Laboratory	ESC	0	0	4	4	2
6.	24EC4107	Microprocessors and Microcontrollers	ESC	3	0	2	5	4
							Total	**20**

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HUMANITIES, SOCIAL SCIENCES AND MANAGEMENT COURSES (HSMC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24HS1101	Professional English	HSMC	3	0	2	5	4
2.	24GE1102	Heritage of Tamils – தமிழர் மரபு	HSMC	1	0	0	1	1
3.	24HS2101	Writing Skills for Professionals / Language Elective	HSMC	3	0	0	3	3
4.	24GE2103	Tamils and Technology தமிழரும் தொழில்நுட்பமும்	HSMC	1	0	0	1	1
5.	24HS7101	Professional Ethics in Engineering	HSMC	2	0	0	2	2
							Total	**11**

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24GE4201	Technical Seminar	EEC	0	0	2	2	1
2.	24GE5201	Building Communication Skills Laboratory	EEC	0	0	2	2	1
3.	24CS7501	Mini Project	EEC	0	0	4	4	2
4.	24IS7201	Internship	EEC	-	-	-	-	1
5.	24CA7201	Case Study	EEC	-	-	-	-	1
6.	24CS8501	Project Work	EEC	0	0	20	20	10
							Total	**16**

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PROFESSIONAL CORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CS2101	Programming in C	PCC	3	0	2	5	4
2	24CS3101	Programming in Java	PCC	3	0	2	5	4
3	24IT3101	Computer Organization and Logic Design	PCC	3	0	0	3	3
4	24CS3102	Database Technologies	PCC	3	0	0	3	3
5	24CS3103	Data Structures and Algorithms	PCC	3	0	2	5	4
6	24IT3201	Computer Organization and Logic Design Laboratory	PCC	0	0	3	3	1.5
7	24CS3201	Database Design Laboratory	PCC	0	0	3	3	1.5
8	24CS4101	Core Concepts in Data Science	PCC	3	0	0	3	3
9	24CS4102	Theory of Computation	PCC	3	0	2	5	4
10	24CS4103	Principles of Operating Systems	PCC	3	0	0	3	3
11	24CS4201	Data Science Laboratory	PCC	0	0	3	3	1.5
12	24CS4202	Operating Systems Laboratory	PCC	0	0	3	3	1.5
13	24CS5101	Compiler Design	PCC	3	0	2	5	4
14	24CS5102	Artificial Intelligence and Machine Learning	PCC	3	0	2	5	4
15	24CS5103	Internet and Web Programming	PCC	3	0	0	3	3
16	24CS5105	Network Architecture and Cryptography	PCC	3	0	0	3	3
17	24CS5201	Internet and Web Programming Laboratory	PCC	0	0	3	3	1.5
18	24CS5202	Network Laboratory	PCC	0	0	3	3	1.5
19	24CS6101	Principles of IoT Communication	PCC	3	0	2	5	4
20	24CS6102	Software Engineering	PCC	3	0	0	3	3

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21	24IT5102	Full Stack Web Development	PCC	3	0	0	3	3
22	24CS6201	Software Engineering Laboratory	PCC	0	0	3	3	1.5
23	24IT5202	Full Stack Web Development Laboratory	PCC	0	0	3	3	1.5
							Total	**64**

LIST OF PROFESSIONAL ELECTIVE COURSES (PEC)
SEMESTER III & IV, PROFESSIONAL ELECTIVE I & II
DATA SCIENCES & CYBER SECURITY

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CSPE01	Design and Analysis of Algorithm	PEC	3	0	0	3	3
2	24CSPE02	Data Exploration and R Programming	PEC	3	0	0	3	3
3	24CSPE03	Vulnerability Assessment & Penetration Testing	PEC	3	0	0	3	3
4	24CSPE04	Data Warehousing and Data Mining	PEC	3	0	0	3	3
5	24CSPE05	Emerging Digital Innovations	PEC	3	0	0	3	3
6	24CSPE06	Database Security	PEC	3	0	0	3	3
7	24CSPE07	Information Extraction and Retrieval	PEC	3	0	0	3	3
8	24CSPE08	Multimedia Systems	PEC	3	0	0	3	3

SEMESTER V & VI, PROFESSIONAL ELECTIVE III & IV
ADVANCED COMPUTING

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CSPE09	Security in Computing	PEC	3	0	0	3	3
2	24CSPE10	High Performance Computing	PEC	3	0	0	3	3
3	24CSPE11	Graph Theory	PEC	3	0	0	3	3
4	24CSPE12	Cyber Forensics	PEC	3	0	0	3	3

5	24CSPE13	Fuzzy Systems and Applications	PEC	3	0	0	3	3
6	24CSPE14	Quantum Cryptography	PEC	3	0	0	3	3
7	24CSPE15	Wireless Sensor Network	PEC	3	0	0	3	3
8	24CSPE16	Business Insights from Big Data	PEC	3	0	0	3	3

SEMESTER VI&VII, PROFESSIONAL ELECTIVE V & VI
CLOUD COMPUTING & ADVANCED SOFTWARE SYSTEMS

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CSPE17	Cyber Threats and Vulnerabilities	PEC	3	0	0	3	3
2	24CSPE18	Auditing IT Infrastructure for Compliance	PEC	3	0	0	3	3
3	24CSPE19	Architecture and Design of SOA	PEC	3	0	0	3	3
4	24CSPE20	Cloud Virtualization	PEC	3	0	0	3	3
5	24CSPE21	Database Application Development using Open Source Technologies	PEC	3	0	0	3	3
6	24CSPE22	Knowledge Based Decision Support Systems	PEC	3	0	0	3	3
7	24CSPE23	Computational Linguistics	PEC	3	0	0	3	3
8	24CSPE24	Parallel Architecture and Programming	PEC	3	0	0	3	3

SEMESTER VII, PROFESSIONAL ELECTIVE VII & VIII
BLOCKCHAIN & SOFTWARE DEVELOPMENT

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1	24CSPE25	Block Chain and Distributed Ledger Technology (DLT)	PEC	3	0	2	5	4
2	24CSPE26	Advanced Computer Networks	PEC	3	0	2	5	4
3	24CSPE27	Exploratory Data Analysis	PEC	3	0	2	5	4

		and Time Series						
4	24CSPE28	C# and .Net Programming	PEC	3	0	2	5	4
5	24CSPE29	Android App Development	PEC	3	0	2	5	4
6	24CSPE30	DevOps Engineering Foundation (DOEF)	PEC	3	0	2	5	4
7	24CSPE31	Artificial Neural Networks	PEC	3	0	2	5	4
8	24CSPE32	Software Testing Methodologies	PEC	3	0	2	5	4

MANDATORY COURSES(MC)

MANDATORY COURSES I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24MC3101	Legal System of India	MC	3	0	0	3	0
2.	24MC3102	Introduction to IPR and Patent Drafting	MC	3	0	0	3	0
3.	24MC3103	Elements of Literature	MC	3	0	0	3	0
4.	24MC3104	Disaster Risk Reduction and Management	MC	3	0	0	3	0
5.	24MC3105	Film Appreciation	MC	3	0	0	3	0
6.	24MC3106	Introduction to Women and Gender Studies	MC	3	0	0	3	0

MANDATORY COURSES II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24MC5101	Food and Nutrition	MC	3	0	0	3	0
2.	24MC5102	Design Thinking	MC	3	0	0	3	0
3.	24MC5103	History of Science and Technology in India	MC	3	0	0	3	0
4.	24MC5104	Political and Economic Thought	MC	3	0	0	3	0

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		for a Humane Society						
5.	24MC5105	State, Nation Building and Politics in India	MC	3	0	0	3	0
6.	24MC5106	Industrial Safety	MC	3	0	0	3	0

OPEN ELECTIVE COURSES (OEC)

OPEN ELECTIVE I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS PER WEEK	CREDITS
				L	T	P		
1.	24OCI101	Estimation and Costing of Building	OEC	3	0	2	5	4
2.	24OCI102	Quality assessment of Building Materials	OEC	3	0	2	5	4
3.	24OCI103	Project Management	OEC	3	0	2	5	4
4.	24OCI104	Building planning using Vaastu Sastra	OEC	3	0	2	5	4
5.	24OEI101	Basics of Control Systems	OEC	3	0	2	5	4
6.	24OEI102	Power Electronics and Drives	OEC	3	0	2	5	4
7.	24OEI103	Introduction to PLC Programming	OEC	3	0	2	5	4
8.	24OEI104	Fundamentals of Electronic Devices and Circuits	OEC	3	0	2	5	4
9.	24OMI101	Internal Combustion Engines	OEC	3	0	2	5	4
10.	24OMI102	Testing of Engineering Materials	OEC	3	0	2	5	4
11.	24OMI103	Industrial Layout Design and Safety	OEC	3	0	2	5	4
12.	24OMI104	Product Design and Process Development	OEC	3	0	2	5	4
13.	24OBI101	Introduction to Digital Signal Processing	OEC	3	0	2	5	4
14.	24OBI102	IoT and Sensors Types	OEC	3	0	2	5	4
15.	24OBI103	Medical Diagnostic and Therapeutic	OEC	3	0	2	5	4

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		Equipments						
16.	24OBI104	Biomedical Instrument and Design	OEC	3	0	2	5	4

OPEN ELECTIVE II & III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	24OCT201	Building Planning and Approval	OEC	3	0	0	3	3
2.	24OCT202	Energy Efficient Building	OEC	3	0	0	3	3
3.	24OCT203	Environmental Impact Assessment	OEC	3	0	0	3	3
4.	24OCT204	Rehabilitation of Structures	OEC	3	0	0	3	3
5.	24OCT205	Drinking water supply and Treatment	OEC	3	0	0	3	3
6.	24OCT206	Project Scheduling and Optimization using CPM and PERT Techniques	OEC	3	0	0	3	3
7.	24OET101	Electrical Vehicle Technologies	OEC	3	0	0	3	3
8.	24OET102	Power System	OEC	3	0	0	3	3
9.	24OET103	Circuit Theory	OEC	3	0	0	3	3
10.	24OET104	Advanced Electrical Machines	OEC	3	0	0	3	3
11.	24OET105	Hybrid Renewable Power Generation	OEC	3	0	0	3	3
12.	24OET106	Electrical Maintenance and Safety	OEC	3	0	0	3	3
13.	24OMT201	Bioenergy Conversion Technologies	OEC	3	0	0	3	3
14.	24OMT202	Automotive Materials, Components, Design and Testing	OEC	3	0	0	3	3
15.	24OMT203	Green Manufacturing Design and Practices	OEC	3	0	0	3	3
16.	24OMT204	Semiconductor Manufacturing	OEC	3	0	0	3	3

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17.	24OMT205	Future Energy Resources and Mobility	OEC	3	0	0	3	3
18.	24OMT206	Failure Analysis and NDT Techniques	OEC	3	0	0	3	3
19.	24OBT201	Hospital Management	OEC	3	0	0	3	3
20.	24OBT202	Assist Devices	OEC	3	0	0	3	3
21.	24OBT203	Robotics in Medicine	OEC	3	0	0	3	3
22.	24OBT204	Introduction to DSP Architecture	OEC	3	0	0	3	3
23.	24OBT205	Basics of Image Processing	OEC	3	0	0	3	3
24.	24OBT206	Wireless Sensor Networks	OEC	3	0	0	3	3

SUMMARY

S.No.	Subject Area	Credits per Semester								Total Credit
		I	II	III	IV	V	VI	VII	VIII	
1.	Basic Science Course (BSC)	12	7	4	2	-	-	-	-	**25**
2.	Professional Core Courses (PCC)	-	4	17	13	17	13	-	-	**64**
3.	Professional Elective Courses (PEC)	-	-	3	3	3	6	11	-	**26**
4.	Open Elective Courses (OEC)	-	-	-	-	-	4	6	-	**10**
5.	Employability Enhancement Courses (EEC)	-	-	-	1	1	-	4	10	**16**
6.	Engineering Science Courses (ESC)	6	10	-	4	-	-	-	-	**20**
7.	Mandatory Courses (MC)	-	-	-	-	-	-	-	-	**-**
8.	Humanities, Social sciences and Management Courses (HSMC)	5	4	-	-	-	-	2	-	**11**
	Total Credit	**23**	**25**	**24**	**23**	**21**	**23**	**23**	**10**	**172**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 172

24HS1101 PROFESSIONAL ENGLISH **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To enable the students to learn the fundamentals of English grammar.
- To develop the ability to write complex texts and essays that are relevant to authentic contexts.
- To present their opinions through letters and reports that will be relevant for their future endeavours.

UNIT I FUNDAMENTALS & SUMMATION **9**

Grammar & Vocabulary: Parts of Speech, Articles, Pronoun, Homonyms & Homophones, Word Formation (Prefix and Suffix). **Listening:** Telephonic Conversations - different viewpoints on a topic. **Speaking:** Self-Introduction Conversation - politeness strategies; asking for information to fill details in a form **Reading:** Reading biographies, travelogues, newspaper reports. **Writing**: Report writing (Accident report, Survey Report), Checklist.

UNIT II PROBLEM SOLVING & RECOMMENDATIONS **9**

Grammar & Vocabulary: Abbreviations & Acronyms, Tenses, Subject -Verb Agreement, Active, Passive and Impersonal Passive Voice. **Listening:** Listening to anecdotes, stories & event narration. **Speaking:** Narrating personal experiences/ events, Extempore, Story-Telling. **Reading:** Reading Editorials; and Opinion Blogs. **Writing**: Letter Writing (Complaint Letter, Response to complaint), Recommendations.

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UNIT III DESCRIPTION OF A PROCESS OR PRODUCT AND USAGE OF IMPERATIVE **9**

Grammar & Vocabulary: Adjective, Degrees of Comparison, Imperative and Gerund, One Word Substitution. **Listening:** Classroom Lecture, advertisements about products.**Speaking –** Picture description; giving instruction to use the product; presenting a product. **Reading:** Reading advertisements, gadget reviews; user manuals. **Writing**: Instructions, Process and Product Description.

UNIT IV DRAFTING AND RESUME MAKING **9**

Grammar & Vocabulary: Collocations, Conjunction, Framing Question Tags/ "Wh" questions. **Listening:** TED talks, educational videos. **Speaking –** Small Talk; Mini presentations and making recommendations. **Reading**: Reading brochures (technical context). **Writing:** Email writing and Email etiquette- Job Application Letter and Resume.

UNIT V EXPRESSING IDEAS **9**

Grammar & Vocabulary: Discourse Markers, Cause and Effect words, Modal verbs, Spotting Errors. **Listening:** Panel Discussions, listening to debates.**Speaking:** Group discussions, Debates and Expressing opinions & Role play. **Reading:** Reading Newspaper articles; Journal reports. **Writing:** Essay writing (Narrative, Descriptive), Reading Comprehension, Transcoding (Bar chart, Pie chart, Table).

TOTAL: 45 PERIODS

LIST OF ACTIVITIES

1. Self-Introduction-Politeness Strategies.
2. Extempore.
3. Story Telling.
4. Picture Description.
5. Product Description.
6. Presentations.
7. Group Discussion.
8. Role-Play.
9. Debates and Expressing Opinions.
10. Narrating Personal Experiences.
11. Reading Biographies, Travelogues.
12. Reading Advertisements, User Manuals.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explore the basic grammatical structures and use them in right context.
CO2: Write complaint letters and recommendations with utmost accuracy.
CO3: Describe about products and processes clearly.
CO4: Write a job application letter and resume without flaws.
CO5**:** Speak fluently and interpret information presented in tables, charts and other Graphic Forms.

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TEXT BOOKS

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, 2020.
2. Dr S Gunasekaran, “A Workbook of Professional English”, Vishnu Prints Media, 2021.
3. Meenakshi Raman & Sangeeta Sharma, “Technical Communication – Principles and Practices”, Oxford Univ. Press, 2022.

REFERENCE BOOKS

1. Raymond Murphy, “Essential English Grammar”, 2nd Edition, Cambridge University Press, 2024.
2. Brain Chanen, “IB English A: Language and Literature”, Oxford Publications, 2019.
3. Phil Williams, “Advanced Writing Skills for Students of English”, Goodwill Publishing House, 2022.
4. Stella Cortrell, “The Study Skills Handbook”, Red Globe Press, 2019.
5. Adrian Wall, “English for Academic Correspondence and Socializing”, Springer Publications, 2017.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO2	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO3	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO4	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO5	-	-	-	-	-	-	-	2	2	2	2	2	2	-
AVG	-	-	-	-	-	-	-	**2**	**2**	**2**	**2**	**2**	**2**	-

1-Low, 2-Medium, 3-High, '-' - No Correlation

24MU1101 MATRICES AND CALCULUS **L T P C**
3 1 0 4

COURSE OBJECTIVES

- To familiarize the students with Eigen values and Eigen vectors to reduce the quadratic form to canonical form.
- To familiarize the students with differential calculus and functions of several variables.
- To make the students to solve the problems on integration and multiple integration.

UNIT I MATRICES **9+3**

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem(without proof) – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms .

UNIT II DIFFERENTIAL CALCULUS **9+3**

Limit of a function – Continuity – Derivatives – Differentiation rules (sum, product, quotient, chain rules) – Implicit differentiation – Logarithmic differentiation – Applications: Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **9+3**

Partial differentiation – Homogeneous functions and Euler's theorem (without proof) – Jacobians – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

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UNIT IV INTEGRAL CALCULUS **9+3**

Definite and Indefinite integrals – Substitution rule – Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions – Improper integrals.

UNIT V MULTIPLE INTEGRALS **9+3**

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

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1: Apply matrix algebra methods for solving various application problems.
CO2: Apply differential calculus methods in solving various application problems.
CO3: Apply the differential calculus ideas on several variable functions.
CO4: Apply different methods of integration in solving practical problems.
CO5: Apply multiple integral methods in solving areas, volumes and other practical problems.

TEXT BOOKS

1. T. Veerarajan, “Engineering Mathematics (Volume I & II)”, McGraw Hill Education, New Delhi, 2018.
2. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 45th Edition, 2024.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley India Pvt Ltd., New Delhi, 2015.

REFERENCE BOOKS

1. B.V .Ramana, "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd., New Delhi, 2016.
2. John Bird, “Bird’s Higher Engineering Mathematics”, 9th Edition, Routledge Taylor and Fransis Group, 2021.
3. H. Anton I. Bivens. I and S. Davis, “Calculus ", Wiley, 10th Edition, 2016.
4. R.K. Jain and S.R.K. Iyengar, “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2016.
5. G.B.Thomas, J.Hass and M.D.Weir, “Thomas Calculus ", 14th Edition, Pearson India, 2018.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO2	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO3	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO5	2	3	-	2	-	-	-	-	-	-	-	-	2	-
AVG	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24PH1101 ENGINEERING PHYSICS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To make the students to understand the properties of matter.
- To analysis the ultrasonic wave and laser with applications.
- To get knowledge on optical fibers and the importance of quantum theory.

UNIT I PROPERTIES OF MATTER **9**

Introduction – Elasticity – Hooke's Law – Stress –strain diagram – Types of modulus of elasticity –bending of beams – bending moment – cantilever : theory and experiment – uniform and non-uniform bending: theory and experiment – twisting couple – torsion pendulum: theory and experiment – I – shaped girders.

UNIT II ULTRASONICS AND BIO MEDICAL APPLICATIONS **9**

Introduction – Production of ultrasonics: magnetostriction effect and piezo electric effect – Velocity measurement: acoustic grating – Industrial applications: drilling, welding, soldering and cleaning –SONAR – Non Destructive testing – pulse echo system through transmission and reflection modes- A, B and C – scan displays, Clinical Applications -Sonograms.

UNIT III LASERS **9**

Introduction – Einstein's theory – Population inversion, pumping – Types of lasers; Nd-YAG Laser, He-Ne Laser,Semiconductor lasers (homo junction & hetero junction) – Industrial Applications-Lasers in welding, heat treatment, cutting.

UNIT IV FIBER OPTICS **9**

Principle and propagation of light in optical fibres – Acceptance angle and Numerical aperture-Types of optical fibres (material, refractive index, mode) – Optical Loss in optical fibre – attenuation, dispersion, bending – Fibre optical communication system (Block diagram) – Endoscope.

UNIT V QUANTUM PHYSICS **9**

Black body radiation – Planck's theory (derivation) – Compton effect – Theory and experimental verification – Matter waves – Schrodinger's wave equation – Time independent and time dependent equations – Physical significance of wave function–Transmission Electron microscope –Scanning electron microscope.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Determination of rigidity modulus – Torsion pendulum.
2. Determination of unknown mass of a body for known rigidity modulus – Torsion pendulum.
3. Determination of Young's modulus by non – uniform bending method.
4. Determination of unknown mass of a body for known Young's modulus by non – uniform bending method.
5. Determination of Young's modulus by uniform bending method.
6. Determination of unknown mass of a body for known Young's modulus by uniform bending method.
7. Determination of wavelength of Laser by diffraction grating method.
8. Determination of thickness of material using Air wedge.
9. Determination of width of the groove in a CD using Laser Diffraction.
10. Determination of Compressibility of given liquid using Ultrasonic interferometer.
11. Simple harmonic oscillations of cantilever.
12. Determination of unknown mass of a body for known Young's modulus by cantilever simple harmonic oscillations.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Gain knowledge on basics of properties of matter.
CO2: Acquire knowledge on magnetic ultrasonic waves and its applications.
CO3: Demonstrate the strong fundamental knowledge in Laser.
CO4: Acquire knowledge on function of fiber optical devices and its applications.
CO5: Explore the concepts of quantum physics.

TEXT BOOKS

1. Bhattacharya D K & Poonam T, "Engineering Physics", Oxford University Press,2015.
2. Gaur R K & Gupta S L, "Engineering Physics", Dhanpat Rai Publishers, 2018.
3. Arthur Beiser, Shobhit Mahajan Sand Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill (Indian Edition), 2017.

REFERENCE BOOKS

1. Serway R A & Jewett J W, “Physics for Scientists and Engineers”, Cengage Learning,2016.
2. Tipler P A & Mosca G, “Physics for Scientists and Engineers with Modern Physics”, W.H.Freeman, 2017.
3. K Thyagarajan & A Ghatak, “Lasers: Fundamentals and Applications”, Laxmi Publications, (Indian Edition), 2019.
4. D. Halliday, R. Resnick and J Walker, “Principles of Physics”, Wiley (Indian Edition), 2015.
5. Pandey B K & Chaturvedi S “Engineering Physics”, Cengage Learning India, 2012.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	3	-	-	-	-	-	-	-	3	2	-
CO2	3	2	3	2	-	-	-	-	-	-	-	3	2	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	2	-
CO4	3	2	3	2	-	-	-	-	-	-	-	2	2	-
CO5	3	2	3	2	-	-	-	-	-	-	-	3	2	-
AVG	**3**	**2**	**2.8**	**2.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.6**	**2**	**-**

1-Low, 2-Medium, 3-High, ‘-’- No Correlation

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24CY1101 ENGINEERING CHEMISTRY **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To familiarize students about the treatment of boiler feed water.
- To gain the knowledge about the various types of batteries and fuels.
- To understand the properties of Engineering materials and Nanomaterials.

UNIT I WATER TECHNOLOGY **9**

Hardness of water - Types - Boiler troubles - Scale - Sludge - Caustic embrittlement - Priming and Foaming - Softening of boiler feed water - Internal conditioning (phosphate, calgon and carbonate conditioning) - External conditioning - Ion Exchange process - Zeolite process.

UNIT II ENERGY STORAGE **9**

Batteries - Types of batteries - Primary battery - Dry cell, Secondary battery - Lead acid battery and Lithium- ion-battery - Fuel cells - H_2-O_2 fuel cell- E-Vehicles - Advantages of E-Vehicles.

UNIT III ENGINEERING MATERIALS **9**

Refractories - classification - properties and applications of refractories - Abrasives - properties and Applications of abrasives - Cement - composition of cement - setting and hardening of cement - Glass - Manufacture - Types of glass and its uses.

UNIT IV NANOCHEMISTRY **9**

Nanomaterials - Distinction between Nanoparticles, Molecules and Bulk materials - Types of Nanomaterials - Nanoparticle - Nanowire and Nanotube - Preparation of Nanomaterials - sol-gel- solvothermal Methods and Applications of Nanomaterials in Agriculture and Medicine field.

UNIT V FUELS **9**

Fuels - Coal - Analysis of coal (Proximate Analysis)-Refining of Petroleum - Fractional Distillation - Manufacture of metallurgical coke (Otto Hoffmann method) - Manufacture of synthetic petrol (Bergius process) - Power alcohol – Biodiesel.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Estimation of total, temporary and permanent Hardness of the sample water by EDTA method.
2. Estimation of strength of given Hydrochloric acid using pH meter.
3. Estimation of strength of given Hydrochloric acid using conductivity meter.
4. Determination of strength of acids in a mixture of acids using conductivity meter.
5. Estimation of amount of $BaCl_2$ present in the given solution using Std.Na_2SO_4 using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Estimation of amount of Cl^- ion present in the given solution by Argentometric method.
8. Determination of alkalinity of the water sample using HCl with Na_2CO_3 as the primary standard.
9. Prepare Na_2CO_3 as primary standard and using it to estimate the acidity present in the given water sample.
10. Estimation of copper content of the given solution by EDTA method.
11. Determination of Dissolved oxygen content of water sample by Winkler's method.
12. Preparation of Biodiesel by using vegetable oil.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Assess water impurities, determining hardness and eliminating substances Responsible for hardness.

CO2: Identify diverse energy resources and effectively apply them in various sectors of The energy industry.

CO3: Assess engineering materials that meet industry specifications and requirements.
CO4: Identify and apply basic concepts of Nano science and technology in designing the synthesis of Nanomaterials for Engineering and Technology.
CO5: Recommend suitable fuels for engineering processes and applications.

TEXT BOOKS

1. P C Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company(P) Ltd, New Delhi , 17th Edition, 2022.
2. Friedrich Emich, "Engineering Chemistry", Scientific International Pvt. Ltd., New Delhi, 2017.
3. S S Dara, "A text book of Engineering Chemistry", S Chand Publishing, 12th Edition, 2018.

REFERENCE BOOKS

1. Hammer Sr and Hammer Jr, "Water and waste water technology", Pearson Education India, 7th Edition, 2015.
2. Nihal Kularatna and Kosala Gunawardane," Energy Storage Devices for Renewable Energy-based Systems, Academic Pr, 2nd Edition, 2021.
3. Kenneth G Budinski, Michael K Budinski, "Engineering Materials", Pearson, 9th Edition, 2016.
4. Chattopadhyay K K, "Introduction to Nanoscience and Nanotechnology", Prentice Hall India Learning Private Limited, 2021.
5. James G Speight, "Handbook of Natural Gas Analysis", Wiley, 1st Edition, 2018.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	2	2	-	2	-	-	-	-	-	2	2	-
CO2	2	2	2	2	-	2	-	-	-	-	-	2	2	-
CO3	2	2	2	2	-	2	-	-	-	-	-	2	2	-
CO4	2	2	2	2	-	2	-	-	-	-	-	2	2	-
CO5	2	2	2	2	-	2	-	-	-	-	-	2	2	-
AVG	**2**	**2**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24GE1101 PROBLEM SOLVING AND PYTHON PROGRAMMING **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING **9**

Fundamentals of Computing – Identification of Computational Problems – Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flowchart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guessan integer number in a range, Towers of Hanoi.

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS **9**

Python interpreter and interactive mode, debugging; values and types: int, float, Boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS **9**

Conditionals: Boolean values and operators, conditional (if), alternative (if – else), chained conditional (if el if – else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES **9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V FILES, MODULES, PACKAGES **9**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter‘s age validation, Marks range validation (0-100).

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Calculate the GCD of two numbers.
2. Find the square root of an integer using Newton‘s method.
3. Find power of a number using Exponential operator.
4. Find the maximum of a list of numbers.
5. Develop a program to search the given numbers using linear search and binary search.
6. Develop a program that sorts a list by implementing selection sort, insertion sort.
7. Develop a program that sorts a list by implementing mergesort.
8. Program to print n prime numbers.
9. Find multiplication of two matrix.

10. Programs that take command line arguments (word count).
11. Find the most frequent words in a text read from a file.
12. Simulate elliptical orbits and bouncing ball using Py game.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Write simple Python programs using conditionals, loops and functions for solving problems.

CO3: De compose a Python program into functions.

CO4: Represent compound data using Python lists, tuples, and dictionary.

CO5: Read and write data from / to files in Python programs.

TEXT BOOKS

1. Allen B Downey, ”Think Python: How to Think like a Computer Scientist”, 2nd Edition, O‘Reilly Publishers, 2016.
2. Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited,2017.
3. Eric Matthes, “Python Crash Course: Python for beginners”, 3rd Edition, No Strach Press Limited, 2024.

REFERENCE BOOKS

1. Paul Deitel and Harvey Deitel, “”Python for Programmers, Pearson Education”, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund,”” Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, 3rd Edition, MIT Press, 2021.
4. Eric Matthes, “Python Crash Course, A Hands – on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
5. Martin C.Brown, “Python: The Complete Reference”,4th Ed., Mc-Graw Hill, 2018.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	3	-	-	-	-	-	-	-	2	-
CO2	3	3	3	2	3	-	-	-	-	-	-	-	2	-
CO3	3	3	3	2	3	-	-	-	-	-	-	-	2	-
CO4	3	3	3	2	3	-	-	-	-	-	-	-	2	-
CO5	3	3	3	2	3	-	-	-	-	-	-	-	2	-
AVG	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

1-Low, 2-Medium, 3-High, ‘-’- No Correlation

24GE1102 தமிழர் மரபு **L T P C**
1 0 0 1

பாடத்தின் நோக்கங்கள்

- மாணவர்கள் மொழி மற்றும் இலக்கியம் பற்றி கற்றறிதல்.
- தமிழர்களின் பாரம்பரிய மரபு மற்றும் நாட்டுப்புற கலைகளை அறிந்து கொள்ளுதல்.
- தமிழர்களின் திணைக்கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு பற்றி அறிந்து கொள்ளுதல்.

அலகு I மொழி மற்றும் இலக்கியம் **3**

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள் - தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் -சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வரலாற்றில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை–சிற்பக்கலை **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரி முனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகள் **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக்கோட்பாடு **3**

தமிழகத்தின் தாவரங்களும் விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்க காலத்தில் தமிழகத்தில்

எழுத்தறிவும், கல்வியும் - சங்க கால நகரங்களும் துறைமுகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்தமிழர்களின் பங்களிப்பு **3**

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL: 15 PERIODS

பாடநெறி முடிவுகள்

பாடதிட்டத்தை முடித்த பிறகு, மாணவர்கள் செய்ய கூடியவை

CO1: செம்மொழி மற்றும் சமகால படைப்புகளில் கவனம் செலுத்தி, மொழிப்புலமை மற்றும் இலக்கிய பகுப்பாய்வின் முக்கியத்துவத்தை கற்றறிந்தனர்.

CO2: தமிழ் இலக்கியத்தின் பாரம்பரிய மரபு கலைகளை மாணவர்கள் அறிந்து கொண்டனர்.

CO3: சங்ககால இலக்கியங்களையும் இக்கால இலக்கிய கவிஞர்களின் தமிழையும் மாணவர்கள் அறிந்து கொண்டனர்.

CO4: தமிழ் இலக்கியத்தின் கலாச்சார மற்றும் சமூக தாக்கங்களை அறிந்து கொண்டனர்.

CO5: பண்டைக்கால மக்களின் தமிழ் அடையாளம் மற்றும் கலாச்சார பாரம்பரியத்தைப் பற்றி கற்றறிந்தனர்.

பாட புத்தகங்கள்

1. கே கே பிள்ளை "தமிழக வரலாறு - மக்களும் பண்பாடும்" தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் கழகம், 2004.
2. முனைவர் இல சுந்தரம், "கணினித் தமிழ்" , விகடன் பிரசுரம், 2015.
3. டாக்டர். எஸ் வி சுப்ரமணியன், டாக்டர். கே டி திருநாவுக்கரசு, "தமிழர்களின் வரலாற்றுப் பாரம்பரியம்", சர்வதேச தமிழாய்வு நிறுவனம்.

குறிப்பு புத்தகங்கள்

1. டாக்டர். சிங்காரவேலு, "தமிழர்களின் சமூக வாழ்க்கை", சர்வதேச தமிழாய்வு நிறுவனம்.
2. கீழடி "வைகை ஆற்றின் கரையில் உள்ள சங்க நகர நாகரிகம் கூட்டு" தொல்லியல் துறை, தமிழ்நாடு பாடநூல் மற்றும் கல்வி சேவைகள் கழகம், தமிழ்நாடு, 2015.
3. டாக்டர். கே கே பிள்ளை, "இந்திய வரலாறு" வெளியீடு ஆசிரியர்.
4. "பொருணை நாகரிகம்", தொல்லியல்துறை & தமிழ்நாடு பாடநூல் மற்றும் கல்வி சேவைகள் கழகம்.
5. ஆர் பாலகிருஷ்ணன், "வைகை, சிந்து நாகரிகத்தின் பயணம்" வெளியீடு – EMRL.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO2	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO3	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO4	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO5	-	-	-	-	-	2	-	2	-	-	-	-	2	-
AVG	-	-	-	-	-	**2**	-	**2**	-	-	-	-	**2**	-

1 - Low, 2 - Medium, 3 – High, '-' No correlation

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24GE1201 PROFESSIONAL DEVELOPMENT **L T P C**
0 0 4 2

COURSE OBJECTIVES

- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWER POINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the present ability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered

MS WORD **15**

- Create and format a document.
- Working with tables.
- Working with Bullets and Lists.
- Working with styles, shapes, smart art, charts.
- Inserting objects, charts and importing objects from other office tools.
- Creating and Using document templates.

- Inserting equations, symbols and special characters.
- Working with Table of contents and References, citations.
- Insert and review comments.
- Create bookmarks, hyperlinks, endnotes foot note.
- Viewing document in different modes.
- Working with document protection and security.
- Inspect document for accessibility.

MS EXCEL **15**

- Create worksheets, insert and format data.
- Work with different types of data: text, currency, date, numeric etc.
- Split, validate, consolidate, Convert data.
- Sort and filter data.
- Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
- Work with Lookup and reference formulae.
- Create and Work with different types of charts.
- Use pivot tables to summarize and analysis data.
- Perform data analysis using own formulae and functions.
- Combine data from multiple worksheets using own formulae and built-in functions to generate results.
- Export data and sheets to other file formats.
- Working with macros.
- Protecting data and Securing the workbook.

MS POWERPOINT **15**

- Select slide templates, layout and themes.
- Formatting slide content and using bullets and numbering.
- Insert and format images, smart art, tables, charts.
- Using Slide master, notes and handout master.
- Working with animation and transitions.
- Organize and Group slides.
- Import or create and use media objects: audio, video, animation.
- Perform slideshow recording and Record narration and create presentable videos.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Use MS Word to create quality documents, by structuring and organizing content.

CO2: Use MS Word for their day to day technical and academic requirements

CO3: Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements

CO4: Use MS EXCEL to visualize data for ease of understanding

CO5: Use MS PowerPoint to create high quality academic presentations by including

common tables, charts, graphs, interlinking other elements, and using media objects.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO2	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO3	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO4	-	-	-	-	-	-	-	2	2	2	2	2	2	-
CO5	-	-	-	-	-	-	-	2	2	2	2	2	2	-
AVG	-	-	-	-	-	-	-	2	2	2	2	2	2	-

1-Low, 2-Medium, 3-High, '-'- No Correlation

24HS2101 WRITING SKILLS FOR PROFESSIONALS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To use appropriate language structures to write letters.
- To write reports and emails with ease.
- To think critically and write different types of essays.

UNIT I SELF EXPRESSION **9**

Grammar: Punctuation-Direct and Indirect Questions - Adverbs- Prepositions. **Vocabulary:** Commonly confused words. **Writing:** Extended Definitions- Letter to the Editor.

UNIT II FORMAL EXPRESSION **9**

Grammar: Phrasal Verbs, Adverbs, Simple, Compound and Complex Sentences. **Vocabulary:** Synonyms & Antonyms. **Writing:** Email Writing (formal & informal) –Report Writing (Industrial Visit & Field Visit).

UNIT III CREATIVE EXPRESSION **9**

Grammar: Prepositional Phrases, Numerical Adjectives, Compound Nouns. **Vocabulary:** British and American words. **Writing:** Compare and Contrast Essay, SOP.

UNIT IV EXPRESSION OF IDEAS **9**

Grammar: Direct and Indirect Speech, Relative Pronoun. **Vocabulary:** Idioms & phrases. **Writing:** Asking for information and making suggestions- Report Writing on College Event.

UNIT V PROFESSIONAL EXPRESSIONS **9**

Grammar: Fixed and Semi- fixed - Content vs Function words. **Vocabulary:** Jumbled Sentences. **Writing:** Accepting/ Declining an Offer/ invitation-Note- Making, Argumentative Essay.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Enhance their grammatical competency for flawless writing.
CO2: Write reports, emails meeting professional expectations.
CO3: Use grammar to form correct sentences with maximum accuracy.
CO4: Present their ideas and opinions in a planned and logical manner.
CO5: Write essays on various topics.

TEXT BOOKS

1. English for Engineers & Technologists, Orient Blackswan Private Ltd. Department of English, Anna University, 2020.
2. English for Science & Technology Cambridge University Press, 2021.
3. Communication Skills for Professionals, Nira Konar, 2nd Edition, PHI Learning Pvt.Ltd, 2021.

REFERENCE BOOKS

1. William Zinsser Paperback, "On Writing Well", Harper Perennial Publishers, 2016.
2. D S Paul, "Advanced Writing Skills", Good will Publishing House, 2022.
3. Matthew T Zakaria, "Successful Writing Skills", Commonwealth Publishers, 2022.
4. G S Hook, "Effective Communication" (Updated version 2nd edition), Sannainvest Ltd., 2021.
5. Alan Baker, "Improve Your Communication Skills" (How to Build Trust, Be Heard and Communicate with Confidence), Kogan Page Publishers, 2019.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO2	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO3	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO5	2	3	-	2	-	-	-	-	-	-	-	-	2	-
AVG	2	3	-	2	-	-	-	-	-	-	-	-	2	-

1-Low, 2-Medium, 3-High, '-'- No Correlation

24MU2101 STATISTICS AND NUMERICAL METHODS **L T P C**
3 1 0 4

COURSE OBJECTIVES

- To understand the concept of Correlation, Regression, Testing of hypothesis and design of experiments.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To understand the concept of numerical methods for solving differentiation and integration equations.

UNIT I CORRELATION AND REGRESSION **9+3**

Correlation – Coefficient of Correlation – Rank Correlation – Regression – Estimation of Regression lines.

UNIT II TESTING OF HYPOTHESIS & DESIGN OF EXPERIMENTS **9+3**

Sampling distributions – Small samples – t-test – Tests for single mean and difference of means – F-test – Tests for single variance and equality of variances – One way and two-way classifications – Completely randomized design – Randomized block design – Latin square design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **9+3**

Solution of Algebraic and Transcendental equations – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Inverse of Matrix by Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power Method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION **9+3**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

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UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Single step methods : Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order differential equations – Multi step methods: Milne's and Adam's – Bash forth predictor corrector methods for solving first order differential equations.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1: Apply the correlation and regression equations for engineering problems.

CO2: Apply the concept of testing of hypothesis for small samples in real life problems and, classifications of design of experiments in the field of agriculture.

CO3: Apply the numerical methods to solve the algebraic, transcendental and linear system of equations.

CO4: Apply interpolation techniques and numerical methods to solve the derivatives and integrals.

CO5: Apply various numerical methods for solving ordinary differential equations.

TEXT BOOKS

1. Gupta S.C., and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2. Gupta S.P., "Statistical Method", Sultan Chand & Sons, New Delhi, 46th Edition, 2019.
3. Grewal B. S., and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCE BOOKS

1. Spiegel M.R., Schiller J., and Srinivasan R.A., "Schaum's easy Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2020.
2. Devore J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 9th Edition, 2020.
3. Johnson R. A., Miller I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, 9th Edition, 2020.
4. Burden R.L and Faires J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
5. Jain M.K., Iyengar S.R.K. and Jain R.K., "Numerical Methods", New International Publishers, 8th Edition, 2022.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO2	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO3	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO4	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO5	2	3	-	2	-	-	-	-	-	-	-	-	2	-
AVG	2	3	-	2	-	-	-	-	-	-	-	-	2	-

1-Low, 2-Medium, 3-High, '-'- No Correlation

24PH2101 MATERIALS SCIENCE **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the properties of conducting and semiconducting materials.
- To acquire knowledge on magnetic and dielectric materials with their applications.
- To get an idea of nano structures and basics of quantum computing.

UNIT I CONDUCTING MATERIALS **9**

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS **9**

Intrinsic semiconductor – intrinsic carrier concentration derivation – Fermi level – electrical conductivity – band gap determination – derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC MATERIALS **9**

Origin of magnetic moment – Bohr magneton – properties of Dia, Para and Ferro magnetic materials – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites and its applications.

UNIT IV DIELECTRIC MATERIALS **9**

Electrical susceptibility – dielectric constant– electronic, ionic, orientational and space charge polarization–frequency and temperature dependence of polarization – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – ferro electricity and applications.

UNIT V NANO DEVICES AND QUANTUM COMPUTING **9**

Introduction – quantum confinement – quantum structures: quantum wells, wires and dots – Tunneling – Coulomb blockade – Single electron phenomena: single electron transistor – Quantum system for information processing – quantum states – classical bits – quantum bits – CNOT gate – advantage of quantum computing over classical computing.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Gain knowledge on electrical and thermal properties of conducting materials.

CO2: Get adequate knowledge on charge carrier's distribution in different types of semiconductors.

CO3: Get the necessary understanding of functioning of Magnetic materials.

CO4: Get the necessary understanding of functioning of dielectric materials.

CO5: Gain knowledge on new engineering materials and their preparation methods.

TEXT BOOKS

1. S.O. Kasap, "Principles of Electronic Materials and Devices", Mc-Graw Hill, 2018.
2. Jasprit Singh, "Semiconductor Optoelectronics: Physics and Technology", Mc-Graw Hill India, 2019.
3. Parag K. Lala, "Quantum Computing: A Beginner's Introduction", McGraw-Hill Education, Indian Edition, 2020.

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REFERENCE BOOKS

1. R. Balasubramaniam, Callister's, "Materials Science and Engineering". Wiley Indian Edition, 2015.
2. Wendelin Wright and Donald Askeland, "Essentials of Materials Science and Engineering", CL Engineering, 2015.
3. Charles Kittel, "Introduction to Solid State Physics", Wiley India Edition, 2019.
4. Mark Fox, "Optical Properties of Solids", Oxford Univ.Press, 2021.
5. B.Rogers, J.Adams and S.Pennathur, "Nanotechnology: Understanding Small Systems", CRC Press, 2017.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-	2	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-	2	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-	2	-
CO5	3	2	3	2	-	-	-	-	-	-	-	-	2	-
AVG	**3**	**2**	**2.8**	**2**	-	-	-	-	-	-	-	-	**2**	-

1-Low, 2-Medium, 3-High, '-'- No Correlation

24GE2101 ENGINEERING GRAPHICS **L T P C**
2 0 4 4

COURSE OBJECTIVES

- Drawing Engineering Curves, Freehand Sketch of Simple Objects and Orthographic Projections.
- Drawing Projection, Section and Development of Solids.
- Drawing Isometric and Perspective Projections of Simple Solids.

CONCEPTS AND CONVENTIONS (Not for Examination) **6+12**

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

UNIT I PLANE CURVES AND FREEHAND SKETCHING **6+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE **6+12**

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

UNIT III PROJECTION OF SOLIDS **6+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **6+12**

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

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **6+12**

Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL: 90 PERIODS

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COURSE OUTCOMES

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

CO1: Construct the conic curves, involutes and cycloid.
CO2: Solve practical problems involving projection of line and plane surfaces.
CO3: Explore the orthographic, isometric and perspective projections of simple solids.
CO4: Explore the development of section of solids and development of surfaces.
CO5: Explore the isometric and perspective projections.

Publication of Bureau of Indian Standards

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

TEXT BOOKS

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

REFERENCE BOOKS

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I & II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren J and Duff, John M, "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. Shah M B, and Rana B C, "Engineering Drawing", Pearson, 2nd Edition, 2009.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-	2	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-	2	-
CO4	3	2	3	2	-	-	-	-	-	-	-	-	2	-
CO5	3	2	3	2	-	-	-	-	-	-	-	-	2	-
AVG	3	2	2.8	2	-	-	-	-	-	-	-	-	2	-

1-Low, 2-Medium, 3-High, '-'- No Correlation

24GE2102 FUNDAMENTALS OF BUILDING AND MECHANICAL SCIENCE **L T P C 3 0 2 4**

COURSE OBJECTIVES

- To Provide the Basic Knowledge, Concepts and Specialized Sub-disciplines of Civil and Mechanical Engineering.
- To Introduce Fundamental Principles of Surveying, Building Materials, and Construction Techniques.
- To Impart Knowledge on Power Plants, Internal Combustion Engines, Refrigeration and Air Conditioning Systems.

UNIT I OVERVIEW OF CIVIL ENGINEERING **5**

Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

OVERVIEW OF MECHANICAL ENGINEERING **4**

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS **9**

Surveying: Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours. Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building component (brief discussion only).

UNIT III BUILDING COMPONENTS AND INFRASTRUCTURE **9**

Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering. Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS **9**

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM **9**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Properties of air - water mixture, concepts of psychometric and its process.

TOTAL: 45 PERIODS

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LIST OF EXPERIMENTS

Basic Mechanical Laboratory **15**

1. Study of IC Engines, Components.
2. Study of Steam Generators and Turbines.
3. Valve Timing and Port Timing Diagrams.
4. Determination of Viscosity –Red Wood Viscometer.
5. Determination of Flash Point and Fire Point.
6. Izod Impact Test.
7. Rockwell Hardness Test.

Basic Civil Laboratory **15**

I. TESTS ON CEMENT

a. Determination of fineness of cement.
b. Determination of consistency of cement.
c. Determination of specific gravity of cement.
d. Determination of initial and final setting time of cement.

II. TESTS ON FINE AGGREGATE AND COURSE AGGREGATE

a. Determination of specific gravity and water absorption of fine aggregate.
b. Determination of grading of fine aggregate.
c. Determination of aggregate crushing value of coarse aggregate.
d. Determination of specific gravity and water absorption of coarse aggregate.

III. TESTS ON BRICKS

a. Determination of compressive strength of bricks.
b. Determination of water absorption of bricks.
c. Determination of efflorescence of bricks.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explore the role of Civil and Mechanical Engineering in societal development.
CO2: Recognize different types of building materials and their modern applications.
CO3: Comprehend the principles and methods used in surveying and leveling.
CO4: Explain the working principles of internal combustion engines and power plants.
CO5: Explore the refrigeration, air conditioning systems, and psychrometric processes.

TEXT BOOKS

1. Satheesh Gopi, “Basic Civil Engineering”, Pearson India, 2009.
2. Pravin Kumar, “Basic Mechanical Engineering”, Pearson Education India, 2013.
3. G Shanmugam and M S Palanichamy, “Basic Civil and Mechanical Engineering”, McGraw Hill Education; 1st Edition, 2018.

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REFERENCE BOOKS

1. Palanikumar K, "Basic Mechanical Engineering", ARS Publications, 2018.
2. Ramamrutham S, "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3. Seetharaman S, "Basic Civil Engineering", Anuradha Agencies, 2005.
4. Shantha Kumar SRJ, "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.
5. D Natarajan, Basic Civil and Mechanical Engineering, Anuradha Publications, 2013.

Mapping of COs with POs & PSOs

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CO1	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO5	2	3	3	-	-	-	-	-	-	-	-	-	2	-
AVG	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS2101 PROGRAMMING IN C **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To Understand the Constructs of C Language.
- To Develop C Programs using Basic Programming Constructs
- To Develop C Programs Using Arrays and Strings

UNIT I BASICS OF C PROGRAMMING **9**

Introduction to programming paradigms – Applications of C Language – Structure of C program – C programming: Data Types – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input / Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

UNIT II ARRAYS AND STRINGS **9**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS **9**

Modular programming – Function proto type, function definition, function call, Built – in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV STRUCTURES AND UNION **9**

Structure – Nested structures – Pointer and Structures – Array of structures –Self-referential structures Dynamic memory allocation – Singly linked list – typed ef – Union - Storage classes and Visibility.

UNIT V FILE PROCESSING **9**

Files – Types of file processing: Sequential access, Random access – Sequential access file – Random access file – Command line arguments.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Simple C programs using I/O statements, operators, and expressions.
2. Implement C Programs using decision - making constructs: if-else, goto, switch-case, break – continue.
3. Develop a C Programs using Loops: for, while, do-while.
4. Implement C Programs using Arrays:1D and 2D, multi-dimensional arrays, traversal.
5. Develop C program using in-built mathematical and string functions.
6. Implement C Programs to perform String operations.
7. Program to use structures and unions
8. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
9. Implement recursive functions in C program.
10. C Program to print addresses and values of variables using Pointer
11. Implement C Programs to perform arithmetic operations using Pointer.
12. Initialization of pointer variables, address of variable, accessing a variable through its pointer.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Demonstrate knowledge on C Programming constructs.
CO2: Develop simple applications in C using basic constructs.
CO3: Design and implement applications using arrays and strings.
CO4: Develop and implement modular applications in C using functions.
CO5: Develop applications in C using structures and pointers.

TEXT BOOKS

1. Reema Thareja, “Programming in C”, Oxford University Press, 2nd Edition, 2016.
2. Kernighan, B Wand Ritchie, D. M, “The C Programming language”, 2nd Edition, Pearson Education, 2015.
3. Yashavant Kanetkar, “Authentic guide to C programming language”, 2nd Edition, 2024.

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REFERENCE BOOKS

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", 8th Edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw – Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press, 2013.
5. Anita Goeland Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3	3	2	3	-	-	-	-	-	-	-	3	-
CO2	2	3	3	2	3	-	-	-	-	-	-	-	3	-
CO3	2	3	3	2	3	-	-	-	-	-	-	-	3	-
CO4	2	3	3	2	3	-	-	-	-	-	-	-	3	-
CO5	2	3	3	2	3	-	-	-	-	-	-	-	3	-
AVG	**2**	**3**	**3**	**2**	**3**	-	-	-	-	-	-	-	**3**	-

1-Low, 2-Medium, 3-High, '-'- No Correlation

24GE2103 தமிழரும் தொழில்நுட்பமும் **L T P C**
1 0 0 1

பாடத்தின் நோக்கங்கள்

- மாணவர்கள் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தைக் கற்றறிதல்
- கட்டிட மற்றும் உற்பத்தித் தொழில்நுட்பத்தை அறிந்து கொள்ளுதல்
- வேளாண்மை நீர்பாசனம் மற்றும் அறிவியல் தமிழ் கணினித் தமிழ் தொழில்நுட்பத்தை அறிந்து கொள்ளுதல்

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் **3**

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் **3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் - சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லப்புரச் சிற்பங்களும் கோயில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபட்டுத் தலங்கள்- நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல் -மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் -

பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சரோசெனிக் கட்டிடக்கலை.

அலகு III உற்பத்தித் தொழில்நுட்பம் **3**

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல் - எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம் **3**

அணை, ஏரி, குளம், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவு சார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் **3**

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL: 15 PERIODS

பாடநெறி முடிவுகள்

பாடதிட்டத்தை முடித்த பிறகு, மாணவர்கள் செய்ய கூடியவை:

CO1: மாணவர்கள் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தைக் கற்றறிந்தனர்.

CO2: கட்டிடத் தொழில்நுட்ப முக்கியத்துவத்தை அறிந்து கொண்டனர்.

CO3: உற்பத்தித் தொழில்நுட்பத்தை கற்றறிந்தனர்.

CO4: வேளாண்மை மற்றும் நீர்பாசனம் தொழில்நுட்பங்களை தெரிந்துகொண்டனர்.

CO5: அறிவியல் தமிழ் மற்றும் கணித் தமிழ் தொழில்நுட்பத்தை அறிந்துகொண்டனர்.

பாட புத்தகங்கள்

1. கே கே பிள்ளை "தமிழக வரலாறு - மக்களும் பண்பாடும்", தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் கழகம், 2004.
2. முனைவர் இல சுந்தரம், "கணினித் தமிழ்", விகடன் பிரசுரம், 2015.
3. டாக்டர். எஸ் வி சுப்ரமணியன், டாக்டர். கே டி திருநாவுக்கரசு, "தமிழர்களின் வரலாற்றுப் பாரம்பரியம்", சர்வதேச தமிழாய்வு நிறுவனம்.

குறிப்பு புத்தகங்கள்

1. டாக்டர் சிங்காரவேலு, "தமிழர்களின் சமூக வாழ்க்கை", சர்வதேச தமிழாய்வு நிறுவனம்.
2. கீழடி - "வைகை ஆற்றின் கரையில் உள்ள சங்க நகர நாகரிகம் கூட்டு" தொல்லியல் துறை & தமிழ்நாடு பாடநூல் மற்றும் கல்வி சேவைகள் கழகம், தமிழ்நாடு, 2015.
3. டாக்டர். கே கே பிள்ளை, "இந்திய வரலாறு" வெளியீடு ஆசிரியர்.
4. "பொருணை நாகரிகம்", தொல்லியல் துறை, தமிழ்நாடு பாடநூல் மற்றும் கல்வி சேவைகள் கழகம்.
5. ஆர். பாலகிருஷ்ணன், "வைகை, சிந்து நாகரிகத்தின் பயணம்" வெளியீடு (EMRL).

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO2	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO3	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO4	-	-	-	-	-	2	-	2	-	-	-	-	2	-
CO5	-	-	-	-	-	2	-	2	-	-	-	-	2	-
AVG	-	-	-	-	-	**2**	-	**2**	-	-	-	-	**2**	-

1 - Low, 2 - Medium, 3 – High, '-' No correlation

24GE2201 ENGINEERING PRACTICES LABORATORY **L T P C**
0 0 4 2

COURSE OBJECTIVES

- To develop practical skills in handling and assembling various components used in household plumbing, woodworking, welding, and electronic circuits.
- To provide hands-on experience in operating basic tools and equipment essential for engineering practices.
- To provide hands-on experience in domestic wiring procedures practically.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES **15**

PLUMBING WORK:

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

WOOD WORK EXCERSIES:

a) Excises on sawing and planning of woods
b) Prepare joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.
c) Studying joints in door panels, wooden furniture and common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES **15**

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin sockets
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type)

GROUP – B (MECHANICAL & ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES **15**

WELDING WORK:

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

BASIC MACHINING WORK:

a) Turning(simple).
b) Drilling and Tapping.

SHEET METAL WORK:

a) Making of a square tray.

STUDY AND ASSEMBLE THE FOLLOWING:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air conditioner.

FOUNDRY WORK:

a) Demonstrating of basic foundry operations.

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PART IV ELECTRONIC ENGINEERING PRACTICES **15**

a) Soldering simple electronic circuits and checking continuity.
b) Assembling and testing electronic components on a small PCB.
c) Study an element of smart phone.
d) Assembly and dismantle of LED TV.
e) Assembly and dismantle of computer.
f) Assembly and dismantle of laptop.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1: Proficiently connect and troubleshoot plumbing systems using various pipe fittings and materials.
CO2: Demonstrate competence in woodworking techniques including sawing, planing, and joint preparation.
CO3: Understand and execute electrical wiring tasks, including switchboard installations and appliance connections.
CO4: Gain practical skills in welding, machining, sheet metal work, and foundry operations.
CO5: Assemble and test electronic devices such as PCBs, smartphones, LED TVs, and computers, enhancing their understanding of electronic assembly and testing procedures.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	2	-	-	-	2	-	-	2	2	-
CO2	3	3	3	2	2	-	-	-	2	-	-	2	2	-
CO3	3	3	3	2	2	-	-	-	2	-	-	2	2	-
CO4	3	3	3	2	2	-	-	-	2	-	-	2	2	-
CO5	3	3	3	2	2	-	-	-	2	-	-	2	2	-
AVG	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**2**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24MU3104 DISCRETE MATHEMATICS **L T P C**
3 1 0 4

COURSE OBJECTIVES

- The students will gain knowledge on logical equivalence and equivalence rules to simplify logical expressions, predicate and quantifiers.
- To teach the basic concepts of combinatorics and generating functions to solve combinatorial problems.
- To familiarize the applications of algebraic structures and understand the concepts.

UNIT I LOGIC AND PROOFS **9+3**

Introduction to logic and proofs – Logical connectives – Propositional equivalences – logical equivalences and implication – Normal forms – Rules of inference - Predicates and quantifiers –Logical equivalences and implications for quantified statements – Nested quantifiers.

UNIT II COMBINATORICS **9+3**

Mathematical induction -The pigeonhole principle (without proof) –Inclusion and exclusion principle - Permutations and combinations - Recurrence relations – Solving linear recurrence relations -Generating functions.

UNIT III GRAPHS **9+3**

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

UNIT IV ALGEBRAIC STRUCTURES **9+3**

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

UNIT V LATTICES AND BOOLEAN ALGEBRA **9+3**

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

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1: Solve the logic and proof problems.
CO2: Solve the combinations problems for generating functions.
CO3: Solve the shortest paths using Graph theory.
CO4: Apply algebraic structure technique for groups.
CO5: Solve the lattices for partial ordering set problems.

TEXT BOOKS

1. Tremblay.J.P. And Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing Company, Limited, New Delhi 2017.
2. Rosen. K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Publishing Company Limited, New Delhi July 2021.
3. Oscar Levin "Discrete Mathematics''An Open Introduction", 12th Media Services**.**

REFERENCE BOOKS

1. Koshy. T. "Discrete Mathematics with Applications", Elsevier India, 2014.
2. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Publishing Company Limited Co. Ltd., New Delhi, 3rd Edition, 2017.

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3. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2019.
4. Veerarajan.T “Discrete Mathematics with Graph theory and Combinatorics”, Tata McGraw -Hill Publishing Company Limited, New Delhi, 8th Edition 2019.
5. Sastry.C.V, Rakesh Nayak, “Discrete Mathematics”, Wiley Publisher 2020.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	2	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-	2	-
AVG	**2**	**3**	-	-	-	-	-	-	-	-	-	-	**2**	-

1 - Low, 2 - Medium, 3 – High, ‘-’ No correlation

24CS3101 PROGRAMMING IN JAVA **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of inheritance, packages, and interfaces and to develop a Java application with threads and generics classes.
- To define exceptions and use I/O streams and to design and build Graphical User Interface Application using JavaFX.

UNIT I OBJECT ORIENTED PROGRAMMING AND JAVA **9**

Introduction to OOP – Features – Object Oriented programming paradigms – Features of Java – Java Development Environment – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors – Methods – Access specifiers – Static members.

UNIT II INHERITANCE, PACKAGES AND INTERFACES **9**

Method Overloading – Objects as Parameters – Returning Objects – Static, Nested and Inner Classes. -Inheritance: Basics – Types of Inheritance – Super keyword – Method Overriding – Abstract Classes – final with Inheritance – Packages and Member Access – Importing Packages – Interfaces.

UNIT III EXCEPTION HANDLING AND MULTITHREADING 9

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User-defined Exception**.** Multithreading – Thread Model – Creating a Thread and Multiple Threads – Thread Priorities – Synchronization – Inter-Thread Communication – Suspending, Resuming, and Stopping Threads.

UNIT IV I/O, GENERICS, STRING HANDLING 9

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types Restrictions and Limitations. String: Basic String class, methods, and String Buffer Class.

UNIT V JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 9

JavaFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button, Radio Buttons, List View, Combo Box, Choice Box, Text Controls, Scroll Pane. Layouts: Flow Pane, HBox and VBox, Border Pane, Stack Pane, Grid Pane. Menu: Menu bars, Menu Item.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Solve problems by using the concept of classes and objects (sequential search, binary search, Insertion sort and Selection sort).
2. Develop stack and queue data structures using classes and objects.
3. Write a java Program by using inheritance , abstract class and packages.
4. Solve this program by using Interface. (class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle.
5. Write a java program that Implement exception handling and creation of user defined exceptions.
6. 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, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
7. Write a program to perform file handling operations and to demonstrate the features of generics function & template classes.
8. Develop applications using JavaFX controls, layouts and menus.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Apply the concepts of classes and objects to solve simple problems.

CO2: Develop programs using inheritance, packages and interfaces.

CO3: Make use of exception handling mechanisms and multithreaded model to solve real world problems.

CO4: Build Java applications with I/O packages, string classes, Collections and generics Concept.

CO5: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based application.

TEXT BOOKS

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015
3. The Complete Reference: Java 2: Herbert Schildt

REFERENCE BOOKS

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.
2. Cox Brad, "Object–Oriented Programming: An Evolutionary Approach", Addison–Wesley.
3. Design Patterns by Erich Gamma, Pearson Education.
4. Arnold Ken, Gosling J, "The Java Programming Language" 5th Edition, MGH, Addison Wesley.
5. Matt Weisfeld, "The Object-Oriented Thought Process", Pearson.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1	1	3	1	3	-	-	-	3	2	2	2	3	1
CO2	2	1	3	2	1	-	-	-	2	1	1	3	2	3
CO3	3	3	1	2	2	-	-	-	3	2	1	2	3	1
CO4	3	1	2	2	2	-	-	-	1	2	1	3	2	1
CO5	1	1	2	3	2	-	-	-	3	2	1	2	2	3
AVG	**2**	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**1**	**2**	**3**	**2**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24IT3101 COMPUTER ORGANIZATION AND LOGIC DESIGN **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To Analyze and Design Combinational Circuits and to Analyze and Design Sequential Circuits.
- To Understand the Basic Structure and Operation of a Digital Computer.
- To Study the Design of the Control Unit and Processor, as well as to Understand Memory Management and its Different Types.

UNIT I COMBINATIONAL LOGIC **9**

Combinational Circuits – Karnaugh Map – Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder – Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.

UNIT II SYNCHRONOUS SEQUENTIAL LOGIC **9**

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Registers – Counters.

UNIT III COMPUTER FUNDAMENTALS **9**

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

UNIT IV PROCESSOR **9**

Instruction Execution– Building a Data Path – Designing a Control Unit–Hardwired Control, Microprogrammed Control–Pipelining–Data Hazard–Control Hazards.

UNIT V MEMORY AND I/O **9**

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

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Design various combinational digital circuits using logic gates.

CO2: Design sequential circuits and analyze the design procedures.

CO3: State the fundamentals of computer systems and analyze the execution of an Instruction.

CO4: Analyze different types of control design and identify hazards.

CO5: Identify the characteristics of various memory systems and I/O communication.

TEXT BOOKS

1. M. Morris Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog”, 6th Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, 6th Edition, Morgan Kaufmann / Elsevier, 2020.
3. Digital Logic and Computer Design by M. Morris Mano.

REFERENCE BOOKS

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, 6th Edition, Tata McGraw-Hill, 2012.
2. William Stallings, “Computer Organization and Architecture – Designing for

Performance", 10th Edition, Pearson Education, 2016.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.
5. "Structured Computer Organization" by Andrew S. Tanenbaum and Todd Austin.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	1	2	-	-	-	1	1	2	1	3	2
CO2	2	2	1	2	2	-	-	-	1	1	1	2	3	3
CO3	2	1	-	1	1	-	-	-	2	1	1	2	2	3
CO4	2	2	1	2	2	1	1	-	1	2	1	3	3	3
CO5	3	2	2	1	2	-	-	-	1	1	2	2	2	3
AVG	2	2	1	1	2	1	1	-	1	1	1	2	3	3

1-Low, 2-Medium, 3-High, "- "- No Correlation

24CS3102 DATABASE TECHNOLOGIES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce the fundamentals of database systems and conceptual modelling.
- To learn DDL, DML and relational model and to learn database design, decomposition and normalization.
- To explore the fundamental concepts of transaction processing, concurrency control and recovery techniques and to learn basic concepts of distributed and NoSQL database.

UNIT I INTRODUCTION TO DATABASE SYSTEMS **9**

Introduction to database systems, advantages of database system over traditional file system – Basic concepts & definitions, database users – Database language – Database system architecture – Schemas, Subschemas, & Instances – Database constraints – 3-level database architecture – Data abstraction, data independence, mappings, structure, components & functions of DBMS – Data models.

UNIT II SQL AND RELATIONAL DATA MODEL **9**

SQL: Concepts and features – DDL – DML – Dynamic and Embedded SQL Entity relationship model, Components of ER model, Mapping E-R model to Relational schema – Network and Object-Oriented Data models – Relational Algebra – Relational Query Languages – Query processing and optimization.

UNIT III DATABASE DESIGN **9**

Database development lifecycle (DDLC), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design,

Normalization, Normal forms: 1NF, 2NF, 3NF, and BCNF, Multi-valued Dependencies, 4NF & 5NF.

UNIT IV TRANSACTION MANAGEMENT **9**

Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time-stamped & optimistic concurrency control algorithms, deadlock management. Data Capturing Technique. RAID, Indexing and Hashing – B+ Tree Index Files: Structure of a B+ Tree – Queries in B+ Trees – Static Hashing, Dynamic Hashing – Locking protocols.

UNIT V DISTRIBUTED AND NO SQL DATABASES **9**

Distributed Database Concepts – Data fragmentation and Replication – Allocation techniques -Introduction to NoSQL Systems – The CAP Theorem – Document-Based NoSQL Systems and MongoDB – Column-based NoSQL systems

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Apply the architecture and core components of a Database Management System to demonstrate understanding of database systems, schemas, and data models.

CO2: Apply relational concepts by writing SQL queries and using relational algebra to retrieve, manipulate, and optimize data in a structured database..

CO3: Analyze various data modeling and normalization techniques such as ER modeling, functional dependencies, and decomposition to determine efficient schema designs.

CO4: Evaluate different transaction management techniques, indexing methods, and concurrency control mechanisms to ensure database consistency, integrity, and performance.

CO5: Create a database solution for distributed or large-scale applications using NoSQL features.

TEXT BOOKS

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, 7th Edition, Pearson, 2016.
2. Raghu Ramakrishnan, “Database Management Systems”, 4th Edition, Tata McGraw Hill, 2010.
3. M. Tamer Özsu and Patrick Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.

REFERENCE BOOKS

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems:
2. The Complete Book”, 2nd Edition, Pearson International Edition.
3. Elmasri & Navathe: Fundamentals of Database Systems, Pearson Education.

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4. Ramakrishnan: Database Management Systems, McGraw-Hill Education.
5. Andrew S. Tanenbaum: Modern Operating Systems, 3rd Edition, Pearson Education. Terry Dawson, Olaf Kirch: Linux Network Administrator's Guide, 3rd Edition, O'Reilly

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	3	2	1	-	-	-	2	1	1	1	2	1
CO2	3	1	1	1	1	-	-	-	2	3	3	3	3	1
CO3	3	2	3	2	1	-	-	-	2	1	1	2	2	3
CO4	1	2	3	2	-	-	-	-	3	2	3	3	1	2
CO5	1	1	3	3	2	-	-	-	1	3	3	1	2	2
AVG	**2**	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**

1-Low,2-Medium,3-High, '-"-No Correlation

24CS3103 DATA STRUCTURES AND ALGORITHMS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand the concepts of ADTs and to design linear data structures – lists, stacks, and queues.
- To understand non-linear data structures – trees and graphs and sorting, searching, and hashing algorithms
- To critically analyze the efficiency of graph and different algorithm design techniques

UNIT I ABSTRACT DATATYPES **9**

Abstract Data Types (ADTs) – ADTs and classes – Introduction to OOP – Classes in Python – Inheritance – Namespaces – Shallow and deep copying Introduction to analysis of algorithms – Asymptotic notations – Divide & conquer – Recursion – Analyzing recursive algorithms.

UNIT II LINEAR DATA STRUCTURE **9**

Abstract Data Types (ADTs) – List ADT – Linked list implementation – Singly linked lists Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT — Multi lists. Stack and Queues – Balancing Symbols – Evaluating Arithmetic Expressions – Infix to Postfix Conversion – Function Calls.

UNIT III MULTIWAY SEARCH TREES AND GRAPHS **9**

Tree ADT – Tree Traversals – Binary Tree ADT – Expression Trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap. B-Tree – B+ Tree – Graph Definition – Representation of Graphs – Types of Graph – Breadth-first Traversal – Depth-

first Traversal – Bi-connectivity – Topological Sort – Dijkstra's Algorithm – Minimum Spanning Tree.

UNIT IV SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching – Linear Search – Binary Search. Sorting – Bubble Sort – Selection Sort – Insertion Sort – Shell Sort – Merge Sort – Analysis of Sorting Algorithms, Collision handling – Load Factors and Efficiency – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

UNIT V INTRODUCTION TO ALGORITHM TECHNIQUES 9

Floyd-Warshall Algorithm – Network Flow – Ford-Fulkerson Method – Matching Maximum Bipartite Matching. Pattern Search – The Naive String-Matching Algorithm – Rabin-Karp algorithm – Knuth-Morris-Pratt Algorithm. Greedy Technique: Elements of the greedy Strategy – N Queens Problem – Optimal Merge Pattern – Huffman Trees.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Linked list implementation of List.
2. Implementation of Stack and Queue ADTs.
3. Implementation of Sorting and Searching Algorithms.
4. Implementation of Hash Tables.
5. Implementation of Tree Representation and Traversal Algorithms.
6. Implementation of Binary Search Trees.
7. Implementation of single source Shortest Path Algorithm.
8. Implement N Queens problem using Backtracking.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explain Abstract Data Types.

CO2: Design, Implement, and Analyze Linear Data Structures, such as Lists, Queues, and Stacks, according to the needs of different applications.

CO3: Model problems as graph problems and implement efficient Graph Algorithms to solve them.

CO4: Analyze the various searching and Sorting Algorithms.

CO5: Solve maximum flow problems using the Ford-Fulkerson method.

TEXT BOOKS

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures & Algorithms in Python”, An Indian Adaptation, John Wiley & Sons Inc., 2021.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2005.

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3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.

REFERENCE BOOKS

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2006.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press, 2014.
3. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.
4. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
5. Homas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Also Known As: CLRS, Level: Intermediate to Advanced

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	3	2	1	-	-	-	2	1	3	1	2	1
CO2	1	3	3	1	2	-	-	-	2	2	2	1	1	3
CO3	2	2	2	3	3	-	-	-	3	2	1	1	1	2
CO4	1	2	1	3	1	-	-	-	3	2	1	1	1	2
CO5	3	3	2	2	2	1	3	3	3	3	2	2	2	1
AVG	**1.8**	**2.4**	**2.2**	**2.2**	**1.8**	**1**	**3**	**3**	**2.6**	**2**	**1.8**	**1.2**	**1.4**	**1.8**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24IT3201 COMPUTER ORGANIZATION AND LOGIC DESIGN LABORATORY **L T P C 0 0 3 1.5**

COURSE OBJECTIVES

- To analyze and design combinational circuits and to analyze and design sequential circuits.
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards and to understand the concept of various memories and I/O interfacing.

LIST OF EXPERIMENTS

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.

4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits.
6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters.
8. Implementation of a Universal Shift register.
9. Simulator-based study of Computer Architecture.
10. Simulating a Simple Instruction Cycle and Addressing Modes.
11. Simulation of Memory Access and I/O Interfaces.
12. Designing a Simple CPU Datapath and Control Unit.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Design various combinational digital circuits using logic gates.

CO2: Design sequential circuits and analyze the design procedures.

CO3: State the fundamentals of computer systems and analyze the execution of an instruction.

CO4: Analyze different types of control design and identify hazards.

CO5: Identify the characteristics of various memory systems and I/O communication.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	3	2	1	1	1	1	2	3	2	3
CO2	3	3	3	3	2	1	1	1	1	1	2	3	1	2
CO3	3	3	3	3	2	2	1	1	1	1	2	3	2	3
CO4	3	3	3	3	1	1	1	1	1	1	1	2	1	3
CO5	3	3	3	3	1	2	1	1	1	1	1	2	1	2
AVG	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**

1-Low,2-Medium,3-High, '-"-No Correlation

24CS3201 DATABASE DESIGN LABORATORY **L T P C**

0 0 3 1.5

COURSE OBJECTIVES

- To understand data definitions and data manipulation commands.
- To learn about the use of nested and join queries and to understand procedural extensions of databases.
- To design a database schema for an application using ER model, normalization and to implement a database application using front-end tools.

LIST OF EXPERIMENTS

1. Data Definition Commands
    a) Creating tables with constraints, constraint violations

b) Schema modifications

2. Data Manipulation Commands
   a) Update operations
   b) Simple SQL queries
   c) Transaction Control statements – Save point and Rollback
3. Complex SQL Queries
4. Nested Queries
5. Correlated Subqueries
6. Joins and Outer Joins
   a) Aggregate functions
   b) Grouping and Ordering commands
7. Views
8. Database Programming: PL/SQL - Procedures and Functions
9. Triggers
10. Database Design
11. ER Model, ER-to-relational mapping
    a) Normalization
12. Implement a database application by applying database design and database programming using library class. Example:
    a) Timetable Management System
    b) Hospital Management System
    c) Library Management System
    d) Railway Reservation System
    e) Inventory Control System
    f) Online Commerce System

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Construct queries using SQL in database creation and manipulation.

CO2: Construct simple and complex SQL queries using DCL commands.

CO3: Develop PL/SQL blocks using database programming constructs.

CO4: Use advanced features such as stored procedures and triggers and incorporate in GUI- based application development.

CO5**:** Design ER model and develop a database application using library class with a DBMS server via API.

Mapping of COs with POs and PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3
CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3
CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1

CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1
AVG	**2**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**1**	**3**	**2**	**2**	**2**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS4101 CORE CONCEPTS IN DATA SCIENCE **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.

UNIT I INTRODUCTION **9**

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data.

UNIT II DESCRIBING DATA **9**

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores.

UNIT III DESCRIBING RELATIONSHIPS **9**

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations – regression towards the mean.

UNIT IV PYTHON LIBRARIES FOR DATA WRANGLING **9**

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT V DATA VISUALIZATION **9**

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Define the data science process.

CO2: Explore different types of data description for data science process.

CO3: Gain knowledge on relationships between data.
CO4: Use the Python Libraries for Data Wrangling.
CO5**:** Apply visualization Libraries in Python to interpret and explore data.

TEXT BOOKS

1. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, Introducing Data Science, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, "Statistics", 11th Edition, Wiley Publications, 2017.
3. JakeVanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCE BOOKS

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.
2. Foundations of Data Science, 2020 by Avrim Blum, John Hopcroft, Ravindran Kannan.
3. Applied Data Science, 2nd Edition, by Alex Galea,2012.
4. Fundamentals of Data Science, 3rd Edition, 2020 Dwarakanath.
5. Foundation of Data Science, 2nd Edition 2019 by Dr. R Madonna Arieth.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	1	2	2	-	-	-	1	1	1	2	-	-
CO2	2	1	-	1	1	-	-	-	2	1	1	2	-	-
CO3	2	2	1	2	2	1	1	-	1	2	1	3	-	-
CO4	3	2	2	1	2	-	-	-	1	1	2	2	-	-
CO5	2	2	1	2	2	-	-	-	1	1	1	2	-	-
AVG	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**1**	**2**	**-**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS4102 THEORY OF COMPUTATION **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand Foundations of Computation including Automata Theory.
- To construct models of Regular Expressions and Languages and to design context free Grammar and Pushdown Automata.
- To understand Turing Machines and their capability and to understand Undecidability and NP Class Problems.

UNIT I FINITE AUTOMATA **9**

Introduction to Formal Proof – Additional Forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-Deterministic Finite Automata – Finite Automata with Epsilon Transitions – An application: Text Search.

UNIT II REGULAR LANGUAGES **9**

Regular Expressions – FA and Regular Expressions – Applications of Regular expressions – Proving Languages not to be Regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA **9**

CFG – Parse Trees – Applications of Context Free Grammar – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata – Pumping lemma for CFG.

UNIT IV TURING MACHINE **9**

Definitions of Turing machines – Models – Computable languages and functions – Techniques for Turing machine construction – Multihead and Multitape Turing Machines – The Halting problem – Partial Solvability – Problems about Turing machine – Chomskian hierarchy of languages.

UNIT V UNDECIDABILITY **9**

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

TOTAL: 45 PERIODS

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LIST OF EXPERIMENTS

1. Design a DFA over the input set {a, b} accept all the strings starting with symbol.
2. Design a DFA over the input set {0, 1}. Accept all the Strings Starting with and ending with 1.
3. Design a Program for creating machine that accepts three consecutive ones.
4. Design a Program for creating machine that accepts the string always ending with 101.
5. Design a Program for Mode 3 Machine.
6. Design a program for accepting binary number divisible by 2.
7. Design a program for creating a machine which accepts string having even no. of 1's and 0's.
8. Design a program for creating a machine which counts number of 1's and 0's in a given string.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Demonstrate their understanding of key Notions, such as Algorithm, Computability, Decidability, and Complexity through Problem Solving.

CO2: Develop formal Mathematical methods to prove properties of Languages, Grammars and Automata.

CO3: Design Turing Machines for any Language.

CO4: Propose Computation Solutions using Turing Machines.

CO5: Illustrate the Decidability or Undecidability of Various Problems.

TEXT BOOKS

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Education, 2016.
2. John C. Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.
3. Sanjeev Arora, Boas Barak, "Computational Complexity: A Modern Approach", 7th Edition, Cambridge University Press.

REFERENCE BOOKS

1. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 3rd Edition, 2013.
2. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015.
3. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.
4. K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.
5. Vivek Kulkarni, "Theory of Computation", 4th Edition, Oxford University Press, 2013.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1	3	2	3	-	-	-	-	1	1	2	3	3	1
CO2	2	2	3	2	1	-	-	-	3	3	2	3	3	2
CO3	2	2	3	2	1	-	-	-	1	3	1	2	2	1
CO4	2	2	2	1	-	-	-	-	1	3	3	2	3	2
CO5	2	2	2	1	1	-	-	-	1	1	3	2	2	2
AVG	**2**	**2**	**2**	**2**	**1**	-	-	-	**1**	**2**	**2**	**2**	**3**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24EC4107 MICROPROCESSORS AND MICROCONTROLLERS **L T P C**
3 0 2 4

COURSE OBJECTIVE

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To study and design the Architecture of 8051 microcontroller.

UNIT I INTRODUCTION OF 8086 MICROPROCESSOR **9**

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

UNIT II 8086 SYSTEM BUS STRUCTURE **9**

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

UNIT III I/O INTERFACING **9**

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

UNIT IV MICROCONTROLLER **9**

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

UNIT V INTERFACING MICROCONTROLLER **9**

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

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

8086 Programs using kits

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.

Peripherals and Interfacing Experiments

1. Traffic light controller

2. Stepper motor control
3. Key board and Display

8051 Experiments using Kit and Keil Sofware

1. Basic arithmetic and Logical Operations
2. Square and Cube Program, Find 2's Complement of a number

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Execute programs based on 8086 microprocessor.
CO2: Design Memory Interfacing circuits.
CO3: Design and interface I/O circuits.
CO4: Design and implement 8051 microcontroller based systems.
CO5: Design 8051 microcontroller with interfacing circuits.

TEXT BOOKS

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design", 2nd Edition, Prentice Hall of India, 2007. (UNIT III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson education, 2011. (UNIT IV-V)
3. R. Gaonkar - Microprocessor Architecture, Programming and Applications with the 8086.

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REFERENCE BOOKS

1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012.
2. A.K. Ray, K.M. Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd Edition, Tata Mc Graw Hill, 2012.
3. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
4. S. Furber, "ARM system On Chip Architecture", 2nd Edition, Pearson, 2015.
5. A. Sloss, D. Symes, C. Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", 1st Edition, Elsevier, 2004.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	2	3
CO2	3	3	3	-	-	-	-	-	-	-	-	2	2	2
CO3	3	3	3	-	-	-	-	-	-	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	2	3

CO5	3	3	3	-	-	-	-	-	-	-	-	2	2	3
AVG	**3**	**3**	**2.6**	**2**	-	-	-	-	-	-	-	**2**	**2**	**2.6**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24CS4103 PRINCIPLES OF OPERATING SYSTEMS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To be familiar with the basics of virtual machine
- To understand the basics and functions of operating systems.
- To understand processes and threads

UNIT I INTRODUCTION **6**

Overview of Operating Systems, Operating system functions and design issues, Design approaches, Types of advanced operating systems. - Introduction to Virtual Machines.

UNIT II PROCESS MANAGEMENT **10**

Process Model - Creation - Termination - Hierarchies - States - Implementation - Scheduling Criteria - Scheduling Algorithms - Multithreading Models - Thread Libraries - Threading Issues - Thread and Multiprocessor Scheduling Algorithms - Interprocess Communication.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS **11**

Race Conditions - Critical Section - Mutual Exclusion - Peterson's Solution - Synchronization: Hardware - Semaphores - Mutex - Monitor - Message Passing, Dining Philosophers Problem - Readers Writers Problem. Deadlocks: Conditions - Detection - Recovery - Prevention - Avoidance.

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UNIT IV MEMORY MANAGEMENT **10**

Main Memory: Swapping - Contiguous Memory Allocation - Paging - Structure of Page Table - Segmentation - Examples. Virtual Memory: Demand Paging - Copy on Write - Page Replacement - Allocation of Frames - Thrashing - Memory Mapped Files - Allocating Kernel Memory.

UNIT V STORAGE MANAGEMENT **8**

Files: Naming - Structure - Types - Access - Attributes - Operations - Implementation. Directories: Operations - Path Names - Hierarchical Directory System - Implementation - Allocation Methods - Free Space Management - Efficiency and Performance - Recovery. Mass Storage: Disk Structure - Disk Scheduling Algorithms - Swap Space Management.

TOTAL:45 PERIODS

COURSE OUTCOMES

On successful completion of this course, the students should be able to

CO1**:** Understand the basic concepts and functions of operating systems.

CO2: Understand concepts of Processes and analyze Scheduling algorithms.

CO3: Analyze various scheduling algorithms and process synchronization.

CO4: Understand the concept of Deadlocks.

CO5: Explain the functionality of file systems, I/O systems, and Virtualization.

TEXT BOOKS

1. Silberschatz A, Galvin P, Gagne G, "Operating Systems Concepts", John Wiley and Sons, Singapore, 2018.
2. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, New Delhi, 2018.
3. Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2004.

REFERENCES BOOKS

1. Andrew S. Tanenbaum, "Modern Operating System", 4th Edition, PHI Learning, New Delhi, 2018.
2. Dhamdhere, "Operating Systems: A Concept Based approach", 3rd Edition, Tata McGraw Hill, New Delhi, 2015.
3. Harvey M Deitel, Paul J Deitel, David R Choffnes, "Operating Systems", 3rd Edition, Pearson Education, New Delhi, 2013.
4. Remzi Arpaci-Dusseau , Andrea Arpaci-Dusseau, "Operating Systems: Three Easy Pieces", 1st Edition, Arpaci-Dusseau Books, 2015
5. Achyut S Godbole, AtulKahate, "Operating Systems", 1st Edition, McGraw Hill Education, 2016.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	2	2	-	-	-	-	3	2	3	1	1	2
CO2	2	2	3	1	1	-	-	-	2	1	1	2	2	1
CO3	1	3	2	2	1	-	-	-	2	2	1	1	1	2
CO4	1	3	3	3	-	-	-	-	1	2	1	2	1	3
CO5	3	1	2	1	1	-	-	-	3	2	3	2	2	2
AVG	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**1**	**2**

1 - low, 2 - medium, 3 - high, '-"- no correlation

24CY4101 ENVIRONMENTAL SCIENCE **L T P C**
2 0 0 2

COURSE OBJECTIVES

- To Introduce the Fundamental Ideas of Environment and Interrelationship between Living Organism.
- To Impart Knowledge on Pollution and Perspectives on Renewable Resources.
- To Inculcate and Embrace Sustainability Practices and Develop a Broader Understanding on Green Materials.

UNIT I ENVIRONMENT AND BIODIVERSITY **6**

Definition - Scope and Importance of Environment. Eco-System and Energy flow– Ecological Succession. Types of Biodiversity: Genetic, Species and Ecosystem Diversity– Values of Biodiversity, India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In- Situ and Ex-Situ.

UNIT II NATURAL RESOURCES **6**

Forest Resources: Deforestation, Timber Extraction, Mining, Dams and their effects on forests and tribal people. Water resources: over-utilization of surface and ground water. Mineral resources: Environmental Effects of Extracting and using Mineral Resources. Food Resources: World Food Problems, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity.

UNIT III ENVIRONMENTAL POLLUTION **6**

Causes, Effects and Preventive measures of Water, Soil and Air Pollution, Environmental Protection Acts [Environment Act, Air Act, Water Act], Disaster Management: Causes – Effects - Control Measures of Floods – Earthquake.

UNIT IV NON-CONVENTIONAL ENERGY **6**

Energy Management and Conservation, New Energy Sources: Solar Energy, Wind Energy, Biomass Energy, Hydrogen Energy, Ocean Energy Resources, Tidal Energy Conversion, Concept, Origin and Power Plants of Geothermal Energy.

UNIT V SUSTAINABILITY MANAGEMENT **6**

Sustainable Development, Unsustainability to Sustainability, GDP, Carbon Credit, Carbon Footprint, Zero Waste and R Concept, Sustainable Habitat: Green Buildings, Green Materials, Energy Efficiency, Sustainable Transports, Green Engineering.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Summarize the functions of Environment, Ecosystems and Biodiversity.
CO2: Examine the Relationship Between Natural Resources and their Environment.
CO3: Identify the Causes, Effects of Environmental Pollution.
CO4: Recognize the Sources of Non-Conventional Energy.
CO5: Interpret the needs of Sustainable Development and Green Mate

TEXT BOOKS

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Pearson Education, 2004.

REFERENCE BOOKS

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances And Standards", Vol. I and II, Enviro Media. 38th Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice Hall of India Pvt. Ltd., New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 3rd Edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	-	-	-	-	3	-	-	-	-	-	2	-
CO2	2	2	-	-	-	-	3	-	-	-	-	-	2	-
CO3	2	2	-	-	-	-	3	-	-	-	-	-	2	-
CO4	2	2	-	-	-	-	3	-	-	-	-	-	2	-
CO5	2	2	-	-	-	-	3	-	-	-	-	-	-	-
AVG	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS4201 DATA SCIENCE LABORATORY **L T P C**

0 0 3 1.5

COURSE OBJECTIVES

- To understand the data science fundamentals and process.
- To learn to describe the data and variability.
- To utilize present and interpret data using Python libraries for Data Wrangling.

LIST OF EXPERIMENTS

1. Explore features of Python data packages (NumPy, SciPy, Pandas, Matplotlib, Seaborn, Plotly, Bokeh).
2. Work with NumPy arrays.
3. Manipulate Pandas DataFrames.
4. Read and analyze data from files and web sources.
5. Perform univariate analysis on diabetes datasets.
6. Calculate skewness and kurtosis on datasets.
7. Build linear and logistic regression models.
8. Perform multiple regression analysis.
9. Apply visualization techniques on UCI datasets.
10. Conduct correlation analysis with heatmaps.
11. Handle and clean missing data using Pandas.
12. Use groupby and aggregation for data summaries.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Define the data science process and basic statistical description of data.
CO2: Recognize different types of data descriptions for data science process.
CO3: Gain knowledge on relationships between data.
CO4: Illustrate how to use the Python Libraries for Data Wrangling.
CO5: Apply visualization Libraries in Python to interpret and explore data.

Mapping of COs with POs and PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	1	2	2	-	-	-	1	1	1	2	2	2
CO2	2	1	-	1	1	-	-	-	2	1	1	2	2	3
CO3	2	2	1	2	2	1	1	-	1	2	1	3	2	2
CO4	3	2	2	1	2	-	-	-	1	1	2	2	3	3
CO5	2	2	1	2	2	-	-	-	1	1	1	2	2	2
AVG	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**1**	**2**	**2**	**2**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24CS4202 OPERATING SYSTEMS LABORATORY **L T P C**

0 0 3 1.5

COURSE OBJECTIVES

- To Install Windows Operating Systems and Basics of Unix Command and Shell Programming.
- To Implement Various CPU Scheduling Algorithms and Deadlock Avoidance and Deadlock Detection Algorithms.

- To Implement Page Replacement Algorithms and Various Memory Allocation Methods and Familiar with File Organization and File Allocation Strategies.

LIST OF EXPERIMENTS

1. Install and Configure Windows Operating System
   Learn the step-by-step procedure to install the Windows OS, including partitioning, formatting, and configuring basic system settings.
2. Execute Basic UNIX Commands and Develop Shell Programs
   Gain hands-on experience with fundamental UNIX/Linux commands and write simple shell scripts for file handling, looping, and automation.
3. Implement Process Management using System Calls
   Write C programs using system calls like fork(), exit(), getpid(), wait(), and close() to create and manage processes.
4. Simulate CPU Scheduling Algorithms using C
   Develop C programs to implement various CPU scheduling techniques such as FCFS, SJF, Priority Scheduling, and Round Robin.
5. Demonstrate Inter-Process Communication (IPC) Techniques
   Illustrate different IPC strategies using shared memory, pipes, or message queues to enable communication between processes.
6. Implement Mutual Exclusion using Semaphores
   Write C programs using semaphore concepts to achieve synchronization and prevent race conditions between concurrent processes.
7. Avoid Deadlocks using Banker's Algorithm in C
   Develop a C program to implement Banker's Algorithm for resource allocation and demonstrate how deadlocks can be avoided.
8. Detect Deadlocks using Resource Allocation Graphs in C
   Write a C program that detects the presence of deadlocks using appropriate detection algorithms and resource allocation graphs.
9. Create and Manage Threads in C
   Implement multithreading in C using POSIX threads to run multiple tasks concurrently and handle synchronization issues.
10. Simulate Paging Technique using C
    Develop a C program to demonstrate paging in memory management, including page tables and logical to physical address translation.
11. Implement Memory Allocation Strategies in C
    Write C programs to simulate memory allocation methods:
    First Fit , Worst Fit, Best Fit
12. Simulate Page Replacement Algorithms in C and Create C programs to implement and compare various page replacement algorithms.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Define and implement UNIX Commands.

CO2: Compare the performance of various CPU Scheduling Algorithms.
CO3: Compare and contrast various Memory Allocation Methods.
CO4: Define File Organization and File Allocation Strategies.
CO5: Implement various Disk Scheduling Algorithm

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2
CO5	2	2	1	1	3	-	-	-	1	2	2	1	1	3
AVG	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24GE4201 TECHNICAL SEMINAR **L T P C**
0 0 2 1

COURSE OBJECTIVES

- To gain knowledge on literature survey in a selected area of study.
- To know an academic document from the literate and to give a presentation about it.
- To prepare a technical report.

COURSE SUMMARY

The Course 'Technical Seminar' is anticipated to support a B.E./B.Tech graduate to read, understand, present and prepare report of an academic document. The learner shall search in the literature including peer reviewed journals, conference, books, project reports etc., and identify an appropriate paper/thesis/report in her/his area of interest, in consultation with her/his Technical Seminar coordinator/guide. This course can help the learner to experience how a presentation can be made about a selected academic document and also empower her/him to prepare a technical report.

GENERAL GUIDELINES

1. The Department shall form an Internal Evaluation Committee (IEC) for the seminar for that program as the Chairperson/Chairman and seminar coordinator & seminar guide as members.
2. During the seminar presentation of a student, all members of IEC shall be present.
3. Formation of IEC and guide allotment shall be completed within a week after the University examination (or last working day) of the previous semester.
4. Guide shall provide required input to their students regarding the selection of topic/ paper.

Choosing a seminar topic: The topic for a UG seminar should be current and broad based rather than a very specific research work. It's advisable to choose a topic for the

Seminar to be closely linked to the final year project area. Every member of the project team could choose or be assigned Seminar topics that covers various aspects linked to the Project area.

- A topic/paper relevant to the discipline shall be selected by the student during the semester break.
- Topic/Paper shall be finalized in the first week of the semester and shall be submitted to the IEC.
- The IEC shall approve the selected topic/paper by the second week of the semester.
- Accurate references from genuine peer reviewed published material to be given in the report and to be verified.

Evaluation pattern (Only internal evaluation)

Guide: (i) 20 marks (Background Knowledge – 10 & Relevance of the paper/topic selected – 10).

Seminar Coordinator: 20 marks (Seminar Diary – 10 (Each student shall maintain a seminar diary and the guide shall monitor the progress of the seminar work on a weekly basis and shall approve the entries in the seminar diary during the weekly meeting with the student), Attendance – 10).

Presentation: 40 marks to be awarded by the IEC (Clarity of presentation – 10, Interactions – 10 (to be based on the candidate's ability to answer questions during the interactive session of her/his presentation), Overall participation – 10 (to be given based on her/his involvement during interactive sessions of presentations by other students), Quality of the slides – 10).

Report: 20 marks to be awarded by the IEC (check for technical content, overall quality, templates followed, adequacy of references etc.).

COURSE OUTCOMES

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

CO1: Identify academic documents from the literature which are related to her/his areas of interest.

CO2: Read and apprehend an academic document from the literature which is related to her/ his areas of interest.

CO3: Prepare a presentation about an academic document.

CO4: Give a presentation about an academic document.

CO5: Prepare a technical report.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	-	-	2	-	-	-	-	2	-	3	-	-
CO2	3	2	-	-	-	-	-	-	-	2	-	3	-	-
CO3	3	3	-	-	-	-	-	-	-	2	-	3	-	-
CO4	3	3	-	-	2	-	-	-	-	2	-	3	-	-
CO5	3	3	-	-	2	-	-	-	-	2	-	3	-	-
AVG	**2.8**	**2.6**	-	-	**2**	-	-	-	-	**2**	-	**3**	-	-

1-Low, 2-Medium, 3-High, '-'- No correlation

24CS5101 COMPILER DESIGN **L T P C**
3 0 2 4

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION **9**

Language Processors- The Structure of a Compiler Lexical Analysis-The Role of the Lexical Analyzer- Input Buffering- Specification and Recognition of Tokens- The Lexical-Analyzer Generator: Lex.

UNIT II SYNTAX ANALYZER **9**

The Role of the Parser- Context-free grammars –Error-Recovery Strategies- Top-Down Parsing- Bottom-Up Parsing: SLR, CLR, LALR- The Parser Generator YACC Tool.

UNIT III SYNTAX DIRECTED TRANSLATION & INTERMEDIATE CODE GENERATION **10**

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type Checker Equivalence of Type Expressions- Three address codes – Types and Declarations – Translation of expression- Type checking - Control Flow-Back Patching-Switch Statements-Intermediate code for procedures.

UNIT IV CODE GENERATION **8**

Issues in the design of code generation – Target Language-Addresses in target code- Basic Blocks and Flow Graphs- Optimization of Basic Blocks – A simple Code generator – Peephole optimization.

UNIT V CODE OPTIMIZATION AND RUN-TIME ENVIRONMENTS **9**

Machine-Independent Optimizations: The Principal Sources of Optimization - Loops in Flow Graphs Run-Time Environments: Storage organization- Stack allocation space- Access to non-local data on the stack-Heap management Optimizing for Parallelism-Basic Concepts.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Using the Lex tool, develop a lexical analyzer to recognize a few patterns in C. (Ex.identifiers, constants, comments, operators etc.). Create a symbol table, while,recognizing identifiers.
2. Implement a Lexical Analyzer using LEX Tool
3. Generate YACC specification for a few syntactic categories.
4. Program to recognize

a. valid arithmetic expression that uses operator +, -, * and /.
b. Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
c. Program to recognize a valid control structures syntax of C language (For loop, while loop, if-else, if-else-if, switch-case, etc.).
d. Implementation of calculator using Lex and Yacc.

5. Generate three address code for a simple program using Lex and Yacc.
6. Implement type checking using Lex and Yacc.
7. Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)
8. Implement back-end of the compiler for which the three-address code is given as input and the 8086-assembly language code is produced as output.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Summarize the techniques in different phases of a compiler
CO2: Design a lexical analyzer for a sample language and learn to use the Lex tool.
CO3: Apply different parsing algorithms to develop a parser and learn to use Yacc tool.
CO4: Recall semantics rules (SDT), intermediate code generation and run-time environment.
CO5: Implement code generation and apply code optimization techniques

TEXT BOOKS

MIET
Mohamed Institute of Education & Technology
INSTITUTIONS
Since 1984

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers: Principles Techniques and Tools”, 2nd Edition, Pearson Education, 2009.
2. V Raghavan, “Principles of Compiler Design”, tata McGraw Hill Publishing Co Ltd, 2016.
3. Rafting Interpreters (Robert Nystrom) – Great starting point, builds an interpreter then a bytecode compiler, highly praised for clarity.

REFERENCE BOOKS

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence Based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers - Elsevier Science, India, 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publishers, Elsevier Science, 2004.
4. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C‖, Prentice-Hall Software Series, 199

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	-	-	-	-	3	3	1	3	2	3
CO2	3	3	3	3	3	-	-	-	3	2	3	2	2	1
CO3	3	3	2	2	3	-	-	-	3	1	1	1	2	2
CO4	3	2	2	1	1	-	-	-	2	3	2	3	1	2
CO5	3	3	3	2	1	-	-	-	2	1	1	3	2	1
AVG	**3**	**2.8**	**2.6**	**2.2**	**2**	**-**	**-**	**-**	**2.6**	**2**	**1.6**	**2.4**	**1.8**	**1.8**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS5102 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand the various characteristics of Intelligent agents and different ways of designing software agents.
- To learn the different search strategies in AI and represent knowledge in solving AI problems.
- To evaluate the algorithms based on corresponding metrics identified.

UNIT I INTRODUCTION **9**

Foundation of AI - Agents and Environments- Concept of Rationality - Nature of Environments - Structure of Agents-Problem- Solving Agents and examples-Uninformed Search Strategies-Searching with Partial Information.

UNIT II PROBLEM SOLVING METHODS **9**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

UNIT III KNOWLEDGE REPRESENTATION **9**

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

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING **9**

Acting under uncertainty - Bayes‟ rule and Its use – Representing Knowledge in an Uncertain, Domain –The Semantics of Bayesian Networks – Exact Inference in Bayesian Network –Approximate Inference in Bayesian Networks – Hidden Markov Models – Kalman Filters.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build SVM models
6. Implement clustering algorithms
7. Implement EM for Bayesian networks
8. Build deep learning NN models.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Use appropriate search algorithms for any AI.
CO2: Represent a problem using first order and predicate logic.
CO3: Provide the apt agent strategy to solve a given problem.
CO4: Design software agents to solve a problem.
CO5: Evaluate and compare different models.

TEXT BOOKS

1. S. Russell and P. Norvig, "Artificial Intelligence": A Modern Approach‖, Prentice Hall, 3rd Edition, 2009.
2. I. Bratko, Prolog: Programming for Artificial Intelligence, 4th Edition, Addison Wesley Educational Publishers Inc., 2011.
3. Stuart J Russell and Peter Norvig, "Artificial Intelligence- A Modern Approach", Pearson Education Series, 3rd Edition, 2010.

REFERENCE BOOKS

1. M. Tim Jones, Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc. 1st Edition, 2008.
2. J. Nilsson, The Quest for Artificial Intelligence Cambridge University Press, 2009.
3. Sebastain Raschka, Vahid Mirjalili ,"Python Machine Learning", Packt publishing, 3rd Edition, 2019.
4. Stephen Marsland, "Machine Learning: An Algorithmic Perspective" 2nd Edition", CRC Press, 2014.
5. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	-	-	-	-	3	3	1	3	2	3
CO2	3	3	3	3	3	-	-	-	3	2	3	2	2	1
CO3	3	3	2	2	3	-	-	-	3	1	1	1	2	2
CO4	3	2	2	1	1	-	-	-	2	3	2	3	1	2
CO5	3	3	3	2	1	-	-	-	2	1	1	3	2	1
AVG	**3**	**2.8**	**2.6**	**2.2**	**2**	**-**	**-**	**-**	**2.6**	**2**	**1.6**	**2.4**	**1.8**	**1.8**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS5103 INTERNET AND WEB PROGRAMMING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the architecture and infrastructure of the Internet and web and design and develop dynamic web pages using HTML, CSS, and JavaScript.
- To learn server-side scripting and database interaction for web development and asynchronous data communication using AJAX and RESTful APIs.
- To explore web hosting and web application security best practices.

UNIT I INTERNET FUNDAMENTALS AND HTML **9**

Introduction to Internet – Evolution – Web vs Internet – Web Protocols (HTTP/HTTPS) – Browsers – URL – IP and DNS – HTML5: Tags, Forms, Tables, Multimedia Elements – Semantic Tags – Introduction to Responsive Web Design.

UNIT II CSS AND JAVASCRIPT **9**

CSS: Inline, Internal, External – Selectors – Box Model – Layout Techniques (Flexbox, Grid) – Media Queries – Introduction to Bootstrap-JavaScript: Basics – Data Types – Functions – Events – DOM Manipulation – Form Validation – Introduction to ES6.

UNIT III SERVER-SIDE PROGRAMMING AND DATABASES **9**

PHP Basics – Syntax – Arrays – Functions – Form Handling – Sessions – File I/O – Error Handling – Connecting with MySQL – SQL Basics – CRUD Operations – Data Validation – Security Practices.

UNIT IV AJAX AND WEB SERVICES **9**

Introduction to AJAX – XML HTTP Request – Fetch API – JSON – RESTful APIs – Consuming APIs with JavaScript – Dynamic Content Loading – Real-time Interactions – Case Studies.

UNIT V WEB HOSTING AND SECURITY **9**

Web Hosting Platforms – FTP – Domain Registration – Hosting Control Panel – Web

Application Deployment – HTTPS and SSL – Introduction to OWASP Top 10 – Input Sanitization – Authentication – Security Best Practices.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Recall the fundamentals of Internet, HTML and web design.

CO2: Apply CSS and JavaScript to create interactive and responsive web pages.

CO3: Develop dynamic web applications using PHP and MySQL.

CO4: Implement AJAX and RESTful services for asynchronous communication.

CO5: Demonstrate web hosting and basic security implementation.

TEXT BOOKS

1. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5 6th Edition by Robin Nixon.
2. Web Development & Design Foundations with HTML5 7th Edition by Terry Felke-Morris.
3. JavaScript: The Definitive Guide 7th Edition by David Flanagan.

REFERENCE BOOKS

1. Kogent Learning Solutions Inc., "Web Technologies, Dreamtech Press", 2012.
2. Chris Bates, Web Programming: Building Internet Applications, Wiley, 2012.
3. Steven Holzner, Ajax: A Beginner's Guide, McGraw Hill, 2008.
4. Jon Duckett, JavaScript, Interactive Front-End Web Development, Wiley, 2014.
5. Welling and Thomson, PHP and MySQL Web Development, Pearson Education, 5th Edition,2016.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	-	-	-	-	-	1	2	-	-	2	2
CO2	3	2	3	2	2	-	-	-	2	3	-	-	3	2
CO3	3	2	3	3	2	-	-	-	2	2	-	-	3	3
CO4	2	2	3	2	2	-	-	-	2	2	-	-	2	3
CO5	2	2	2	2	2	-	-	-	2	2	-	-	2	3
AVG	**2.6**	**2**	**2.6**	**2.3**	**2**	**-**	**-**	**-**	**1.8**	**2.2**	**-**	**-**	**2.4**	**2.6**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS5105 NETWORK ARCHITECTURE AND CRYPTOGRAPHY **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand fundamental principles of network architecture and protocol design.
- Evaluate advanced network designs like IoT, 5G, and cloud-based architectures.
- Explain and implement basic cryptographic techniques and their applications.

UNIT I FUNDAMENTALS OF NETWORK ARCHITECTURE **9**

Introduction to Network Architecture - ISO/OSI Reference Model - TCP/IP Architecture - Layered Architecture and Design Principles - Network Performance Metrics - Protocol Layering and Service Models- End-to-End Principle - Architectural Evolution of Networks - Network Models in Cloud and Distributed Systems.

UNIT II NETWORK HARDWARE & SWITCHING ARCHITECTURES **9**

Network Interface Cards and Switches - Routers and Routing Architecture - Hardware Design Considerations - Switching Fabric Architectures - Packet Switching and Circuit Switching - MPLS Architecture - SDN (Software Defined Networking) Concepts - Data Plane vs Control Plane - Network Function Virtualization (NFV).

UNIT III ADVANCED NETWORK ARCHITECTURES **9**

Internet Architecture and Tiered ISP Model - Peer-to-Peer Architecture - Content Delivery Networks (CDN)- Data Center Network Architecture - 5G Network Architecture -Wireless Mesh Networks- IoT Network Architectures - Edge and Fog Computing Architectures - Green Networking and Energy Efficient Design.

UNIT IV CRYPTOGRAPHIC FOUNDATIONS **9**

Introduction to Cryptography & Security Goals - Symmetric Key Encryption: Techniques and Examples - Asymmetric Key Encryption: RSA, ECC- Hash Functions: SHA, MD5Digital Signatures: RSA, DSS - Key Exchange Protocols: Diffie-Hellman - Authentication Mechanisms - Message Integrity and MAC.

UNIT V APPLIED CRYPTOGRAPHY AND SECURITY PROTOCOLS **9**

Public Key Infrastructure (PKI) - Secure Email Protocols (PGP, S/MIME) - Secure Web Communications (SSL/TLS) - IPsec and VPN Architectures - Blockchain and Distributed Ledger Cryptography - Quantum Cryptography Basics - Digital Certificates and Certificate Authorities - Smart Cards and Cryptographic Tokens - Real-World Attacks and Security Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Recall fundamental principles of network architecture and protocol design

CO2: Analyze the architectural components and switching techniques in networks.

CO3: Evaluate advanced network designs like IoT, 5G, and cloud-based architectures.
CO4: Explain and implement basic cryptographic techniques and their applications.
CO5: Apply cryptographic methods in securing real-world communication systems.

TEXT BOOKS

1. "Computer Networking": A Top-Down Approach, 8th Edition, 2021.
2. "Cryptography and Network Security": Principles and Practice, 8th Ed, Dec 2023.
3. "Network Architecture", Hardware, CDN, 5G, SDN/IoT, "Computer Networking" , Kurose & Ross, 8th Ed, 2021.

REFERENCE BOOKS

1. "Computer Networking": A Top-Down Approach, James F. Kurose, Keith W. Ross, 8th Edition, 2021.
2. "Data and Computer Communications", William Stallings 11th Edition, 2021.
3. Michael T. Goodrich, Introduction to Computer Security, Pearson. 1st Ed. 2017.
4. James Kurose & Keith Ross, Computer Networking: A Top-Down Approach, Pearson.
5. Thomas D. Nadeau, SDN: Software Defined Networks, O'Reilly,1st Edi.,1999.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	3	2	1	2	-	-	-	-	-	-	-	2	-
CO3	3	3	3	2	2	-	-	-	1	2	-	-	2	-
CO4	3	3	2	2	1	2	-	-	-	-	-	-	2	-
CO5	3	3	3	3	2	2	1	-	1	2	-	2	-	-
AVG	**3**	**2.8**	**2.2**	**1.6**	**1.4**	**0.8**	**0.2**	**-**	**0.4**	**0.8**	**-**	**0.4**	**1.4**	**-**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS5201 INTERNET AND WEB PROGRAMMING LABORATORY **L T P C**
0 0 3 1.5

COURSE OBJECTIVES

- To Understand the Architecture and Infrastructure of the Internet and web. Design and Develop Dynamic Web Pages using HTML, CSS, and JavaScript.
- To Learn Server-Side Scripting and Database Interaction for Web Development.
- To Implement Asynchronous Data Communication using AJAX and RESTful APIs, and Explore Web Hosting and Web Application Security Best Practices.

LIST OF EXPERIMENTS

1. Design a responsive personal profile page using HTML and CSS.
2. Develop a user registration form with validation using JavaScript.
3. Create a blog layout using CSS Grid and Flexbox.

4. Create a login module using PHP and MySQL.
5. Develop a PHP-based CRUD application (e.g., Student Records).
6. Integrate AJAX with PHP to fetch data dynamically.
7. Connect to a third-party API using Fetch and display data.
8. Host a static website using GitHub Pages.
9. Use developer tools to analyze performance and debug errors.
10. Implement a contact form with CAPTCHA and input validation.
11. Build a Simple To-Do List Application using JavaScript and Local Storage
12. Implement a Responsive Image Gallery using Bootstrap.

TOTAL :30 PERIODS

COURSE OUTCOMES:

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

CO1: Interpret the fundamentals of Internet, HTML and web design.
CO2: Apply CSS and JavaScript to create interactive and responsive web pages.
CO3: Develop dynamic web applications using PHP and MySQL.
CO4: Implement AJAX and RESTful services for asynchronous communication.
CO5: Demonstrate web hosting and basic security implementation

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	1	2	-	-	-	2	2	-	-	3	2
CO2	3	2	3	2	3	-	-	-	2	2	-	-	3	2
CO3	3	3	3	2	3	1	-	-	2	2	1	-	3	3
CO4	3	2	3	3	3	1	-	-	2	2	1	-	3	3
CO5	3	2	3	2	3	2	1	1	2	3	1	2	3	3
AVG	**3**	**2.2**	**3**	**2**	**2.8**	**1.3**	**1**	**1**	**2**	**2.2**	**1**	**2**	**3**	**2.6**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS5202 NETWORK LABORATORY **L T P C**

0 0 3 1.5

COURSE OBJECTIVES

- To enable students to configure, implement, and troubleshoot network components and topologies.
- To introduce software-defined networking (SDN) concepts and tools.
- To develop practical skills in cryptography and secure communication.

LIST OF EXPERIMENTS

1 Simulate and analyze OSI and TCP/IP layers using a network simulator.

2 Configure subnetting and simulate layered communication.

3	Design and test various network topologies using Cisco Packet Tracer.
4	Implement switching and routing scenarios using a simulator.
5	SDN controller setup using Mininet and OpenFlow.
6	Simulate a data center network and evaluate performance.
7	Build a basic IoT network architecture using Node-RED or Arduino devices.
8	Implement RSA algorithm and verify encryption/decryption process.
9	Implement AES algorithm in ECB and CBC mode.
10	Simulate Diffie-Hellman key exchange using Python or Java.
11	Create a secure client-server chat app using SSL/TLS.
12	Design and demonstrate a blockchain-based transaction record.

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

CO1: Simulate and analyze the functionalities of OSI and TCP/IP layers using network simulation tools.

CO2: Configure subnetting and simulate communication across layered network models.

CO3: Design and test different network topologies using Cisco Packet Tracer to understand real-world networking setups.

CO4: Implement switching and routing concepts through simulation-based network environments.

CO5: Set up a Software-Defined Network (SDN) controller using Mininet and OpenFlow to analyze flow control and packet forwarding.

Mapping of COs with POs and PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	3	-	-	-	2	2	-	2	3	2
CO2	3	2	3	2	3	-	-	-	2	2	1	2	3	2
CO3	3	3	3	3	3	1	-	-	2	2	1	2	3	3
CO4	3	2	3	2	3	1	1	-	2	2	-	2	3	3
CO5	3	3	3	3	3	2	-	1	2	2	-	2	3	3
AVG	**3**	**2.6**	**3**	**2.4**	**3**	**1.3**	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2.6**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24GE5201 BUILDING COMMUNICATION SKILLS LABORATORY **L T P C**
0 0 2 1

COURSE OBJECTIVES

- To enhance students' verbal and non-verbal communication skills.
- To build confidence in public speaking, presentations, and group discussions.
- To equip students for professional interactions like interviews and workplace communication.

LIST OF EXPERIMENTS

1. Self-Introduction & Public Speaking.
2. Listening Skills & Comprehension.
3. Group Discussions (GD) Techniques.
4. Technical Presentation on CSE Topics.
5. Mock Interviews & HR Questions.
6. Resume Writing & Cover Letter Drafting.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Demonstrate improved verbal and non-verbal communication.

CO2: Apply effective communication strategies in professional settings.

CO3: Develop technical writing and presentation skills.

CO4: Engage in group discussions and teamwork effectively.

CO5: Exhibit confidence in interviews and workplace interactions.

TEXTBOOKS

1. Raymond Murphy. English Grammar in Use, Cambridge University Press, 2022.
2. Aruna Koneru. Professional Communication, McGraw Hill, 2016.
3. Meenakshi Raman & Sangeeta Sharma, Technical Communication, OUP, 2018.

REFERENCE BOOKS

1. John Seely. The Oxford Guide to Writing & Speaking, Oxford University Press, 2019.
2. Bovee & Thill. Business Communication Today, Pearson, 2021.
3. Barun K. Mitra, Personality Development and Soft Skills, OUP, 2020.
4. Lesikar, R.V. & Flatley, M.E., Basic Business Communication, McGraw-Hill, 2011.
5. Goleman, D., Emotional Intelligence, Bantam Books, 2006.

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Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	2	-	2	3	3	3	3	2	-	-
CO2	-	-	-	2	2	-	3	3	3	3	2	3	-	-
CO3	-	-	-	2	3	-	2	3	3	3	2	3	-	-
CO4	-	-	-	-	3	-	3	3	3	3	3	3	-	-
CO5	-	-	-	-	3	-	3	3	3	3	3	3	-	-
AVG	0	0	0	2	3	0	3	3	3	3	3	3	0	0

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CS6101 PRINCIPLES OF IOT COMMUNICATION **L T P C**

3 0 2 4

COURSE OBJECTIVES

- Understand Learn its main components, and issues like security and privacy and IoT

is applied in areas like manufacturing, healthcare, smart homes, and transport.

- Learn about IoT systems are built and organized using different models and views.
- Understand how data moves in IoT systems through network layers like the data link and transport layers and functions of sensors used in IoT devices.

UNIT I INTRODUCTION **9**

Definition of IoT, Applications, Architectures, Wireless Networks, Devices, Security and Privacy, Event-Driven Systems. Levels & deployment templates.

UNIT II IOT AN ARCHITECTURAL OVERVIEW **9**

IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT III IOT APPLICATIONS AND LAYERS **9**

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Aspects in your Business to Master IoT, Home Management, eHealth- IoT Transport -IoT Data Link Layer

UNIT IV INTRODUCTION TO SENSORS FOR IOT **9**

Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device

UNIT V SEVEN GENERATIONS OF IOT SENSORS **9**

Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Write 8051 Assembly Language Experiments using Simulator.
2. Perform ALU Operations.
3. Introduction to Arduino Platform and Programming.
4. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth).
5. Introduction to Raspberry PI Platform and Python Programming.
6. Setup a Cloud Platform to Log the Data.
7. Log Data using Raspberry PI and Upload to the Cloud Platform.
8. Design an IOT based system.

TOTAL: 30PERIODS

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COURSE OUTCOMES

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

CO1: Define IoT and Explain its Applications, Components, and Related Security and Privacy Concerns.

CO2: Describe IoT Architecture and Reference Models, including Various Views used to Design IoT Systems.

CO3: Identify and Analyze the use of IoT in Industrial and Consumer Domains such as Manufacturing, Healthcare, and Smart Homes.

CO4: Explain the Role of Communication Layers in IoT, Data Link and Transport Layers.

CO5: Classify and Describe Various IoT Sensors and their Roles in Connected Devices and Applications.

TEXT BOOKS

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", Pearson Education 2015.
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition.
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley 2014.

REFERENCE BOOKS

1. Patranabis, Sensors and Actuators, 2nd Edition, PHI, 2013.
2. D. Patranabis, Sensors and Transducers, 1st Edition, PHI Learning Private Limited,2013 Monk, Simon.
3. Programming the Raspberry Pi: getting started with Python, 1st Edition, McGraw-Hill Education, 2016.
4. 'Internet of Things', Arshdeep Bagha and Vijay Madisetti, Universities Press, 2015
5. 'Wireless Sensor Networks', Kazem Sohraby, Daniel Minoli and Taieb Znati, Wiley, 2015.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	-	-	-	2	1	-	-	-	-	3	2
CO2	3	3	2	2	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	2	-	2	1	-	-	-	-	2	3
CO4	2	3	2	3	2	-	-	-	-	-	-	-	3	2
CO5	3	2	2	2	2	-	-	-	-	-	-	-	2	2
AVG	**2.6**	**2.4**	**2**	**1.8**	**1.2**	**0**	**0.8**	**0.4**	**0**	**0**	**0**	**0**	**2.6**	**2.2**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24CS6102 SOFTWARE ENGINEERING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the fundamentals of software processes, lifecycle models.
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies and explore software testing strategies.

UNIT I INTRODUCTION TO SOFTWARE PROCESS AND UML **9**

The Nature of Software -Software Engineering Failures- Software Engineering - Software Process Structure - Software Lifecycle Models - Agile Development - Scrum - Prototyping- Modeling with UML -Modeling Concepts

UNIT II SOFTWARE REQUIREMENTS AND ANALYSIS **9**

Requirements Analysis and Specification - Requirements Gathering and Analysis- Value of good SRS – Requirement process- Requirement Specification – desirable characteristics, components and Structure of requirements document – Functional Specification with use cases – basics - developing Use Cases -DFDs - Data Dictionary - ER Diagrams.

UNIT III SOFTWARE DESIGN **9**

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles - User interface design-Case Study.

UNIT IV TESTING AND MAINTENANCE **9**

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging. Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Re engineering-BPR model-Re engineering process model-Reverse and Forward Engineering.

UNIT V SOFTWARE PROJECT MANAGEMENT AND DEVOPS **9**

Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Overall Architecture Building and Testing-Deployment- Tools.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the Software Processes, Lifecycle Models, and Agile Methods Like Scrum, Prototyping, and UML modeling.

CO2: Analyze and Specify Software Requirements using Use cases, DFDs, ER diagrams, and Create an SRS Document

CO3: Apply Design Principles and Patterns to Create Efficient and Maintainable Software.
CO4: Perform software testing (unit, black-box, white-box, regression) and apply Maintenance, techniques like refactoring
CO5: Learn project management, scheduling, configuration, and apply DevOps for cloud platforms and deployment

TEXT BOOKS

1. Roger S. Pressman, Software Engineering – A Practitioner's Approach, 7th Edition, Mc Graw-Hill International Edition, 2010.
2. Ian Sommerville,"Software Engineering", 9th Edition, Pearson Education Asia, 2011.
3. Software Engineering, A Practitioner's Approach, Roger S. Pressman, TMG Hill.

REFERENCE BOOKS

1. Rajib Mall, ―Fundamentals of Software Engineering‖, 3rd Edition, PHI Learning Pvt. Ltd., 2009
2. Pankaj Jalote, ―Software Engineering, A Precise Approach‖, Wiley India, 2010.
3. Kelkar S.A., ―Software Engineering, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, ―Software Engineering‖, Tata McGraw-Hill Publishing Company Limited, 2007.
5. Ian Sommerville, ―Software Engineering, 9th Edition, Pearson Education Asia, 2011.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	2	-	-	-	1	2	1	2	3	1
CO2	3	3	3	2	3	-	-	-	2	2	1	2	3	2
CO3	3	3	3	2	3	-	-	-	2	2	1	2	3	2
CO4	3	3	3	3	3	1	-	-	2	2	1	2	3	2
CO5	3	2	3	2	3	2	1	1	2	2	2	3	3	2
AVG	3	2.8	2.8	2.2	2.8	1.5	1	1	1.8	2	1.2	2.2	3	1.8

1-Low, 2-Medium, 3-High, "- "- No Correlation

24IT5102 FULLSTACK WEB DEVELOPMENT **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the various components of full stack development.
- To develop applications with MongoDB.
- To learn Node.js features and applications.

UNIT I BASICS OF FULLSTACK **9**

Understanding the Basic Web Development Framework - User - Browser - Webserver - Backend Services - MVC Architecture - Understanding the different stacks -The role of Express - Angular- Node - Mongo DB – React.

UNIT II NODE JS **9**

Basics of Node JS – Installation – Working with Node packages –Using Node package manager- Creating a simple Node.js application - Using Events - Listeners -Timers - Callbacks - Handling Data I/O - Implementing HTTP services in Node.js.

UNIT III MONGODB **9**

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control–Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications.

UNIT IV EXPRESS AND ANGULAR **9**

Implementing Express in Node.js - Configuring routes - Using Request and Response objects Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives.

UNIT V REACT **9**

MERN STACK - Basic React applications - React Components - React State - Express REST APIs - Modularization and Web pack - Routing with React Router - Server-side rendering.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Compare the various stacks available for web application development.
CO2: Use Node.js for application development.
CO3: Develop applications with MongoDB.
CO4: Use the features of Angular and Express.
CO5: Design and Develop React applications.

TEXT BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js Mongo DB and Angular Web Development”, 2nd Edition, Addison-Wesley, 2018.
2. Vasan Subramanian, Pro MERN Stack: “Full Stack Web App Development with Mongo, Express, React, and Node”, 2nd Edition, A press, 2019.
3. Frank Zammetti, “Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker”, 2nd Edition, 2022.

REFERENCE BOOKS

1. Chris Northwood, "The FullStack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", 1st Edition, A press; 2018.
2. Kirupa Chinnathambi, "Learning React: A Hands-On Guide to Building Web Application Using React and Redux", 2nd Edition, Addison-Wesley Professional, 2018.
3. Shyam Seshadri, "Angular Up and Running", 2nd Edition, O'Reilly Media; 2018.
4. David Choi, "Full-Stack React, Type Script, and Node", 1st Edition, Packet Publishing, 2022.
5. Alex Banks, Eve Porcello, "Learning React: Modern Patterns for Developing React Apps", 3rd Edition, O'Reilly Media, 2023.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	0	0	0	0	0	0	1	1	1	1	1	1
CO2	3	3	3	3	2	1	0	0	2	0	2	3	2	2
CO3	3	3	2	2	2	2	0	0	2	2	2	3	2	2
CO4	3	3	2	2	2	1	0	0	1	1	2	2	2	1
CO5	3	3	3	3	3	1	0	0	0	0	2	2	2	2
AVG	**3**	**3**	**2**	**2**	**2**	**1**	**0**	**0**	**1**	**1**	**2**	**2**	**2**	**2**

1-Low, 2-Medium, 3-High, '-'- No correlation

24CS6201 SOFTWARE ENGINEERING LABORATORY **L T P C**
0 0 3 1.5

COURSE OBJECTIVES

- To understand the fundamentals of software processes, lifecycle models.
- To understand fundamental concepts of requirements engineering and Analysis Model.
- To understand the various software design methodologies and to explore software testing strategies.

LIST OF EXPERIMENTS

1. Develop requirements specification for a given problem
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required).
3. Develop structured design for the DFD model developed
4. Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML or Visual Paradigm etc. is required).
5. Develop Sequence Diagrams

6. Develop Class diagrams
7. Develop code for the developed class model using Java.
8. Use testing tool such as Junit
9. Use a configuration management tool
10. Use any one project management tool such as Microsoft Project or Gantt Project, etc.

SUGGESTED DOMAINS FOR MINI-PROJECT

1. Passport automation system.
2. Book bank
3. Exam registration
4. Stock maintenance system.
5. Online course reservation system
6. Airline/Railway reservation system
7. Software personnel management system
8. Credit card processing
9. Library management system
10. Student information system.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Develop Software Requirement Specifications (SRS) and represent functional requirements using DFDs and data dictionaries.

CO2: Model system behavior and structure using UML diagrams such as use case, sequence, and class diagrams with appropriate CASE tools.

CO3: Implement object-oriented design using programming languages such as Java based on the developed design models.

CO4: Apply unit testing techniques using tools like JUnit to validate and verify software functionality.

CO5: Utilize configuration management and project management tools to plan, track, and control software development activities.

Mapping of COs with POs and PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	2	-	-	-	2	2	1	2	3	2
CO2	3	2	3	2	3	-	-	-	2	2	1	2	3	2
CO3	3	3	3	2	3	-	-	-	2	2	-	2	3	2
CO4	3	3	3	3	3	1	-	-	2	2	1	2	3	2
CO5	3	2	3	2	3	2	1	1	2	2	2	3	3	2
AVG	**3**	**2.6**	**2.8**	**2.2**	**2.8**	**1.5**	**1**	**1**	**2**	**2**	**1.3**	**2.2**	**3**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24IT5202 FULL STACK WEB DEVELOPMENT LABORATORY **L T P C**
0 0 3 1.5

COURSE OBJECTIVES

- To understand the various components of full stack development.
- To learn node.js features and applications.
- To develop applications with MongoDB.

LIST OF EXPERIMENTS

1. Develop a port folio web site for yourself which gives details about yourself for a potential recruiter.
2. Create a web application to manage the To-Do list of users, where users can log in and manage their to-do items.
3. Create a simple microblogging application (like Twitter) that allows people to post their content which can be viewed by people who follow them.
4. Create a food delivery website where users can order food from a particular restaurant listed in the website.
5. Develop a classifieds web application to buy and sell used products.
6. Create a leave management system allowing users to apply for casual or medical leave and check available leave balances.
7. Build a project management dashboard to add tasks and update their status as Pending, In Progress, or Completed.
8. Develop an online survey application where a collection of questions is available and users are asked to answer any random ones.
9. Create a NodeJS server that creates, reads, updates and deletes event, details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
10. Create a docker container that will deploy a NodeJS ping server using the, NodeJS image.
11. Create a NodeJS server that serves static HTML and CSS files to the, user without using Express. 15
12. Create a form and validate the contents of the form using JavaScript.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Compare and contrast the various stacks available for web application development..

CO2: Use Node.js for application development.

CO3: Develop applications with MongoDB.

CO4: Use the features of Angular and Express.

CO5: Develop React applications.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	2	-	-	2	2	3	3	2	2	2	-
CO2	3	3	3	3	2	2	2	3	3	3	3	3	3	2
CO3	3	3	3	3	2	2	2	3	3	3	3	3	3	2
CO4	3	3	3	3	2	2	2	3	3	3	3	3	3	2
CO5	3	3	3	3	2	2	2	3	3	3	3	3	3	2
AVG	**3**	**2.8**	**2.8**	**2.8**	**2**	**2**	**2**	**2.8**	**3**	**3**	**2.8**	**2.8**	**2.8**	**2**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24PD6201 NCC/NSS/NSO **L T P C**

2 0 0 2

All students shall enroll on admission in any one of the personality and character development program. NCC/NSS/NSO/YRC/SPORTS is a mandatory requirement and undergo training / conduct activities for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first aid. Alternately activities of science, literature and arts also help for personality and character development. The training activities will normally be during weekends and the camp will normally be during vacation period. A certificate will be given by the authorities concerned and duly forwarded by the Head of the Department to the Controller of Examinations for the purpose of record and scrutiny. No fee shall be charged for all these activities.

(OR)

Enroll as a student member of a recognized professional society/other bodies such as

- Student Chapters of Institution of Engineers (India)/ISTE/ Department Association
- Student Chapters of other Professional bodies like ICI, IEEE, SAE, ASHRAE, CSI, IEI, IIC, IGS, IETE, IWS etc. Students will have activities to improve technical skills, innovative skills, and career development.

24HS7101 PROFESSIONAL ETHICS IN ENGINEERING **L T P C**

2 0 0 2

COURSE OBJECTIVES

- To enable the students to create an awareness on professional ethics
- To Impart Moral and Social Values.
- To learn the moral leadership and corporate responsibility.

UNIT I SOCIAL ETHICS **6**

Application of ethical reasoning to social problems – Gender bias and issues –Social discrimination – Constitutional protection and policies – Inclusive practices. Engineering as

Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT II ENGINEERING ETHICS **6**

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 SCIENTIFIC ETHICS **6**

Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **6**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk –Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES **6**

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: 30 PERIODS

COURSE OUTCOMES

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

CO1: Apply ethical reasoning to analyze social issues and evaluate inclusive practices in societal and professional contexts.

CO2: Explain key concepts of engineering ethics, and apply them to engineering decision-making.

CO3: Evaluate the role of scientists in society and ethical use of scientific inventions for societal welfare.

CO4: Analyze safety and risk assessment in professional settings and demonstrate understanding of rights, responsibilities, and ethical challenges in workplace scenarios such as confidentiality, conflict of interest, and IPR.

CO5: Assess global ethical challenges faced by engineers, including environmental Concerns and responsibilities in corporate and managerial roles.

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TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”. McGraw-Hill, New York, 2005.
2. Edmund G Seebauer and Robert L Barry, Fundamentals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001.
3. Charles B. Fleddermann, ―Engineering Ethic, Pearson Prentice Hall, New Jersey, 2004.

REFERENCE BOOKS

1. Luke W. Galen “The Nonreligious: Understanding Secular People and Societies”, Oxford University Press,2016.
2. Bullivant, Stephen; Lee, Lois, “Secularism: A Dictionary of Atheism”, Oxford University Press, 2016.
3. Soumitro Banerjee, “Research Methodology for Natural Sciences”, IISc Press, January 2022.
4. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2014.
5. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ Mc Graw Hill Education, India Pvt. Ltd., New Delhi, 2013.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	2	-	3	3	-	3	-	-
CO2	-	-	-	-	-	-	2	-	3	3	-	3	-	-
CO3	-	-	-	-	-	-	2	2	**3**	3	-	3	-	-
CO4	-	-	-	-	-	-	2	2	**3**	3	-	3	-	-
CO5	-	-	-	-	-	-	2	2	**3**	3	-	3	-	-
AVG	-	-	-	-	-	-	**2**	**2**	**3**	**3**	-	**3**	-	-

1-Low, 2-Medium, 3-High, ‘-’- No correlation

24CS7501 MINI PROJECT **L T P C**
0 0 4 2

COURSE OBJECTIVES

- To apply theoretical knowledge to practical problems.
- To enhance problem-solving and critical-thinking skills.
- To develop skills in software development lifecycle (SDLC).

The students shall individually or as group work on a specific topic approved by the Department. The student can select any topic which is relevant to his/her specialization of the

programmer. The student should continue the work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work, results and discussion, conclusion and references should be prepared as per the format prescribed by the University and submitted to the Head of the department. The students will be evaluated based on the report and viva-voce examination by a panel of examiners as per the Regulations.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

CO1: Formulate Appropriate Objectives for Project Development / create a new product/ process.

CO2: Design and develop efficient software or system-based solutions.

CO3: Work effectively in a team to manage tasks, roles, responsibilities, and time within the scope of a mini project.

CO4: Demonstrate the use of modern development environments, version control systems, and testing strategies to ensure quality and reliability of the solution.

CO5: Preparing of project report and presentation

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	2	3	3	3	1	-	1	2	2	1	1	1	1
CO2	2	2	3	3	3	1	-	1	2	2	1	1	1	1
CO3	2	2	3	3	3	1	-	1	2	2	1	1	1	1
CO4	2	2	3	3	3	1	-	1	2	2	1	1	1	1
CO5	2	2	3	3	3	1	-	1	2	2	1	1	1	1
AVG	**2**	**2**	**3**	**3**	**3**	**1**	**-**	**1**	**2**	**2**	**1**	**1**	**1**	**1**

1-Low, 2-Medium, 3-High, '-'- No correlation

24IS7201 INTERNSHIP **L T P C**

0 0 0 1

COURSE OBJECTIVES

- Students acquire practical knowledge through hands-on experience in an area of modern industries.
- Gain real-world experience in the profession and enables correlation of classroom learning.
- To experience the career development goals involve exploring the duties and qualifications of different careers.

COURSE DESCRIPTION

The purpose of the Internship Education Program is to provide each student practical experience in a standard work environment. An internship is an integral part of engineering education. It provides real-world experience in the profession; enables correlation of classroom learning with applications in industry; broadens understanding of the types of employment available in the field; helps the student discover individual interests; builds resume credentials; and develops relationships with industrial companies.

MONITORING OF INTERNSHIP

Documents required after the internship

1. Final report with full details of internship activities and contents learned during the entire period of internship.
2. Students shall maintain a day-to-day record of their engagement for the period of training. This will be recorded in an authorized diary to be counter signed by the concern authority at the each day and the same diary shall be submitted to the internship co-ordinator.
3. At the end of the training period, a student shall produce a certificate of satisfactory completion of training.

The final report should address the following:

- Projects and duties performed during the Internship.
- Learning that occurred as a result of the internship, in regard to
  - The engineering profession.
  - The particular industry.
  - The organization/company.
  - The technical skills developed.
  - The individual interests and preferences discovered.
  - Suggestions.
  - Goals and plans regarding future professional development.

EVALUATION PROCEDURE

The weightage as follows

1. Internship final report : 30%
2. Authorized diary : 30%
3. Oral presentation through PPT : 40%

COURSE OUTCOMES

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

CO1: Apply appropriate workplace behaviors in a professional setting.

CO2: Demonstrate content knowledge appropriate to job assignment.

CO3: Exhibit evidence of increased content knowledge gained through practical experience.

CO4: Evaluate the internship experience in terms of their personal, educational and career needs.

CO5: Refine and clarify professional and career goals through critical analysis of the internship experience.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	2	3	-	-	-	-	2	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	2	-	-	-	-
CO3	3	2	2	2	3	-	-	-	-	2	-	-	-	-
CO4	3	2	2	2	3	-	-	-	-	2	-	-	-	-
CO5	3	2	2	2	3	-	-	-	-	2	-	-	-	-
AVG	**3**	**2**	**2**	**2**	**3**	-	-	-	-	**2**	-	-	-	-

1-Low, 2-Medium, 3-High, '-'- No correlation

24CA7201 CASE STUDY **L T P C**
0 0 0 1

COURSE OBJECTIVES

- To gain hands on industrial experience.
- To introduce industry problem solving skill.
- To familiarize the industrial operations.

The students should study at least two case studies during 6th Semester vacation and submit a details report not less than 20 pages with a copy of case study completion certificate from the Industry.

Part A: Case Study on Industry Operation

The students should undergo case study on Industrial Operations.

- They should understand the company's structure, operational workflow, safety norms, and business model.
- Learn the specific department such as production, quality control, logistics, human resources, turn-over and other major tools and software's used by the industry.
- Students interact with industry experts, gather background information relevant to the industry.
- The students have to collect data, gather real-time processes, and analyze the challenges faced by the industry by using standard tools such as Fishbone diagrams, Pareto charts, or SWOT analysis.

Part B: Case Study on Completed Project

The students should identify and select case study 2 as previously completed project relevant to their domain.

- Students should follow the work flow structure such as interacting with team leader or manager, identify and understand the problem, collect relevant data, analyze roots &

methodology employed to complete the project and should understand the final outcome of the project.

- Students consolidate their findings and prepare a comprehensive report.

At the end of study,

The students should prepare a report not less than 20 pages and should include the copy of case study completion certificate in the report.

COURSE OUTCOMES

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

CO1: Gain foundational knowledge of industrial operations, practices, and workflows.
CO2: Analyze and interpret industrial data.
CO3: Apply engineering principles to industry real time problems.
CO4: Collaborate effectively with industry experts and teams.
CO5: Communicate technical information clearly and professionally.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	3	-	-	-	-	2	2	2	2	-	-
CO2	3	3	2	3	3	-	-	-	2	2	2	2	-	-
CO3	3	3	2	3	3	-	-	-	2	2	2	2	-	-
CO4	2	2	-	-	-	-	-	-	2	2	2	2	-	-
CO5	2	2	-	-	3	-	-	-	2	2	2	2	-	-
AVG	2.6	2.6	2	3	3	-	-	-	2	2	2	2	-	-

1-Low, 2-Medium, 3-High, '-'- No correlation

24CS8501 PROJECT WORK **L T P C**
0 0 20 10

COURSE OBJECTIVES

- For gaining domain knowledge, and technical skills to solve potential business / Research, problems and gather requirements with suitable software solutions.
- To work in small teams and understand the processes and practices in the 'industry to implement, test and deploy solutions for target platforms.
- Preparing project reports and presentation.

COURSE DESCRIPTION

The students shall individually or as group work on business/research domains and related problems approved by the Department / Organization that offered the Internship / Project. The student can select any topic which is relevant to his/her specialization of the program. The student should continue the work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the

identified problem, detailed literature review related to the area of work and methodology for carrying out the work, results and discussion, conclusion and references should be prepared as per the format prescribed by the University and submitted to the Head of the department. The students will be evaluated based on the report and viva-voce examination by a panel of examiners as per the Regulations.

COURSE OUTCOMES

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

CO1: Apply domain knowledge to identify and define a relevant business or research problem.

CO2: Analyze literature to understand the current state-of-the-art and research gaps.

CO3: Develop an appropriate methodology to address the identified problem.

CO4: Evaluate and interpret results to derive meaningful conclusions.

CO5: Create a structured project report and defend the work through a viva-voce.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	-	2	2	2	-	3	2	-	-	2	2
CO2	3	2	3	2	2	2	2	2	3	2	3	2	2	2
CO3	3	-	3	-	2	2	2	2	3	-	3	-	2	2
CO4	3	2	3	2	2	-	2	2	3	2	3	2	2	-
CO5	3	-	2	-	2	3	2	2	3	-	2	-	2	3
AVG	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**3**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24CSPE01 DESIGN AND ANALYSIS OF ALGORITHMS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To critically analyze 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 techniques for solving various problems.

UNIT I INTRODUCTION **8**

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

UNIT II BRUTE FORCE AND DIVIDE AND CONQUER **10**

Brute Force – String Matching - Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Multiplication of Large Integers and Strassen's Matrix Multiplication – Closest-Pair and Convex - Hull Problems. Decrease and Conquer: - Topological Sorting – Transform and Conquer: Presorting – Heaps and Heap Sort.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE **10**

Dynamic programming – Principle of optimality - Coin changing problem – Warshall's and Floyd 's algorithms – Optimal Binary Search Trees - Multi stage graph - Knapsack Problem and Memory functions. Greedy Technique – Dijkstra's algorithm - Huffman Trees and codes - 0/1 Knapsack problem.

UNIT IV ITERATIVE IMPROVEMENT **8**

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

UNIT V LIMITATIONS OF ALGORITHM POWER **9**

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 – Traveling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Traveling Salesman problem – Knapsack problem.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On successful completion of this course, the student 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 analyze the problems using dynamic programming and greedy algorithmic techniques.

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

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

TEXT BOOKS

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, 2006.
3. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, and Stein (CLRS)Edition: Currently, the 4th edition (2022).

REFERENCE BOOKS

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/C++, 2nd Edition, Universities Press, 2019.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI Learning Private Limited, 2012.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, 2014.
4. "Algorithm Design" by Jon Kleinberg and Éva Tardos Edition: 1st Edition (2005).
5. The Design and Analysis of Computer Algorithms Authors: Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Publisher: Addison-Wesley. 1st Edition, 1974.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	1	1	-	-	-	1	1	2	2	3	2
CO2	2	1	1	3	2	-	-	-	2	2	1	2	2	2
CO3	3	2	1	2	2	-	-	-	2	1	1	2	1	3
CO4	3	2	3	2	2	-	-	-	3	3	3	2	2	1
CO5	3	1	2	3	3	-	-	-	2	2	2	2	3	1
AVG	**2.8**	**1.8**	**2**	**2.2**	**2**	**-**	**-**	**-**	**2**	**1.8**	**1.8**	**2.8**	**1.8**	**2**

1-Low, 2-Medium, 3-High, '-'- No Correlation

24CSPE02 DATA EXPLORATION AND R PROGRAMMING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis

UNIT I EXPLORATORY DATA ANALYSIS **9**

EDA Fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with Classical and Bayesian Analysis – Software Tools for EDA - Visual Aids for EDA- Data Transformation Techniques-Merging Database, Reshaping and Pivoting, Transformation Techniques - Grouping Datasets - Data Aggregation – Pivot Tables and Cross- Tabulations.

UNIT II VISUALIZING USING MATPLOTLIB **9**

Importing Matplotlib – Simple Line Plots – Simple Scatter Plots – Visualizing Errors – Density and Contour Plots – Histograms – Legends – Colors – Subplots – Text and Annotation – Customization – Three-Dimensional Plotting – Geographic Data with Basemap – Visualization with Seaborn.

UNIT III UNIVARIATE ANALYSIS **9**

Introduction to Single Variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT IV BIVARIATE AND MULTIVARIATE ANALYSIS **9**

Relationships Between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations - Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data.

UNIT V GETTING STARTED WITH R **9**

Installing R - The R Environment - R Packages - Basics of R - Data Structures - Reading Data into R - Graphics in R. Writing R Functions - Control Statements (if and else, switch, if else, compound tests) - Loops in R (for, while, controlling loops) - Applications using the Functions and Loops**.**

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the fundamentals of exploratory data analysis.
CO2: Implement the data visualization using Matplotlib.
CO3: Perform univariate data exploration and analysis.
CO4: Apply bivariate data exploration and visualization techniques for multivariate.
CO5: The learner will learn to use R programming to solve decision models.

TEXT BOOKS

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016.
3. Sandip Rakshit, R Programming for Beginners, McGrawHill Education,2017.

REFERENCE BOOKS

1. Eric Pimpler, Data Visualization and Exploration with R, Geo Spatial Training Service, 2017.
2. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly Publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC Press,2015.
4. Jared P.L., R for Everyone -Advanced Analytics and Graphics, Addison Wesley Data and Analytics Series, 2015.
5. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	3	3	-	-	-	-	2	3	3	3	2	2
CO2	2	2	2	1	1	-	-	-	3	2	3	1	3	1
CO3	2	1	2	1	1	-	-	-	3	2	1	2	2	2
CO4	2	2	2	1	-	-	-	-	1	2	1	3	1	3
CO5	3	1	1	2	1	-	-	-	3	2	1	2	2	2
AVG	**2.4**	**1.4**	**2**	**1.6**	**1**	**-**	**-**	**-**	**2.4**	**2.2**	**1.8**	**2.4**	**1.4**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE03 VULNERABILITY ASSESSMENT AND PENETRATION TESTING **L T P C 3 0 0 3**

COURSE OBJECTIVES

- To understand the fundamentals of cybersecurity, threats, and vulnerabilities.
- To acquire knowledge of various vulnerability assessment and penetration testing tools.
- To learn systematic approaches to ethical hacking and penetration testing.

UNIT I INTRODUCTION TO CYBER SECURITY AND VAPT **9**

Fundamentals of Information Security - Types of Threats, Vulnerabilities, and Attacks-Vulnerability Assessment vs Penetration Testing-Ethical Hacking and Hacker Types-Cyber Law and Legal Compliance (IT Act, GDPR, etc.)

UNIT II INFORMATION GATHERING AND SCANNING TECHNIQUES **9**

Reconnaissance: Active and Passive – Foot printing Techniques (WHOIS, NSLookup, Google Hacking)- Network Scanning and Port Scanning-Enumeration Techniques (SNMP, SMB, LDAP)-Tools: Nmap, Netcat, Recon-ng, Shodan.

UNIT III VULNERABILITY ASSESSMENT **9**

Classification of Vulnerabilities (OS, Web, Network)-CVE, CVSS, NVD Databases-Automated Vulnerability Scanners: Nessus, OpenVAS-Web Vulnerability Scanners: Nikto, ZAP-Risk Rating and Mitigation Planning.

UNIT IV PENETRATION TESTING METHODOLOGIES **9**

Phases of Penetration Testing-Planning, Reconnaissance, Exploitation, Reporting-Web Application Penetration Testing (OWASP Top 10)-Exploiting Web Vulnerabilities (XSS, SQLi, CSRF)-System and Network Exploitation-Tools: Metasploit, Burp Suite, SQLMap

UNIT V WIRELESS TESTING, REPORTING, AND ETHICAL ISSUES 9

Wireless Security and Common Attacks (WEP, WPA/WPA2)-Wireless Hacking Tools: Aircrack-Sniffing and Spoofing with Wireshark-Post-Exploitation and Maintaining Access VAPT Report Writing – Format and Best Practices-Ethical, Legal, and Professional Issues.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Describe fundamental concepts of cybersecurity and ethical hacking.

CO2: Apply information gathering and scanning techniques using appropriate tools.

CO3: Conduct vulnerability assessments using automated tools.

CO4: Execute penetration testing on web and network systems.

CO5: Generate VAPT reports with ethical and legal considerations.

TEXT BOOKS

1. Rafay Baloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2014.
2. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press, 2014.
3. "Penetration Testing: A Hands-On Introduction to Hacking" by Georgia Weidman,1st Edition No Starch Press, 2014.

REFERENCE BOOKS

1. William Stallings, Network Security Essentials: Applications and Standards, Pearson, 2017.
2. Peter Kim, The Hacker Playbook 3: Practical Guide to Penetration Testing, 2018.
3. Vivek Ramachandran, The Web Application Hacker's Handbook, Wiley, 2012.
4. "Hacking: The Art of Exploitation" by Jon Erickson.
5. "Advanced Penetration Testing: Hacking the World's Most Secure Networks" by Wil Allsopp 1st Edition, Publisher: Wiley (John Wiley & Sons), 2017.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	-	-	1	-	2	-	-	-	-	2	3
CO2	3	2	3	2	3	-	-	-	-	-	-	1	2	3
CO3	3	2	3	2	3	-	-	-	-	-	-	1	2	3
CO4	3	2	3	3	3	-	-	1	-	-	-	2	2	3
CO5	2	2	2	2	2	1	1	3	2	3	1	2	2	2
AVG	2.8	2	2.4	2.3	2.8	1	1	2	2	3	1	1.5	2	2.8

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE04 DATA WAREHOUSING AND DATA MINING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand data warehouse concepts, architecture, business analysis and tools.
- To understand data pre-processing and business analysis and OLAP.
- To study about basic concept of data mining and its tools.

UNIT I INTRODUCTION TO DATA WAREHOUSE **9**

Introduction to Data Warehouse - Multidimensional Data Model - Data warehouse components- Data Warehouse Architecture Implementation - Data Warehousing to Data Mining - Efficient Methods for Data Cube Computation - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse.

UNIT II DATA WAREHOUSING, BUSINESS ANALYSIS AND OLAP **9**

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP – WEKA tools.

UNIT III INTRODUCTION TO DATA MINING **9**

Data Mining – Definition- Motivation – Importance - Kinds of Data – Functionalities – Preprocessing Cleaning – Integration – Transformation – Reduction - Discretization - Concept Hierarchy Generation.

UNIT IV CLASSIFICATION AND CLUSTERING **9**

Cluster Analysis - Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods Partitioning Methods - Hierarchical Methods - Density Based Methods - Grid Based Methods - Model Based Clustering Methods - Outlier Analysis - Mining Data Streams - Mining Time Series Data - Mining Sequence Patterns in Transactional Databases.

UNIT V SUBFIELDS AND TECHNIQUES OF DATA MINING **9**

Spatial Data Mining - Multimedia Data Mining - Text Mining - Mining World Wide Web - Data Mining Applications - Data Mining Systems Products and Research Prototypes - Social Impacts of Data Mining - Trends in Data Mining.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the architecture, components, and models of data warehousing systems.

CO2: Apply data warehouse design principles and OLAP techniques for business intelligence and decision support using tools like WEKA.

CO3: Explain the concepts, motivations, and functionalities of data mining, and perform data preprocessing techniques.

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CO4: Implement classification and clustering methods for different data types, and analyze patterns in streaming, time-series, and transactional datasets.

CO5: Explore specialized domains of data mining and evaluate trends, applications, and societal impacts of data mining technologies.

TEXT BOOKS

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, 2008.
2. Ralph Kimball, "The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", 3rd Edition, 2013
3. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, 3rd Edition, 2012.

REFERENCE BOOKS

1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2004.
2. Sam Anahory and Dennis Murry, "Data Warehousing in the Real World", Pearson Education, 2003.
3. David Hand, Heikki Manila and Padhraic Symth, "Principles of Data Mining", PHI, 2004.
4. W.H.Inmon, "Building the Data Warehouse", 3rd Edition, Wiley, 2003.
5. Alex Bezon and Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", McGraw- Hill edition, 2001.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	2	-	-	-	3	-	-	3	2	3
CO2	3	2	2	1	2	-	-	-	1	2	2	3	3	2
CO3	3	1	1	2	1	-	-	-	1	1	1	3	2	3
CO4	3	3	2	2	2	-	-	-	2	2	2	2	3	3
CO5	2	2	3	2	3	-	-	-	2	2	3	3	2	3
AVG	**2.8**	**2.2**	**2.2**	**1.8**	**2**	**-**	**-**	**-**	**1.8**	**1.8**	**2**	**2.8**	**2.4**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE05 EMERGING DIGITAL INNOVATIONS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce recent trends and advancements in emerging technologies.
- To understand the basics and applications of AI, ML, Blockchain, IoT, AR/VR, and quantum Computing.
- To explore how these technologies impact society, industry, and innovation.

UNIT I ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING **9**

Introduction to AI and ML-Types of Machine Learning: Supervised, Unsupervised, Reinforcement-Applications of AI in healthcare, finance, education-Ethical Considerations and Bias in AI-Tools: TensorFlow, Scikit-learn (overview only).

UNIT II INTERNET OF THINGS (IoT) **9**

Fundamentals of IoT and Architecture-IoT Communication Protocols: MQTT, CoAP, HTTP-Sensors, Actuators, and Embedded Systems-IoT Applications: Smart Homes, Agriculture, Healthcare-Introduction to Arduino and Raspberry Pi (conceptual)

UNIT III BLOCKCHAIN TECHNOLOGY **9**

Blockchain Basics: Blocks, Hash, Distributed Ledger-Cryptographic Concepts: Hash Functions, Digital Signatures-Smart Contracts and Decentralized Applications (DApps)-Applications: Supply Chain, Cryptocurrencies, E-Governance-Challenges: Scalability, Security, Regulation.

UNIT IV AUGMENTED, VIRTUAL AND MIXED REALITY **9**

Definitions and Differences: AR, VR, MR-Components and Hardware (Sensors, Cameras, Displays)-Application Areas: Gaming, Education, Medical Simulations-Development Platforms: Unity, Unreal Engine (intro only)-Human-Computer Interaction in AR/VR.

UNIT V QUANTUM COMPUTING AND FUTURE TRENDS **9**

Quantum Computing Basics: Qubits, Superposition, Entanglement-Quantum vs Classical Computing-Use Cases: Cryptography, Drug Discovery, Optimization-Emerging Trends: Edge AI, Digital Twins, 6G Networks, Web 3.0-Future Tech Challenges: Ethics, Privacy, Security.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Explore fundamental concepts of AI and Machine Learning.

CO2: Describe the architecture and real-time applications of the Internet of Things.

CO3: Explain the working of Blockchain and its use in decentralized applications.

CO4: Illustrate the concepts and applications of AR, VR, and MR in industry.

CO5: Analyze emerging computing paradigms and their real-world implications.

TEXT BOOKS

1. Kaur, H., & Saxena, P. Emerging Technologies for Education, Springer, 2020.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things – A Hands-on Approach, VPT, 2015.
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson, 2021.

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REFERENCE BOOKS

1. Melanie Swan, Blockchain: Blueprint for a New Economy, O'Reilly, 2015.
2. Grus, Joel, Data Science from Scratch, O'Reilly, 2019.
3. Andreas M. Antonopoulos, Mastering Bitcoin, O'Reilly, 2017.
4. "Emerging Technologies: A Primer for Educators" by Jennifer Koerber and Michael P. Sauers 1st Edition, May 6 2015.
5. "Introduction to Emerging Technologies in Computing" by Ajit Singh and Anand Nayyar , 1st Edition- CRC Press , 2020.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	-	2	-	-	-	-	-	-	2	2	3
CO2	3	2	2	1	3	-	-	-	-	-	-	2	2	3
CO3	2	2	2	2	3	-	-	1	-	-	-	3	2	3
CO4	2	2	2	2	3	-	-	1	-	1	-	2	2	3
CO5	2	3	3	3	3	2	2	2	1	2	1	3	3	3
AVG	**2.4**	**2.2**	**2.3**	**2**	**2.8**	**2**	**2**	**1.3**	**1**	**1.5**	**1**	**2.4**	**2.2**	**3**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE06 DATABASE SECURITY **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the concepts of web security and cryptographic system.
- To learn privacy protection techniques and web server security concepts.
- To understand access control models in XML, web server security and security in data warehouses.

UNIT I INTRODUCTION **9**

The Web Security, the Web Security Problem, Risk Analysis and Best Practices Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification.

UNIT II SECURITY MODELS **9**

The Web 's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications.

UNIT III DATABASE SECURITY **9**

Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems.

UNIT IV SECURITY RE-ENGINEERING FOR DATABASES **9**

Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy

Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Database.

UNIT V PRIVACY IN DATABASE **9**

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy enhanced Location-based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain web security challenges and apply cryptographic techniques for secure communication.

CO2: Analyze privacy risks and implement security for servers and web applications.

CO3: Recognize access control models and trust management in database systems.

CO4: Apply re-engineering methods like watermarking and damage recovery for database security.

CO5: Evaluate privacy-preserving techniques for database publishing and mobile environments.

TEXT BOOKS

1. Web Security, Privacy and Commerce by Simson Garfinkel & Gene Spafford, 2nd Edition- O'Reilly Media, June 1997.
2. Database security applications and trends Michael Gertz, Sushil Jajodia,1st Ed., 2007.
3. Michael Gertz and Sushil Jajodia (Editors), Handbook of Database Security: Applications and Trends, ISBN-10: 0387485325. Springer, 2007.

REFERENCE BOOKS

1. Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, Ahmed Sallam, and Hala S. El-Sayed, Multilevel Security for Relational Databases, 1st Edition Auerbach Publications, 2014.
2. Bhavani Thuraisingham, Database and Applications Security: Integrating Information Security and Data Management, CRC Press, Taylor & Francis Group, 2005.
3. Database Security and Auditing, Hassan A. Afyouni, India Edition, CENGAGE Learning, 2009.
4. Database Security, Castano, 2nd Edition, Pearson Education, 1994.
5. Database Security by Alfred Basta, Melissa Zgola, Cengage Learning, 1st Edition Addison-Wesley / ACM Press, 1995.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	-	2	-	-	-	-	-	-	2	3	2
CO2	3	2	3	-	3	2	2	-	-	-	-	2	3	2
CO3	2	2	3	2	3	-	2	-	-	-	1	3	2	3
CO4	3	3	3	3	3	1	-	1	-	-	1	3	1	3
CO5	2	3	3	2	3	2	2	2	1	2	2	3	1	2
AVG	**2.6**	**2.4**	**3**	**2.3**	**2.8**	**1.7**	**2**	**1.5**	**1**	**2**	**1.3**	**2.6**	**2**	**2.4**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE07 INFORMATION EXTRACTION AND RETRIEVAL **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To Understand the Basics of Information Retrieval.
- To Understand Machine Learning Techniques for Retrieval Models.
- To Learn Hadoop and Map Reduce for Analysis Process.

UNIT I INTRODUCTION **9**

History of IR- Components of IR - Issues -Open source Search engine Frameworks - The Impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus Web Search - Components of a search engine, Characterizing the web.

UNIT II BOOLEAN AND VECTOR SPACE RETRIEVAL MODELS **9**

Term weighting - TF-IDF weighting- cosine similarity - Preprocessing - Inverted indices - efficient processing with sparse vectors Language Model based IR - Probabilistic IR -Latent Semantic indexing - Relevance feedback and query expansion.

UNIT III WEB SEARCH OVERVIEW **9**

Web structure the user paid placement search engine optimization, Web Search Architectures - crawling - meta-crawlers, Focused Crawling - web indexes – Near duplicate detection - Index Compression - XML retrieval.

UNIT IV LINK ANALYSIS **9**

Hubs and Authorities - Page Rank and HITS algorithms -Searching and Ranking - Relevance Scoring and ranking for Web - Similarity - Hadoop & Map Reduce - Evaluation - Personalized search - Collaborative filtering and content-based recommendation of documents and products - handling invisible Web - Snippet generation Summarization. Question Answering, Cross- Lingual Retrieval.

UNIT V TEXT CLASSIFICATION AND CLUSTERING **9**

Text Mining- Text classification and clustering - Categorization algorithms, Naive Bayes, decision trees and nearest neighbor - Clustering Algorithms: Agglomerative Clustering, K-Means, Expectation Maximization (EM).

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1**:** Explain the fundamentals of Information Retrieval (IR) and the impact of web and AI technologies on IR systems.

CO2**:** Apply Boolean, vector space, and probabilistic models for document retrieval using term weighting and relevance feedback techniques.

CO3**:** Describe web search engine architectures, crawling techniques, indexing, and optimization strategies.

CO4**:** Analyze link-based ranking algorithms and recommendation systems, and evaluate web search performance using tools like MapReduce.

CO5**:** Apply classification and clustering algorithms for text mining and document organization.

TEXT BOOKS

1. C. Manning, P. Raghvanand H Schutze Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro –Neto, Modern Information Retrieval, The Concepts and Technology behind Search 2nd Edition, ACM Press Books, 2011.
3. An Introduction to Information Retrieval: Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, 1st Edition, Cambridge University Press-2008.

REFERENCE BOOKS

1. Information Retrieval: Implementing and evaluating search engines: Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, 1st Edition, MIT Press.
2. Phir Frieder “Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series “, 2nd Edition, Springer, 2004.
3. Modern Information Retrieval : Ricardo Yates, Berthier Ribeiro-Neto, 2nd Edition , Addison Wesley Professional, 2010.
4. Bruce Croft, Donald Metzler and Trevor Strohman Search Engines Information Retrieval in Practice 1st Edition Addison Wesley, 2009.
5. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	2	-	-	-	2	1	1	2	3	2
CO2	3	2	3	3	2	-	-	-	1	1	1	2	2	1
CO3	3	2	2	2	3	-	-	-	2	1	2	1	3	2
CO4	3	3	2	2	2	-	-	-	2	2	1	1	2	1
CO5	3	2	2	2	3	-	-	-	1	1	1	-	3	1
AVG	**3**	**2.4**	**2.4**	**2.2**	**2.4**	**-**	**-**	**-**	**1.6**	**1.2**	**1.2**	**1.5**	**2.6**	**1.4**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE08 MULTIMEDIA SYSTEMS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To provide an overview of multimedia systems and components.
- To understand multimedia data representations, file formats and compression techniques.
- To develop multimedia applications using appropriate tools and techniques.

UNIT I MULTIMEDIA SYSTEMS **9**

Definition – Multimedia elements – Multimedia applications – Multimedia system architecture – Multimedia hardware and software – Components of multimedia – Multimedia Authoring – Editing Tools – Multimedia Data – Text – Images – Audio – Video – Animation.

UNIT II MULTIMEDIA DATA REPRESENTATION **9**

Graphics/Image Data types – File formats – Color models – Color transformation – Basics of digital audio – Audio file formats – Video fundamentals – Analog video – Digital video – Video file formats – Storage requirements – Optical media.

UNIT III COMPRESSION TECHNIQUES **9**

Need for Compression – Lossless compression techniques – Run Length Encoding – Huffman Encoding – Dictionary Based – Arithmetic Coding – Lossy Compression Techniques – JPEG Image Compression Standard – MPEG Video Compression Standard – Audio compression – MP3 – Adaptive Differential PCM.

UNIT IV MULTIMEDIA COMMUNICATION AND NETWORKING **9**

Multimedia Communication Models – Multimedia Network Characteristics – Network Requirements for Audio/Video Transmission – Multimedia over LAN/WAN – IP Multicast – Multimedia Transport in Internet – RTP – RTCP – Voice over IP (VoIP) – Multimedia Conferencing.

UNIT V MULTIMEDIA APPLICATIONS AND TOOLS **9**

Multimedia Databases – Content-Based Retrieval – Virtual Reality – Augmented Reality –

Multimedia Authoring Tools – OpenGL – Flash – Animation Software – Case Studies: Gaming, E-Learning, Digital Libraries, Interactive TV, and Mobile Multimedia Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Outline the essential architecture and modules involved in multimedia systems.

CO2: Analyze multimedia data formats and representations.

CO3: Apply suitable compression techniques for multimedia content.

CO4: Demonstrate understanding of multimedia communication protocols and networking.

CO5: Develop multimedia applications using authoring tools and frameworks.

TEXT BOOKS

1. Ralf Steinmetz and Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education, 1st Edition, 2002.
2. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", Pearson Education, 2nd Edition, 2014.
3. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Pearson Education, 2001.

REFERENCE BOOKS

1. Prabhat K. Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI Learning, 2013.
2. Judith Jeffcoate, "Multimedia in Practice: Technology and Applications", PHI, 1998.
3. K. R. Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education, 2002.
4. Mark J. P. Wolf and Bernard Perron, "The Routledge Companion to Video Game Studies", Routledge, 2014.
5. Pankaj Sharma, "Multimedia and Web Technology", Firewall Media, 2008.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	3	-	-	-	2	2	3	1	1	3
CO2	3	3	2	3	2	-	-	-	2	2	3	3	2	3
CO3	3	3	3	2	3	-	-	-	2	2	1	2	2	3
CO4	2	3	3	3	3	-	-	-	2	2	3	2	3	3
CO5	3	3	3	3	3	-	-	-	3	1	3	2	3	2
AVG	**2.8**	**3**	**2.8**	**2.8**	**2.8**	**-**	**-**	**-**	**2.2**	**1.8**	**2.6**	**2**	**2.2**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

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24CSPE09 SECURITY IN COMPUTING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect and prevent a cyber attack.

UNIT I INTRODUCTION **9**

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT II ATTACKS AND COUNTER MEASURES **9**

OWASP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT III RECONNAISSANCE **10**

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT IV INTRUSION DETECTION **8**

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT V INTRUSION PREVENTION **9**

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Describe the fundamentals of cyber security, cybercrime types, and relevant cyber laws including the Indian IT Act.

CO2**:** Identify common cyber attacks, threats and vulnerabilities and apply basic countermeasures to mitigate them.

CO3**:** Perform reconnaissance using scanning tools and techniques to gather information

about target systems.

CO4**:** Explain various intrusion detection systems and their role in identifying cyber threats.

CO5**:** Evaluate firewall architectures and intrusion prevention systems for securing networks.

TEXT BOOKS

1. Behrouz A. Forouzan, Cryptography and Network Security, 3rd Edition, Tata McGraw- Hill, 2015.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security 1st Edition, Pearson Education - 2010.
3. Mark Ciampa, Security+ Guide to Network Security Fundamentals, 6th Edition, Cengage Learning - 2017.

REFERENCE BOOKS

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 .
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011.
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007.
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", 3rd Edition, Pearson Education, 2015.
5. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, 2014.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1	1	1	1	-	1	-	-	-	-	1	-	2	2
CO2	1	3	1	3	2	1	-	-	-	-	-	-	2	2
CO3	2	1	1	1	-	1	-	-	-	-	1	-	2	2
CO4	3	3	2	2	2	1	-	-	-	-	-	-	2	2
CO5	3	2	1	1	1	1	-	1	-	-	1	-	2	2
AVG	**2**	**2**	**1.2**	**1.6**	**1.7**	**1**	**-**	**1**	**-**	**-**	**1**	**-**	**2**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE10 HIGH PERFORMANCE COMPUTING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To learn the different ways of exploiting Instruction Level Parallelism.
- To understand message passing paradigm using MPI.
- To learn shared memory programming paradigm with Pthreads, OpenMP and

architecture.

UNIT I HIGH PERFORMANCE COMPUTING **10**

Classes of computers - Classes of parallelism - Dependability - Quantitative principles of computer design - ILP: Concepts and challenges - Basic compiler techniques for exposing ILP - Branch prediction - Dynamic scheduling - Hardware based Speculation - Multiple issue, static and dynamic scheduling - Limitations of ILP - Case Study: Intel Core i7, ARM Cortex - A53.

UNIT II MESSAGE PASSING PARADIGM **9**

Basic MPI programming - MPI_Init and MPI_Finalize - MPI communicators - SPMD programs- Message passing -MPI_Send and MPI_Recv - Message matching - The Trapezoidal Rule in MPI - MPI I/O - Collective communication: MPI_Reduce - MPI_Allreduce - Broadcast – Scatter- Gather - Allgather - Derived Datatypes– Performance evaluation of MPI programs - Parallel Sorting.

UNIT III SHARED MEMORY PARADIGM: PTHREADS AND OPENMP **9**

Basics of P threads - Matrix-Vector Multiplication - Critical section - Busy waiting - Mutexes - Semaphores – Barriers and Condition variables. OpenMP: Basic OpenMP constructs - Trapezoidal Rule - Scope of variables – Reduction clause - Parallel For directive – Sorting - Scheduling loops - Synchronization in OpenMP: Atomic and Critical Directive, Locks.

UNIT IV VECTOR, SIMD AND GPU ARCHITECTURES **8**

Vector architecture: Vector Execution Time - Multiple Lanes - Vector-Length Registers - Vector Mask Registers - Vector Mask Register - Memory Banks – Stride – Gather and Scatter - Programming Vector Architecture. SIMD instruction set extensions for multimedia. Graphics processing units: Programming the GPU-NVIDIA GPU Computational Structures - NVIDA GPU Instruction Set Architecture-NVIDIA GPU Memory Structures – Similarities and Differences between Vector Architectures, SIMD Computers and GPUs - Detecting and Enhancing Loop Level Parallelism.

UNIT V MULTIPROCESSOR AND WAREHOUSE-SCALE ARCHITECTURE **9**

Multiprocessor architecture: Issues and approaches - Centralized shared memory architecture – Multiprocessor cache coherence - Snooping cache coherence protocol - Directory based cache coherence protocols.Warehouse-Scale Architectures: Programming models and workloads for Warehouse-Scale computers - Architecture for Warehouse-Scale computers – Efficiency and costs - Cloud computing - Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Explain Instruction-Level Parallelism (ILP) concepts and evaluate modern processor architectures such as Intel Core i7 and ARM Cortex-A53.

CO2**:** Develop parallel programs using the Message Passing Interface (MPI) and assess their performance.

CO3**:** Implement parallel algorithms using Pthreads and OpenMP, and handle synchronization mechanisms efficiently.

CO4**:** Execute parallel programming techniques for GPU-based systems.

CO5**:** Analyze multiprocessor and warehouse-scale architectures, and evaluate programming models used in cloud computing environments.

TEXT BOOKS

1. John L. Hennessey and David A. Patterson, "Computer architecture - A quantitative approach", Morgan Kaufmann / Elsevier Publishers, 6th Edition, 2017.
2. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011.
3. Thomas Rauber and Gudula Rünger, Parallel Programming: For Multicore and Cluster Systems, Springer, 2nd Edition, 2013.

REFERENCE BOOKS

1. David E.Culler, Jaswinder Pal Singh, "Parallel computing architecture: A hardware/software approach", Morgan Kaufmann /Elsevier Publishers, 1999.
2. Kai Hwang and Zhi Wei Xu, "Scalable Parallel Computing", Tata McGraw Hill, New Delhi, 2003.
3. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill Education, 2003.
4. Barbara Chapman, Gabriele Jost, and Ruud van der Pas, Using OpenMP: Portable Shared Memory Parallel Programming, MIT Press, 2007.
5. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", Prentice Hall, 2011.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	1	2	1	1	1	2	1	1	1	-	-
CO2	2	3	2	2	3	2	2	2	3	2	2	2	-	-
CO3	3	3	3	3	3	3	3	3	3	3	3	3	-	-
CO4	2	3	2	2	3	2	2	2	3	2	2	2	-	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3	-	-
Avg	**2.6**	**2.8**	**2.2**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	**2.8**	**2.2**	**2.2**	**2.2**	-	-

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE11 GRAPH THEORY **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the graph models and basic concepts of graphs.
- To study the characterization and properties of trees and graph connectivity.
- To provide an exposure to the Eulerian, Hamiltonian graphs and Optimization Graph algorithms.

UNIT I INTRODUCTION TO GRAPHS **9**

Graphs and Graph Models – Connected graphs – Common classes of graphs – Multi graphs and Digraphs – Degree of a vertex – Degree Sequence – Graphs and Matrices – Isomorphism of graphs.

UNIT II TREES AND CONNECTIVITY **9**

Bridges – Trees – Characterization and properties of trees – Cut vertices – Connectivity.

UNIT III TRAVERSABILITY **9**

Eulerian graphs – Characterization of Eulerian graphs – Hamiltonian graphs – Necessary condition for Hamiltonian graphs – Sufficient condition for Hamiltonian graphs -Tree Traversals- Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap. B-Tree – B+ Tree – Graph Definition – Representation of Graphs.

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UNIT IV PLANARITY AND COLOURING **9**

Planar Graphs – The Euler Identity – Non planar Graphs – Vertex Colouring – Lower and Upper bounds of chromatic number.

UNIT V DESIGN OPTIMIZATION GRAPH ALGORITHMS **9**

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Explore basic graph concepts, representations, and identify isomorphic graphs.
CO2**:** Analyze the properties of trees, bridges, and graph connectivity.
CO3**:** Apply traversal algorithms on trees and graphs, and implement advanced tree data structures like AVL and B-trees.
CO4**:** Explain planar graphs and graph coloring, and determine chromatic bounds.
CO5**:** Evaluate classification algorithms using cross-validation and statistical tests in machine learning experiments.

TEXT BOOKS

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PHI, 2004.
2. Douglas B. West, Introduction to Graph Theory, 2nd Edition, Pearson Education, 2001.
3. Seymour Lipschutz, Theory and Problems of Discrete Mathematics, Schaum's Outline Series, McGraw-Hill, 2007.

REFERENCE BOOKS

1. J.A. Bondy and U.S.R. Murty, Graph Theory with Applications, Macmillan, 1976.
2. Robin J. Wilson, Introduction to Graph Theory, 5th Edition, Pearson Education, 2010.
3. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill, 2011.
4. Thomas H. Cormen et al., Introduction to Algorithms, 3rd Edition, MIT Press, 2009.
5. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann, 2011.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO4	3	3	2	-	-	-	-	-	-	-	-	-	2	3
CO5	3	3	2	2	2	-	-	-	-	-	-	-	3	3
AVG	3	2.8	2	2	2	-	-	-	-	-	-	-	2.8	2.8

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE12 CYBER FORENSICS **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To understand the fundamentals of cyber forensics.
- To study various cybercrimes and investigation techniques.
- To explore tools and techniques used in cyber forensics.

UNIT I INTRODUCTION TO CYBER FORENSICS **9**

Fundamentals of Computer Forensics - Digital Evidence – Types, Rules, Integrity - Basics of Cyber Crimes - Forensics Procedures & Ethics - Computer Forensics vs Cyber Forensics - Legal Aspects of Cyber Forensics - Cyber Laws in India (IT Act 2000, Amendments).

UNIT II CYBER CRIME INVESTIGATION **9**

Cyber Crime Investigation Process - Evidence Collection and Preservation - Chain of Custody - Search & Seizure of Digital Evidence - Incident Response & Handling - Role of

Forensics Investigator - Types of Cyber Crimes: Hacking, Phishing, Identity Theft, Cyber Terrorism, Financial Frauds.

UNIT III DIGITAL FORENSICS TECHNIQUES & TOOLS 9

Disk Imaging & Cloning - Data Recovery Techniques - File Systems Forensics (FAT, NTFS, EXT) - Steganography & Cryptography in Forensics - Email & Web Forensics - Forensic Tools: FTK (Forensic Toolkit), Autopsy, EnCase, Wireshark, Volatility (Memory Forensics).

UNIT IV NETWORK & MOBILE FORENSIC 9

Network Forensics Concepts - Packet Capturing & Analysis - Wireless Attacks & Investigation - Mobile Device Forensics - SIM Card & Memory Analysis - Android & iOS Forensics Tools - Cloud Forensics Basics.

UNIT V CASE STUDIES & RECENT TREND 9

Case Studies of Real Cyber Crime Incidents - Investigation Reports - Dark Web & Deep Web Analysis - Challenges in Cyber Forensics - Future Trends: AI in Forensics, Blockchain Forensics, IoT Forensics, Cyber Threat Intelligence.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Explain the fundamentals of cyber forensics, digital evidence handling, and legal aspects including the IT Act.

CO2**:** Describe the cybercrime investigation process and apply standard procedures for evidence collection and preservation.

CO3**:** Use forensic techniques and tools for data recovery, file system analysis, and email/web forensics.

CO4**:** Analyze digital evidence from networks, mobile devices, and cloud environments using appropriate tools.

CO5**:** Evaluate real-world cybercrime cases and recent trends including AI, blockchain, and IoT in cyber forensics.

TEXT BOOKS

1. Guide to Computer Forensics and Investigations by Bill Nelson, Amelia Phillips, and Christopher Steuart 7th Edition, Cengage Learning publications- 2024.
2. Computer Forensics: Computer Crime Scene Investigation by John R. Vacca, 2nd Edition, Charles River Media, 2005.
3. B.B.Gupta, D.P.Agrawal, Handbook of Computer Networks and Cyber Security, Springer, 2020.

REFERENCE BOOKS

1. Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, 1st Edition Pearson Education – 2004.
2. Eoghan Casey, Digital Evidence and Computer Crime, Academic Press, 3rd Edition, 2011.
3. Nilabh Nishchhal, Cyber Forensics Uncovered, BPB Publications, 2021.

4. Pankaj Sharma, Cyber Security and Cyber Forensics, Khanna Publishing House, 2019.
5. Dhananjay R. Kalbande and Saurabh Babar, Introduction to Cyber Forensics and Investigation, Dreamtech Press, 2021.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	2	1	-	-	2	-	-	-	1	3	2
CO2	2	3	2	3	3	2	-	2	-	-	-	1	2	3
CO3	2	2	3	3	3	-	-	2	1	-	-	1	2	3
CO4	2	2	1	2	2	2	-	3	1	-	-	2	2	3
CO5	3	3	2	3	3	2	1	2	2	2	1	2	3	3
AVG	**2.4**	**2.4**	**2**	**2.6**	**2.4**	**2**	**1**	**2.2**	**1.3**	**2**	**1**	**1.4**	**2.4**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE13 FUZZY SYSTEMS AND APPLICATIONS

L T P C
3 0 0 3

COURSE OBJECTIVES

- To understand the basic concepts of fuzzy sets.
- To understand the concepts of arithmetic operations on fuzzy numbers.
- To understand the concepts fuzzy relations and fuzzy logic.

UNIT I FUNDAMENTALS OF FUZZY LOGIC 9

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union intersection- combination of operation- general aggregation operations- fuzzy relations- compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems.

UNIT II FUZZY MODELING 9

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of adaptive learning capability.

UNIT III ARCHITECTURE OF NEURAL NETWORKS 9

Basic concepts: Fuzzy Set Theory- Basic Concept of Crisp Sets and Fuzzy Sets- Complements- Union Intersection- Combination of Operation- General Aggregation Operations- Fuzzy Relations- Compatibility Relations-Orderings- Morphisms- Fuzzy Relational Equations-Fuzzy Set and Systems Pattern Classification- Biases and Thresholds, Linear Separability - Hebb's Rule- Algorithm - Perceptron - convergence theorem-Delta rule.

UNIT IV GENETIC ALGORITHMS **9**

Introduction - Genetic Algorithm and Search Space - Basic Terminologies in Genetic Algorithm - Operators in Genetic Algorithm - Classification of Genetic Algorithm - Advantages and Limitations of Genetic Algorithm - Applications of Genetic Algorithm.

UNIT V APPLICATIONS **9**

Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction: CANFIS modeling for color recipe prediction.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Describe the principles of fuzzy logic, including fuzzy sets, relations, and aggregation operations.

CO2: Analyze the structure and learning capabilities of neuro-fuzzy models such as ANFIS.

CO3: Explain the architecture of neural networks and apply learning algorithms for pattern classification.

CO4: Illustrate the working of genetic algorithms and use them for solving optimization problems.

CO5: Apply soft computing techniques to real-world applications like character recognition and color prediction.

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TEXT BOOKS

1. Jang J.S.R., Sun C.T and Mizutami,Neuro Fuzzy and Soft computing, Prentice Hall New Jersey, 1998.
2. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India Pvt Ltd, 2019.
3. Kliryvan- Fuzzy System & Fuzzy logic, 1st Edition , Prentice Hall of India, 1995.

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1. Roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.
2. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
3. S. N. Sivanandam and S. N. Deepa, Principles of Soft Computing, Wiley India, 2nd Edition, 2011.
4. Lawrence Fussett- Fundamental of Neural network Prentice Hall, 1st Edition.
5. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley India, 4th Edition, 2020.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1	3	3	-	-	3	-	-	-	3	-	-	1	2
CO2	-	-	-	-	3	3	-	-	-	3	-	-	1	-
CO3	1	3	3	-	3	3	-	-	-	2	-	-	2	1
CO4	-	3	3	-	2	3	-	-	-	2	-	-	2	-
CO5	1	3	3	-	3	3	-	-	-	3	-	-	3	2
AVG	**1**	**3**	**3**	**-**	**2.8**	**3**	**-**	**-**	**-**	**2.6**	**-**	**-**	**1.8**	**1.7**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE14 QUANTUM CRYPTOGRAPHY **L T P C**

3 0 0 3

COURSE OBJECTIVE

- To understand the components of computing in a quantum world
- To gain knowledge on mathematical representation of quantum physics and operations.
- To write computations in the real world (standard) in a quantum computer and simulator.

UNIT I FUNDAMENTAL CONCEPTS **9**

Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information.

UNIT II QUANTUM INFORMATION **9**

Quantum Noise and Quantum Operations: Classical Noise and Markov processes – Quantum Operations – Examples – Applications – Distance Measures for Quantum Information – Quantum Error Correction – Entropy.

UNIT III QUANTUM COMPUTATION **9**

Circuit model of Quantum Computing: Quantum gates and Circuit, Qiskit programming. Entanglement: Bell state, Quantum Teleportation, Superdense coding, Phase kickback, No-cloning theorem, Quantum parallelism, Deutsch-Jozsa algorithm, Bernstein-Vazirani algorithm, Grover search algorithm.

UNIT IV QUANTUM MECHANICS **9**

Quantum Mechanics: Linear Algebra – Postulates of Quantum Mechanics – Application: Superdense Coding– Density Operator – The Shmidt Decomposition and Purifications –EPR and the Bell Inequality – Computational Models: Turing Machines – Circuits – Analysis of Computational Problems.

UNIT V QUANTUM DATA COMPRESSION **9**

Quantum States and Accessible Information – Data Compression – Classical Information

Over Noisy Quantum Channels – Quantum Information Over Noisy Quantum Channels – Entanglement as a Physical Resource – Quantum Cryptography.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Discuss the basics of quantum computation and information.

CO2**:** Analyze quantum operations, noise, and error correction methods.

CO3**:** Implement quantum circuits and algorithms using Qiskit.

CO4**:** Apply quantum mechanics to computational models and problems.

CO5**:** Explain quantum data compression and secure information transfer.

TEXT BOOKS

1. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", 10th Edition, Cambridge University Press, 2010.
2. Maria Schuld, Francesco Petruccione, "Machine Learning with Quantum Computers", Springer International Publications, 2021.
3. Venkateswaran Kasirajan, "Fundamentals of Quantum Computing -Theory and Practice", Springer, 2021.

REFERENCE BOOKS

1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.
3. Chris Bernhardt, "Quantum Computing for Everyone (The MIT Press)",2019.
4. Nielsen MA, Chuang IL. "Quantum computation and quantum information". Cambridge university press;2010
5. David McMahon, "Quantum Computing Explained", Wiley-IEEE Computer Society Press, 2007.

Mapping of COs with POs & PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	-	2	-	-	-	-	-	-	2	-	-	3	-	-
CO2	3	3	-	-	-	2	-	-	2	-	-	2	-	-
CO3	3	2	3	-	-	1	-	-	3	-	-	3	3	-
CO4	-	2	-	-	-	2	-	-	1	-	-	2	-	-
CO5	3	-	3	-	-	2	-	-	3	-	-	1	3	-
AVG	**3**	**2.3**	**3**	**-**	**-**	**1.8**	**-**	**-**	**2.2**	**-**	**-**	**2.2**	**3**	**-**

1-Low, 2-Medium, 3-High, '-' - No Correlation

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24CSPE15 WIRELESS SENSOR NETWORK **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand wireless communication basics and types.
- To learn the structure and uses of ad hoc and sensor networks.
- To explore different types of routing protocols and energy-saving methods in wireless networks.

UNIT I INTRODUCTION **9**

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

UNIT II AD HOC AND SENSOR NETWORKS **9**

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

UNIT III MAC PROTOCOLS **9**

MAC Protocols : Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

UNIT IV ROUTING PROTOCOLS **9**

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

UNIT V QoS AND ENERGY MANAGEMENT **9**

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Summarize wireless communication technologies, channel characteristics, and network types.

CO2: Explain the architecture, challenges, and applications of ad hoc and sensor networks.

CO3: Analyze MAC protocols and their design issues in wireless and sensor networks.

CO4: Classify and compare routing protocols used in ad hoc networks.

CO5: Identify QoS challenges and energy management techniques in wireless networks.

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TEXT BOOKS

1. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education- 2008.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, “Wireless Sensor Networks, Technology, Protocols and Applications”, Wiley, 2007.
3. Jun Zheng, Abbas Jamalipour, “Wireless Sensor Networks: A Networking Perspective”, Wiley, 2009.

REFERENCE BOOKS

1. Erdal Cayirci and Chunming Rong, Security in Wireless Ad Hoc and Sensor Networks, Wiley, 2009.
2. Subir Kumar Sarkar, T. G. Basavaraju, and C. Puttamadappa, Ad Hoc Mobile Wireless Networks: Principles, Protocols and Applications, Auerbach Publications, 2007.
3. Feng Zhao and Leonides Guibas"Wireless sensor networks",Elsevier publication 2004.
4. Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2003.
5. William Stallings, "Wireless Communications and Networks ", Pearson Education 2004.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	-	2	-	1	-	-	-	-	2	3	2
CO2	3	3	2	-	2	1	2	-	-	-	-	2	3	3
CO3	3	3	3	2	3	-	1	-	-	1	-	3	3	2
CO4	3	3	3	2	3	-	1	-	-	1	-	3	3	3
CO5	3	2	2	2	3	2	3	-	-	-	-	3	3	3
AVG	**3**	**2.6**	**2.2**	**2**	**2.6**	**1.5**	**1.6**	**-**	**-**	**1**	**-**	**2.6**	**3**	**2.6**

1 – Low, 2 – Medium, 3 – High, ‘-’ – No correlation

24CSPE16 BUSINESS INSIGHTS FROM BIG DATA **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To introduce the fundamentals of Big Data and Business Analytics.
- To understand data integration techniques and big data processing frameworks.
- To develop knowledge of data management, visualization, and analytical tools.

UNIT I INTRODUCTION **9**

Introduction to Big data: Characteristics of Data- Challenges with Big Data-Traditional Business Intelligence (BI) versus Big Data- Business Analytics vs. Business Intelligence -Big Data Analytics and Business Analytics: An introduction– Business Analytics— Business Intelligence– Challenges of Big Data and Business Analytics.

UNIT II DATA INTEGRATION **9**

Data Integration – Data Integration Solutions – ETL – Data Integration Methodologies – Big Data Processing: Architecture – Traditional vs Big Data Framework– Big Data related technologies– Big Data Industry 4.0 Applications.

UNIT III DATA ANALYTICS IN BUSINESS **9**

Data Management, Data Visualization, Data Warehousing-ETL Data Processing Chain From Business Intelligence to Business Analytics-Business Analytics Cycle- Analytical Tools & Methods,-Integration Social Analytics-Operational Analytics-Big Data Analytics-Tools- Hadoop, Informatics, Cognos , power BI.

UNIT IV STATISTICAL METHODS **9**

Statistical methods and analytics techniques used across business – Statistical methods and analytics techniques used in sales and marketing– Data types generated in sales and marketing function– Statistical Methods and Analytical Techniques– Statistical Methods and Analytics Techniques used in Supply Chain Management– Analytics use case in SCM.

UNIT V BIG DATA APPLICATIONS IN BUSINESS **9**

Applications of Big Data – Big Data Analytics in Finance Industry–Education–Biomedical Research— Applications in Healthcare– Big Data Use case: Warehouse Management and Supply Chain – Automobile in Industry– Pharmaceuticals – Sport Analytics -Transportation-Advertising and Marketing-Banking and Financial Services.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Summarize the fundamentals of big data, business analytics, and their challenges.

CO2: Explain data integration methods and big data processing frameworks and applications.

CO3: Apply data analytics tools for business insights and decision-making.

CO4: Use statistical techniques for analytics in marketing, sales, and supply chain.

CO5: Identify big data applications across various industries and business functions.

TEXT BOOKS

1. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses by Michael Minelli, Michele Chambers, and Ambiga Dhiraj, 1st Edition- John Wiley & Sons , January 2013.
2. "Big Data Analytics: Applications in Business and Marketing" by Kiran Chaudhary and Mansaf Alam , 1st Edition – Auerbach , 2021.
3. "Business and Big Data Analytics" by Amit Johri & Dr. Akshai Aggarwal , 1st Edition - Himalaya Publishing House , 2023.

REFERENCE BOOKS

1. Michael Minelli, Michele hambers, Ambiga Dhiraj, ―Big Data, Big Analytics: Emerging Business
2. Intelligence and Analytic Trends for Today‘s Business, Wiley CIO Series, 1st Edition,2013.
3. Rajiv Sabherwal, Irma Becerra- Fernandez, ― Business Intelligence – Practice, Technologies and Management, John Wiley, 1st Edition,2011.
4. Arvind Sathi, ―Big Data Analytics: Disruptive Technologies for Changing the Game, IBM Corporation, 1st Edition,2012.
5. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	1	3	3	-	-	3	-	-	-	3	-	-	1	2
CO2	-	-	-	-	3	3	-	-	-	3	-	-	1	-
CO3	1	3	3	-	3	3	-	-	-	2	-	-	2	1
CO4	-	3	3	-	2	3	-	-	-	2	-	-	2	-
CO5	3	2	2	2	3	2	3	-	-	-	-	3	3	3
AVG	**1.7**	**2.8**	**2.8**	**2**	**2.8**	**2.8**	**3**	**-**	**-**	**2.5**	**-**	**3**	**1.8**	**2**

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

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24CSPE17 CYBER THREATS AND VULNERABILITIES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the fundamental concepts of cybersecurity threats and vulnerabilities.
- To explore the types and techniques of cyberattacks and risk assessment practices on system and networks.
- To study the tools and methodologies used in threat detection and prevention and to apply theoretical knowledge in real-world threat scenarios.

UNIT I INTRODUCTION TO CYBER SECURITY AND THREATS **9**

Cybersecurity fundamentals – Importance of security – Threat landscape – Types of threats: malware, phishing, social engineering, DoS/DDoS – Insider vs outsider threats – Cyber kill chain model – Real-world attack case studies.

UNIT II SYSTEM AND NETWORK VULNERABILITIES **9**

System vulnerabilities – Operating system flaws – Buffer overflows – Insecure APIs – Network vulnerabilities – Protocol weaknesses – Open ports – Wireless network threats – Vulnerability assessment tools and techniques.

UNIT III WEB APPLICATION AND SOFTWARE VULNERABILITIES 9

Common web vulnerabilities – OWASP Top 10 – SQL Injection – Cross Site Scripting(XSS) – Cross Site Request Forgery (CSRF) – Directory traversal – Software bugs and logic flaws – Secure software development practices.

UNIT IV THREAT DETECTION AND INCIDENT RESPONSE 9

Threat Intelligence – Indicators of Compromise (IOCs) – Logging and monitoring – Security Information and Event Management (SIEM) – Intrusion Detection Systems (IDS) – Incident response lifecycle – Containment and recovery.

UNIT V CASE STUDIES AND MITIGATION STRATEGIES 9

Advanced Persistent Threats (APT) – Zero-day vulnerabilities – Ransomware analysis Social engineering scenarios – Penetration testing basics – Cybersecurity frameworks (NIST, ISO 27001) – Best practices and mitigation.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Identify and describe various cyber threats and vulnerabilities.
CO2: Analyze system and network-level security risks.
CO3: Evaluate and mitigate web application and software security issues.
CO4: Demonstrate threat detection and incident response strategies.
CO5: Apply security frameworks and best practices to mitigate cyber risks.

TEXT BOOKS

1. William Stallings, "Computer Security: Principles and Practice", Pearson, 4th Edition, 2023.Mark Ciampa, "Security+ Guide to Network Security Fundamentals", Cengage Learning, 6th Edition, 2018.
2. Mike Shema, "Hacking Web Apps", Syngress, 1st Edition, 2012.
3. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook", Wiley, 2nd Edition, 2011.

REFERENCE BOOKS

1. Nina Godbole and Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India, 2011.
2. Kevin Mitnick, "The Art of Invisibility", Back Bay Books, 2019.
3. Jonathan Ness and Scott Lambert, "Windows Security Threats and Countermeasures", Microsoft Press, 2006.
4. EC-Council, "Certified Ethical Hacker (CEH) Official Courseware", 2025.
5. Bruce Schneier, "Secrets and Lies: Digital Security in a Networked World", Wiley, 2015.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	3	-	-	-	2	2	3	1	1	3
CO2	3	3	2	3	2	-	-	-	2	2	3	3	2	3
CO3	3	3	3	2	3	-	-	-	2	2	1	2	2	3
CO4	2	3	3	3	3	-	-	-	2	2	3	2	3	3
CO5	3	3	3	3	3	-	-	-	3	1	3	2	3	2
AVG	**2.8**	**3**	**2.8**	**2.8**	**2.8**	**-**	**-**	**-**	**2.2**	**1.8**	**2.6**	**2**	**2.2**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE18 AUDITING IT INFRASTRUCTURE FOR COMPLIANCE **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To learn the IT infrastructure auditing Frameworks and standards.
- To understand the legal requirements and challenges in Compliance and to introduce risk management and strategy methods.
- To know about hardware & software components and tools and techniques for analyzing auditing.

UNIT I INTRODUCTION **9**

Overview of IT Auditing - Frameworks and Standards: SOX – HIPAA- PCI-DSS- GDPR-ISO 27001-IT audit types: Security audits -compliance audits-performance audits-operational audits. Audit Process: Planning-data collection-analysis-reporting- follow-up-Compliance and Risk Management.

UNIT II LEGAL AND REGULATORY COMPLIANCE IN IT **9**

Legal Requirements for IT Infrastructure: Data privacy laws-Intellectual property rights-Industry-Specific Regulations: GDPR-HIPAA- PCI-DSS-SOX – an overview and compliance requirements-IT Governance Frameworks: COBIT- ITIL-ISO/IEC 27001-NIST-Global Compliance Challenges: Cross-border data flow-multi-jurisdictional compliance challenges.

UNIT III RISK MANAGEMENT IN IT INFRASTRUCTURE **9**

Introduction to Risk Management-Risk Assessment Models: Qualitative risk methods - Quantitative risk methods. Risk Mitigation Strategies: Technical- administrative-physical controls-Business Continuity and Disaster Recovery: Importance of backup-redundancy-recovery plans.

UNIT IV AUDITING IT INFRASTRUCTURE COMPONENTS **9**

Auditing Hardware Components: Servers- storage systems- network devices-Cloud Infrastructure-Auditing Software and Systems: Operating systems-databases-enterprise applications-Network Auditing: Analyzing network security-intrusion detection-firewalls-

Cloud Auditing: SaaS-PaaS-IaaS-Auditing Data Management: Data integrity-encryption-secure data storage.

UNIT V TOOLS AND TECHNIQUES FOR IT AUDITING **9**

Audit Tools: Introduction-Wireshark-Nessus-Nmap-Splunk-Network Auditing Tools Vulnerability scanners-intrusion detection systems (IDS)-intrusion prevention systems (IPS)-Log Management-Automation in Auditing: Scripted auditing tools-real-world IT infrastructures.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Explore IT auditing concepts, standards, and audit types.
CO2**:** Interpret legal and regulatory compliance frameworks relevant to IT.
CO3**:** Apply risk assessment models and develop mitigation strategies.
CO4**:** Perform audits on IT infrastructure components including networks and cloud.
CO5**:** Use tools and techniques for IT auditing and automation.

TEXT BOOKS

1. Information Technology Auditing by Jason Wood , 1st Edition , John Wiley & Sons, 2013.
2. IT Governance: An International Guide to Data Security and Compliance by Alan Calder & Steve Watkins 8th Edition, IT Governance Publishing- 2024.
3. Auditing IT infrastructure for compliance, 3rd Edition, Robert Johnson, Marty Weiss - Jones & Bartlett Learning - 2022.

REFERENCE BOOKS

1. Auditing IT Infrastructures for Compliance by Chris Davis, Mike Schiller, and Kevin McDonald 3rd Edition- Jones & Bartlett Learning, October 25, 2022.
2. Information Security Risk Analysis by Thomas R. Peltier 3rd Edition , Taylor & Francis - 2010.
3. ISO/IEC 27001:2013 Information Security Management Standards by Jointly developed and published by the International Organization for Standardization (ISO) and the International Electrotechnical Commission 2nd Edition, 2013.
4. Audit Risk Assessment Made Easy by Charles B.Hall,CPA 1st Edition , CPA Hall Talk - 2021.
5. Auditing your information systems and IT infrastructure by Nwabueze Ohia , 1st Edition - Independently published, 2017.

Mapping of COs with POs & PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	-	-	-	-	-	-	2	2	2	2	1
CO2	2	3	1	-	-	-	-	-	-	2	1	1	3	1
CO3	2	3	2	-	2	-	-	-	-	2	2	2	1	1

CO4	1	3	2	-	2	-	-	-	-	2	3	2	2	1
CO5	2	3	2	-	-	-	-	-	-	3	3	1	3	1
AVG	**2**	**2.8**	**1.8**	**-**	**0.8**	**-**	**-**	**-**	**-**	**2.2**	**2.2**	**1.6**	**2.2**	**1.2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE19 ARCHITECTURE AND DESIGN OF SOA **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand and explore the basic principles and architecture of Service-Oriented Architecture (SOA).
- To understand service design principles, web services standards, and technologies.
- To analyze and evaluate SOA for business processes, security, governance, and performance aspects in SOA environments and enterprise systems.

UNIT I INTRODUCTION TO SOA **9**

Introduction – Evolution of SOA – Characteristics of SOA – Benefits of SOA – Principles of Service Orientation – Comparison with Client-Server and Distributed architectures – SOA in the enterprise.

UNIT II WEB SERVICES FUNDAMENTALS **9**

Web services standards – WSDL – SOAP – UDDI – XML – JSON – RESTful services – Messaging – Service Description and Discovery – Role of WSDL and UDDI in SOA – REST vs SOAP.

UNIT III SERVICE DESIGN AND COMPOSITION **9**

Design principles of SOA – Service modeling – Service granularity – Orchestration and choreography – BPEL – Service composition – Transactions in SOA – Compensation handling.

UNIT IV SOA PLATFORMS AND TOOLS **9**

Enterprise Service Bus (ESB) – SOA governance – SOA middleware – SOA in cloud computing – Integration with BPM – Case studies using Apache CXF, WSO2, Mule ESB – Open-source tools.

UNIT V SECURITY AND PERFORMANCE IN SOA **9**

Security challenges in SOA – Identity and access management – WS-Security – Policy enforcement – Performance metrics – Service monitoring – SLA management – Case studies on SOA deployment.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Describe the evolution, principles, and enterprise applications of SOA.

CO2**:** Explain key web service standards and technologies such as SOAP, WSDL, UDDI, and REST.

CO3**:** Design and model services using SOA principles including composition and orchestration.

CO4**:** Utilize SOA platforms and tools for integration, middleware, and governance.

CO5**:** Evaluate security, performance, and monitoring mechanisms in SOA-based systems.

TEXT BOOKS

1. Thomas Erl, Service-Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2005.
2. Thomas Erl, SOA Principles of Service Design", Prentice Hall, 2008.
3. Michael Rosen et al., Applied SOA: Service-Oriented Architecture and Design Strategies, Wiley, 2008.

REFERENCE BOOKS

1. Dirk Krafzig, Karl Banke, and Dirk Slama, "Enterprise SOA: Service-Oriented Architecture Best Practices", Prentice Hall, 2005.
2. Arnon Rotem-Gal-Oz, "SOA Patterns", Manning Publications, 2012.
3. Frank Cohen, "Fast SOA", Prentice Hall, 2007.
4. Rick Sweeney, "Enterprise SOA Implementation", McGraw-Hill, 2008.
5. Mark O'Neill, "Web Services Security", McGraw-Hill Professional, 2003.

Mapping of COs with POs & PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	3
CO2	3	3	2	-	3	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	3	-	-	-	-	-	1	2	3	3
CO4	3	2	3	2	3	-	-	-	-	-	2	2	3	3
CO5	3	3	2	2	2	1	1	1	1	1	2	2	3	2
AVG	**3**	**2.4**	**2**	**1.2**	**2.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**1**	**1.8**	**2.8**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE20 CLOUD VIRTUALIZATION **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce Cloud Computing and Virtualization concepts and explore Cloud Technologies.
- To understand the Basics of Virtualization and experiment with Various Virtualization Tools.
- To learn about Security issues in Cloud and Virtualization.

UNIT I INTRODUCTION TO CLOUD **9**

Evolution of Cloud Computing – System Models for Distributed and cloud computing- NIST Reference Architecture – Cloud Service Models-Cloud Deployment Models-Characteristics of Cloud Computing

UNIT II CLOUD TECHNOLOGIES AND RESOURCE MANAGEMENT **9**

Hadoop-MapReduce-Virtual Box-Google app Engine- Cloud Software environment – OpenStack, Nimbus, Open Nebula-Eucalyptus-Inter Cloud Resource Management – Resource provision- Resource provision methods- Global Exchange of cloud service.

UNIT III VIRTUALIZATION BASICS **9**

Basics of virtual machines-taxonomy of virtual machines-types of virtualization-Implementation levels of virtualization-virtualization structures-tools &mechanism-virtualization of CPU, Memory, I/O Devices-Virtualization supports & Disaster recovery.

UNIT IV VIRTUALIZATION INFRASTRUCTURE & TOOLS **9**

Comprehensive Analysis-Resource Pool-Testing environment-Server virtualization-virtual workloads-Desktop Virtualization, - App virtualization-Work with App virtualization-VM Ware-Amazon Aws, Microsoft Hyper -V – Oracle VM VirtualBox-IBM power vm-Google Virtualization-Case study.

UNIT V SECURITY IN CLOUD AND VIRTUALIZATION **9**

Virtualization system-specific attacks-Guest hopping-vm migration attacks-hyper jacking-cloud security overview-cloud security challenges-security governance-vm security-IAM Standards-IAM Challenges-IAM Architecture and practice-Risk management-Security monitoring.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1**:** Explain cloud computing models, architecture, and characteristics.

CO2**:** Demonstrate knowledge of cloud platforms, resource provisioning, and management.

CO3**:** Describe virtualization concepts and techniques for computing resources.

CO4**:** Apply tools for server, desktop, and app virtualization using industry platforms.

CO5**:** Analyze security issues in cloud and virtualization, including IAM and risk management.

TEXT BOOKS

1. Rittinghouse, John W., and James F. Ransome, Cloud Computing: Implementation, Management & Security, CRC Press, 2017.
2. Kumar, R. R., Wills R. D. K., Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley Publications, 2019.
3. "Virtualization for dummies in a nutshell approach" – Anthony T. Velte, Toby J. Velte Robert Elsenpeter, Tata McGraw-Hill, New Delhi – 2013.

REFERENCE BOOKS

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata McGraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing – A Practical Approach, Tata McGraw Hill, 2009.
3. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platform for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
4. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'Reilly Media, Inc., 2009.
5. Danielle Ruest, Nelson Ruest, "Virtualization: A Beginner's Guide", McGraw-Hill Osborne Media, 2009.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	-	-	2	-	-	-	-	-	-	1	3	2
CO2	2	2	2	2	3	-	-	-	-	-	-	1	3	3
CO3	2	3	2	2	3	-	-	-	-	-	-	1	3	3
CO4	2	3	3	2	3	1	-	-	1	1	2	2	3	3
CO5	3	2	2	3	3	3	2	2	1	1	1	2	3	3
AVG	**2.4**	**2.4**	**1.8**	**1.8**	**2.8**	**1.0**	**0.4**	**0.4**	**0.4**	**0.4**	**0.6**	**1.4**	**3.0**	**2.8**

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

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24CSPE21 DATABASE APPLICATION DEVELOPMENT USING OPEN SOURCE TECHNOLOGY **L T P C 3 0 0 3**

COURSE OBJECTIVES

- To learn about basic concepts for a given database application.
- To understand DDBMS concepts and design and identify the Key Constraints for OODBMS.
- To learn OODBMS design and key aspects of ODMG, ORDBMS and understand Active database and triggers.

UNIT I INTRODUCTION **9**

Purpose of DBMS - Applications - Views of Databases - Database Architecture - Database users and administrators - History of Database systems -Architectural Models for Distributed DBMS - Distributed Database Design- Inheritance, object identity, persistent programming languages - OODBMS and ORDBMS.

UNIT II DISTRIBUTED DBMS CONCEPTS AND DESIGN **9**

Introduction – Functions and Architecture of DDBMS – Distributed database environments -

Distributed Relational Database Design – Transparency in DDBMS – DDBMS Control – Date's Twelve Rules for a DDBMS.

UNIT III OBJECT ORIENTED DATABASES **9**

Introduction – Weakness of RDBMS – Object Oriented Concepts Storing Objects in Relational Databases – Object Oriented Data models – OODBMS Perspectives – Persistence – Issues in OODBMS – Advantages and Disadvantages of OODBMS.

UNIT IV OBJECT ORIENTED DATABASE DESIGN **9**

Object Oriented Database Design: OODBMS Standards and Systems – Object Management Group – Object Database Standard ODMG – Object Relational DBMS – Comparison of ORDBMS and OODBMS.

UNIT V ACTIVE DATABASE AND ADVANCED CONCEPTS **9**

Active Database Concepts and Triggers – Types of SQL Triggers – Temporal Database Concepts – Deductive Databases - Mobile Database – Multimedia Database – Spatial Databases.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Construct ER Model for a given database application.

CO2: Illustrate the concepts for transaction processing and concurrency control for RDBMS.

CO3: Identify the transparency in RDBMS.

CO4: Design an Object-Oriented Database for the given applications.

CO5: Implement active database concepts using triggers.

TEXT BOOKS

1. Thomas M. Connolly and Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation, and Management", 3rd Edition, Pearson Education, 2003.
2. Abraham Silberschatz, Henry F. Korth, S.Sudharshan, Database System Concepts, McGraw-Hill, 7th Edition, 2019.
3. Developing Modern Database Applications with PostgreSQL by Quan Ha-Le and Marcelo Diaz (Aug 2021, Packt) — focuses on app dev, administration, performance, monitoring, and testing using PostgreSQL.

REFERENCE BOOKS

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, 7th Edition, 2015.
2. M.TamerOzsu and Patrick Ualduriel, Principles of Distributed Database Systems, 2nd Edition, Pearson Education, 2003.
3. C.S.R.Prabhu, Object Oriented Database Systems, PHI, 2003.
4. Peter Rob and Corlos Coronel, Database Systems – Design, Implementation and

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Management, Thompson Learning, Course Technology, 5th Edition, 2003.

5. Practical PostgreSQL: A Hardened, Robust, Open-Source Database by Joshua D. Drake & John C. Worsley (2002, O'Reilly) — a classic guide on installing, configuring, and programming PostgreSQL, including PL/pgSQL and replication.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	3	2	1	-	-	-	2	1	1	1	2	1
CO2	2	2	3	1	2	-	-	-	1	2	1	2	2	3
CO3	3	2	2	2	2	-	-	-	2	1	1	2	2	3
CO4	3	2	2	2	2	-	-	-	1	2	1	2	3	3
CO5	3	2	3	2	2	-	-	-	2	1	1	3	2	3
AVG	2.6	2	2.6	1.8	1.8	-	-	-	1.6	1.4	1	2	2.2	2.6

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE22 KNOWLEDGE BASED DECISION SUPPORT SYSTEM

L T P C
3 0 0 3

COURSE OBJECTIVES

- To give students the up-to-date of decision-making concepts, process, strategies, and technologies and used to support decision making in real-world issues coupled with agile approach.
- Students will know how to analyse, to design, to implement and to validate an IDSS and integration of Artificial Intelligence models and Statistical models.
- The course consists of foundations and developments of IDSS, software tools for IDSS development, IDSS for Digital Manufacturing Systems, and IDSS applications.

UNIT I DECISION SUPPORT SYSTEM 9

Decision Making and computerized support: Management support systems. Decision making systems modeling- support.

UNIT II BUSINESS INTELLIGENCE SYSTEM 9

Decision Making Systems – Modeling and Analysis – Business Intelligence – Data Warehousing, Data Acquisition - Data Mining. Business Analysis – Visualization -Decision Support System Development.

UNIT III KNOWLEDGE MANAGEMENT AND COLLABORATION 9

Collaboration, Communicate Enterprise Decision Support System & Knowledge Management – Collaboration Com Technologies Enterprise Information system – Knowledge management.

UNIT IV KNOWLEDGE REPRESENTATION IN AI **9**

Intelligent Support Systems – AI & Expert Systems – Knowledge based Systems – Knowledge Acquisition, Representation & Reasoning, Advanced intelligence system – intelligence system over internet.

UNIT V MANAGEMENT SUPPORT SYSTEM **9**

Implementing MSS in the E-Business ERA – Electronic Commerce – integration, Impacts and the future management support systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the role of decision support systems and computerized decision-making.

CO2: Apply business intelligence tools like data warehousing and data mining for analysis.

CO3: Demonstrate knowledge management and collaboration in enterprise systems.

CO4: Utilize AI techniques for knowledge representation and intelligent support systems.

CO5: Assess the implementation of management support systems in e-business contexts.

TEXT BOOKS

1. Decision Support Systems & Intelligent Systems – 7th Edition Efraim Turban & Jay E.Aronson Ting-Peng Liang - Pearson/Prentice Hall, 2004.
2. Decision support Systems – 2nd Edition – George M Marakas - Pearson/PHI 2002.
3. Decision Support Systems: A Knowledge-based Approach Hardcover – Import, 1996 by C.W. Holsapple (Author), Andrew B . Whinston (Author).

REFERENCE BOOKS

1. Decision Support Systems – V.S. Janakiraman & K. Sarukesi, 1st Edition PHI Learning-2008.
2. Decision Support systems and Data warehouse Systems by Efrem G Mallach-McGraw Hill,2002.
3. Decision Support System -Prentice Hall- George M.Marakas,2003.
4. Knowledge–Based Decision Support Systems With Applications in Business Hardcover – Import, 1995 by Michel R. Klein (Author), Leif B. Methlie (Author).
5. Knowledge management – Enabling Business Growth- Tata McGraw-Hill by Ganesh Natarajan, Sandhya Shekhar, 2002.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	-	3	-	-	2	-	-	-	-	2	-
CO2	-	2	-	-	1	-	-	2	-	-	-	-	1	-
CO3	2	-	-	-	2	-	-	2	-	-	-	-	2	-

CO4	2	-	-	-	3	-	-	2	-	-	-	-	1	-
CO5	2	-	-	-	2	-	-	2	-	-	-	-	1	-
AVG	**2.3**	**0.8**	**0.4**	**-**	**2.2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1.5**	**-**

1-Low, 2-Medium, 3-High, "- "- No Correlation

24CSPE23 COMPUTATIONAL LINGUISTICS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce the fundamentals of natural language processing.
- To understand morphology, syntax, and semantics of text and explore various natural language processing techniques.
- To study applications such as machine translation and analyze and develop NLP.

UNIT I INTRODUCTION TO NLP AND TEXT PROCESSING **9**

Definition – History – Applications – Challenges – NLP tasks – Linguistic essentials – Spoken language and written text – Regular expressions – Tokenization – Text normalization – Sentence segmentation – Part-of-Speech Tagging – Stemming and Lemmatization.

UNIT II MORPHOLOGY AND SYNTAX **9**

Morphological Analysis – Word classes and part-of-speech tagging – Rule-Based and Statistical taggers – Context Free Grammar – Parsing techniques – Top-down and Bottom-up parsing – Dependency Grammar – Transition based dependency parsing.

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UNIT III SEMANTICS AND PRAGMATICS **9**

Meaning representation – Lexical semantics – WordNet – Word Sense Disambiguation – First Order Predicate Calculus – Compositional semantics – Pragmatics – Discourse – Reference resolution – Co-reference resolution.

UNIT IV MACHINE LEARNING FOR NLP **9**

Statistical approaches – N-grams – Language models – Smoothing – Text classification – Sentiment analysis – Naïve Bayes – Logistic regression – Vector Semantics – Word embeddings – Introduction to Transformers and BERT.

UNIT V NLP APPLICATIONS **9**

Machine Translation – Text Summarization – Information Extraction – Named Entity Recognition – Question Answering – Dialogue Systems – Recent trends in NLP – Case Studies using Python NLP libraries (NLTK, SpaCy, Hugging Face).

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Describe the basics of Natural Language Processing and text preprocessing.
CO2: Apply morphological and syntactic analysis techniques.
CO3: Interpret semantic and pragmatic structures of language.
CO4: Analyze and apply machine learning models in NLP.
CO5: Design real-world NLP applications using modern tools

TEXT BOOKS

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", 3rd Edition, Prentice Hall, 2023.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly Media, 2009.
3. James Allen, "Natural Language Understanding", 2nd Edition, Pearson Education, 1995.

REFERENCE BOOKS

1. Chris Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
2. Jacob Eisenstein, Introduction to Natural Language Processing, MIT Press, 2019.
3. Ekaterina Kochmar, Natural Language Processing, Cambridge University Course Notes , University of Bath (Fall 2022).
4. Dan Jurafsky, James H. Martin, Speech and Language Processing, Pearson Education, 2025.
5. Yoav Goldberg, "Neural Network Methods for Natural Language Processing", Morgan & Claypool Publishers, 2017.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	3	-	-	-	2	2	3	1	1	3
CO2	3	3	2	3	2	-	-	-	2	2	3	3	2	3
CO3	3	3	3	2	3	-	-	-	2	2	1	2	2	3
CO4	2	3	3	3	3	-	-	-	2	2	3	2	3	3
CO5	3	3	3	3	3	-	-	-	3	1	3	2	3	2
AVG	**2.8**	**3**	**2.8**	**2.8**	**2.8**	**-**	**-**	**-**	**2.2**	**1.8**	**2.6**	**2**	**2.2**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE24 PARALLEL ARCHITECTURE AND PROGRAMMING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Understand the need and evolution of parallel computing and explore different types of parallel architectures and models
- Develop parallel algorithms using programming paradigms such as OpenMP and MPI.
- Evaluate performance, speed-up, and scalability, debugging, and optimizing parallel systems.

UNIT I INTRODUCTION TO PARALLEL COMPUTING **9**

Introduction to parallel computing and its need - Flynn's Classification (SISD, SIMD, MISD, MIMD) - Levels of parallelism - Amdahl's Law & Gustafson's Law - Trends in parallel architectures - Overview of applications: Scientific, AI/ML, Big Data, etc.

UNIT II PARALLEL ARCHITECTURES **9**

Shared memory and Distributed memory architectures - NUMA vs UMA - Multi-core and Many-core processors - Cache coherence and consistency models - Interconnection networks – Topologies: Mesh, Hypercube, Torus - GPU architecture overview.

UNIT III PARALLEL PROGRAMMING MODELS **9**

Task Parallelism and Data Parallelism - Programming Models: Shared memory (OpenMP), Message passing (MPI) - Synchronization: Barriers, Mutex, Semaphores - Thread creation and management - Race conditions and deadlocks -Performance issues in parallel code.

UNIT IV OPENMP PROGRAMMING **9**

Basics of OpenMP - Parallel constructs: #pragma omp parallel, for, sections, barrier, etc. – Variable scoping (shared, private, reduction) - Scheduling strategies - Nested parallelism - Case studies and performance tuning.

UNIT V MPI PROGRAMMING AND APPLICATIONS **9**

Basics of MPI - MPI communication primitives: Send, Recv, Bcast, Scatter, Gather, Reduce - Point-to-point and Collective communication - Data decomposition techniques - Writing MPI programs using C/C++ - Applications in scientific computing - Hybrid MPI + OpenMP models.

TOTAL: **45 PERIODS**

COURSE OUTCOMES

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

CO1: Explain the fundamentals and classifications of parallel computing systems.
CO2: Compare various parallel architectures and interconnection networks.
CO3: Apply parallel programming models like OpenMP and MPI.
CO4: Develop parallel programs using OpenMP with appropriate synchronization.
CO5: Implement MPI-based programs and hybrid models for real-world applications.

TEXT BOOKS

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Introduction to Parallel Computing Pearson , 2nd Edition - Addison–Wesley , 2003.
2. Quinn, M. J., Parallel Programming in C with MPI and OpenMP, 1st Edition McGraw-Hill , 2003.
3. Parallel Computer Architecture: A Hardware/Software Approach, (by David Culler, Jaswinder Pal Singh & Anoop Gupta) 1st Edition , Morgan Kaufmann – 1998.

REFERENCE BOOKS

1. Peter S. Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann. 1st Edition – published 2011.
2. David B. Kirk & Wen-mei W. Hwu, Programming Massively Parallel Processors, Morgan Kaufmann, 4th Edition: 2022.
3. Barry Wilkinson and Michael Allen, Parallel Programming, 2nd Edition-Pearson, 2004.
4. Advanced Computer Architecture: Parallelism, Scalability, Programmability (by Kai Hwang & Faye Briggs) 1st Edition , 1992.
5. Parallel Programming for Multicore and Cluster Systems (by Thomas Rauber & Gudula Rünger, 3rd Edition, 2023).

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	2	2	-	-	1	-	-	-	1	2	2
CO2	3	3	2	2	3	-	-	1	-	-	-	1	2	3
CO3	2	2	3	3	3	-	-	1	2	2	1	1	3	3
CO4	2	3	2	3	3	-	-	2	1	-	-	2	2	3
CO5	3	3	2	3	3	1	-	2	2	1	1	2	3	3
AVG	**3**	**3**	**2**	**3**	**3**	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**2**	**3**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE25 BLOCK CHAIN AND DISTRIBUTED LEDGER TECHNOLOGY(DLT) **L T P C 3 0 2 4**

COURSE OBJECTIVES

- To understand the fundamentals of blockchain technology and its components.
- To explore different blockchain subjects, platforms, and deploy smart contracts.
- To analyze the impact of blockchain on various industries and gain hands-on experience with blockchain development tools and frameworks

UNIT I INTRODUCTION TO BLOCK CHAIN **9**

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security - Consensus, Permissions, Privacy - Block chain Architecture and Design - Basic crypto primitives: Hash, Signature Hash chain to Block chain - Basic consensus mechanisms.

UNIT II CONSENSUS **9**

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains - Design goals - Consensus protocols for Permissioned Block chains.

UNIT III HYPERLEDGER FABRIC COMPONENT AND DESIGN **9**

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

UNIT IV BLOCKCHAIN IN FINANCIAL SERVICES **9**

Block chain in Financial Software and Systems (FSS): -Settlements, - KYC, - Capital markets -Insurance- Block chain in trade/supply chain: Provenance of goods, visibility,trade supply chain finance, invoice management/discounting.

UNIT V BLOCKCHAIN APPLICATIONS AND DLT **9**

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance- Case Study. Decentralized Network manager: Tezos, Maidsafe, BigChainDB .

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Install Docker, Node.js, Java, Hyperledger Fabric, and Ethereum locally or on the cloud.
2. Create a blockchain network using Hyperledger Fabric Java SDK, set up channel, install chain code, and perform invoke/query.
3. Develop a blockchain-based token system for managing digital assets.
4. Build an app to execute transactions and test rules on the blockchain network.
5. Deploy a smart contract-based application for secure asset transfers.
6. Analyze real-time app development within Hyperledger Fabric.
7. Create a web app using Hyperledger to track fitness club member rewards.
8. Implement a basic car auction app using Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Describe core concepts and architecture of blockchain.

CO2: Evaluate consensus mechanisms and scalability.

CO3: Implement smart contracts using Hyperledger tools.
CO4: Analyze blockchain applications in finance and supply chains.
CO5: Utilize DApps, NFTs, and DLT platforms for real-world solutions**.**

TEXT BOOKS

1. Mark Gates, "Block chain: Ultimate guide to understanding block chain, bit coin, cryptocurrencies" Wise Fox Publishing and Mark , 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
3. Bahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017.

REFERENCE BOOKS

1. Daniel Drescher, "Blockchain Basics", 1st Edition, Apress, 2017.
2. Arvind Narayanan,"Bitcoin and cryptocurrency technologies: a comprehensive introduction" Princeton University Press, 2016.
3. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
4. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology Blockchain Programming', Independent Publishing Platform, 2017.
5. Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World by Don Tapscott & Alex Tapscott , 2016.

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Mapping of COs with POs & PSOs

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	1	-	1	-	-	-	-	-	-	1	-	1	-
CO2	1	2	2	1	-	-	2	-	-	-	1	-	1	-
CO3	2	2	2	2	-	-	1	-	-	-	2	-	2	-
CO4	2	2	-	1	-	-	2	-	-	-	2	-	2	-
CO5	2	-	-	1	-	-	2	-	-	-	-	-	2	-
AVG	**1.8**	**1.4**	**0.8**	**1.2**	**-**	**-**	**1.4**	**-**	**-**	**-**	**1.2**	**-**	**1.6**	**-**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE26 ADVANCED COMPUTER NETWORKS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand advanced concepts in network architectures and protocols and explore the mechanisms.
- To analyze network security techniques and cryptographic protocols, gain knowledge on wireless sensor network.

- To implement routing and data dissemination strategies in sensor networks.

UNIT I ADVANCED NETWORK ARCHITECTURE 9

OSI and TCP/IP Models Recap - Next Generation Internet Protocols - MPLS Architecture and Forwarding - Software Defined Networking (SDN) - OpenFlow Protocol - Network Function Virtualization (NFV) - QoS Frameworks - Traffic Engineering - Case Study: Google B4 Network.

UNIT II CONGESTION, QOS AND SECURITY 9

Congestion Control Mechanisms - Random Early Detection - Quality of Service Models - IntServ and DiffServ - RSVP Protocol - Firewalls and Intrusion Detection - IPSec and VPN - SSL/TLS Protocols - Cryptographic Techniques in Networking.

UNIT III NETWORK PERFORMANCE AND APPLICATIONS 9

Network Measurement and Monitoring - Performance Metrics Packet Tracing Tools - Network Simulation Tools (NS2/NS3) - Overlay and P2P Networks - Content Distribution Networks - Cloud Networking - Traffic Shaping and Policing - Application Layer Protocols.

UNIT IV WIRELESS SENSOR NETWORKS – ARCHITECTURE 9

Introduction to Sensor Networks - Sensor Node Architecture - WSN Protocol Stack - MAC Protocols for WSN - Energy- efficient Protocols - Localization Techniques - Synchronization Issues - Coverage and Deployment Strategies - WSN Hardware Platforms.

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UNIT V WIRELESS SENSOR NETWORKS – ROUTING AND APPLICATIONS 9

Routing in WSN – Flat and Hierarchical - LEACH, PEGASIS, and TEEN Protocols - Data Aggregation and Fusion - Transport Layer Issues - Security in WSN - Middleware for WSN - WSN Applications in Agriculture, Health, and Environment - Mobile Sensor Networks - Recent Trends and Case Studies in WSN.

TOTAL:45 PERIODS

LIST OF EXPERIMENTS

1. Simulation of Distance Vector Routing Protocol using NS2.
2. Configuration and Analysis of OSPF.
3. Implementation of TCP Congestion Control.
4. IPv6 Configuration and Routing.
5. Network Security using Wireshark (Packet Capture and Analysis).
6. SSL/TLS Protocol Simulation.
7. Wireless LAN Setup and Configuration.
8. Simulation of Mobile IP using NS2.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Analyze advanced network architectures including MPLS, SDN, NFV, and QoS

mechanisms.

CO2: Evaluate congestion control techniques, QoS models, and network security protocols.

CO3: Apply performance measurement and simulation tools to assess network behavior.

CO4: Design energy-efficient protocols and deployment strategies for Wireless Sensor Networks.

CO5: Assess routing protocols, middleware, and real-time applications of WSNs in diverse domains.

TEXT BOOKS

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill, 2017.
2. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2018.
3. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 5th Edition, Morgan Kaufmann, 2021.

REFERENCE BOOKS

1. Andrew S. Tanenbaum and David Wetherall, Computer Networks, 5th Edition, Pearson, 2017.
2. James F. Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson, 2018.
3. C. Siva Ram Murthy & B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson, 2019.
4. Ivan Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley, 2020.
5. Thomas Krag and Sebastien Büettrich, Wireless Mesh Networking, O'Reilly, 2020.

MIET Engineering Institute of Education & Technology INSTITUTIONS Since 1984

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	1	1	1	1	1	1	2	1	2	3	2
CO2	3	3	3	2	2	1	1	1	2	2	1	2	3	3
CO3	2	3	2	2	2	2	2	1	1	2	2	2	3	2
CO4	2	2	2	2	3	1	2	1	2	2	2	1	2	3
CO5	3	3	2	3	3	1	2	1	2	3	2	2	3	3
AVG	**2.6**	**2.6**	**2.2**	**2**	**2.4**	**1.2**	**1.6**	**1**	**1.6**	**2.2**	**1.6**	**1.8**	**2.8**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE27 EXPLORATORY DATA ANALYSIS AND TIME SERIES **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib
- To perform univariate data exploration and analysis.

UNIT I EXPLORATORY DATA ANALYSIS **9**

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT II EDA USING PYTHON **9**

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations.

UNIT III BIVARIATE ANALYSIS **9**

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality -Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT IV INTRODUCTION TO TIME SERIES **9**

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping – Information Architecture**.**

UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS **9**

Introduction to Multivariate Analysis- Multivariate Descriptive Statistics- Multivariate Regression and Classification- Dimensionality Reduction Techniques- Cluster Analysis and Classification- Time Series Models.

TOTAL :45 PERIODS

LIST OF EXPERIMENTS

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ PowerBI.
2. Perform exploratory data analysis (EDA) with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Working with Numpy arrays, Pandas data frames , Basic plots using Matplotlib.

4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..
7. Perform EDA on Wine Quality Data Set.
8. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Discuss the fundamentals of exploratory data analysis
CO2: Implement the data visualization using Matplotlib.
CO3: Perform univariate data exploration and analysis.
CO4: Apply bivariate data exploration and analysis.
CO5: Use Data exploration and visualization techniques for multivariate and time data.

TEXT BOOKS

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O Reilly, 2017.
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

REFERENCE BOOKS

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training, 2017.
2. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly, 2019.
3. Ward, Grinstein & Keim, Interactive Data Visualization, 2nd Ed., CRC Press, 2015.
4. Tarek A. Atwan, Time Series Analysis with Python Cookbook, 2nd Ed., 2020.
5. Aileen Nielsen, Practical Time Series Analysis, 2004.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	3	3	-	-	-	2	2	3	2	3	3
CO2	2	2	2	3	3	-	-	-	3	2	2	2	1	2
CO3	2	3	2	2	3	-	-	-	2	2	2	1	2	3
CO4	2	2	2	2	3	-	-	-	3	2	2	1	2	2
CO5	2	2	3	2	1	-	-	-	1	2	2	1	2	2
AVG	**2.2**	**2.2**	**2.4**	**2.4**	**2.6**	**-**	**-**	**-**	**2.2**	**2**	**2.2**	**1.4**	**2**	**2.4**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE28 C# AND .NET PROGRAMMING **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To learn basic programming in C# and the object oriented programming concepts.
- 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.

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

LIST OF EXPERIMENTS

1. Write a program to C# to find the smallest single digit factor for a given value.
2. C# console program to display Factorial of a number.
3. Write a C# program for addition and multiplication of two matrices.
4. Write a C# program to simulate the traffic signal.
5. Write a C# programs to demonstrate the concepts of Structures and Enumerations.
6. Write a VB program to design a simple calculator to perform addition, subtraction, multiplication and division.
7. Write a VB Program to accept birth date from user and calculate age.

8. Write a .NET FRAMEWORK Program demonstrate the concepts.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explore C# basics and object-oriented programming concepts

CO2: Apply advanced C# features to create efficient applications.

CO3: Use .NET libraries for data handling, multithreading, and UI development.

CO4: Develop Windows and web applications using .NET technologies.

CO5: Implement and deploy applications using .NET and Compact Framework.

TEXT BOOKS

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, Professional C# 2012 and .NET 4.5‖, Wiley, 2012.
2. Andy Wigley, Daniel Moth, Peter Foot, ―Mobile Development Handbook, Microsoft Press, 2011.
3. Head First C#: A Learner's Guide to Real-World Programming by Jennifer Greene & Andrew Stellman Engaging, visually rich start covering C# 8 and .NET Core, with practical projects and puzzles, 2010.

REFERENCE BOOKS

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, ―Programming C# 4.0, O'Reilly, 4th Edition, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
3. Learn C# in One Day and Learn It Well by Jamie Chan , Paperback updated Edition, 2016.
4. C# 10 in a Nutshell: The Definitive Reference by Joseph Albahari, 1st Edition O'Reilly Media - 2022.
5. Pro C# 10 with .NET 6 by Andrew Troelsen & Philip Japikse ,11th Edition Apress-2022

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	1	3	1	-	-	-	3	3	2	1	3	3
CO2	2	3	1	3	2	-	-	-	1	2	2	2	1	2
CO3	1	3	3	2	2	-	-	-	2	3	1	2	1	3
CO4	1	2	3	3	1	-	-	-	3	2	1	3	3	3
CO5	1	2	3	2	1	-	-	-	2	1	1	1	3	3
AVG	**1.6**	**2.2**	**2.2**	**2.6**	**1.4**	**-**	**-**	**-**	**2.2**	**2.2**	**1.4**	**1.8**	**2.2**	**2.8**

1-Low, 2-Medium, 3-High, "- "- No Correlation

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24CSPE29 ANDROID APP DEVELOPMENT **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To learn basic principles of Android, PHP AND HTML basics.
- To understand the Object-Oriented concepts in JAVA.
- To know about the Android OS and Database connectivity.

UNIT I FUNDAMENTALS OF ANDROID **9**

OOPS Concept - SQL queries - Basics of Designing - Android Basics: Installing Android Studio, Creating an Android app project, Deploying the app to an emulator and a device Layouts, Views and Resources, Text and Scrolling views (working with TextView Elements) - PHP and HTML basics

UNIT II LEARNING THE LANGUAGE: JAVA **9**

Classes and Object- Encapsulation - Constructors - Inheritance - Method Overriding - Polymorphism -Abstract method and classes -Interface and Packages - Exception Handling - Multitasking and Multithreading -Synchronization Module.

UNIT III ACTIVITIES AND INTENTS **9**

Activities and Intents - Activity Lifecycle and Saving State - Activities and Implicit Intents - Debugging Your App -Testing Your App - User Input Controls - Menus - Screen Navigation – Recycler View - Delightful User Experience: Drawable, Themes and Styles, Material design, Supporting landscape, multiple screen sizes, AsyncTask and AsyncTaskLoader.

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UNIT IV DATABASE CONNECTIVITY **9**

SQLite Data Types - Adding, Updating and Deleting Content using SQLite Database - Working with MySQL.

UNIT V DESIGN AND DEVELOPMENT OF ANDROID APPLICATION **9**

Project Development Using Android, Project Proposal and Planning, Implementation of Front-end and Back-end, Integration of App Features, Testing and Debugging.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Install Android Studio and Run Hello World.
2. Exploring Fundamentals of HTML and PHP.
3. Working with Text view Elements.
4. Screen Navigation Using the App Bar and Tabs.
5. Adding, Updating and Deleting Content in APP using SQLite Database.
6. Send Data to Server using PHP and MySQL.
7. Develop an application that uses GUI components, Fonts and Colors.
8. Develop a mobile application that functions as an alarm clock.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Apply object-oriented programming concepts and SQL queries in designing basic Android applications.

CO2: Implement core Java programming features including inheritance, multithreading, and exception handling for Android development.

CO3: Analyze the use of activities, intents, user interface elements, and asynchronous tasks to enhance user experience in Android apps.

CO4: Develop apps with database connectivity using SQLite and MySQL for data storage and manipulation.

CO5: Design and build complete Android applications integrating front-end, back-end, and testing components.

TEXT BOOKS

1. John Horton, Android Programming with Kotlin, 2012.
2. Pradeep Kothari, Android Application Development Black Book(With Kitkat Support), 2010.
3. How to Build Android Apps with Kotlin, GoalKicker, Packt Publishing, 2009.

REFERENCE BOOKS

1. Android Programming: Big Nerd Ranch Guide, Kotlin, 2012.
2. Android Application Development for JAVA Programmers, James Sheusi, 2013.
3. The Busy Coder's Guide to Advanced Android Development, Mark L. Murphy, 2009.
4. Inside the Android OS: Building, Customizing, Managing and Operating Android System Services, G Blake Meike, 2021.
5. Professional. Android™ Application Development, Reto Meier, 2015.

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Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1	1	2	-	-	-	-	1	-	2	3	2
CO2	3	3	2	2	3	-	-	-	1	1	1	2	3	2
CO3	3	2	3	2	3	1	1	-	1	1	1	3	3	3
CO4	3	3	2	2	3	-	-	-	-	1	1	2	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	3
AVG	**3**	**2.6**	**2.2**	**2**	**2.8**	**0.2**	**0.2**	**0**	**0.4**	**0.8**	**0.6**	**1.8**	**3**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE30 DEVOPS ENGINEERING FOUNDATION **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To introduce DevOps terminology, definition & concepts and Version control tools.
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment and Configuration management using Ansible.
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

UNIT I INTRODUCTION TO DEVOPS **9**

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and GitHub - Basic Git commands - Branching and merging strategies - Git workflows - Configuration Management and Automation.

UNIT II COMPILE AND BUILD USING MAVEN & GRADLE **9**

Introduction - Installation of Maven - POM files - Maven Build lifecycle - Build phases(compile build, test, package) Maven Profiles - Maven repositories(local, central, global) - Maven plugins - Maven create and build Artificats - Dependency management - Installation of Gradle - Understand build using Gradle.

UNIT III CONTINUOUS INTEGRATION USING JENKINS **9**

Install & Configure Jenkins - Jenkins Architecture Overview - Creating a Jenkins Job - Configuring a Jenkins job, Introduction to Plugins - Adding Plugins to Jenkins - Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher - Copy Artifact and Extended choice parameters) - Configuring Jenkins to work with java - Git and Maven - Creating a Jenkins Build and Jenkins workspace.

UNIT IV CONFIGURATION MANAGEMENT USING ANSIBLE **9**

Ansible Introduction – Installation - Ansible master/slave configuration - YAML basics - Ansible modules - Ansible Inventory files - Ansible playbooks - Ansible Roles - adhoc commands in ansible.

UNIT V BUILDING DEVOPS PIPELINES USING AZURE **9**

Create GitHub Account - Create Repository - Create Azure Organization - Create a new pipeline - Build a sample code - Modify azure - pipelines.yaml file.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Create Maven Build pipeline in Azure.
2. Run regression tests using Maven Build pipeline in Azure.
3. Install Jenkins in Cloud.
4. Create CI pipeline using Jenkins.
5. Create a CD pipeline in Jenkins and deploy in Cloud.

6. Install Ansible and configure ansible roles and to write playbooks.
7. Build a simple application using Gradle.
8. Create an Ansible playbook for a simple web application infrastructure

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Apply DevOps principles and use Git-based version control systems for efficient collaboration and configuration management.

CO2: Develop and manage build automation using Maven and Gradle with proper dependency and lifecycle handling.

CO3: Configure Jenkins for continuous integration by integrating with Git, Java, and Maven tools.

CO4: Implement configuration management using Ansible, including playbooks, roles, and inventory files.

CO5: Build end-to-end DevOps pipelines using Azure DevOps and GitHub integration.

TEXT BOOKS

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", 2nd Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by Gene Kim, Jez Humble, Patrick Debois & John Willis.

REFERENCE BOOKS

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for DevOps and Microsoft Azure (English Edition) Paperback –2020 by Mitesh Soni.
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", 1st Edition, 2015.
3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", 2nd Edition, 2016.
4. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", 2nd Edition, 2019.
5. "The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr & George Spafford a must-read allegorical story illustrating DevOps principles**,** 2018.

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO4	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO5	3	3	3	2	3	-	-	-	-	-	-	-	2	2
AVG	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE31 ARTIFICIAL NEURAL NETWORKS **L T P C**

3 0 2 4

COURSE OBJECTIVES

- Introduce the fundamentals of Artificial Neural Networks and their architectures.
- Understand the concepts of deep learning, its models like TensorFlow/Keras/ PyTorch and applications.
- Explore optimization algorithms, activation functions and solving problems in vision, NLP.

UNIT I INTRODUCTION TO NEURAL NETWORKS **9**

Biological neuron model - Artificial neurons and perceptron - Activation functions Learning rules: Hebbian, Delta, Gradient Descent - Multilayer Perceptron (MLP) - Error back propagation.

UNIT II DEEP NEURAL NETWORKS **9**

Introduction to deep learning - Architecture of DNNs - Forward and backward propagation - Vanishing gradient problem - Optimization techniques: SGD, Adam, RMSprop - Regularization: L1/L2, Dropout, Batch Normalization.

UNIT III CONVOLUTIONAL NEURAL NETWORKS (CNNS) **9**

Convolution operations - Feature maps, pooling layers - CNN architectures: LeNet, AlexNet, VGG, ResNet - Image classification using CNNs -Transfer learning.

UNIT IV RECURRENT NEURAL NETWORKS (RNNS) AND VARIANTS **9**

Sequential data modeling - RNN architecture - Vanishing gradient in RNNs - LSTM, GRU - Applications: Text generation, Sentiment analysis.

UNIT V DEEP LEARNING TOOLS AND APPLICATIONS **9**

Deep Learning frameworks: TensorFlow – Keras - PyTorch - Building, training - and tuning models - Applications in image recognition – speech – NLP - and autonomous systems - Ethics and biases in deep learning - Trends: GANs - Transformers (overview only).

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Implement simple vector addition in TensorFlow.
2. Implement a regression model in Keras.
3. Implement a perceptron in TensorFlow/Keras Environment.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Improve the Deep learning model by fine tuning hyper parameters.
7. Implement a Transfer Learning concept in Image Classification.
8. Develop an Autoencoder for anomaly detection.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explain the fundamental concepts of neural networks and learning paradigms.
CO2: Design and train simple neural networks using backpropagation.
CO3: Apply deep learning architectures such as CNNs and RNNs to solve problems.
CO4: Evaluate model performance and apply techniques to improve generalization.
CO5: Implement neural networks using popular deep learning libraries.

TEXT BOOKS

1. Ian Goodfellow and Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Charu Aggarwal, “Neural Networks and Deep Learning”, Springer, 2018.
3. “Pattern Recognition and Machine Learning” by Christopher M. Bishop, 2006.

REFERENCE BOOKS

1. François Chollet, “Deep Learning with Python”, 1st Edition-Manning Publications , 2017.
2. “Make Your Own Neural Network” by Tariq Rashid, 1st Edition - CreateSpace Independent Publishing Platform , 2016.
3. Nikhil Buduma, “Fundamentals of Deep Learning”, O’Reilly , 2017.
4. “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow” by Aurélien Géron , 1st Edition - O’Reilly Media , 2017.
5. “Neural Network Design”, Martin T. Hagan, Howard B. Demuth, Mark H. Beale , 1st Edition - PWS Publishing , 1996 .

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	2	1	-	-	1	-	-	-	1	3	2
CO2	3	3	2	2	2	-	-	1	-	-	-	1	2	3
CO3	2	3	3	3	3	-	-	2	1	-	-	1	3	3
CO4	2	2	2	3	3	-	-	2	1	-	-	2	2	3

CO5	3	3	3	3	3	1	-	2	1	1	-	2	3	3
AVG	**3**	**3**	**2**	**3**	**2**	**0**	**0**	**2**	**1**	**0**	**0**	**1**	**3**	**3**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24CSPE32 SOFTWARE TESTING METHODOLOGIES **L T P C**
3 0 2 4

COURSE OBJECTIVES

- Understand the basics of software testing and appreciate the different aspects of testing techniques.
- Understand the testing process management.
- Explore the testing tools and test automation and testing of various applications.

UNIT I INTRODUCTION **9**

Introduction to software testing – Evolution of Software Testing – Goals of Software Testing - Software Testing Definitions - Model for Software Testing - Software Testing as a Process - software testing terminology and methodology – Software Testing Terminology – STLC – Software Testing Methodology – Verification and Validation

UNIT II TESTING TECHNIQUES **9**

Black-Box Testing Techniques – Equivalence Class Testing - State Table-Based Testing - Decision Table-Based Testing – Cause-Effect Graphing Based Testing – Error Guessing – White Box Testing Techniques - Need – Basis Path Testing – Graph Matrices – Loop Testing – Data Flow Testing – Mutation Testing – Static Testing – Progressive vs. Regressive Testing – Regression Testing Techniques.

UNIT III MANAGING THE TESTING PROCESS **9**

Test Management – Software Metrics – Testing Metrics for Monitoring and Controlling the Testing Process – Efficient Test Suit Management.

UNIT IV BUILDING AGILITY & TOOL SUPPORT **9**

Building Agility into the Testing Process- Using Agile Methods to Improve Software Testing — Tool Support For Testing.

UNIT V TEST AUTOMATION &TESTING THE APPLICATIONS **9**

Test Automation – Software Testability – Components of a test case – A test Automation framework -Testing Object-Oriented Software – Testing Web-Based Systems – Testing Web Applications – Functional Web testing with Twill – Selenium – Testing a simple Web Application – Testing Mobile Smartphone Applications.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. GUI checkpoint for single property.
2. GUI checkpoint for single object/window.
3. Test Case for Calculator in Windows Application
4. Test Cases for Mobile Application Testing.

5. Test Cases for Cloud Environment Testing.
6. Test Cases for Pen.
7. Write test cases for a function that accepts a number between 1 and 100.
8. Write test scripts to test a login form (valid and invalid cases).

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Analyze the evolution, goals, models, and methodologies involved in the software testing lifecycle.

CO2: Apply black-box and white-box testing techniques to detect software defects effectively.

CO3: Evaluate software testing metrics and manage test cases for improved quality assurance.

CO4: Integrate agile methodologies into the testing process and explore relevant testing tools.

CO5: Develop test cases and automate testing for various applications, including web and mobile systems, using frameworks and tools like Selenium.

TEXT BOOKS

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing: Principles and Practices", Pearson Education, 2006.
2. Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", 4th Edition, CRC Press, 2013.
3. Ron Patton, "Software Testing", 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS

1. Glenford J. Myers, Corey Sandler, Tom Badgett, "The Art of Software Testing", 3rd Edition, Wiley, 2011.
2. Aditya P. Mathur, "Foundations of Software Testing", Pearson Education, 2008.
3. Ilene Burnstein, "Practical Software Testing", Springer, 2003.
4. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dreamtech Press, 2003.
5. Software Testing: Principles and Practices, By Srilatha V. and Srinivasan Desikan, 1st Edition - Pearson Education , 2006 .

Mapping of COs with POs & PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	3	3	3	-	-	-	1	3	3	1	3	2
CO2	2	2	2	1	2	-	-	-	2	2	1	3	2	2
CO3	1	1	3	2	3	-	-	-	1	2	1	1	1	2
CO4	2	3	3	1	2	-	-	-	3	1	2	2	2	2
CO5	1	2	3	2	2	-	-	-	2	1	3	1	1	1
AVG	**1.8**	**2.0**	**2.8**	**1.8**	**2.4**	**-**	**-**	**-**	**1.8**	**1.8**	**2**	**1.6**	**1.8**	**1.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24MC3101 LEGAL SYSTEM OF INDIA **L T P C**
3 0 0 0

COURSE OBJECTIVES

- To introduce the basic concepts, necessity of law among engineers.
- To introduce Indian legal system.
- To familiarize taxations and basic laws.

UNIT I INTRODUCTION TO INDIAN LEGAL SYSTEM **9**

Constitution of India, Sources of Law and Judicial system.

UNIT II CONTRACTS AND ITS ELEMENTS **9**

Employment contracts, Contract Interpretation, Service Contract, Contract of Indemnity, Law of Agency. Employment agreement.

UNIT III LEGAL DOCUMENTATION **9**

Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and subcontracting.

UNIT IV CYBER AND LABOUR LAWS **9**

E-Commerce and E-Governance. Provident Fund, ESIC, Gratuity, Bonus, Perquisites, Contract Labour Health, Safety and welfare of construction workers.

UNIT V TAXATION **9**

Income Tax, Service Tax, VAT, Excise Duty, GST. Alternate Dispute Resolution (ADR) in Domestic and International dealings, Code of Conduct and Ethics for engineering professionals

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the Indian Legal System.
CO2: Explain the basics of different laws.
CO3: Analyze the cyber and labour law.
CO4: Use the tax system.
CO5**:** Understand the tax system.

TEXT BOOKS

1. Karnika Seth, “Computer Internet” and New Technology Laws, Lexisnexis, 1st Edition, 2013.
2. Prafulla C Pant, The Arbitration and Conciliation Act, 1996, Butterworths India, New Delhi.
3. Joseph Minattur, Indian Legal System, Indian Law Institute, New Delhi.

MIET Mohamed Institute of Education & Technology INSTITUTIONS Since 1984

REFERENCE BOOKS

1. J. Beatson, Anson's Law of Contract, Oxford University Press.
2. V. S. Datey , Indirect Taxes: Law and Practice, Taxmann Publications (P) Ltd.
3. Dr. Vinod K. Singhania and Dr. Monica Singhania , Student's Guide To Income Tax, Taxmann Publications (P) Ltd.
4. S.C. Srivastava, Industrial Relations and Labour Laws, Vikas Publishing House Pvt. Ltd.
5. Singh, M. P., & Kumar, N, The Indian legal system: An enquiry. Oxford University Press, 2019.

24MC3102 INTRODUCTION IPR AND PATENT DRAFTING **L T P C**
3 0 0 0

COURSE OBJECTIVES

- To introduce the basic concepts intellectual property.
- To familiarize the importance of patent copyrights and trademarks.
- To train the students for drafting of patent.

UNIT I BASICS OF IPR **9**

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (Movable Property, Immovable Property and Intellectual Property).

UNIT II PATENT, COPYRIGHTS AND TRADEMARKS **9**

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III INTERNATIONAL PATENT FILING **9**

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement.

UNIT IV DRAFT OF PATENT **9**

Pre-drafting requirement, Types of specifications, Drafting of Provisional specifications, Drafting of complete specifications, Drafting of claims, Filing procedure for Ordinary application, Convention application, PCT International Phase application, PCT National Phase application, Patent of addition, Divisional application, Publication of paten, First Examination Report, Time limit for different phase of prosecution, Pre Grant opposition, Post Grant opposition.

UNIT V INFRINGEMENT OF PATENTS AND CASE STUDIES 9

Infringement & remedies, Literal Infringement, Case Studies on – Patents, Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the basics of IPR.
CO2: Explore the importance of Patenting.
CO3: Discuss the method of international patent filing.
CO4: Draft of patent application.
CO5: Explain the importance of patent infringement.

TEXT BOOKS

1. Kompal Bansal, Parikshit Bansal, Fundamentals of Intellectual Property for Engineers, BS Publications 2013.
2. Pmbuddha Ganguli, Inrelletul property right - Unleasbing the knowledge economy, Tata Mccraw HiU Publishing Company Ltd.
3. Deborah Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets Delmar Cengage Learning; 5th Edition.

REFERENCE BOOKS

1. N.K Acharya, Intellectual property rights, Asia Law House, 9th Edition.
2. Jeffrey G. Sheldon, How to Write a Patent Application, 3rd Edition, Practising Law Institute, 2016.
3. WIPO Intellectual Prcpeny Handbook. Policy, Law and Use, 2nd Edition.
4. Dr. R. Ashok Raj, Dr. K. Panneer Selvam, and V. Sivaganesan "Introduction to Intellectual Property Rights and Patent Drafting, JBR TRY SEA Publishers, 2024.
5. The American Society of International law, Electronic resource guide, ERC publication.

24MC3103 LITERARY FORMS AND TECHNICQUES

L	T	P	C
3	0	0	0

COURSE OBJECTIVES

- To make the students aware about the finer sensibilities of human existence through an art form.
- The students will learn to appreciate different forms of literature as suitable modes of expressing human experience.
- To gain knowledge in modern tools for visualization.

UNIT I INTRODUCTION TO ELEMENTS OF LITERATURE **9**

Relevance of literature, Enhances Reading, thinking, discussing and writing skills. Develops finer sensibility for better human relationship. Increases understanding of the problem of humanity without bias. Providing space to reconcile and get a cathartic effect.

UNIT II ELEMENTS OF FICTION **9**

Fiction, fact and literary truth. Fictional modes and patterns. Plot character and perspective.

UNIT III ELEMENTS OF POETRY **9**

Emotions and imaginations. Figurative language. Simile, metaphor, conceit, symbol, pun and irony). Personification and animation. Rhetoric and trend.

UNIT IV ELEMENTS OF DRAMA **9**

Drama as representational art. Content mode and elements. Theatrical performance. Drama as narration, mediation and persuasion. Features of tragedy, comedy and satire.

UNIT V MODERN TOOLS FOR VISUALIZATION **9**

Plot Diagram Infographic, Theme Video Tone & Mood, Visual Set, Setting Diorama or 3D Model Soundtrack for a Story, Symbolism Poster, Book Trailer.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the relevance of literature in human life.
CO2: Explore the relevance various aspects in developing finer sensibilities.
CO3: Explain the essence of poetry.
CO4: Enumerate the essence of drama.
CO5: Use the modern tools for visualization.

TEXT BOOKS

1. W.H. Hudson, "An Introduction to the Study of English Literature", Atlantic, 2007.
2. Mario Klarer, Routledge, "An Introduction to Literary Studies", 2013.
3. The Experience of Poetry, Graham Mode, Open college of Arts with Open University.Press,1991.

REFERENCE BOOKS

1. Wolfstuff, The Elements of Fiction: A Survey, Ulf Wolf (ed), 2014
2. The Elements of Drama, J.L.Styan, Literary Licensing, 2011.
3. WIPO Intellectual Prcpeny Handbook. Policy, Law and Us.
4. Kelly J. Mays "The Norton Introduction to Literature", W. W. Norton & Company, 15th Edition, 2025.
5. Eleclronic resource guide ERc published online by the American Society of International law.

24MC3104 DISASTER RISK REDUCTION AND MANAGEMENT **L T P C**

3 0 0 0

COURSE OBJECTIVES

- To impart knowledge on concepts related to disaster management.
- To acquaint with the skills for planning and organizing disaster response.
- To impart knowledge on concepts related to disaster, disaster risk reduction.

UNIT I HAZARDS, VULNERABILITY AND DISASTER RISKS **9**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies,-Inter relations between Disasters and Sustainable development Goals.

UNIT II DISASTER RISK REDUCTION (DRR) **9**

Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.

UNIT III DISASTER MANAGEMENT **9**

Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA-DDMA-NRDF- Civic Volunteers).

UNIT IV TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT **9**

Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. - Elements of Climate Resilient Development –Standard operation Procedure for disaster response – Financial planning for disaster Management.

UNIT V DISASTER MANAGEMENT: CASE STUDIES **9**

Discussion on selected case studies to analyse the potential impacts and actions in the contest of disasters-Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Use the concepts of Disaster, Vulnerability and Disaster Risk reduction.
CO2: Explore on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction.
CO3**:** Develop disaster reponse skills by adopting relevant tools and technology.
CO4**:** Enhance awareness of institutional process for disaster response in the country.
CO5**:** Develop rudimentary ability to respond to their surroundings with potentials.

TEXT BOOKS

1. Taimpo, "Disaster Management and Preparedness", CRC Publications, 2016.
2. Singh R, "Disaster Management Guidelines for earthquakes", Landslides, Avalanches and tsunami, Horizon Press Publications, 2017.
3. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.

REFERENCE BOOKS

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010.
2. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
3. Government of India, National Disaster Management Policy, 2009.
4. Shaw R., Community based Disaster risk reduction, Oxford University Press, 2016.
5. Madu, C. N., Kuei, C.-H., Madu, I. E., Ozumba, B. C., Nnadi, V. E., Odinkonigbo, U. L., & Ezeasor, I. C. (Eds.), Handbook of disaster risk reduction & management: Climate change and natural disasters. World Scientific Publishing Co, 2017.

24MC3105 FILM APPRECIATION **L T P C**
3 0 0 0

COURSE OBJECTIVES

- To gain knowledge on concepts film.
- To acquaint the skills on film language.
- To know the developments in films.

Theme - A: The Component of Films

A-1: The material and equipment
A-2: The story, screenplay and script
A-3: The actors, crew members, and the director
A-4: The process of film making… structure of a film

Theme - B: Evolution of Film Language

B-1: Film language, form, movement etc.
B-2: Early cinema… silent film (Particularly French)
B-3: The emergence of feature films: Birth of a Nation
B-4: Talkies

Theme - C: Film Theories and Criticism/Appreciation

C-1: Realist theory; Auteurists
C-2: Psychoanalytic, Ideological, Feminists
C-3: How to read films?

C-4: Film Criticism / Appreciation

Theme – D: Development of Films

D-1: Representative Soviet films

D-2: Representative Japanese films

D-3: Representative Italian films

D-4: Representative Hollywood film and the studio system

Theme - E: Indian Films

E-1: The early era

E-2: The important films made by the directors

E-3: The regional films

E-4: The documentaries in India

READING:

A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the components of film.
CO2: Utilize the development of film languages.
CO3: Explain the film theories.
CO4: Discuss the latest developments in film.
CO5: list the latest developments in Indian film.

TEXT BOOKS

MIET
Mohamed Institute of Education & Technology
INSTITUTIONS
Since 1994

1. Jim Piper, "The Film Appreciation Book",: The Film Course You Always Wanted to Take, Allworth Press, 2014.
2. Monaco, How to read a film, Oxford University Press, 2000.
3. Bordwell, D., & Thompson, K., Film art: An introduction, 12th Edition, McGraw-Hill Education., 2020.

REFERENCE BOOKS

1. Nichols, B., Engaging cinema: An introduction to film studies. W. W. Norton & Company, 2017.
2. Cook, D. A., A history of narrative film, 4th Edition,W. W. Norton & Company, 2004.
3. Giannetti, L., Understanding movies, 14th Edition, Pearson, 2020.
4. Boggs, J. M., & Petrie, D. W., The art of watching films, 9th Edition, McGraw-Hill Education, 2017.
5. Hayward, S. (2013). Cinema studies: The key concepts (4th edition). Routledge.

24MC3106 INTRODUCTION TO WOMEN AND GENDER STUDIES **L T P C**
3 0 0 0

COURSE OBJECTIVES

- To gain knowledge in feminism and its theory's.
- To know the woman's global, national and locals movements.
- To understand the gender and representations.

UNIT I CONCEPTS **9**

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

UNIT II FEMINIST THEORY **9**

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.

UNIT III WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL **9**

Rise of Feminism in Europe and America. Women's Movement in India.

UNIT IV GENDER AND LANGUAGE **9**

Linguistic Forms and Gender. Gender and narratives.

UNIT V GENDER AND REPRESENTATION **9**

Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Distinguish between key concepts related to sex, gender, patriarchy, and gender roles.
CO2: Analyze various feminist theories, including liberal, Marxist, socialist, radical, and postmodernist perspectives.
CO3: Examine the development of women's movements globally, nationally (India), and locally.
CO4: Interpret the relationship between gender and language, including narrative forms and linguistic structures.
CO5: Evaluate the representation of gender in mainstream, alternative, and social media platforms.

TEXT BOOKS

1. Madhu Nagla,"Women and Gender Studies: A Textbook, Rawat Publications; 1st Edition, 2025.
2. Mary S Evans, Kathy Davis and Judith Lorber, Handbook of Gender and Women's Studies, Sage Publications, 2006.

3. Gillis, M. J., & Jacobs, A. T. Introduction to women's and gender studies: An interdisciplinary approach, 2nd Edition, Oxford University Press, 2019.

REFERENCE BOOKS

1. Launius, C., & Hassel, H., Threshold concepts in women's and gender studies, 2nd Edition, Routledge, 2018.
2. Hunter College Women's and Gender Studies Collective. Women's realities, women's choices: An introduction to women's and gender studies. Oxford University Press, 2014.
3. Saraswati, L. A., Shaw, B., & Rellihan, H. (2017). Introduction to women's, gender, and sexuality studies. Oxford University Press
4. Clemens, C. L.Introduction to women's & gender studies. The Pennsylvania Alliance for Design of Open Textbooks (PA-ADOPT), 2023.
5. Judith Lorber inequality. feminist theories and politics, oxford university press, third edition ,2010.

24MC5101 FOOD AND NUTRITION

L	T	P	C
3	0	0	0

COURSE OBJECTIVES

- Obtain knowledge of different food groups, their composition and role in diet.
- To gain knowledge of different plant and animal derived foods and their nutritive values and properties.
- To gain knowledge in different methods of processing and cooking.

UNIT I FOOD GROUPS **9**

Basic 4, 5&7 food groups. Functional food groups-energy yielding, body building and protective foods (only sources and not properties and functions). Food Pyramid, My Plate. Study of various cooking methods - Boiling, steaming, stewing, frying, baking, roasting, broiling, cooking under pressure. Cereals - composition of rice, wheat, effects of cooking on parboiled and raw rice, principles of starch cookery, gelatinization.

UNIT II PULSES AND GRAMS **9**

Varieties of pulses & grams, composition, nutritive value, cooking quality of pulses, germination and its effect. Vegetables - Classification, composition, nutritive value, selection and preparation for cooking, methods and principles involved in cooking. Fruits - Composition, nutritive value, changes during ripening, methods and effects of cooking, enzymatic browning.

UNIT III BEVERAGES **9**

Classification, nutritive value, Milk based beverages- methods of preparing tea and coffee, fruit based beverages and preparation of carbonated non – alcoholic beverages. Spices and Condiments - Uses and abuses. Fats and Oils - Types of oils, function of fats and oils,

shortening effects of oil, smoking point of oil, factors affecting absorption of oil. Sugar cookery- Stages of sugar cookery, crystallization and factors affecting crystallization.

UNIT IV MILK **9**

Composition, nutritive value, kinds of milk, pasteurization and homogenization of milk, changes in milk during heat processing, preparation of cheese and milk powder Egg - Structure, composition, classification, nutritive value, uses of egg in cookery, methods of cooking, foam formation and factors affecting foam formation.

UNIT V MEAT **9**

Structure, composition, nutritive value, selection of meat, post mortem changes in meat, aging, tenderness, methods of cooking meat and their effects. Poultry – types, composition, nutritive value, selection, methods of cooking. Fish - Structure, composition, nutritive value, selection of fish, methods of cooking and effects

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Understand the food groups.
CO2: Understand properties of pulses and grams.
CO3: Understand properties of beverages.
CO4: Understand properties of milk.
CO5: Understand properties of meats.

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TEXT BOOKS

1. M.Swaminathan. Food science, Chemistry and Experimental foods, International Book House Publication
2. Norman.N.Potter, Food Science, New York: Chapman & HalI, 1995
3. Griswold R.M, Experimental study of Foods, John Wiely & Sons, INC, New York, 1962.

REFERENCE BOOKS

1. Helen Charley, Food Science, Macmillan, 1982.
2. A.G. Peckam, Foundation of Food Preparation, Collier Macmillan Ltd, 1969.
3. Modern Cookery for teaching and trade, Volume I & II ,Thangam Philip. Orient Longmans Ltd.
4. Food Fundamentals by MacWiliams, John Willy and son‟s, New York.
5. Food Facts & Principles by Shakunthala manay & Shadakhraswamy.

24MC5102 DESIGN THINKING **L T P C**
3 0 0 0

COURSE OBJECTIVES

- To learn design thinking concepts and principles.
- To use design thinking methods in every stage of the problem.

- To learn the different phases of design thinking.

UNIT I INTRODUCTION **9**

Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.

UNIT II UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM **9**

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

UNIT III IDEATION AND PROTOTYPING **9**

Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.

UNIT IV TESTING AND IMPLEMENTATION **9**

Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.

UNIT V FUTURE **9**

Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow**.**

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the principles of Design Thinking.
CO2: Define the problems.
CO3: Create prototype.
CO4: Test the product.
CO5: Implement the product in the market sale.

TEXT BOOKS

1. Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking.
2. Jeanne Liedtka and Tim Ogilvie, Designing for Growth: a design thinking tool kit for managers.
3. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation.

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REFERENCE BOOKS

1. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, O'Reilly Media, 2017.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
4. http://ajjuliani.com/design-thinking-activities.
5. https://venturewell.org/class-exercices

24MC5103 HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA

L	T	P	C
3	0	0	0

COURSE OBJECTIVES

- To know the contributions of sciences.
- To gain knowledge astronomy, mathematics and Ayurveda.
- To gain knowledge on technological development of India.

UNIT I INTRODUCTION **9**

Logic and methodology of Indian sciences. An overview of Indian contributions to sciences. An overview of Indian contributions to technology.

UNIT II ASTRONOMY **9**

Development of astronomy in India. Pancanga: Indian calendrical computations. The distinct features of Indian planetary models. Computation of eclipses: Its simplicity, elegance and efficiency. Observational astronomy in India.

UNIT III MATHEMATICS **9**

An overview of the development of mathematics in India. Mathematics contained in Sulbasutras. Combinatorial aspects of the Chandassastra. Solutions to the first and second order indeterminate equations. Weaving mathematics into beautiful poetry: Bhaskaracarya. The evolution of sine function in India. The discovery of calculus by Kerala astronomers

UNIT IV AYURVEDA **9**

History of Ayurveda, Rational foundations of Ayurveda, Textual sources in Ayurveda, Ayurveda and allied disciplines, Approach to health and disease in Ayurveda – 2 lectures, Approach to diet and nutrition in Ayurveda. Modern medicine, Ayurveda and Yoga.

UNIT V TECHNOLOGICAL DEVELOPMENT IN INDIA **9**

Agriculture- Origin, development, and Ancient crops, Water management- Overview, Harappan water management, other case studies, Medieval Water structures, Pottery-technical aspects, Silpasastra: Architecture and Construction- An introduction to Silpasastra

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and Construction Technology.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the Indian science.
CO2: Explore the essence of Indian astronomy.
CO3: Enumerate the development of Indian mathematics
CO4: Discuss the sources of Ayurveda.
CO5: Explain the technological development of India.

TEXT BOOKS

1. Soni, S., India's glorious scientific tradition: Exploration of ancient knowledge and modern insights. Prabhat Prakashan.2020.
2. Joseph, G. G, A passage to infinity: Medieval Indian mathematics from Kerala and its impact. SAGE Publications, 2009.
3. Mohan, K., Science and technology in colonial India. Routledge, 2023.

REFERENCE BOOKS

1. Sarma, K. V. A history of the Kerala school of Hindu astronomy. Vishvesh varananda Institute of Sanskrit and Indological Studies, 1972.
2. Seshadri, C. S. (Ed.). Studies in the history of Indian mathematics. Hindustan Book Agency, 2010.
3. Datta, B., & Singh, A. N. History of Hindu mathematics: A source book. Asia Publishing House, 1962.
4. Kashyapa, K., Kashyapa Samhita. Chaukhambha Orientalia, 2007.
5. https://onlinecourses.swayam2.ac.in/arp19_ap87/preview.

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24MC5104 POLITICAL AND ECONOMIC THOUGHT FOR A HUMANE SOCIETY **L T P C 3 0 0 0**

COURSE OBJECTIVES

- To know the human society and system.
- To understand the capitalism, fascism and communism.
- To gain knowledge in human welfare and essential elements in Indian civilization.

UNIT I HUMAN SOCIETY AND SYSYTEM **9**

Considerations for humane society, holistic thought, human being’s desires, harmony in self, harmony in relationships, society, and nature, societal systems.

UNIT II CAPITALISM **9**

Capitalism – Free markets, demand-supply, perfect competition, laissez-faire, monopolies, Imperialism. Liberal democracy.

UNIT III FASCISM AND COMMUNISM **9**

Fascism and totalitarianism. World War I and II. Cold war. Communism – Mode of production, theory of labour, surplus value, class struggle, dialectical Materialism, historical materialism, Russian and Chinese models.

UNIT IV HUMAN WELFARE **9**

Welfare state. Relation with human desires. Empowered human beings, satisfaction. Gandhian thought. Swaraj, Decentralized economy & polity, Community. Control over one's lives, Relationship with nature.

UNIT V ESSENTIAL ELEMENTS OF INDIAN CIVILIZATION **9**

Essential elements of Indian civilization, Technology as driver of society, Role of education in shaping of society. Future directions.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the human society and system.
CO2: Explain the principles of capitalism.
CO3: Discuss the fascism and communism.
CO4: Explore the importance of Human Welfare.
CO5: List the essential elements of Indian civilization.

TEXT BOOKS

1. Capra, F, The Turning Point: Science, Society, and the Rising Culture (Revised ed.). HarperOne,2023.
2. Marx, K., & Engels, F. The Communist Manifesto. Penguin Classics. 2022.
3. Paxton, R. O. The Anatomy of Fascism. Vintage, 2022.

REFERENCES BOOKS

1. Kumar, S.,The Song of the Earth. Green Books, 2022.
2. Stiglitz, J. E, Globalization and Its Discontents Revisited: Anti-Globalization in the Era of Trump. Penguin UK, 2017.
3. Lenin, V. I., The State and Revolution. Penguin Random House 2024.
4. Sen, A., Development as Freedom. Oxford University Press.2022.
5. Capra, F., & Luisi, P. L., The Systems View of Life: A Unifying Vision. Cambridge University Press, 2022.

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24MC5105 STATE, NATION BUILDING AND POLITICS IN INDIA **L T P C**
3 0 0 0

COURSE OBJECTIVE

- To gain knowledge in need and role of state and politics.
- To gain knowledge in Indian national movements.
- To gain knowledge in national politics and constitution.

UNIT I INTRODUCTION **9**

Understanding the need and role of State and politics. Development of Nation-State, sovereignty, sovereignty in a globalized world.

UNIT II STATE POLITICS **9**

Organs of State – Executive, Legislature, Judiciary. Separation of powers, forms of government unitary-federal, Presidential-Parliamentary.

UNIT III INDIAN NATIONAL MOVEMENTS **9**

The idea of India. 1857 and the national awakening. 1885 Indian National Congress and development of national movement – its legacies.

UNIT IV CONSTITUTION OF INDIA **9**

Constitution making and the Constitution of India. Goals, objective and philosophy.

UNIT V NATIONAL POLITICS **9**

National integration and nation-building. Challenges of nation-building – State against democracy (Kothari) New social movements. The changing nature of Indian Political System, the future scenario.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the needs of politics.
CO2: Explain the organs of state politics.
CO3: Explain the history of Indian national movements.
CO4: Discuss the constitution of India.
CO5: Discuss the roles of national politics.

TEXT BOOKS

1. Sunil Khilnani, The Idea of India. Penguin India Ltd., New Delhi.
2. Madhav Khosla, The Indian Constitution, Oxford University Press. New Delhi, 2012.
3. Chatterjee P, State and politics in India. Oxford University Press, 1997.

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REFERENCE BOOKS

1. Sumantra Bose, Transforming India: Challenges to the World's Largest Democracy, Picador India, 2013.
2. V. Atul Kohli, Democracy and Discontent: India's Growing Crisis of Governability, Cambridge University Press, Cambridge, U. K., 1991.
3. M. P. Singh and Rekha Saxena, Indian Politics: Contemporary Issues and Concerns, PHI, New Delhi, 2008.
4. Rajni Kothari, Rethinking Democracy, Orient Longman, New Delhi, 2005.
5. Brij Kishore Sharma, Introduction to the Indian Constitution, PHI, New Delhi.

24MC5106 INDUSTRIAL SAFETY **L T P C**

3 0 0 0

COURSE OBJECTIVES

- To Understand the Introduction and basic Terminologies safety.
- To enable the students to learn about the Important Statutory Regulations and standards.
- To enable students to Conduct and participate the various Safety activities in the Industry.

UNIT I SAFETY TERMINOLOGIES **9**

Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) - Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS

UNIT II STANDARDS AND REGULATIONS **9**

Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006.

UNIT III SAFETY ACTIVITIES **9**

Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment.

UNIT IV WORKPLACE HEALTH AND SAFETY **9**

Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane SafetyToxic gas Release.

UNIT V HAZARD IDENTIFICATION TECHNIQUES **9**

Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the basic concept of safety

CO2: Obtain knowledge of statutory regulations and standards.

CO3: Know about the safety activities of the working place.

CO4: Analyze on the impact of occupational exposures and their remedies.

CO5: Obtain knowledge of risk assessment techniques.

TEXT BOOKS

1. R.K. Jain and Prof. Sunil S. Rao ,"Industrial Safety", Health and Environment Management Systems khanna publisher.
2. L. M. Deshmukh "Industrial Safety Management": Hazard Identification and Risk Control McGraw-Hill Education.
3. Asfahl, C. R., & Rieske, D. W, "Industrial safety and health management" 7th edition, Pearson 2018.

REFERENCE BOOKS

1. Frank Lees, 'Lees' Loss Prevention in Process Industries. Butterworth-Heinemann publications, UK, 4th Edition., 2012.
2. John Ridley & John Channing, Safety at Work: Routledge, 7th Edition., 2008.
3. Dan Petersen, Techniques of Safety Management: A System Approach, 2003.
4. Alan Waring, Safety management system: Chapman & Hall, England 5. Society of Safety Engineers, USA, 1996.
5. Ferris, R. W., & Murphy, D, Workplace safety: Establishing an effective violence prevention program. Butterworth-Heinemann.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	3	-	-	-	-	-	-	-	3	-
CO2	-	3	-	2	3	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	3	-	-	-	-	-	-	-	-	3
CO4	-	-	-	-	3	2	-	-	-	-	-	-	-	3
CO5	-	-	-	3	3	-	-	-	-	-	-	-	-	3
AVG	3	2.5	3	2.5	3	2	-	-	-	-	-	-	3	3

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCI101 ESTIMATION OF COSTING AND BUILDING **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand methods for estimating quantities in a range of construction projects, including buildings, roads, and infrastructure.
- To acquire knowledge in rate analysis and cost estimation for construction activities.
- To build proficiency in drafting construction specifications, technical reports, and tender documents.

UNIT I ESTIMATION OF QUANTITIES **9**

Philosophy – Purpose – Methods of estimation – Centre line method – Long and short wall method – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit.

UNIT II COSTING AND RATE ANALYSIS **9**

Standard Data – Observed Data – Schedule of rates – Market rates – Materials and Labour – Standard Data for Man Hours and Machineries for common civil works.

UNIT III CONSTRUCTION SPECIFICATIONS AND DOCUMENTATION **9**

Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads.

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UNIT IV TYPES OF CONTRACTS **9**

Contract – Types of contracts – BOT – Types - Formation of contract – Contract conditions – Contract for labour, material, design, construction.

UNIT V PROPERTY VALUATION **9**

Definitions – Various types of valuations – Valuation methods - Necessity –Year's purchase-sinking fund- Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent.

TOTAL:45 PERIODS

LIST OF EXPERIMENTS (Using MS Excel Software)

1. Deriving an approximate estimate for a multistoried building by approximate methods.
2. Detailed estimate for the following with the required material survey for the same.
3. Derive an estimate for Ground plus three storied RCC Framed structure with blockwork walls.
4. Prepare the detailed estimate for the bridge with minimum 2 spans.
5. Detailed estimate for the factory building.
6. Detailed estimate for the road work cross drainage work.

7. Derive an estimate for Ground plus three storied building with load-bearing walls.
8. Preparation of valuation report in standard Government form.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Estimate quantities for construction projects using standard methods and software.

CO2: Analyze rates and create cost estimates for different construction works.

CO3: Gain skills in preparing construction specifications, reports, and tenders.

CO4: Analyze the different types of construction contracts, their formation, and how disputes are resolved.

CO5: Value the properties such as land, buildings, mortgages, and leases.

TEXT BOOKS

1. B.N Dutta "Estimating and Costing in Civil Engineering", CBS Publishers & Distributors (P) Ltd, 28th Edition, 2020.
2. B.S.Patil, "Civil Engineering Contracts and Estimates", 7th Edition, University Press, 2015.
3. D.N. Banerjee, "Principles and Practices of Valuation" V Eastern Law House, 2015.

REFERENCE BOOKS

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD.
2. Tamil Nadu Transparencies in Tenders Act, 1998 and rules 2000.
3. Arbitration and Conciliation Act, 1996.
4. Standard Bid Evalu. Form, Procurement of Good or Works, The World Bank, 1996.
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2019.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	-	-	3	-	-	-	-	-	-	-	3	-
CO2	-	3	-	2	3	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	3	-	-	-	-	-	-	-	-	3
CO4	-	-	-	-	3	2	-	-	-	-	-	-	-	3
CO5	-	-	-	3	3	-	-	-	-	-	-	-	-	3
AVG	3	2.5	3	2.5	3	2	-	-	-	-	-	-	3	3

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCI102 QUALITY ASSESSMENT OF BUILDING MATERIALS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To learn the importance of quality control and testing standards for building materials.

- To understand the methods for testing materials like cement, concrete, aggregates, bricks, and steel.
- To gain hands-on experience in testing the quality of building materials in the laboratory.

UNIT I INTRODUCTION TO QUALITY ASSESSMENT AND TESTING STANDARDS **9**

Importance of quality control in construction - Properties of building materials - physical, chemical, and mechanical properties - Quality assurance vs. quality control - IS codes for material testing (cement, aggregates, steel, etc.) - Sampling techniques and procedures - Acceptance criteria and reporting.

UNIT II CEMENT AND CONCRETE **9**

Types and grades of cement - Testing of cement: fineness, consistency, setting time, strength - Concrete mix design (brief introduction) – Grades of Concrete - Workability and durability tests - Compressive, tensile, and flexural strength of concrete - Nondestructive testing (NDT) - rebound hammer, ultrasonic pulse velocity. Types and roles of admixtures - Quality assessment of chemical and mineral admixtures.

UNIT III AGGREGATES **9**

Types of aggregates - fine and coarse - Tests on aggregates - sieve analysis, specific gravity, water absorption, impact value, crushing value - Bulking of sand - Alkali-aggregate reaction - IS codes relevant to aggregate testing.

UNIT IV BRICKS, BLOCKS, AND MASONRY UNITS **9**

Classification and properties of bricks and blocks - Water absorption, compressive strength, efflorescence of bricks - Testing of solid and hollow concrete blocks - Masonry mortar: types and tests - Quality standards for masonry units relevant to IS codes.

UNIT V STEEL, TIMBER, AND OTHER MATERIALS **9**

Types of steel used in construction – mild steel, HYSD, TMT - Tensile and bend tests for steel – Timber - defects, moisture content, and strength grading - Quality control for paints, plastics, and glass - Modern materials - Geosynthetics, Graphine infused materials, Fiber reinforced polymers, Phase change materials (PCMs), Recycled and sustainable materials, Geopolymer, Advanced composite materials and Nano materials.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Fineness and consistency test on cement.
2. Compressive strength test on cement mortar cubes and concrete cubes.
3. Workability test on fresh concrete using slump cone and compaction factor.
4. Compressive and flexural strength test on hardened concrete.
5. Sieve analysis and specific gravity test on aggregates.
6. Impact and crushing value test on coarse aggregates.

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7. Water absorption and compressive strength test on bricks.
8. Non-Destructive test on concrete specimens. **TOTAL: 30 PERIODS**

COURSE OUTCOMES

On Successful completion of this course, the students will be able to

CO1: Demonstrate the use of quality control techniques to verify building material standards.

CO2: Evaluate the properties of cement, concrete, and admixtures using standard methods and non-destructive testing.

CO3: Perform tests on different types of aggregates to evaluate their properties and compliance with relevant IS codes.

CO4: Analyze the quality of bricks and blocks to ensure they meet construction requirements.

CO5: Perform testing on steel, timber, and modern materials to determine their construction suitability.

TEXT BOOKS

1. Shetty, M.S., "Concrete Technology"(Theory and Practice), S. Chand and Company Ltd., 2008.
2. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Education, 5th ed., 2013.
3. Varghese, P.C., Quality Control and Testing of Construction Materials, PHI Learning Pvt. Ltd., 2007.

REFERENCE BOOKS

1. Duggal, S.K., Building Materials, New Age International Publishers, 4th Edition,2008.
2. IS 456:2000 – Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards, New Delhi.
3. IS 383:2016 – Specification for Coarse and Fine Aggregates for Concrete, Bureau of Indian Standards, New Delhi.
4. IS 516:2018 – Method of Tests for Strength of Concrete, Bureau of Indian Standards, New Delhi.
5. IS 3495 (Parts 1 to 4):1992 – Methods of Tests of Burnt Clay Building Bricks, Bureau of Indian Standards, New Delhi.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	–	–	–	–	–	–	–	2	–	1	3	2
CO2	3	3	–	2	2	–	–	–	–	2	–	1	3	3
CO3	3	3	–	2	2	–	–	–	–	1	–	1	2	3
CO4	3	2	–	2	1	–	–	–	–	1	–	1	2	2
CO5	3	3	–	2	2	–	1	–	–	2	–	1	3	3
AVG	**3**	**2.6**	**-**	**2**	**1.8**	**-**	**1**	**-**	**-**	**1.6**	**-**	**1**	**2.6**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlatio

24OCI103 PROJECT MANAGEMENT **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To study and understand the formulation, scheduling and various safety concepts and its requirements applied to construction projects.
- To study the various management techniques for successful completion of construction projects.
- To study the effect of management for project organization, workers, material and equipment utilization, and cost estimation.

UNIT I GENERAL OVERVIEW AND PROJECT ORGANIZATION **9**

Introduction - Interdisciplinary nature of modern construction projects – execution of project – evaluation of bits – resource management.

UNIT II ESTIMATION OF PROJECT COST & ECONOMICS **9**

Estimating quantities – description of items – estimation of project cost – running account bills – decision making in construction projects – depreciation of construction equipment – case study.

UNIT III PLANNING AND SCHEDULING **9**

Introduction – project scheduling – uncertainties in duration of activities using PERT – Project monitoring and control system – resource levelling and allocation – crashing of network.

UNIT IV SAFETY DURING CONSTRUCTION **9**

Basic terminology in safety - types of injuries - safety pyramid - Accident patterns - Planning for safety budget, safety culture - Introduction to OSHA regulations - Site safety programs - Job hazardanalysis, accident investigation & accident indices-violation, penalty.

UNIT V SAFE OPERATING PROCEDURES **9**

Safety during alteration, demolition works – Earthwork, steel construction, temporary structures, masonry & concrete construction, cutting & welding - Construction equipment, materials handling- disposal & hand tools - Other hazards – fire, confined spaces, electrical safety - Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Introduction to various construction management software.
2. Planning and creating new project.
3. Scheduling and constraints using PRIMAVERA.
4. Project cost management using PRIMAVERA.
5. Construction project safety management using BIM.

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6. Gantt Chart and Network Diagram Creation.
7. Critical Path Method (CPM) & PERT Analysis.
8. Risk Management Simulation.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Perform formulations of projects.
CO2: Analyze project costing.
CO3: Identify and estimate the activity in the construction.
CO4: Develop the knowledge on accidents and their causes.
CO5: Plan, assess, analyze and manage the construction project sites using CPM/PERT.

TEXT BOOKS

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control,Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. Choudhury S, Project Management, McGraw-Hill Publishing Company, New Delhi,1988.
3. Chris Hendrickson and Tung Au, Project Management for Construction Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.

REFERENCE BOOKS

1. Barcus, S.W. and Wilkinson. J. W., Hand Book of Management Consulting Services, McGraw Hill,New York, 1986.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992.
3. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth- Heinemann, USA, 2017.
4. Patrick X.W. Zou, Riza Yosia Sunindijo, Strategic Safety Management in Construction andEngineering John Wiley & Sons, Ltd 2015.
5. Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	–	2	–	–	–	–	2	–	1	3	2
CO2	3	3	2	2	2	–	–	–	–	1	–	2	3	2
CO3	3	2	3	2	3	–	–	–	–	1	–	2	2	3
CO4	2	–	–	–	1	3	3	2	–	–	2	1	2	1
CO5	3	3	3	2	3	–	–	–	–	2	–	2	3	3
AVG	**2.8**	**2.5**	**2.5**	**2**	**2.2**	**3**	**3**	**2**	**-**	**1.5**	**2**	**1.6**	**2.6**	**2.2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCI104 BUILDING PLANNING USING VAASTU SASTRA **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To introduce the principles of Vaasthu Shastra and its role in modern building planning.
- To equip students with the knowledge of guidelines for residential and commercial spaces.
- To develop the skills to apply principles in planning spaces for maximum comfort, energy flow, and harmony.

UNIT I INTRODUCTION TO VAASTHU SHASTRA **9**

Introduction to traditional Indian building orientation concepts including Vaasthu Shastra: overview, historical context, and philosophical background. Introduction to the five elements (Pancha Bhootas), cardinal directions, and their relevance in spatial organization. Role of energy flow and psychological comfort in building planning.

UNIT II GUIDELINES FOR RESIDENTIAL BUILDINGS **9**

General Vaasthu planning guidelines for residential buildings with functional and spatial arrangements. Orientation and zoning for daylight, ventilation, and thermal comfort. Introduction to structural load considerations as per IS 875 – Part 1: Dead Loads and IS 875 – Part 2: Imposed Loads. Importance of safety, utility, and aesthetic harmony in layout design.

UNIT III PLANNING OF COMMERCIAL AND PUBLIC BUILDINGS **9**

Design principles for commercial and public buildings such as offices, retail spaces, educational institutions, and hospitals. Functional requirements, circulation, and service zoning. Application of planning standards and integration with IS 875 loading codes and IS 456: Plain and Reinforced Concrete – Code of Practice.

UNIT IV CLIMATIC DESIGN & ENVIRONMENTAL INTEGRATION **9**

Importance of site context, solar orientation, prevailing winds, and daylighting in building design. Incorporating passive design strategies for thermal comfort and sustainability. Overview of IS SP 41: Guidelines for Climatic Design and ECBC (Energy Conservation Building Code) basics.

UNIT V COMMON DEFECTS AND SOLUTIONS **9**

Common functional and structural design issues in residential and commercial buildings. Remedial measures as per structural codes and basic planning principles. Introduction to basic concepts of defect rectification through both engineering practices and traditional approaches. Real-life examples and mini-case studies.

TOTAL:45 PERIODS

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LIST OF EXPERIMENTS

1. Vaasthu analysis of an existing residential floor plan.
2. Designing room layouts based on Vaasthu principles.
3. Vaasthu compliant commercial building layout planning.
4. Identifying and correcting Vaasthu defects in a building plan.
5. Vaasthu guidelines for entrance and exit planning.
6. Selecting a construction site based on Vaasthu considerations.
7. Kitchen layout design following Vaasthu principles.
8. Optimizing solar and wind orientation in building design using Vaasthu.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Explain the key principles of Vaasthu Shastra.

CO2: Apply guidelines in the design of residential and commercial buildings.

CO3: Plan spaces that promote balance, energy flow, and harmony.

CO4: Design buildings that respond to climate and environment using passive strategies and relevant IS codes.

CO5: Identify and rectify common defects in existing buildings.

TEXT BOOKS

1. Narayan, S. Vastu Shastra: For a better living. Rupa Publications, 2005.
2. Vasudevan, R. Vastu: Transcending time, tradition, and modernity. Orient Black Swan, 2011.
3. Sastry, B. K. Vastu Shastra: The ancient Indian science of architecture. TBS Publishers, 2002.

REFERENCE BOOKS

1. Bhat, S. Vastu for modern living. New Age International,2009.
2. Chakraborty, P. The art of Vastu Shastra. Allied Publishers, 2010.
3. Nambiar, S. M. Vastu Shastra for home and office. Srishti Publishers, 2013.
4. Kumar, P. Vastu for health, wealth, and happiness. Orient Longman, 2016.
5. Sharma, A. Practical Vastu Shastra for the home. Sterling Pub. Pvt. Ltd,2008.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	–	–	–	–	2	–	2	–	1	–	–	2	1
CO2	3	2	3	2	2	–	–	–	–	2	–	2	3	2
CO3	2	–	2	–	–	–	2	2	–	1	–	–	3	2
CO4	3	2	3	2	3	–	3	2	–	1	–	2	3	3
CO5	2	2	2	2	2	–	–	–	–	1	–	1	2	2
AVG	**2.4**	**2**	**2.5**	**2**	**2.3**	**2**	**2.5**	**2**	**-**	**1.2**	**-**	**1.6**	**2.6**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OEI101 BASICS OF CONTROL SYSTEMS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems

UNIT I MATHEMATICAL MODELS OF PHYSICALSYSTEMS **9**

Definition & classification of system – terminology & structure of feedback control theory – Analogous systems - Physical system representation by Differential equations – Block diagram reduction–Signal flow graphs.

UNIT II TIME RESPONSE ANALYSIS **9**

Standard test signals – Steady state error & error constants – Time Response of I and II order system.

UNIT III FREQUENCY RESPONSE ANALYSIS **9**

Correlation between Time & Frequency response – Polar plots – Bode Plots – Determination of Transfer Function from Bode plot.

UNIT IV STABILITY CONCEPTS & ANALYSIS **9**

Concept of stability – Necessary condition – RH criterion – Relative stability – Nyquist stability criterion – Stability from Bode plot – Relative stability from Nyquist & Bode – Closed loop frequency response.

UNIT V STATE VARIABLE ANALYSIS **9**

Concept of state – State Variable & State Model – State models for linear & continuous time systems–Solution of state & output equation–controllability & observability.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Mathematical modelling and analysis of Mechanical and Electrical systems using transfer function approach.
2. Time domain analysis of second order system.
3. Study of stability using Routh Hurwitz criterion.
4. Root locus technique-based stability analysis.
5. Frequency response and stability analysis using Bode plot.
6. Frequency response and stability analysis using Polar plot.
7. Mathematical modelling and analysis of Mechanical and Electrical systems using state space approach.
8. Test of controllability and observability of a state space model.

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TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Design the basic mathematical model of physical System.
CO2: Analyze the time response analysis and techniques.
CO3: Analyze the transfer function from different plots.
CO4: Apply the stability concept in various criterion.
CO5: Assess the state models for linear and continuous Systems.

TEXT BOOKS

1. Farid Golnarghi , Benjamin C. Kuo, "Automatic Control Systems" Paper back, McGraw Hill Education, 2018.
2. Katsuhiko Ogata, 'Modern Control Engineering", Pearson, 5th Edition2015.
3. J. Nagrath and M. Gopal, "Control Systems Engineering"(Multi Colour Edition), New Age International, 2018.

REFERENCE BOOKS

1. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, Pearson Education, 2010.
2. Control System Dynamics" by Robert Clark, Cambridge University Press, 1996
3. John J. D'Azzo, Constantine H. Houpis and Stuart N. Sheldon, Linear Control System Analysis and Design, 5th Edition, CRC PRESS, 2003.
4. S . Palani, Control System Engineering, McGraw-Hill Education Private Limited, 2009.
5. Yaduvir Singh and S.Janardhanan, Modern Control, Cengage Learning, First Impression, 2010.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	–	–	2	–	–	–	–	–	–	–	3	2
CO2	3	3	2	2	2	–	–	–	–	–	–	–	3	2
CO3	3	2	2	2	2	–	–	–	–	–	–	–	3	2
CO4	3	3	2	3	2	–	–	–	–	–	–	–	3	2
CO5	3	2	2	2	3	–	–	–	–	–	–	–	3	3
AVG	3	2.4	2	2.3	2.2	-	-	-	-	-	-	-	3	2.2

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OEI102 POWER ELECTRONICS AND DRIVES **L T P C**
3 0 2 4

COURSE OBJECTIVES

- Different types of power semiconductor devices and their switching.
- Operation, characteristics and performance parameters of controlled rectifiers and switched mode power supplies.
- Operation of AC voltage controller and various configurations.

UNIT I SINGLE PHASE RECTIFIERS **9**

Power Diode – half wave rectifier – mid-point secondary transformer based full wave rectifier – bridge rectifier - distortion factor - LC filters – SCR-Two transistor analogy based turn- ON, Controlled converters (1 pulse, 2 pulse) displacement factor – ripple and harmonic factor effect of source inductance, inverter angle limit.

UNIT II THREE PHASE RECTIFIERS **9**

Three phase diode rectifiers – Concern for power quality, Controlled converters (3 pulse, 6 pulse) Computation of performance parameters.

UNIT III SWITCHING POWER SUPPLIES **9**

IGBT, MOSFET: dynamic behaviour - driver and snubber circuits -low power high switching frequency switching Power supplies, buck, boost, buck-boost converters – Isolated topologies – resonant converters switching loss calculations and thermal design.

UNIT IV AC PHASE CONTROLLERS **9**

TRIAC triggering concept with positive and negative gate pulse triggering, TRIAC based phase controllers various configurations for SCR based single and three phase controllers.

UNIT V DRIVE CHARACTERISTICS **9**

Electric drive – Equations governing motor load dynamics – steady state stability – multiquadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Characteristics of PN junction diode,
2. Experimental verification of transfer characteristics of AC Phase Controllers.
3. Characteristics of SCR,
4. Simulation of Single-Phase Rectifiers.
5. Experimental verification of transfer characteristic of AC to DC half controlled Converter.
6. Experimental verification of transfer characteristic of AC to DC fully controlled Converter.
7. Simulation of Three Phase Rectifiers.
8. Characteristics of MOSFET and IGBT.

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TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1**:** Explain the operation of semiconductor devices, its dynamic characteristics

CO2**:** Design low power SMPS.

CO3**:** Analyze the various uncontrolled rectifiers and design suitable filter circuits.

CO4**:** Analyze operation of the n-pulse converters and evaluate performance parameters.

CO5**:** Apply voltage control and harmonic Elimination methods to inverter circuits.

TEXT BOOKS

1. Ned Mohan, T.M.Undeland, W.P.Robbins, ”Power Electronics: Converters, applications and design”, John Wiley and Sons, 3rd Edition, 2009.
2. Rashid M.H., Power Electronics Circuits, Devices and Applications, Prentice Hall India, 3rd Edition, New Delhi, 2004.
3. Bimal.K.Bose “Modern Power Electronics and AC Drives”, Pearson Education, 2nd, 2003.

REFERENCE BOOKS

1. Cyril. W. Lander, Power Electronics, McGraw Hill International, 3rd Edition, 1993.
2. P. S. Bimbhra, Power Electronics, Khanna Publishers, 3rd Edition 2003
3. Philip T. Krein, Elements of Power Electronics, Oxford University Press, 2013.
4. P. C. Sen, Power Electronics, Tata McGraw-Hill, 30th reprint, 2008.
5. Bin Wu, Mehdi Narimani, "High-Power Converters and AC Drives", Wiley, 2nd Edition, 2017.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	–	–	2	–	–	–	–	–	–	–	3	2
CO2	3	3	2	2	3	–	–	–	–	–	–	1	3	3
CO3	3	3	2	2	2	–	–	–	–	–	–	1	3	2
CO4	3	3	2	2	3	–	–	–	–	–	–	1	3	3
CO5	3	2	2	2	3	–	–	–	–	–	–	1	3	3
AVG	**3**	**2.6**	**2**	**2**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2.6**

1-Low, 2-Medium, 3-High, ‘-’ - No Correlation

24OEI103 INTRODUCTION TO PLC PROGRAMMING **L T P C**

3 0 2 4

COURSE OBJECTIVES

- To understand the fundamental concepts and architecture of Programmable Logic Controllers (PLCs).
- To identify and analyze the hardware components and interfacing devices used in PLC systems.
- To develop proficiency in PLC programming techniques and logic fundamentals for automation applications**.**

UNIT I PLC BASICS **9**

Programmable Logic Controllers (PLCs): Introduction; definition & history of the PLC; Principles of Operation; Various Parts of a PLC: CPU & programmer/monitors; PLC input & output modules; Solid state memory; the processor; I/O modules; power supplies. PLC advantage & disadvantage; PLC versus Computers, PLC Application.

UNIT II PLC HARDWARE COMPONENTS **9**

The I/O section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O specifications, The CPU, Memory design, Memory Types, Programming Devices, Selection of wire types and size.

UNIT III FUNDAMENTALS OF LOGIC **9**

The Binary Concept, AND, OR and NOT functions, Boolean Algebra, Developing circuits from Boolean Expression expressions, Producing the Boolean equation from given circuit, Hardwired logic versus programmed logic, Programming word level logic instructions. Converting Relay schematics and Boolean equation into PLC Ladder Programs,

UNIT IV VARIOUS INPUT /OUTPUT DEVICES AND ITS INTERFACING WITH PLC **9**

Different types of Input devices: Switches: Push button Switches, Toggle Switches, Proximity switches, Photo switches, Temperature Switch, Pressure Switch, and Level Switch, Flow Switches, manually operated switches, Motor starters, Transducers and sensors, Transmitters etc. Their working, specification and interfacing with PLC.

UNIT V BASICS OF PLC PROGRAMMING **9**

Processor Memory Organization, Program Scan, PLC Programming languages, Relay type Instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Programming Examine if Closed and examine If Open instructions, Entering the ladder diagram, Modes of operation. Creating Ladder Diagrams from Process Control Descriptions.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Introduction to ladder programming& to implement basic logic gates.
2. Develop, Simulate and Test Ladder diagram for Bottle Filling system.
3. Develop, Simulate and Test Ladder diagram for Traffic Light Control System.
4. Develop, Simulate and Test Ladder diagram for Car Parking system.
5. Develop Simulate and Test Ladder diagram for an alarm enunciator system.
6. Develop, Simulate and Test Ladder diagram for Batch Mixer.
7. Develop and test PLC program for three phase motor in both direction.
8. Develop, Simulate and Test Ladder diagram for stepper motor control in forward and reverse direction.

TOTAL: 30 PERIODS

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COURSE OUTCOMES

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

CO1: Compare conventional sequential control with programmable logic control system

CO2: Develop programs using different PLC programming languages for sequential and continuous process.

CO3: Interface analog and digital input/ output devices with PLC using different communication protocol

CO4: Test the PLC based system and troubleshoot the errors associated with it.

CO5: Develop the fundamentals of logic application.

TEXT BOOKS

1. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, McGraw-Hill, New York, 2019.
2. Stuart Boyer A, "SCADA: Supervisory control and data Acquisition", 4th Edition, ISA- The Instrumentation, Systems, and Automation Society, 2010.
3. Programmable Logic Controllers- Principles and Applications by John W. Webb and Ronald A. Reiss, 5th Edition, PHI.

REFERENCE BOOKS

1. Bolton. W, "Programmble Logic Controllers", Elsevier Newnes, 6th Edition 2015. https://nptel.ac.in/courses/108105062.
2. Programmable Logic Controllers- Programming Method and Applications by
3. JR.Hackworth and F.D Hackworth Jr., Pearson, 2004.
4. Embedded Systems- An integrated approach - Lyla b das, Pearson education2012.
5. Computers as Components –Wayne Wolf, Morgan Kaufmann (2nd Edition).

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	–	2	–	–	–	–	–	–	–	3	2
CO2	3	3	3	2	3	–	–	–	–	–	–	1	3	3
CO3	3	3	2	2	3	–	–	–	–	–	–	1	3	3
CO4	3	2	3	3	3	–	–	–	–	–	–	2	3	3
CO5	3	2	2	–	2	–	–	–	–	–	–	–	3	2
AVG	**3**	**2.4**	**2.4**	**2.3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**1.3**	**3**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OEI104 FUNDAMENTALS OF ELECRONIC DEVICES AND CIRCUITS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To introduce the fundamentals of analysis of electronic circuits.
- To provide basic understanding of semiconductor devices.
- To provide understanding of analog integrated circuits.

UNIT I DIODES **9**

The Ideal Diode - Terminal Characteristics of Junction Diodes - Physical Operation of Diodes - Analysis of Diode Circuits - Small Signal Model and Its Application - Operation in the Reverse Breakdown Region - Zener Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTOR **9**

Operation of the NPN transistor in the Active mode – Transistor Characteristics – Transistor as an Amplifier – Basic single Stage BJT Amplifier Configurations-Transistor as a Switch.

UNIT III FIELD EFFECT TRANISITOR **9**

Structure and Physical operation of Enhancement – Type MOSFET – Current Voltage Characteristics of Enhancement – Type MOSFT- The depletion type MOSFET – MOSFET as an Amplifier.

UNIT IV OUTPUT STAGES AND POWER AMPLIFIERS **9**

Classification of output Stages – Class A Output Stage – Class B Output Stage – Biasing the Class AB Stage – Power BJT Tuned Amplifiers – Push Pull Stages.

UNIT V SIGNAL GENERATOR AND WAVEFORM SHAPING CIRCUITS **9**

Basic Principles of Sinusoidal Oscillator – Op Amp- RC Oscillator Circuits – LC And Crystal Oscillators – Multivibrators – Unregulated Power Supply – Integrated Circuit Timers.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Characteristics of PN junction diode.
2. Characteristics of BJT – CB, CE, CC
3. Op-Amp based amplifier circuits Inverting and Non-inverting amplifier.
4. Op-Amp based Differential amplifier/Instrumentation amplifier.
5. Design of Adder-subtractor circuits using Op-Amp.
6. Square wave and Tri-angular wave oscillator.
7. Op-Amp based Wien bridge and RC oscillator.
8. 555 – timer IC based astable multi-vibrator.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explain the structure and underlying semiconductor physics concepts.
CO2: Design circuits employing electronic devices.

CO3: Explore the characteristics of OPAMP and its internal components
CO4: Analyze, design and implement analog electronic circuits involving OP-AMP.
CO5: Analyze, design and implement analog electronic circuits involving timer 555.

TEXT BOOKS

1. David A bell, " Electronic circuits", Oxford University Press, 2011.
2. Ramakant A Gayakwad, " Opamps and Linear Integrated Circuits", 4th Edition, Pearson Education/PHI, 2009.
3. D. Roy Choudary, S.B. Jain, " Linear Integrated Circuits", 3rd Edition, New Age publishers,2014.

REFERENCE BOOKS

1. Millman and Halkias, "Integrated Electronics", McGraw Hill Publications, 2010.
2. Muhammad H. Rashid, "Linear Integrated Circuits", Cengage Learning, 2014.
3. Donald A Neamen, "Electronic Circuits", McGraw Hill, 2007.
4. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill,
5. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	–	2	–	–	–	–	–	–	–	3	2
CO2	3	3	3	2	3	–	–	–	–	–	–	1	3	3
CO3	3	2	2	2	3	–	–	–	–	–	–	–	3	2
CO4	3	3	3	2	3	–	–	–	–	–	–	1	3	3
CO5	3	3	3	2	2	–	–	–	–	–	–	1	3	3
AVG	**3**	**2.6**	**2.6**	**2**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMI101 INTERNAL COMBUSTION ENGINES **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To impart the basic fundamental knowledge on IC engines and its working along with some of the recent trends in IC engine.
- To impart knowledge on cooling and lubrication.
- To study the modern engine technologies.

UNIT I INTRODUCTION IC ENGINES **9**

Introduction, Types of IC engines, Constructional details IC engine, working, principles – 2 & 4 stroke engines, Cycles – Air standard cycles, Fuel air cycles and actual cycles, Actual Indicator diagram for four stroke and two stroke engines, General fuel properties, ignition

properties – octane and cetane rating, Materials for engine components.

UNIT II PETROL ENGINES **9**

Working and constructional details of petrol engines, Carburetor – constructional and working, types of carburetors, additional features in modern carburetor, A/F ratio calculation, Petrol Injection - introduction, Ignition – introduction and requirements, Battery and magneto coil ignition system, Electronic ignition system, Stages of combustion in petrol engines, Combustion chambers for petrol engine, formation of knock in petrol engine.

UNIT III DIESEL ENGINES **9**

Working and constructional details of diesel engines, fuel injection – requirements, types of injection systems – inline, distributor pumps, unit injector, Mechanical and pneumatic governors. Fuel injector, Types of injection nozzles, Spray characteristics. Injection timing, Split and multiple injection, Stages of combustion in Diesel engines, direct and indirect combustion chambers for diesel engine, knocking in diesel engine, Introduction on supercharging and turbocharging.

UNIT IV COOLING AND LUBRICATION **9**

Requirements, Types- Air cooling and liquid cooling systems, forced circulation cooling system, pressure and Evaporative cooling systems, properties of coolants for IC engine. Need of lubrication, Lubricants for IC engines - Properties of lubricants, Types of lubrication – Mist, Wet and dry sump lubrication systems.

UNIT V MODERN TECHNOLOGIES IN IC ENGINES **9**

HCCI Engines – construction and working, CRDi injection system, GDI Technology, E - Turbocharger, Variable compression ratio engines, variable valve timing technology, Fuel cell, Hybrid Electric Technology.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Valve Timing Diagram of a Four-Stroke Engine.
2. Port Timing Diagram of a Two-Stroke Engine.
3. Actual Pressure-Volume (P–V) Diagrams of Internal Combustion Engines.
4. Performance Test on a Four-Stroke Diesel Engine.
5. Heat Balance Test on a Four-Stroke Diesel Engine.
6. Morse Test on a Multi-Cylinder Petrol Engine.
7. Retardation Test on a Diesel Engine.
8. Viscosity Measurement Using a Redwood Viscometer.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explain the working SI engine fundamentals.

CO2: Understand SI engine fundame

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CO3: Express concept of CI engines.
CO4: Explore the purpose of cooling and lubrication.
CO5: Remember the recent trends in IC engines.

TEXT BOOKS

1. Ganesan.V., "Internal Combustion Engines", Tata McGraw Hill Publishing Co., New York,1994.
2. Ramalingam. K. K., Internal Combustion Engines, Scitech publications, Chennai, 200352"Internal Combustion Engines".
3. John B.Heywood, "IC Engines fundamentals", 2nd Edition, New York: McGraw-Hill, 2018.

REFERENCE BOOKS

1. Gupta H.N, "Fundamentals of Internal Combustion Engines", 2nd Edition PHI, 2013.
2. R.B. Mathur & R.P. Sharma, Internal Combustion Engines, Dhanpat Rai & Sons 2007.
3. Duffy Smith, Auto Fuel Systems, The Good Heart Willcox Company, Inc., 1987.
4. Rajput. R. K., "Internal Combustion Engines" Laxmi Publications, 2017.
5. Eric Chowenitz, Automobile Electronics, SAE Publications, 1995.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	–	–	–	–	–	–	–	–	–	3	2
CO2	3	2	2	–	2	–	–	–	–	–	–	–	3	2
CO3	3	2	3	–	2	–	–	–	–	–	–	–	3	3
CO4	3	2	2	–	–	–	–	–	–	–	–	–	2	2
CO5	2	–	–	–	2	–	–	–	–	–	–	–	2	3
AVG	2.8	2	2.3	-	2	-	-	-	-	-	-	-	2.6	2.4

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMI102 TESTING OF ENGINEERING MATERIALS **L T P C**

3 0 2 4

COURSE OBJECTIVES

- To gain and understanding of the response of various metals under the application of stress and temperature.
- To build necessary theoretical back ground of the role of lattice defects in governing both elastic and plastic properties of metals will be discussed.
- Obtain a working knowledge of various hardness testing machines BHN, VHN, RHN.

UNIT I INTRODUCTION **9**

Introduction, Importance of testing Hardness Test: Methods of hardness testing – Brinell, Vickers, Rockwell hardness tests. The Impact Test: Notched bar impact test and its

significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve.

UNIT II TENSILE TESTING **9**

Engineering stress-strain and True stress-strain curves. Tensile properties, conditions for necking. Stress-Strain diagrams for steel, Aluminum and cast iron.

UNIT III FATIGUE TESTING **9**

Introduction, Stress cycles, S-N Curve, Effect of mean stress, Mechanism of fatigue failure, Effect of stress concentration, size, surface condition and environments on fatigue.

UNIT IV CREEP AND STRESS RUPTURE **9**

Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature.

UNIT V NON-DESTRUCTIVE TESTING **9**

Principle, Operation, Advantages and Limitations of Liquid Penetrant, Magnetic Particle, Radiography and Ultrasonic tests.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Tension test on mild steel rod.
2. Torsion test on mild steel rod.
3. Hardness test on metal beam (Rockwell and Brinell Hardness Tests).
4. Compression test on helical spring.
5. Deflection test on carriage spring.
6. Impact Testing on mild steel rod.
7. Deflection of a cantilever wooden and steel beam.
8. Determine the deflection of a simply supported wooden and steel beam

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Classify mechanical testing of ferrous and non-ferrous metals and alloys.

CO2: Recognize the importance of crystal defects including dislocations in plastic deformation.

CO3: Solve the 2D vector variable problems using Finite Element technique.

CO4: Identify the testing methods for obtaining strength and hardness.

CO5: Examine the mechanisms of materials failure through fatigue and creep.

TEXT BOOKS

1. Mechanical Metallurgy – G. E. Dieter, 3rd Edition, published by New York Mc GrawHill,1986.
2. J. Wulff,".Mechanical behavior", John Wiley & Sons Inc; Trans-ed edition.

3. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.

REFERENCE BOOKS

1. Mechanical Metallurgy – White & Lemay.
2. Testing of Metallic Materials - A.V.K. Suryanarayana
3. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9th Edition, American Society for Metals, 1978.
4. Brandon D.G., "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA, 1986.
5. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	–	–	–	–	–	–	–	–	–	3	2
CO2	3	2	2	–	2	–	–	–	–	–	–	–	3	2
CO3	3	2	3	–	2	–	–	–	–	–	–	–	3	3
CO4	3	2	2	–	–	–	–	–	–	–	–	–	2	2
CO5	2	–	–	–	2	–	–	–	–	–	–	–	2	3
AVG	**2.8**	**2**	**2.3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.6**	**2.4**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMI103 INDUSTRIAL LAYOUT DESIGN AND SAFETY **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To introduce the industrial layout design principles, process and material flow analysis and product and equipment analysis.
- To impart knowledge layout design and algorithms.
- To study the safety planning and management.

UNIT I INTRODUCTION **9**

Industrial Facility Layout: Definition, Types of Layout Problems, Engineering Design Problem Approach – Product Analysis, Equipment Selection, Personnel Requirement Analysis, Space Requirement and Availability – Process and Material Flow Analysis, Data Requirement for Layout Decisions, Tools for Presenting Layout Designs.

UNIT II FACILITIES LAYOUT DESIGN & ALGORITHMS **9**

Traditional Approaches to Facility Layout, Systematic Layout Planning, Special Considerations in Office Layout, Engineering Design Problem Approach, Code Compliance, OSHA, ADA Regulations, and Other Considerations in Facility Design – Algorithms for the

Layout Problem, Construction Algorithms, Improvement Algorithms, Hybrid Algorithms, Layout Software (CRAFT, BLOCPLAN, PFAST, Layout-iQ, VIP- PLANOPT, Factory CAD, Factory FLOW, Plant Simulation).

UNIT III FACILITIES LAYOUT PROBLEM MODELS & ALGORITHMS 9

Models for the Layout Problem, Generic Modeling Tools, Models for the Single-Row Layout Problem, Models for the Multi row Layout Problem with Departments of Equal and Unequal Area – Material Handling, Principles, Types, Models for Material- Handling System Design – Storage and Warehousing, Warehouse Functions, Warehouse Design and Operation.

UNIT IV SAFETY PLANNING & MANAGEMENT 9

Introduction: Elements of Safety Programming, Safety Management. Upgrading Safety Developmental Programs: Safety Procedures, Arrangements and Performance Measures, Education, Training and Development in Safety. Safety Performance: An Overview of an Accident, Occupational Health and Industrial Hygiene. Understanding the Risks: Prevention of Accidents Involving Hazardous Substances. Indian Factories Act 1948 for Health and Safety.

UNIT V APPROACHES IN SAFETY MANAGEMENT 9

Safeguarding against Common Potential Hazards: Trips, Slips and Falls, Preventing Electrocution, Static Electricity, Hazardous Energy Control. Specific Hazard Control Measures: Forklift Hazard Control, Tractor Hazard Control. Safe Handling and Storage: Material Handling, Compressed Gas Cylinders, Corrosive Substances, Hydrocarbons, Waste Drums and Containers.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Simulation of Manufacturing Shop
2. Simulation of Batch Production System
3. Simulation of Multi Machine Assignment System
4. Simulation of Manufacturing and Material Handling Systems
5. Simulation of a Shop Floor
6. Simulation of Material Handling Systems
7. Write an algorithm for plant layout
8. Write an algorithm for storage and warehouse.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Explain the industrial facility layout design principles, process and material flow analysis and product and equipment analysis.

CO2: Discuss the facilities layout design algorithms and selecting appropriate software.

CO3: Describe the facilities layout problem modeling tools and algorithms for production, warehouse and material handling.

CO4: Explain the safety planning and management principles in industries.

CO5: Illustrate the various safety management approaches in industries.

TEXT BOOKS

1. Sunderesh S. Heragu, "Facilities Design", 3rd Edition, CRC Press Taylor & Francis Group, 2008.
2. L. M. Deshmukh, "Industrial Safety Management: Hazard Identification and Risk Control", Tata McGraw-Hill Publishing Co. Ltd., 2005.
3. Eric Teicholz, "Facility Design and Management Handbook", Tata McGraw-Hill Publishing Co. Ltd., 2001.

REFERENCE BOOKS

1. James A. Tompkins, John A. White, Yavuz A. Bozer, and J. M. A. Tanchoco, "Facilities Planning", 4th Edition, John Wiley & Sons, 2010.
2. Matthew P. Stevens and Fred E. Meyers, "Manufacturing Facilities Design and Material Handling", 5th Edition, Purdue University Press, 2013.
3. Charles D.Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 2003.
4. J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer, 2017.
5. Industrial Hazard and Safety Handbook: (Revised impression by Ralph W King and John Magid, 2013.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	-	1	-	1	-	-	-	-	-	3	1
CO2	3	3	2	1	2	1	1	1	-	-	-	-	3	2
CO3	3	3	3	1	3	2	1	1	1	-	-	-	3	2
CO4	2	1	1	3	1	3	2	1	-	-	-	-	1	3
CO5	2	1	1	3	2	3	3	2	-	-	-	-	1	3
AVG	**2.6**	**2**	**1.8**	**2**	**1.8**	**2.3**	**1.6**	**1.25**	**1**	**-**	**-**	**-**	**2.2**	**2.2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMI104 PRODUCT DESIGN AND PROCESS DEVELOPMENT **L T P C**
3 0 2 4

COURSE OBJECTIVES

- Applying the principles of generic development process; and understanding the organization structure for new product design and development.
- Identifying opportunity and planning for new product design and development.
- Conducting customer need analysis; and setting product specification for new product design and development.

UNIT I INTRODUCTION **9**

Introduction – Characteristics of Successful Product Development – People involved in Product Design and Development - Duration and Cost of Product Development - The Challenges of Product Development - The Product Development Process - Concept Development: The Front- End Process - Adapting the Generic Product Development Process - Product Development Process Flows - Product Development Organizations.

UNIT II OPPORTUNITY DENTIFICATION & PRODUCT PLANNING **9**

Opportunity Identification: Definition - Types of Opportunities - Tournament Structure of Opportunity Identification - Effective Opportunity Tournaments – Opportunity densification Process - Product Planning: Four Types of Product Development Projects – The Process of Product Planning.

UNIT III IDENTIFYING CUSTOMER NEEDS & PRODUCT SPECIFICATIONS **9**

Identifying Customer Needs: The Importance of Latent Needs - The Process of Identifying Customer Needs. Product Specifications: Definition - Time of Specifications Establishment - Establishing Target Specifications - Setting the Final Specifications.

UNIT IV CONCEPT GENERATION & SELECTION **9**

Concept Generation: Activity of Concept Generation - Structured Approach - Five step method of Concept Generation. Concept Selection: Methodology - Concept Screening and Concepts Scoring.

UNIT V CONCEPT TESTING & PROTOTYPING **9**

Concept Testing: Seven Step activities of concept testing. Prototyping – Principles of Prototyping – Prototyping Technologies – Planning for Prototypes

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Identifying the customer needs for a selected product.
2. Plan for the Design Process.
3. Develop Engineering Specification.
4. Generate a concept for a product.
5. Develop a clay model for a new product.
6. Perform a design calculation.
7. Fabricate a prototype model of the new product as per the design.
8. Perform economic analysis for the new product.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Apply the principles of generic development process; and understand the organization structure for new p1roduct design and development.

CO2: Identify opportunity and plan for new product design and development.

CO3: Conduct customer need analysis; and set product specification for new product

design and development.

CO4: Generate, select, and screen the concepts for new product design and development.

CO5: Test and prototype the concepts to design and develop new products.

TEXT BOOKS

1. Ulrich K.T., Eppinger S. D. and Anita Goyal, "Product Design and Development" McGraw-Hill Education; 7th Edition, 2020.
2. Fabio Giudice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor & Francis 2006
3. Saaksvuori Antti, ImmonenAnselmie, product Life Cycle Management Springer, Dreamtech, 3-540-25731-4.

REFERENCE BOOKS

1. Belz A., 36-Hour Course: "Product Development" McGraw-Hill, 2010.
2. Rosenthal S., "Effective Product Design and Development", Business One Orwin, Home Wood, 1992, ISBN 1-55623-603-4.
3. Stuart Pugh., "Total Design –Integrated Methods for Successful Product Engineering" Addison Wesley Publishing, 1991, ISBN 0-202-41639-5.
4. Chitale, A. K. and Gupta, R. C., Product Design and Manufacturing, PHI Learning, 2013.
5. Jamnia, A., Introduction to Product Design and Development for Engineers, CRC Press 2018.

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Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	1	2	1	1	1	-	-	-	-	3	2
CO2	3	3	3	1	2	1	1	1	-	-	-	-	3	2
CO3	3	3	3	1	2	2	1	1	-	-	-	-	3	2
CO4	3	3	3	1	3	2	1	1	-	-	-	-	3	2
CO5	3	2	3	1	3	3	1	1	-	-	-	-	3	2
AVG	3	2.6	2.8	1	2.4	1.8	1	1	-	-	-	-	3	2

1-Low, 2-Medium, 3-High, '-' - No Correlatio

24OBI101 INTRODUCTION TO DIGITAL SIGNAL PROCESSING **L T P C**

3 0 2 4

COURSE OBJECTIVES

- To introduce the concepts of discrete time random signal processing.
- To introduce about multirate signal processing and its applications.
- To understand the spectrum estimation techniques.

UNIT I MULTIRATE SIGNAL PROCESSING **9**

Review of Convolution, DFT and ZT, Multirate Signal Processing - Decimation, Interpolation, Sampling Rate Conversion by a rational factor – digital filter banks, sub band coding, Quadrature Mirror Filter.

UNIT II DISCRETE TIME RANDOM PROCESSES **9**

Stationary random processes, Autocorrelation, Rational Power Spectra, Filters for generating random Processes from white noise and inverse filter – AR, MA and ARMA processes – relationship between autocorrelation and the filter parameters.

UNIT III LINEAR PREDICTION AND FILTERING **9**

Linear Prediction – Forward and Backward - Wiener filters for filtering and prediction – FIR Wiener Filter – IIR Wiener Filter – Kalman Filter.

UNIT IV ADAPTIVE FILTERING **9**

FIR adaptive filters – adaptive filters based on steepest descent method – LMS algorithm – Variants of LMS algorithm – adaptive echo cancellation – adaptive channel equalization – RLS Algorithm.

UNIT V SPECTRUM ESTIMATION **9**

Estimation of power spectra from finite duration observations of signals – Non parametric methods of spectrum estimation – the Bartlett and the Welch method – Parametric spectrum estimation – AR MA and ARMA.

TOTAL:45 PERIODS

LIST OF EXPERIMENTS

1. Study of autocorrelation and Cross Correlation of random signals.
2. Design and Implementation of Multirate Systems.
3. Design and Implementation of Wiener Filter.
4. Design and Implementation of FIR Linear Predictor.
5. Design of adaptive filters using LMS algorithm.
6. Spectrum Estimation using Bartlett and Welch Methods.
7. Design and Implementation of IIR .
8. Design of adaptive filters using RLS algorithm.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Comprehend multirate signal processing and demonstrate its applications.

CO2: Demonstrate an understanding of the power spectral density and apply to discrete random signals and systems.

CO3: Apply linear prediction and filtering techniques to discrete random signals for signal detection and estimation.

CO4: Analyze adaptive filtering problems and demonstrate its application.

CO5: Apply power spectrum estimation techniques to random signals.

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TEXT BOOKS

1. John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications, 4th Edition, Pearson Education / Prentice Hall, 2007.
2. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993.
3. V. Oppenheim, R.W. Schafer and J.R. Buck, ―Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.

REFERENCE BOOKS

1. Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint 2008.
2. Haykin, Adaptive Filter Theory, 4th Edition, Pearson Education, New Delhi, 2006.
3. Sophoncles J. Orfanidis, "Optimum Signal Processing ", McGraw Hill, 2000.
4. Emmanuel C. Ifeachor& Barrie. W. Jervis, "Digital Signal Processing", 2nd Edition, Pearson Education / Prentice Hall, 2002.
5. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1	3	2	1	1	-	-	-	-	3	2
CO2	3	3	3	1	2	2	1	1	-	-	-	-	3	2
CO3	3	3	3	2	2	2	1	1	-	-	-	-	3	2
CO4	3	3	3	2	3	2	1	1	-	-	-	-	3	2
CO5	3	3	3	1	3	3	1	1	-	-	-	-	3	2
AVG	3	3	2.8	1.4	2.6	2.2	1	1	-	-	-	-	3	2

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBI102 IOT AND SENSORS TYPES **L T P C**

3 0 2 4

COURSE OBJECTIVES

- To understand the fundamental concepts related to IoT and sensors types.
- To understand basics of an IOT System, IoT hardware and communication protocols, data storage, data analysis and use them for real time IoT enabled domains.
- To become familiar with sensor types and its functions.

UNIT I INTRODUCTION TO IOT AND IOT LEVELS **9**

Functional blocks of an IoT system (Sensors, Data Ingress, Data Aggregation Point Communication point back to the cloud, Analysis, Decision making, Actuation) Basic of Physical and logical design of IoT (IoT protocols, communication models) IoT enabled

domains (Home automation, Smart cities, environment monitoring, renewable energy, agriculture, industry, healthcare, marketing and management) M2M, Difference between IoT, Embedded Systems and M2M, Industry 4.0 concepts.

UNIT II IOT SENSORS AND HARDWARE **9**

Passive and active sensors, differences, Different kinds of sensors (Temperature, humidity, pressure, obstacle, water flow, accelerometer, colour, gyro, load cell, finger print, motion, ultrasonic distance, magnetic vibration, eye blink, hear beat, PPG, glucose, body position, blood pressure), Multi-sensors, Pre-processing (sampling, filtering, ADC, size of data, local memory, compression), IoT front end hardware (Raspberry Pi, Arduino, Galileo, beagle bone equivalent platforms).

UNIT III INTRODUCTION TO IOT PROTOCOLS **9**

Infrastructure (6LowPAN, IPv4/IPv6, RPL), Identification (EPC, uCode, IPv6, URIs), Communication/ Transport (Wi-Fi, Bluetooth, ZigBee, LPWAN), Data Protocols (MQTT, CoAP, AMQP, Websocket, Node).

UNIT IV IOT CLOUD AND DATA ANALYTICS **9**

Collecting data from sensors,Data Ingress, Cloud storage, IoT cloud platforms (Amazon AWS, Microsoft Azure, Google APIs), Data analytics for IoT, Software and management tool for IoT, Dashboard design.

UNIT V IOT ARCHITECTURES WITH CASE STUDIES **9**

Business models for IoT, smart cities, agriculture, healthcare, industry. Case studies/Mini projectsfor the real time IoT applications.

TOTAL:45 PERIODS

LIST OF EXPERIMENTS

1. Introduction to Arduino platform and programming.
2. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth).
3. Introduction to Raspberry PI platform and python programming.
4. Interfacing sensors with Raspberry PI.
5. Communicate between Arduino and Raspberry PI using any wireless medium.
6. Setup a cloud platform to log the data.
7. Log Data using Raspberry PI and upload to the cloud platform.
8. Design an IOT based system.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Enumerate basic premise of an IOT System.

CO2: Implement basic and to be familiar with the sensors available for IoT applications.

CO3: Learn the frontend hardware platforms and communication protocols for IoT.

CO4: Explore the cloud storage, data analysis and management.
CO5: Design and develop the usage for real time IoT enabled domains.

TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
2. Mayur Ramgir, "Internet – of – Things, Architecture":, Implementation and Security, 1st Edition, Pearson Education, 2020.
3. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies", Protocols, and Use Cases for the "Internet of Things", CISCO Press, 2017.

REFERENCE BOOKS

1. Raj kamal, Internet of Things, Architecture and Design Principles, McGraw-Hill, 2017.
2. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.H.Gerez, "Algorithms for VLSI Design Automation", John Wiley, 1999.
3. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
4. Perry Lea, "Internet of things for architects", Packt, 2018.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
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CO1	3	3	2	1	2	1	1	1	-	-	-	-	3	2
CO2	3	3	2	1	3	2	1	1	-	-	-	-	3	3
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CO4	3	3	3	1	3	3	1	2	-	-	-	-	3	3
CO5	3	3	3	2	3	3	1	2	-	-	-	-	3	3
AVG	3	3	2.6	1.4	2.8	2.2	1	1.6	-	-	-	-	3	2.8

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBI103 MEDICAL DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS L T P C
3 0 2 4

COURSE OBJECTIVES

- To understand the working of the devices for measurement of parameters related to ECG, EEG and EMG.
- To explain diagnostic and therapeutic devices related to respiratory parameters.
- To understand the various sensory measurements that hold clinical importance.

UNIT I CARDIAC EQUIPMENT **9**

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor- Holter Monitor, Phonocardiography, Cardiac Pacemaker-Internal and External Pacemaker, AC and DC Defibrillator- Internal and External.

UNIT II NEUROLOGICALEQUIPMENT **9**

Clinical significance of EEG, Multi-channel EEG recording system, Evoked Potential– Visual, Auditory and Somatosensory, MEG (Magneto Encephalo Graph), EEG Bio Feedback Instrumentation.

UNIT III MUSCULAR AND BIOMECHANICAL EQUIPMENT **9**

Clinical significance of EEG, Multi-channel EEG recording system, Evoked Potential– Visual, Auditory and Somatosensory, MEG (Magneto Encephalo Graph), EEG Bio Feedback Instrumentation.

UNIT IV RESPIRATORY MEASUREMENT AND ASSIST SYSTEM **9**

Instrumentation for measuring the mechanics of breathing – Spiro meter, Lung Volume and vital capacity, measurements of residual volume, Pneumotacho meter, Whole body Plethysmo graph, Apnoea Monitor.

UNIT V SENSORY DIAGNOSTIC EQUIPMENT **9**

Psycho physiological Measurements – polygraph, basal skin resistance (BSR), galvanic skin resistance (GSR), Sensory responses - Audiometer-Pure tone, Speech, Eye Tonometer, auto refractometer.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Measurement of visually and auditory evoked potential.
2. Galvanic skin resistance (GSR) measurement.
3. Measurement of output intensity from short wave and ultra sonic diathermy.
4. Electrical safety measurements.
5. Measurement of stimulation current wave forms used in medical stimulator.
6. Recording of Audiogram.
7. Study the working of Defibrillator and pacemakers.
8. Study of ECG, EEG and EMG electrodes.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO1: Describe the working and recording setup of all basic cardiac equipment.

CO2: Utilise the working and recording of all basic neurological equipment's.

CO3: Discuss the recording of diagnostic and therapeutic equipment's related to EMG.

CO4: Explain about measurements of parameters related to respiratory system.

CO5: Describe the measurement techniques of sensory responses.

TEXT BOOKS

1. John G.Webster," Medical Instrumentation Application and Design",4th Edition, Wiley India Pvt Ltd, New Delhi, 2015.
2. Joseph J. Carrand John M. Brown," Introduction to Biomedical Equipment Technology", Pearson Education, 2012.
3. Handpur. R.S., "Handbook of Biomedical Instrumentation". 2nd Edition. Tata Mc-Graw Hill Pub. Co., Ltd. 2003.

REFERENCE BOOKS

1. L.A Geddes and L.E.Baker, "Principles of Applied Biomedical Instrumentation", 3rd Edition, 2008.
2. Khandpur. R.S., "Handbook of Biomedical Instrumentation". 2nd Edition. Tata Mc Graw Hill Pub. Co., Ltd. 2003.
3. Antony Y. K. Chan, "Biomedical Device Technology, Principles and design", Charles Thomas Publisher Ltd, Illinois, USA, 2008.
4. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Pearson Education, New Delhi, 2007.
5. Shakti Chatterjee, Aubert Miller, "Bio medical Instrumentation Systems" 2010 1st Edition, Delmar Cencage Learning, Clifton Park, New York.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	1	1	1	-	-	-	-	3	2	3
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CO4	3	3	1	3	3	1	2	-	-	-	-	3	3	3
CO5	3	3	2	3	3	1	2	-	-	-	-	3	3	3
AVG	3	3	1.8	2.6	2.2	1	1.4	-	-	-	-	3	2.6	3

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBI104 BIOMEDICAL INSTRUMENT AND DESIGN **L T P C**

3 0 2 4

COURSE OBJECTIVES

- To understand the origin of various biological signals and electrode configurations specific to bio-potential measurements.
- To understand the characteristics of Bio signals and the design of bio amplifiers.
- To explain the different techniques used for measurement of non-electrical bio-parameters.

UNIT I ELECTRODE CONFIGURATIONS **9**

Bio signals characteristics – Origin of bio potential and its propagation, Frequency and amplitude ranges, Electrode configurations: Electrode-electrolyte interface, electrode–skin interface impedance, Unipolar and bipolar configuration, classification of electrodes.

UNIT II BIO SIGNAL CHARACTERISTICS **9**

Bio signals characteristics – ECG-frequency and amplitude ranges, Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode. EMG - Electrode configuration -unipolar and bipolar mode.

UNIT III BIO AMPLIFIERS **9**

Infrastructure (6LowPAN, IPv4/IPv6, RPL), Identification (EPC, uCode, IPv6, URIs), Communication/ Transport (Wi-Fi, Bluetooth, ZigBee, LPWAN), Data Protocols (MQTT, CoAP, AMQP, Websocket, Node).

UNIT IV MEASUREMENT OF BIO SIGNALS **9**

Temperature, respiration rate and pulse rate measurements. Blood Pressure - indirect methods and direct methods, Blood flow and cardiac output measurement- Indicator dilution and thermal dilution , Electromagnetic and ultrasound blood flow measurements.

UNIT V BIO CHEMICAL MEASUREMENTS **9**

Biochemical sensors - pH, pO2 and pCO2, Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer.

TOTAL:45 PERIODS

LIST OF EXPERIMENTS

1. Design of ECG Amplifiers.
2. Design of EMG amplifier.
3. Design of frontal EEG amplifier.
4. Design a Multiplexer and Demultiplexer for any two bio signals.
5. Measurement of body Temperature.
6. Measurement of pulse-rate using Photo transducer.
7. Measurement of pH and conductivity.
8. Measurement of blood pressure using sphygmomanometer.

TOTAL:30 PERIODS

COURSE OUTCOMES

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

CO1: Illustrate the origin of various biological signals and their characteristics.

CO2: Gain knowledge on characteristics of bio signals.

CO3: Gain knowledge on various amplifiers involved in monitoring and transmission of bio signals.

CO4: Explain the different measurement techniques for non-electrical bio-parameters.

CO5: Explain the biochemical measurement techniques as applicable for diagnosis and further treatment.

TEXT BOOKS

1. Leslie Cromwell,“ Biomedical Instrumentation and measurement”, 2nd Edition, Prentice Hall of India, New Delhi, 2015.
2. John G.Webster, “Medical Instrumentation Application and Design”, 4th Edition, Wiley India Pvt Ltd, New Delhi, 2015.
3. Khandpur R. S, “Handbook of Biomedical Instrumentation”, Tata Mc Graw Hill, New Delhi, 2003.

REFERENCE BOOKS

1. John Enderle, Susan Blanchard,Joseph Bronzino, “Introduction to Biomedical Engineering”, 2nd Edition, Academic Press,2005.
2. Joseph J. Carrand John M.Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education, 2004.
3. L. A. Geddas and L. E. Baker, “Principles of Applied Biomedical Instrumentation”, 2004.
4. John G. Webster, “Bioinstrumentation”, John Willey and sons, New York, 2004.
5. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design”, McGraw-Hill Publisher, 2003.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	2	1	1	1	-	-	-	-	3	2
CO2	3	3	3	2	2	1	1	1	-	-	-	-	3	2
CO3	3	3	3	2	3	2	1	2	-	-	-	-	3	3
CO4	3	3	3	2	3	3	1	2	-	-	-	-	3	3
CO5	3	3	3	2	3	3	1	2	-	-	-	-	3	3
AVG	**3**	**3**	**2.8**	**2**	**2.6**	**2**	**1**	**1.6**	**-**	**-**	**-**	**-**	**3**	**2.6**

1-Low, 2-Medium, 3-High, ‘-’ - No Correlation

24OCT201 BUILDING PLANNING AND APPROVAL **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To understand the principles of building planning, including utility, economy, aesthetics, and circulation.
- To learn the process of site selection, building orientation, and compliance with legal building regulations.
- To explore sustainable building concepts and smart technologies integrated into modern planning practices.

UNIT I FUNDAMENTALS OF BUILDING PLANNING **9**

Covers basic principles of building planning such as utility, economy, aesthetics, and circulation. Introduces types of buildings, their classification, and key components like walls, doors, windows, and stairs.

UNIT II SITE SELECTION AND ORIENTATION **9**

Explains factors affecting site selection including topography, soil, climate, and access. Emphasizes proper building orientation based on sun path, wind direction, and site features for energy efficiency and comfort.

UNIT III BUILDING RULES AND DEVELOPMENT CONTROL **9**

Introduces building byelaws and development regulations including FAR, setbacks, height limits, and open spaces. Discusses provisions of the National Building Code (NBC) and local municipal norms.

UNIT IV BUILDING APPROVAL PROCESS AND DOCUMENTATION **9**

Covers the step-by-step procedure for obtaining building permissions. Includes preparation of site plans, working drawings, and required documents. Introduces online approval systems and key authorities.

UNIT V SUSTAINABLE AND SMART BUILDING CONCEPTS **9**

Highlights eco-friendly planning and green building features. Discusses energy-efficient design, rainwater harvesting, and green certifications (GRIHA, IGBC, LEED). Introduces smart building technologies.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Use planning principles to design practical buildings.
CO2: Follow building rules and codes.
CO3: Choose the right site for building.
CO4: Prepare the required documents for approval.
CO5: Apply green and smart technologies in building designs.

TEXT BOOKS

1. Bindra, S. P., & Arora, S. P. Building construction: Planning techniques and methods. Dhanpat Rai Publishing Company, 2013.
2. Shah, M. G., Kale, C. M., & Patki, S. Y. Building drawing. Tata McGraw-Hill Education, 2010.
3. Bureau of Indian Standards. National building code of India (NBC). Bureau of Indian Standards, 2016.

REFERENCE BOOKS

1. Varghese, P. C. Building construction. PHI Learning Pvt. Ltd,2007 Rai Publications, 2013.
2. Rangwala, S. C. Building construction. Charotar Publishing House, 2014.
3. Gopi, S. Building drawing and detailing. Pearson Education, 2010.
4. Ching, F. D. K. Architecture: Form, space, and order. Wiley,2015.
5. Birdie, G. S., & Birdie, J. S. Building design and drawing. Dhanpat Rai Publishing Company, 2004.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	2	1	1	1	-	-	-	-	2	1
CO2	3	3	2	2	2	1	1	1	-	-	-	-	2	1
CO3	3	2	2	2	1	1	1	1	-	-	-	-	1	1
CO4	3	3	3	2	2	1	1	1	-	-	-	-	2	1
CO5	3	3	3	2	3	1	1	1	-	-	-	-	3	2
AVG	**3**	**2.8**	**2.6**	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1.2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCT202 ENERGY EFFICIENT BUILDING **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand climate-responsive design principles and their impact on building performance.
- To learn passive strategies for heating, cooling, ventilation, and daylighting in buildings.
- To apply energy-efficient design techniques for different climatic zones using relevant tools and case studies.

UNIT I INTRODUCTION **9**

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT II PASSIVE SOLAR HEATING AND COOLING **9**

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General

Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools – Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING 9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts – Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted buildings – Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.

UNIT IV HEAT CONTROL AND VENTILATION 9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed.

UNIT V DESIGN FOR CLIMATIC ZONES 9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Analyze heat transfer, thermal comfort, and site-specific microclimate factors.

CO2: Apply passive heating and cooling strategies, including solar design elements and natural ventilation techniques.

CO3: Design effective daylighting systems using optical materials and integrate electrical lighting controls for energy efficiency.

CO4: Evaluate thermal performance and ventilation requirements for various building orientations and climate types.

CO5: Develop energy-efficient design solutions for diverse climatic zones using case studies, tools, and energy audit methods.

TEXT BOOKS

1. Jagadish, K.S., Venkatarama Reddy, B.V., Alternative Building Materials and Technologies, New Age International, 2005.
2. Majumdar, M (Ed), Energy - Efficient Buildings in India, Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009.
3. Residential Energy: Cost Savings and Comfort for Existing Buildings by John Krigger and Chris Dorsi, Published by Saturn Resource Management, 2013.

REFERENCE BOOKS

1. Energy Conservation Building Code, cau of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP: 41 1995.
3. Brown, G.Z. and DeKay, M., Sun, Wind and Light - Architectural Design Strategies, John Wiley and Sons Inc,3rd Edition, 2014.
4. Marian Keeler and Prasad Vaidya, Fundamentals of Integrated Design for Sustainable Building, John Wiley & Sons, 2016.
5. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	1	1	1	1	-	-	-	-	3	1
CO2	3	3	3	2	2	1	1	1	-	-	-	-	3	2
CO3	3	3	3	2	2	1	1	1	-	-	-	-	3	2
CO4	3	3	3	2	2	1	1	1	-	-	-	-	3	2
CO5	3	3	3	3	3	2	1	1	-	-	-	-	3	3
AVG	3	3	2.8	2.2	2	1.2	1	1	-	-	-	-	3	2

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCT203 ENVIRONMENTAL IMPACT ASSESSMENT **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment.
- To develop the skill to prepare environmental management plan.
- To Gain working knowledge of environmental and human-health risk assessment methods and the strategies used to manage identified risks.

UNIT I INTRODUCTION **9**

Historical development of Environmental Impact Assessment (EIA), Environmental Clearance- EIA in project cycle, legal and regulatory aspects in India – types and limitations of EIA –EIA process screening – scoping - terms of reference in EIA- setting – analysis – mitigation. Cross sectoral issues –public hearing in EIA- EIA consultant accreditation.

UNIT II IMPACT INDENTIFICATION AND PREDICTION **10**

Matrices – networks – checklists – cost benefit analysis – analysis of alternatives – expert systems in EIA. prediction tools for EIA – mathematical modelling for impact prediction – assessment of impacts – air – water – soil – noise – biological — cumulative impact assessment

UNIT III SOCIO-ECONOMIC IMPACT ASSESSMENT **8**

Socio-economic impact assessment - relationship between social impacts and change in community and institutional arrangements. factors and methodologies- individual and family level impacts. communities in transition-rehabilitation.

UNIT IV EIA DOCUMENTATION AND ENVIRONMENTAL MANAGEMENT PLAN **9**

Environmental management plan - preparation, implementation and review – mitigation and rehabilitation plans – policy and guidelines for planning and monitoring programmes – post project audit – documentation of EIA findings – ethical and quality aspects of environmental impact assessment.

UNIT V CASE STUDIES **9**

Mining, power plants, cement plants, highways, petroleum refining industry, storage & handling of hazardous chemicals, common hazardous waste facilities, CETPs, CMSWMF, building and construction projects.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Carry out scoping and screening of developmental projects for environmental and social assessments.

CO2: Explain different methodologies for environmental impact prediction and assessment.

CO3: Asses socio-economic investigation of the environment in a project.

CO4: Plan environmental impact assessments and environmental management plans.

CO5: Gain Knowledge to prepare environmental impact assessment reports for various projects.

TEXT BOOKS

1. Canter, L.W., "Environmental Impact Assessment", McGraw Hill, New York. 1996.
2. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Inter science, New Jersey. 2003.
3. World Bank –Source book on EIA.

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REFERENCE BOOKS

1. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., NewDelhi,1999.
2. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
3. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.
4. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.
5. Westman, Walter E., "Ecology, Impact Assessment and Environment Planning" John Wiley and Sons, Canada, 1985.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	1	1	2	1	-	-	-	-	3	2
CO2	3	3	3	3	2	1	2	2	-	-	-	-	3	2
CO3	3	3	2	2	1	1	3	2	-	-	-	-	3	3
CO4	3	3	3	3	2	2	3	2	-	-	-	-	3	3
CO5	3	3	3	3	3	2	3	2	-	-	-	-	3	3
AVG	3	3	2.6	2.6	1.8	1.4	2.6	1.8					3	2.6

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCT204 REHABILITATION OF STRUCTURES **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To acquire the knowledge on maintenance aspects and causes of deterioration.
- To gain an understanding of concrete quality, durability characteristics and testing techniques.
- To impart knowledge on strengthening techniques and safe demolition procedures.

UNIT I MAINTENANCE AND REPAIR STRATIGES **9**

Maintenance, Repair and Rehabilitation - Facets of Maintenance - Importance of Maintenance - Various aspects of Inspection - Assessment procedure for evaluating a damaged structure - causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE **9**

Quality assurance for concrete – Strength and Durability of concrete - Cracks, different types, causes-Effects due to climate, temperature, Sustained elevated Temperature, Corrosion.

UNIT III TESTING TECHNIQUES AND PROTECTION METHODS **9**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT IV STRENGTHENING AND REPAIR OF STRUCTURES **9**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage and earthquake - Restoration of Heritage structures- Case studies.

UNIT V DEMOLITION **9**

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Discuss the importance of inspection and maintenance.
CO2**:** Study the Impacts of cracks, corrosion and climate on structures.
CO3: Explain about various testing techniques. .
CO4: Classify the strengthening techniques and repair strategies.
CO5: Explore the safe demolition techniques.

TEXT BOOKS

1. Shetty,M.S. Jain A K., Concrete Technology - Theory and Practice, S.Chand and Company, 8th Edition, 2019.
2. B.Vidivelli, Rehabilitation of Concrete Structures Standard Publishes Distribution. 1st Edition, 2009.
3. Peter H.Emmons, “Concrete repair and maintenance illustrated”, Galgotia Publications Pvt. Ltd., 2001.

REFERENCE BOOKS

1. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
2. Hand Book on “Repair and Rehabilitation of RCC Buildings” – Director General works CPWD, Govt of India, New Delhi – 2002.
3. P.C.Varghese, Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd, 2014.
4. Dodge Woodson, Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann, Elsevier, New Delhi 2012.
5. Ravishankar.K., and Krishnamoorthy.T.S, " Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

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Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	1	1	2	1	-	-	-	-	3	2
CO2	3	3	3	3	2	2	2	2	-	-	-	-	3	3
CO3	3	3	3	3	3	2	3	2	-	-	-	-	3	3
CO4	3	3	3	3	3	3	3	2	-	-	-	-	3	3
CO5	3	3	3	3	3	3	3	3	-	-	-	-	3	3
AVG	**3**	**3**	**2.8**	**2.8**	**2.4**	**2.2**	**2.6**	**2**	**-**	**-**	**-**	**-**	**3**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCT205 DRINKING WATER SUPPLY AND TREATMENT **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To provide a basic understanding of water sources, quality, and supply system planning.
- To introduce the design and operation of water conveyance and treatment systems.
- To explain the components of water distribution systems and plumbing in buildings.

UNIT I SOURCES OF WATER **9**

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization -Significance – Drinking Water quality standards.

UNIT II CONVEYANCE FROM THE SOURCE **9**

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials - Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes -appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

UNIT III WATER TREATMENT **9**

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation sand filters – Disinfection -Construction, Operation and Maintenance aspects.

UNIT IV ADVANCED WATER TREATMENT **9**

Water softening – Desalination- R.O. Plant – demineralization – Adsorption – Ion exchange Membrane Systems – Iron and Manganese removal – Defluoridation – Construction and Operation and Maintenance aspects.

UNIT V WATER DISTRIBUTION AND SUPPLY **9**

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs - Functions – Network design – Economics – Computer applications – Appurtenances – Leak detection – Principles of design of water supply in buildings – House service connection - Fixtures and fittings, systems of plumbing and types of plumbing.

TOTAL:45 PERIODS

COURSE OUTCOMES

On Successful completion of this course, the students will be able to

CO1: Identify different sources of water and assess their suitability for supply.

CO2: Design of intake structures, pipes, and pumps used in water conveyance.

CO3: Explain the processes involved in water treatment and apply them in plant design.

CO4: Describe advanced treatment methods like softening, desalination, and removal of contaminants.

CO5: Design water distribution systems and understand plumbing arrangements in buildings.

TEXT BOOKS

1. Garg. S.K., "Water Supply Engineering", Khanna Publishers, Delhi, 2008.
2. Punmia B.C, Arun K.Jain, Ashok K.Jain, “Water supply Engineering” Laxmi Publications (p) LTD, New Delhi, 2016.
3. Rangwala "Water Supply and Sanitary Engineering", Charotar Publishing house Pvt., Ltd, 2022.

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REFERENCE BOOKS

1. Fair. G.M., Geyer.J.C., “Water Supply and Wastewater Disposal”, John Wiley and Sons, 1954.
2. Babbit.H.E, and Donald.J.J, “Water Supply Engineering”, McGraw Hill Book Co, 1984.
3. Steel. E.W.et al., “Water Supply Engineering”, Mc Graw Hill International Book Co, 1984.
4. Duggal. K.N., “Elements of public Health Engineering”, S.Chand and Company Ltd, New Delhi, 1998.
5. Birdie.G.S., "Water Supply and Sanitary Engineering", Dhanpat Rai and Sons, 2018.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	2	1	1	2	1	-	-	-	-	3	2
CO2	3	3	3	3	2	2	2	2	-	-	-	-	3	3
CO3	3	3	3	3	3	2	3	2	-	-	-	-	3	3
CO4	3	3	3	3	3	3	3	2	-	-	-	-	3	3
CO5	3	3	3	3	3	3	3	3	-	-	-	-	3	3
AVG	**3**	**3**	**2.8**	**2.8**	**2.4**	**2.2**	**2.6**	**2**	**-**	**-**	**-**	**-**	**3**	**2.8**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OCT206 PROJECT SCHEDULING AND OPTIMIZATION USING CPM AND PERT TECHNIQUES **L T P C 3 0 0 3**

COURSE OBJECTIVES

- To understand fundamental project management concepts and principles.
- To learn principles and processes related to project scope management.
- To comprehend concepts and tools related to project scheduling and their applications in real-world projects.

UNIT I GENERAL OVERVIEW AND PROJECT ORGANIZATION **9**

Introduction to Projects, Types of Projects, Introduction to Construction Project Management, Project Lifecycle and its Phases, Key Activities Involved in Different Project Lifecycle Phases, Role of Various Stakeholders in Different Project Lifecycle Phases, Project Organization Structure and its Types.

UNIT II PROJECT SCOPE MANAGEMENT **9**

Gathering Project Requirements, Project Scope and Specifications, Project Scope Matrix, Project Contract Management, Work Breakdown Structure (WBS), WBS Types, Creating WBS, Scope Management Steps and Processes

UNIT III PROJECT PLANNING AND SCHEDULING **9**

Project Planning, Planning and Scheduling, Steps Involved in Project Planning, Networking and Non-Networking Techniques Scheduling Techniques, Gantt-Chart, Formulation and Applications of Critical Path Method (CPM), Program Evaluation & Review Technique (PERT) and Precedence Diagram Method (PDM), Introduction to Linear Scheduling Methods

UNIT IV PROJECT CONTROL **9**

Time-Cost Tradeoff, Earned Value Management (EVM), Crashing and Fast-tracking Projects, Resource Constrained Scheduling, Resource Levelling, Schedule Updation and Project Control.

UNIT V ADVANCED TOOLS IN PROJECT SCHEDULING **9**

Software Applications and Use of AI in Project Planning, Scheduling and Control, Data driven Decision Making

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explore the fundamental project management concepts and principles.

CO2: Comprehend the principles and processes related to project scope management.

CO3: Gain the ability to apply concepts and tools related to project scheduling in real world Projects.

CO4: Comprehend the use of advanced project scheduling tools.

CO5: Assess the use of advanced technology platforms in project scheduling and control.

TEXT BOOKS

1. Oberlender, G. D., & Oberlender, G. D. Project management for engineering and construction (Vol. 2). New York: McGraw-Hill,1993.
2. Sears, S. K., Sears, G. A., & Clough, R. H. Construction project management: A practical guide to field construction management. John Wiley & Sons,2010.
3. Callahan, M. T., Quackenbush, D. G., & Rowings, J. E. Construction project scheduling,1992.

REFERENCE BOOKS

1. Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd., 1992.
3. Albert Lester, Project Management, Planning and Control, 7th Edition, Butterworth-Heinemann, USA , 2017.
4. Guide, P. M. B. O. K. A guide to the project management body of knowledge,2008.
5. Mubarak, S. A. Construction project scheduling and control. John Wiley & Sons,2015.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	2	1	-	-	-	1	1	-	2	2	2
CO2	3	2	3	2	1	-	-	-	1	-	-	2	2	2
CO3	3	3	3	3	2	-	-	-	2	-	-	2	3	3
CO4	3	3	3	3	2	-	-	-	2	-	-	2	3	3
CO5	3	3	3	3	3	1	1	-	2	-	-	3	3	3
AVG	**3**	**2.6**	**2.8**	**2.6**	**1.8**	**1**	**1**	**-**	**1.6**	**1**	**-**	**2.2**	**2.6**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OET101 ELECTRIC VEHICLE TECHNOLOGIES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the concept and operations of electric and hybrid electric vehicles (EVs and HEVs), including their architecture.
- To explore the need for energy storage in hybrid vehicle and the technologies available for energy storage.
- To provide an overview of various energy storage technologies applicable to electric vehicles.

UNIT I ELECTRIC VEHICLES AND VEHICLE MECHANICS **9**

Electric Vehicles (EV),Hybrid Electric Vehicles (HEV), Engine ratings – Comparisons of EV with internal combustion Engine vehicles – Fundamentals of vehicle mechanics.

UNIT II ARCHITECTURE OF EV's AND POWER TRAIN COMPONENTS **9**

Architecture of EV's and HEV's - Plug-n Hybrid Electric Vehicles (PHEV) – Power train components and sizing, Gears, Clutches, Transmission and Brakes.

UNIT III POWER ELECTRONICS AND MOTOR DRIVES **9**

Electric drive components – Power electronic switches – four quadrant operation of DC drive – Induction motor and permanent magnet synchronous motor – based vector control operation – Switched Reluctance Motor (SRM) drives – EV motor sizing.

UNIT IV BATTERY ENERGY STORAGE SYSTEM **9**

Battery Basics – Different types – Battery Parameters – Battery life and safety - Battery modeling – Design of battery for large vehicles.

UNIT V ALTERNATIVE ENERGY STORAGE SYSTEMS **9**

Introduction to fuel cell – Types, Operation and Characteristics – Proton Exchange Membrane (PEM) fuel cell for E-mobility – Hydrogen Storage Systems – Super Capacitors for Transportation Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Utilize the concept of electric vehicle and energy storage systems.
CO2: Describe the working and components of Electric and Hybrid Electric Vehicle.
CO3: Explain the principles of power converters and electrical drives.
CO4: Illustrate the operation of storage systems such as battery and super capacitor.
CO5: Analyze various energy storage systems based on fuel cells and hydrogen storage.

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TEXT BOOKS

1. Wei Liu, 'Hybrid Electric Vehicle System Modeling and Control', 2nd Edition, WILEY, 2017
2. James Larminie and John Lowry, 'Electric Vehicle Technology Explained', 2nd Edition, Wiley, 2012.
3. Paul C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, Steven D. Pekarek "Analysis of Electric Machinery and Drive Systems", 3rd Edition, Wiley-IEEE Press, 2013.

REFERENCE BOOKS

1. Stephen D. Umans, "Fitzgerald & Kingsley's Electric Machinery", Tata McGraw Hill, 7th Edition, 2020.
2. Bogdan M. Wilamowski, J. David Irwin, The Industrial Electronics Handbook, 2nd Edition, Power Electronics and Motor Drives, CRC Press, 2011.
3. Paul C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, Steven D. Pekarek "Analysis of Electric Machinery and Drive Systems", 3rd Edition, Wiley-IEEE Press, 2013.
4. Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Pearson, 4th Edition, 10th Impression 2021.
5. Iqbal Husain, 'Electric and Hybrid Electric Vehicles', CRC Press, 2021.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	2	1	-	-	-	-	-	-	1	2	2
CO2	3	2	2	2	2	-	-	-	-	-	-	1	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3
CO5	3	3	3	3	3	1	2	-	-	-	-	2	3	3
AVG	**3**	**2.6**	**2.6**	**2.6**	**2.4**	**1**	**2**	**-**	**-**	**-**	**-**	**1.6**	**2.8**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OET102 POWER SYSTEM **L T P C**

3 0 0 3

COURSE OBJECTVES

- To develop a comprehensive understanding of power system components, their operation, and the overall structure of electrical power systems.
- To acquire the knowledge of transmission line parameters, insulators, cables, and protective devices such as circuit breakers, enabling effective design, analysis, and maintenance of power systems.
- To familiarize students with modern control and monitoring techniques in power systems.

UNIT I INTRODUCTION **9**

Power scenario in India – Power system components – Structure of Power System – Types of Power – Substation layout components.

UNIT II TRANSMISSION LINE PARAMETERS **9**

Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance of solid, stranded and bundled conductors, conductor types – Symmetrical and unsymmetrical spacing and transposition-application of self and mutual GMD; skin and proximity effects.

UNIT III INSULATORS AND CABLES **9**

Main components of overhead lines-Insulators-Types, voltage distribution in insulator string, improvement of string efficiency, Underground cables-Types of cables, insulation materials, Parameters of cable, Grading of cables, Capacitance of 3-core cable, heating, thermal resistance of cables.

UNIT IV COMPUTER CONTROL OF POWER SYSTEMS **9**

Need of computer control of power systems-concept of energy control centers and functions– PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.

UNIT V CIRCUIT BREAKERS **9**

Types of circuit breakers – air blast, air break, oil,SF6, MCBs, MCCBs and vacuum circuit breakers – comparison of different circuit breakers –Rating and selection of Circuit breakers –Relays.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1:Explain the Power System Components and Structure.

CO2:Analyze Transmission Line Parameters and Performance.

CO3: Design and Selection of Insulators and Cables.

CO4: Discuss of Computer Control Systems in Power Systems.

CO5: Interpret the knowledge of Circuit Breakers and Protective Devices.

TEXT BOOKS

1. S.N.Singh, 'Electric Power Generation ,Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2008.
2. B.R.Gupta,' Power System Analysis and Design', S.Chand, New Delhi, 5th Edition, 2005.
3. J.Brian, Hardy and Colin R.Bayliss' Transmission and Distribution in Electrical Engineering', Newnes; 4th Edition, 2012.

REFERENCE BOOKS

1. R.K.Rajput, 'Power System Engineering' Laxmi Publications (P) Ltd, New Delhi, 2006.
2. D.P.Kothari, I.J.Nagarath, 'Power System Engineering' Tata Mc Graw -Hill Publishing Company limited, New Delhi, 2007.
3. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009
4. Luces M.Fualkenberry, Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.
5. Hadi Saadat, 'Power System Analysis, 'PSA Publishing; 3rd Edition, 2010.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	-	-	-	-	-	-	-	-	1	3	2
CO2	3	3	2	2	1	-	-	-	-	-	-	1	3	2
CO3	3	2	2	2	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3
CO5	3	2	2	2	2	-	-	-	-	-	-	2	3	3
AVG	**3**	**2.4**	**2.2**	**2.3**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**3**	**2.4**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OET103 CIRCUIT THEORY **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To introduce electric circuits, including their analysis, solving circuit equations using network theorems, and understanding phasor diagrams and three-phase circuit analysis.
- To explain the phenomenon of resonance in coupled circuits and its significance.
- To educate on determining the transient response of circuits and analyzing their dynamic behavior.

UNIT I BASIC CIRCUITS ANALYSIS **9**

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS **9**

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS **9**

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS **9**

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS **9**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Enumerate the concepts of electrical circuits, and fundamental laws.
CO2: Analyze electric circuits with theorem.
CO3: Analyze the concepts of Three phase circuits.
CO4: Analyze the concepts of resonance circuits.
CO5: Analyze the transient response of circuits.

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", 2nd Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCE BOOKS

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi,2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	2	-	-	-	-	-	-	-	1	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	2	3	2
CO3	3	3	2	2	1	-	-	-	-	-	-	2	3	2

CO4	3	3	2	2	2	-	-	-	-	-	-	2	3	2
CO5	3	3	2	3	2	-	-	-	-	-	-	2	3	3
AVG	**3**	**2.8**	**1.8**	**2.2**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**	**3**	**2.2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OT104 ADVANCED ELECTRICAL MACHINES **L T P C**
3 0 0 3

COURSE OBJECTIVS

- To understand the working of special machines like stepper motor, switched reluctance motor, BLDC motor & PMSM.
- To derive torque equation and study the characteristics of special machines.
- To design the controller for special machines and study the working principle of synchronous reluctance motor.

UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS **9**

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Characteristics and control.

UNIT II PERMANENT MAGNET SYNCHROUNOUS MOTORS **9**

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers– performance characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor.

UNIT III SWITCHED RELUCTANCE MOTORS **9**

Constructional features –Principle of operation- Torque prediction –performance Characteristics-Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT IV STEPPER MOTORS **9**

Constructional features –Principle of operation –Types – Different modes of excitation - Torque equation – Characteristics – Drive circuits – Closed loop control – Applications.

UNIT V STUDY OF OTHER SPECIAL ELECTRICAL MACHINES **9**

Principle of operation and characteristics of Hysteresis motor – Universal motor – Linear induction motor – Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Utilize the control and characteristics for PMBDC motors.

CO2: Optimally design magnetic required in special machines based drive systems using FEM based software tools.

CO3: Analyze the dynamic performance of special electrical machine.

CO4: Explain the operation and characteristics of other special electrical machines.
CO5: Design and conduct experiments towards research.

TEXT BOOKS

1. K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
2. T. Kenjo, 'Stepping Motors and their Microprocessor Controls', Clarendon Press London, 1984
3. E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

REFERENCE BOOKS

1. T.J.E. Miller, 'Brushless magnet and Reluctance motor drives', Clarendon press, London,1989
2. T.Kenjo, 'Stepping Motors and their Microprocessor Controls', Oxford University press, New Delhi, 2000 Dekker 2009
3. R. Krishnan - Switched Reluctance Motor Drives Modeling, Simulation, Analysis, Design and Applications -CRC Press 2017.
4. Bilgin, Berker Emadi, Ali Jiang, James Weisheng - Switched reluctance motor drives:fundamentals to applications-CRC 2019.
5. Ramu Krishnan - Permanent Magnet Synchronous and Brushless DC Motor Drives - CRC Press, Marcel Applications -CRC Press 2009.

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Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	2	2	-	-	-	-	-	-	1	3	2
CO2	3	3	2	3	3	-	-	-	-	-	-	2	3	3
CO3	3	3	2	3	2	-	-	-	-	-	-	2	3	3
CO4	3	2	1	2	1	-	-	-	-	-	-	1	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3	3
AVG	**3**	**2.6**	**2**	**2.6**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**1.8**	**2.8**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OET105 HYBRID RENEWABLE POWER GENERATION **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To learn the working principles and integration of different renewable energy sources.
- To understand the power electronic interfaces and control strategies used in hybrid systems

- To analyze energy storage systems and battery management techniques used in hybrid technologies.

UNIT I HYDRID ENERGY SYSTEMS **9**

Need for Hybrid Energy Systems – Solar-Wind-Fuel Cell-Diesel, Wind Biomass-Diesel, Micro-Hydel-PV, Ocean and geyser energy - Classification of Hybrid Energy systems – Importance of Hybrid Energy systems – Advantages and Disadvantages - Environmental aspects of renewable energy - Impacts of renewable energy generation on the environment - Present Indian and international energy scenario of conventional and RE sources

UNIT II ENERGY STORAGE AND CONTROL SYSTEMS **9**

Energy storage systems: Batteries, flywheels, compressed air, supercapacitors, and pumped hydro- Battery management systems and charge controllers-Control strategies for hybrid systems-Load forecasting and demand-side management.

UNIT III POWER CONVERTERS AND ANALYSIS OF HYBRID SOLAR PV SYSTEMS **9**

Power converters for Solar PV systems: Line-commutated converters (inversion-mode), boost and buck-boost converter-Selection of inverters, battery sizing, and array sizing- Analysis of Solar PV systems: Block diagrams and types (stand-alone PV systems)

UNIT IV ANALYSIS OF POWER CONVERTERS FOR HYBRID ENERGY SYSTEMS **9**

Introduction to Power Converters – Stand-alone Converters -AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters - Bi-Directional Converters - Grid-Interactive Inverters - Matrix converter –Merits and Limitations.

UNIT V CASE STUDIES FOR HYBRID RENEWABLE ENERGY SYSTEMS **9**

Hybrid Systems- Range and type of Hybrid systems – Performance Analysis – Cost Analysis - Case studies of Diesel-PV, Wind-PV-Fuel-cell, Micro-hydel-PV, Biomass-Diesel-Fuel-cell systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the classification, need, and benefits of hybrid energy systems.
CO2: Explain various energy storage systems and control mechanisms for hybrid systems
CO3: Analyze different combinations of renewable energy sources.
CO4: Design and select appropriate converters and control strategies for hybrid systems.
CO5: Interpret real-time case studies of hybrid systems.

TEXT BOOKS

1. Md. Rabiul Islam et al., “Emerging Power Converters for Renewable Energy and Electric Vehicles”, CRC Press, 1st Edition, 2021
2. G.D. Rai, “Solar Energy” Utilization, Khanna Publishers, 3rd Edition, 1987

3. B.H. Khan, “Non-Conventional Energy Sources”, Tata McGraw-Hill Publishing Company, New Delhi, 2017, 3rd Edition.

REFERENCE BOOKS

1. S.N. Bhadra, D. Kastha, & S. Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.Rashid M.H., Power Electronics Handbook, Academic Press, 4th Edition, 2018.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, 6th Edition, 2017.
3. Gray L. Johnson, “Wind Energy System, Prentice Hall of India”, 2nd Edition, 2006
4. “Wind Power Integration”:Connection and System Operational Aspects, Brendan Fox, 2014, IET, 2nd Edition.
5. G.D. Rai, “Solar Energy” Utilization, Khanna Publishers, 3rd Edition, 1987.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	-	-	2	3	-	-	-	-	1	3	2
CO2	3	3	3	2	3	2	3	-	-	-	-	2	3	3
CO3	3	3	3	2	2	2	2	-	-	-	-	2	3	3
CO4	3	3	3	3	3	1	2	-	-	-	-	3	3	3
CO5	2	2	2	2	2	3	3	-	1	1	1	2	2	2
AVG	2.8	2.6	2.6	2.25	2.5	2	2.6	-	1	1	1	2	2.8	2.6

1-Low, 2-Medium, 3-High, ‘-’ - No Correlation

24OET106 ELECTRICAL MAINTENANCE AND SAFETY **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the fundamental principles of electrical safety, including causes and prevention of electrical shocks.
- To develop knowledge of safety protocols and best practices during the installation, testing, commissioning, operation, and maintenance of electrical systems in different settings, including hazardous areas.
- To gain awareness of fire safety measures, including the proper selection and use of fire extinguishers.

UNIT I INTRODUCTION TO ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION **9**

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over’s, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shop.

UNIT II ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS **9**

Wiring and fitting –Domestic appliances –water tap giving shock –shock from wet wall –fan firing shock –multi-storied building –Temporary installations Agricultural pump installation –Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT III ELECTRICAL SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE **9**

Preliminary preparations –safe sequence –risk of plant and equipment –safety documentation –field quality and safety -personal protective equipment –safety clearance notice –safety precautions –safeguards for operators –safety.

UNIT IV ELECTRICAL SAFETY IN HAZARDOUS AREAS **9**

Hazardous zones –class 0, 1 and 2 spark, flashovers and corona discharge and functional requirements Specifications of electrical plants, equipment's for hazardous locations Classification of equipment enclosure for various hazardous gases and vapours classification of equipment/enclosure for hazardous locations.

UNIT V FIRE EXTINGUISHERS **9**

Fundamentals of Fire-Initiation of Fires, Types; Extinguishing Techniques, Prevention of Fire, Types of Fire Extinguishers, Fire Detection and Alarm System, CO2 and Halogen Gas Schemes, Foam Schemes.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Apply the Electrical Safety Principles.
CO2: Explain Safe Electrical Installations and Maintenances.
CO3: Manage Electrical Safety in Hazardous and Special Areas.
CO4: Promote Safety During Electrical Operations and Repairs.
CO5: Implement Fire Safety and Extinguishing Measures.

TEXT BOOKS

1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988.
2. Gupta, B.R., Handbook of Electrical Power System and Wiring, S. Chand Publishing, 2013.
3. B.V.S.Rao, "Operation and Maintenance of Electrical Equipment – Volume I & II" Media Promoters & Publishers Private Limited, Mumbai, 1st Edition, 1st Reprint 2011.

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REFERENCE BOOKS

1. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth Company, 1978.
2. John Codick, "Electrical safety hand book", McGraw Hill Inc., New Delhi, 2000.
3. Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1998.
4. Wadhwa, C.L., "Electric Power Systems", New Age International, 2004.
5. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
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CO4	3	3	2	2	2	3	3	2	–	–	–	2	3	2
CO5	2	2	2	–	2	3	3	–	–	–	–	2	2	2
AVG	**2.8**	**2.6**	**2.2**	**2.3**	**2.3**	**2.8**	**2.8**	**2**	**-**	**-**	**-**	**2.2**	**2.8**	**2.2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMT201 BIOENERGY CONVERSION TECHNOLOGIES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To elucidate on biomass, types, availability, and characteristics.
- To gain knowledge on gasification process.
- To gain knowledge on liquidation process.

UNIT I INTRODUCTION **9**

Biomass: types – advantages and drawbacks – typical characteristics – proximate & ultimate analysis – comparison with coal - Indian scenario - carbon neutrality – biomass assessment studies – typical conversion mechanisms - densification technologies.

UNIT II BIOMETHANATION **9**

Biomethenation process – influencing parameters – typical feed stocks – Biogas plants: types and design, Biogas appliances – burner, luminaries and power generation systems – Industrial effluent based biogas plants.

UNIT III COMBUSTION **9**

Perfect, complete and incomplete combustion – stoichiometric air requirement for biofuels - equivalence ratio – fixed Bed and fluid Bed combustion.

UNIT IV GASIFICATION, PYROLYSIS AND CARBONISATION **9**

Chemistry of gasification - types – comparison – typical application – performance evaluation –economics. Pyrolysis - Classification - process governing parameters – Typical

yield rates. Carbonization – merits of carbonized fuels – techniques adopted for carbonization.

UNIT V LIQUIFIED BIOFUELS **9**

Straight Vegetable Oil (SVO) as fuel - Biodiesel production from oil seeds, waste oils and algae - Process and chemistry - Biodiesel Vs. Diesel – comparison on emission and performance fronts. Production of alcoholic fuels (methanol and ethanol) from biomass – engine modifications

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Estimate the surplus biomass availability of any given area.

CO2: Design a biogas plant for a variety of biofuels.

CO3: Determine and compare the cost of steam generation from biofuels with that of coal and petroleum fuels.

CO4: Analyse the influence of process governing parameters in thermochemical conversion of biomass.

CO5: Synthesize liquid biofuels for power generation from biomass

TEXT BOOKS

1. Biomass for Bioenergy and Biomaterials, by Nidhi Adlakha, Rakesh Bhatnagar Syed Shams Yazdani, CRC Press; 1st Edition,2021.
2. Bioenergy and Biochemical Processing Technologies, by Augustine O. Ayeni, Samuel EshorameSanni , Solomon U. Oranusi, Springer, 2022.
3. Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, Fundamentals and Applications of Renewable Energy, Indian Edition, Graw Hill; 1st Edition 2020.

REFERENCE BOOKS

1. David Boyles, Bio Energy Technology Thermodynamics and costs, Ellis Hoknood Chichester, 1984..
2. Iyer PVR et al, Thermochemical Characterization of Biomass, M N E S.
3. Khandelwal KC, Mahdi SS, Biogas Technology – A Practical Handbook, Tata McGraw Hill, 1986.
4. Maheswari, R.C. Bio Energy for Rural Energisation, Concepts Publication,1997
5. Tom B Reed, Biomass Gasification – Principles and Technology, Noyce Data Corporation, 1981.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	2	3	3	–	–	–	–	2	3	3
CO2	3	3	3	3	3	2	3	–	–	–	–	2	3	3
CO3	3	3	3	3	3	2	3	–	–	–	–	3	3	3
CO4	3	3	3	3	3	3	3	–	–	–	–	3	3	3
CO5	3	3	3	3	3	3	3	–	–	–	–	3	3	3

AVG	**3**	**3**	**2.8**	**2.8**	**2.8**	**2.6**	**3**	**-**	**-**	**-**	**-**	**2.6**	**3**	**3**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMT202 AUTOMOTIVE MATERIALS, COMPONENTS, DESIGN AND TESTING **L T P C 3 0 0 3**

COURSE OBJECTIVES

- To study the functional requirements of engine components and suitable materials.
- To learn to design of cylinder and piston components.
- To learn to design of connecting rod and crank shaft.

UNIT I FUNCTIONAL REQUIREMENTS OF ENGINE COMPONENTS AND SUITABLE MATERIALS **9**

Functional requirements of engine components – Piston, piston pin, cylinder liner, connecting rod, crank shaft, valves, spring, engine block, cylinder head, and flywheel. Suitable materials for engine components.

UNIT II DESIGN OF CYLINDER AND PISTON COMPONENTS **9**

Design of connecting rod – Shank design – small end design – big end design – bolts design. Design of overhang crank shaft under bending and twisting – Crank pin design – Crank web design – Shaft design.

UNIT III DESIGN OF CONNECTING ROD AND CRANK SHAFT **9**

Design of connecting rod – Shank design – small end design – big end design – bolts design. Design of overhang crank shaft under bending and twisting – Crank pin design – Crank web design – Shaft design.

UNIT IV DESIGN OF FLYWHEEL AND VALVE TRAIN **9**

Design of valve – inlet valve – exhaust valve - Valve springs – tappet – rocker arm. Determination of mass of flywheel for a given coefficient of fluctuation of speed. Design of flywheel - rim - hub - arm.

UNIT V ENGINE TESTING **9**

Engine test cycles – WLTC – WHSC – WHVC – NRTC – ISO 8178. Dynamometer – Chassis dynamometer - transient dynamometer. Emission measurement technologies and instruments - NOX – Smoke – Particulate matter – CO – CO2 - HC.-Particle counter.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Discuss the requirements of engine components and select suitable materials.

CO2: Apply the concept of design to cylinder and piston components and solve problems.

CO3: Apply the concept of design to Connecting rod and crank shaft and solve problems.
CO4: Apply the concept of design to flywheel and valve train and solve problems.
CO5: Discuss engine teste cycles, dynamometer and emission measurement technologies and Instruments.

TEXT BOOKS

1. Khurmi. R.S. & Gupta. J.K., "A text book of Machine Design", Eurasia Publishing House (Pvt) Ltd, 2001.
2. Giancarlo Genta and Lorenzo Morello, The Automotive Chassis: Volume 1: Components Design (Mechanical Engineering Series) , 2019.
3. Bhandari V B, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co, 2016.

REFERENCE BOOKS

1. Hiroshima Yamagata, "The science and technology of materials in automotive engines", Woodhead Publishing Limited, Cambridge, England.
2. Jain.R.K, "Machine Design", Khanna Publishers, New Delhi, 2005.
3. Lobna A. Elseify, Mohamad Midani, et al, Manufacturing Automotive Components from Sustainable Natural Fiber Composites (SpringerBriefs in Materials), 2021.
4. Andreas Öchsner and Holm Altenbach, Mechanical and Materials Engineering of Modern Structure and Component Design, 2015.
5. George C. Sih, Alberto Carpinteri, et al, Advanced Technology for Design and Fabrication of Composite Materials and Structures: Applications to the Automotive, Marine, Aerospace and Applications of Fracture Mechanics, 2010.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	–	–	–	2	–	–	–	–	–	3	2
CO2	3	3	3	3	2	–	–	–	–	–	–	–	3	3
CO3	3	3	3	3	2	–	–	–	–	–	–	–	3	3
CO4	3	3	3	3	2	–	–	–	–	–	–	–	3	3
CO5	3	2	2	2	3	3	3	–	–	–	–	2	3	2
AVG	3	2.6	2.6	2.8	2.3	3	2.5	-	-	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMT203 GREEN MANUFACTURING DESIGN AND PRACTICES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce the concept of environmental design and industrial ecology.
- To impart knowledge about air pollution and its effects on the environment.

- To enlighten the students with knowledge about noise and its effects on the environment.

UNIT I DESIGN FOR ENVIRONMENT AND LIFE CYCLE ASSESSMENT 9

Environmental effects of design -selection of natural friendly material - Eco design - Environmental damage Material flow and cycles – Material recycling – Emission less manufacturing- Industrial Ecology – Pollution prevention – Reduction of toxic emission – design for recycle.

UNIT II AIR POLLUTION SAMPLING 9

Primary and Secondary Pollutants, Automobile Pollutants, Industrial Pollution, Ambient air quality Standards, Metrological aspects of air Pollution, Temperature lapse Rates and Stability-wind velocity and turbulence-Pump behavior dispersion of air Pollutants-solution to the atmosphere dispersion equation- the Gaussian Plume Model, Air pollution sampling-collection of gaseous air pollutants-collection of particulate pollutants-stock sampling, analysis of air pollutants-sulfur dioxide-nitrogen dixide, carbon monoxide, oxidants and ozone.

UNIT III NOISE POLLUTION AND CONTROL 9

Frequency and Sound Levels, Units of Noise based power radio, contours of Loudness. Effect of human, Environment and properties, Natural and Anthrogenic Noise Sources, Measuring Instruments for frequency and Noise levels, Masking of sound, Types, Kinetics, Selection of different reactors used for waste treatment, Treatment of noise at source, Path and Reception, Sources of noise, Effects of noise- Occupational Health hazards, thermal Comforts, Heat Island Effects, Radiation Effects.

UNIT IV WATER DEMAND AND WATER QUALITY 9

Factors affecting consumption, Variation, Contaminants in water, Nitrates, Fluorides, Detergents, taste and odour, Radio activity in water, Criteria, for different impurities in water for portable and non-portable use, Point and non-point Source of pollution, Major pollutants of Water, Water Quality Requirement for different uses, Global water crisis issues.

UNIT V GREEN CO-RATING 9

Ecological Footprint - Need For Green Co-Rating – Green Co-Rating System – Intent – System Approach – Weightage- Assessment Process – Types Of Rating – Green Co- Benefits – Case Studies of Green Co- Rating.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the environmental design and selection of eco-friendly materials.

CO2: Analyse manufacturing processes towards minimization or prevention of air

pollution.

CO3: Analyse manufacturing processes towards minimization or prevention of noise pollution.

CO4: Analyse manufacturing processes towards minimization or prevention of water pollution.

CO5: Evaluate green co-rating and its benefits.

TEXT BOOKS

1. Gradel.T.E. and B.R. Allenby – Industrial Ecology – Prentice Hall – 2010.
2. Rao M.N. and Dutta A.K. "Wastewater treatment", Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, 2nd Edition, 2006.
3. Gradel.T.E. and B.R. Allenby – Industrial Ecology – Prentice Hall – 2010.

REFERENCE BOOKS

1. Frances Cairncross– Costing the Earth: The Challenge for Governments, the Opportunities for Business – Harvard Business School Press – 1993.
2. World Commission on Environment and Development (WCED), Our Common Future, Oxford University Press 2005.
3. Rao M.N. and Dutta A.K. "Wastewater treatment", Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, 2nd Edition, 2006.
4. Rao CS Environmental Pollution Control Engineering-, Wiley Eastern Ltd., New Delhi, 2006.
5. Lewis H Bell and Douglas H Bell, Industrial noise control, Fundamentals and applications, Marcel Decker, 1994.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	–	–	3	3	–	–	–	–	2	3	2
CO2	3	3	3	2	2	3	3	–	–	–	–	2	3	2
CO3	3	3	3	2	2	3	3	–	–	–	–	2	3	2
CO4	3	3	3	2	2	3	3	–	–	–	–	2	3	2
CO5	3	2	2	2	3	3	3	–	–	–	–	2	3	2
AVG	**3**	**2.6**	**2.6**	**2**	**2.3**	**3**	**3**	–	–	–	–	**2**	**3**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMT204 SEMICONDUCTOR MANUFACTURING **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To provide the students with a comprehensive understanding of the fundamental principles of semiconductor materials, devices and technology.
- To explore the operational principles of various semiconductor devices, processes

involved in the fabrication.

- Apply their knowledge in designing and analyzing basic semiconductor circuits and systems.

UNIT I INTRODUCTION TO SEMICONDUCTOR MATERIALS 9

Definition and types, comparison with conductors and insulators; bonding and structure - crystal structure (diamond, zinc blende), covalent bonding in semiconductors; energy bands – energy band theory, conduction and valence bands, bandgap and its significance; carrier statistics – electrons and holes, effective mass, fermi level and its significance.

UNIT II SEMICONDUCTOR DEVICES AND THEIR OPERATION 9

P-N junction – formation and properties, depletion region, forward and reverse bias characteristics; diodes – types and applications; bipolar junction transistors – structure and operation, current gain, common configurations; Field effect transistor – JFETs and MOSFETs, threshold voltage and I-V characteristics, applications.

UNIT III FABRICATION TECHNIQUES 9

Crystal growth and wafer preparation – czochralski process, wafer slicing and polishing; oxidation – thermal oxidation process, properties of silicon dioxide; photolithography – photoresist application, exposure and development; etching and doping – wet and dry etching techniques, diffusion and ion implantation; thin film deposition – chemical vapor deposition and physical vapor deposition; fabrication for ceramic components – tapecasting, sintering, machining , challenges in processing ceramic materials, integration with semiconductor fabrication process.

UNIT IV CHARACTERIZATION AND TESTING OF SEMICONDUCTORS 9

Electrical characteristics – I-V and C-V measurements, carrier lifetime and mobility; Optical characterization – photoluminescence and Raman spectroscopy, absorption and reflection measurements; structural characterization – x-ray diffraction, SEM, TEM; Reliability and Failure analysis – stress testing, common failure mechanisms, techniques for failure analysis; characterization of ceramic materials – mechanical testing, thermal properties, electrical properties**.**

UNIT V CERAMICS IN SEMICONDUCTOR TECHNOLOGY 9

Overview of applications in semiconductor devices and fabrication processes, comparison with other materials used in semiconductors; ceramic substrates – types of substrates, properties and advantages of ceramic substrates, applications in power electronics, RF components and high frequency devices; ceramic packaging – importance of packaging in semiconductor devices, types of ceramic packaging, advantages, thermal management and reliability; ceramic s in MEMs – role of ceramics in MEMs, common materials and applications; ceramic dielectrics – types of ceramic dielectric materials, properties and applications, role of high k dielectrics for advanced semiconductor devices

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Apply the fundamental concepts of semiconductor physics.
CO2: Analyze and describe the operation of various semiconductor devices.
CO3: Acquire knowledge of the key processes in semiconductor device fabrication.
CO4: evaluate the properties and performance of semiconductor materials and devices.
CO5: Use of ceramics in semiconductor technology including advancements in materials and fabrication techniques.

TEXT BOOKS

1. Peter Y Yu, Manuel Cardona, "Fundamentals of Semiconductors: Physics and Material Properties", 1995.
2. Dieter K Schroder, "Semiconductor Material and Device Characterization", 2006.
3. Donald A Neamen, "Semiconductor Physics and Devices", McGraw-Hill, 2002.

REFERENCE BOOKS

1. Adel S Sedra, Kenneth C Smith, "Microelectronic Circuits", OUP USA, 2003.
2. Ben G Streetman, Sanjay Banerjee, "Solid State Electronic Devices", Pearson Education, 2015.
3. Stephen A Campbell, "The Science and Engineering of Microelectronic Fabrication". Oxford Univ Press, 2001.
4. Hong Xiao, "Introduction to Semiconductor Manufacturing Technology", Pearson Education, 2000.
5. C Barry Carter, M Grant Norton, " Ceramic Materials: Science and Engineering", 2019.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	–	–	2	3	–	–	–	–	2	3	2
CO2	3	3	3	2	–	2	3	–	–	–	–	2	3	2
CO3	3	3	3	2	–	2	3	–	–	–	–	2	3	2
CO4	3	3	3	2	–	2	3	–	–	–	–	2	3	2
CO5	3	2	2	2	–	2	3	–	–	–	–	2	3	2
AVG	**3**	**2.8**	**2.6**	**2**	**–**	**2**	**3**	**–**	**–**	**–**	**–**	**2**	**3**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

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24OMT205 FUTURE ENERGY RESOURCES AND MOBILITY **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To expose the students to various future energy resources and mobility.
- To explore the various bio, solar, wind, fuel cell energy technologies.
- To study the various types of energy storage devices and technologies and them comparison.

UNIT I CURRENT AND FUTURISTIC ENERGY RESOURCES **9**

High Carbon Fuels - Gasoline and Diesel Fuels. Low Carbon Fuels – Ethanol, Methanol, Isobutanol, Dimethyl Ether(DME), Polyoxymethylene Dimethyl Ether (PODE), Compressed and Liquified Natural Gas (CNG & LNG). Zero Carbon Fuels – Hydrogen and Ammonia Fuels. – Physiochemical Properties – Improvements in Fuel Quality as per BS Norms – Current and Future plans on storage and distribution infrastructures.

UNIT II ALTERNATE ENERGY RESOURCES **9**

Fuel Cell stacks – Types – Working, Batteries – Types – Working – Materials, Comparison of Fuel Cell and Battery. Future scopes in Fuel Cell and Batteries.

UNIT III CURRENT AND FUTURE INTERNAL COMBUSTION ENGINES (ICE) FOR MOBILITY **9**

BSVI Qualified ICE Powered Vehicles and Technologies, Conventional Hybrid Vehicle Technologies, Advanced Combustion Mode enabled ICEs and Hybrids, Hydrogen and Ammonia Fuelled ICEs, Flexi Fuel Engines. Low Carbon Fuelled ICEs. Decarbonisation and De- fossilization.

UNIT IV ALTERNATE ENERGY RESOURCES POWERED MOBILITY **9**

Fuel Cell Powered Vehicle Technologies, Battery Powered Electric Vehicle Technologies, Requirements of fueling and charging Infrastructures, Comparison of Merits and Demerits, Life cycle analysis and Carbon credit gained between Alternate and Conventional Fuel powered mobility.

UNIT V DATA ANALYSIS OF CURRENT AND FUTURE MOBILITY APPLICATIONS **9**

Case studies in present and future technologies in mobility design and its performance analysis.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the impact of high and low carbon energy resource on mobility.
CO2: Synergetic knowledge on fuel cells battery energy resources.
CO3: Discuss on conventional and future propulsion system.
CO4: Enumerate alternate energy sources powered mobility.

CO5: Capability to perform data analysis of conventional and future propulsion systems.

TEXT BOOKS

1. Pundir B.P. "I.C. Engines Combustion and Emission", Narosa Publishing House, 2010.
2. Barclay F.J., "Fuel Cells, Engines and Hydrogen", Wiley, 2009.
3. Bent Sorensen (Sørensen), Hydrogen and Fuel Cells: Emerging Technologies and Applications, Elsevier, UK 2005.

REFERENCE BOOKS

1. Rakesh_Kumar_Maurya Characteristics and Control of Low Temperature Combustion Engines, Springer - ISSN 0941-5122 ISSN 2192-063X.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. Rand D.A.J, Woods, R & Dell RM Batteries for Electric vehicles, John Wiley & Sons 1998.
4. HCCI and CAI Engines – Nptel - https://nptel.ac.in/courses/112104033/33 CO PO PS.
5. HCCI Diesel Engines - Nptel - https://nptel.ac.in/courses/112104033/34.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	–	–	2	3	–	–	–	–	2	3	2
CO2	3	3	2	–	–	2	3	–	–	–	–	2	3	2
CO3	3	3	3	2	–	2	3	–	–	–	–	2	3	2
CO4	3	3	3	2	–	2	3	–	–	–	–	2	3	2
CO5	3	3	3	2	–	2	3	–	–	–	–	2	3	2
AVG	**3**	**3**	**2.6**	**2**	–	**2**	**3**	–	–	–	–	**2**	**3**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OMT206 FAILURE ANALYSIS AND NDT TECHNIQUES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understating the importance of failure analysis.
- To study the causes of failures, principles of NDT methods.
- To gain knowledge on various test methods.

UNIT I INTRODUCTION TO FAILURE ANALYSIS **9**

Need and scope of failure analysis. Engineering Disasters in history and their failure analysis. Sources of failures. Description & origin of Processing defects. Types of failures- Ductile &

Brittle, Fracture Analysis, FMEA. Application of fracture mechanics concepts to design for safety. NDT for failure analysis- an overview.

UNIT II DYE PENETRANT & MAGNETIC PARTICLE INSPECTION 9

Importance of NDT, Visual Inspection: Tools, applications and limitations, Liquid Penetrant Inspection (LPI): Principles, Requisites of a good penetrant and developer, Types of penetrants and developers, Techniques, procedures, interpretation and evaluation of penetrant test indications, advantages, and limitations, case study. Magnetic Particle Inspection (MPI): Principles, Magnetization- Methods, techniques. Continuous & Residual testing of MPI, System sensitivity, Interpretation of MPI indications, Advantages and limitations, case study.

UNIT III ULTRASONIC TESTING 9

Principle, type of Ultrasonic waves, mode conversion in ultrasonics, Principle, UT testing methods: Contact testing and immersion testing, normal beam and straight beam testing, angle beam testing, dual crystal probe, Ultrasonic Testing Techniques: Resonance testing, Through transmission technique, Pulse echo testing technique, Instruments used in UT, Transducer types, Reference blocks with artificially created defects, Calibration of equipment, A-Scan, B-scan & C-scan, case study.

UNIT IV EDDY CURRENT TESTING & THERMOGRAPHY 9

Eddy current Testing: Principles, Physics aspects of ECT- conductivity, permeability, resistivity, inductance, inductive reactance, impedance, Filed factor and lift-off effect, edge effect, end effect, Depth of penetration of ECT, Instrumentation, application of ECT, advantages, limitations, case study. Thermography: Principles, Contact and non-contact inspection methods, Heat sensitive paints and papers, thermally quenched phosphors, Liquid crystals, techniques for applying liquid crystals, advantage and limitations, Infrared radiation and infrared detectors, applications, case study.

UNIT V RADIOGRAPHY TESTING 9

Principle, electromagnetic radiation sources, X-ray sources, Production of X-rays, High energy X-ray source, Gama ray source, Properties of X-rays and gamma rays, Inspection techniques, Exposure, Real-time radiography, Films and screens used in radiography, Quality

of radiographic film processing, interpretation, evaluation of test results, Computed Tomography, Safety aspects required in radiography, Applications, advantages and limitations, case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Discuss on the various failures, their analysis and their importance.

CO2: Adapt the Penetrant testing procedures for evaluating the surface defects.

CO3: Interpret the images and the results obtained from the Thermographic technique

and the Eddy current testing.

CO4: Describe the testing procedure and analyze the results obtained in the Ultrasonic inspection.

CO5: Explain the techniques involved in the Radiographic testing and the various advancements in Radiography**.**

TEXT BOOKS

1. Paul E Mix, "Introduction to Non-destructive testing: a training guide", Wiley, 2nd Edition, New Jersey, 2005.
2. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17, 2000.
3. Baldev Raj, T. Jayakumar, M. Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.

REFERENCE BOOKS

1. ASM International, ASM Handbook, Volume 17: Nondestructive Evaluation of Materials, 2018.
2. B. Hull and V. John, Non-Destructive Testing. New York, NY, USA: Springer, 2012.
3. N. Ida, C. Boller, and R. Diederichs, Eds., Handbook of Advanced Nondestructive Evaluation, 2nd ed. Cham, Switzerland: Springer, 2023.
4. Chuck Hellier, "Handbook of Nondestructive Evaluation", Mc Graw Hill, 2021.
5. G. Lacidogna, Ed., Nondestructive Testing (NDT). Basel: MDPI, 2021.

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Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	–	–	2	2	–	–	–	–	2	3	2
CO2	3	3	3	–	–	2	2	–	–	–	–	2	3	2
CO3	3	3	3	–	–	2	2	–	–	–	–	2	3	2
CO4	3	3	3	–	–	2	2	–	–	–	–	2	3	2
CO5	3	3	3	–	–	2	2	–	–	–	–	2	3	2
AVG	**3**	**3**	**2.8**	–	–	**2**	**2**	–	–	–	–	**2**	**3**	**2**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBT201 HOSPITAL MANAGEMENT **L T P C**

3 0 0 3

COURSE OBJECTIVES

- Understanding Health System Organization.
- To know Regulatory Requirements and Health Care Codes.
- To learn Equipment and Maintenance Management.

UNIT I HEALTH SYSTEM **9**

Health organization of the country, the state, the cities and the region, Health Financing System, Organization of Technical Section.

UNIT II HOSPITAL ORGANISATION AND MANAGEMENT **9**

Management of Hospital organization, Nursing section Medical Sector, Technical Department, Definition and Practice of Management by Objective, Transactional Analysis, Human relation in Hospital, Legal aspect in Hospital Management.

UNIT III REGULATORY REQUIREMENT AND HEAITH CARE CODES **9**

FDA Regulation, joint commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPC.

UNIT IV EQUIPMENT MAINTENANCE MANAGEMENT **9**

Organizing Maintenance Operations, Paper Work Control, Maintenance Job, Planning Maintenance Work, Measurement and Standards, Preventive Maintenance, Maintenance Budgeting and Forecasting, Maintenance Training.

UNIT V TRAINED TECHNICAL PERSONNEL **9**

Function of Clinical Engineer, Role to be performed in Hospital, Man power Market, Professional Registration, Structure in hospital.

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the principles, staffing and marketing processes, discussing their significance.

CO2: Manage their role in effective and efficient management of health care organizations.

CO3: Analyze the various regulations and standards to be followed in hospitals for safety.

CO4: Evaluate various aspects of equipment maintenance.

CO5: Apply the aspects of managing the hospital in terms of staff, marketing and the use of computers.

TEXT BOOKS

1. Cesar A. Caceresand Albert Zara,The practice of Clinical Engineering, Academic Press, 1977.
2. Webster,J.G. and Albert M.Cook, Clinical Engineering Principles and Practices, Prentice Hall Inc. Englewood Cliffs, 1979.
3. Antony Kelly, Maintenance planning and control, Butterworths London, 1984.

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REFERENCE BOOKS

1. Hans P feiff,Vera Dammann (Ed.) Hospital Engineering in Developing Countries, Zreport Eschborn, 1986.
2. Jacob Kline, Handbook of Bio Medical Engineering, Academic Press, SanDiego1988.
3. R.C.Goyal, Handbook of Hospital Personal Management, Prentice Hall of India,1993.
4. G. D. Kunders, "Hospitals–Facilities Planning and Management", TMH, New Delhi–5th Edition, 2007.
5. Peter Berman, "Health Sector Reforming Developing Countries", Harvard University Press, 1995.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1	1	1	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO3	2	3	1	3	1	-	-	-	-	-	-	-	2	2
CO4	3	2	3	2	2	-	-	-	-	-	-	-	3	2
CO5	2	2	3	1	3	-	-	-	-	-	-	-	2	3
AVG	2.6	2.4	2	1.8	1.8	-	-	-	-	-	-	-	2.6	2.4

1-Low, 2-Medium, 3-High, '-' - No Correlation

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24OBT202 ASSIST DEVICES **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To study the role and importance of machines that takes over the functions of the heart and lungs.
- To study various mechanical techniques that helps a non-functioning heart.
- To learn the functioning of the unit which does the clearance of urea from the blood.

UNIT I HEART LUNG MACHINE AND ARTIFICIAL HEART **9**

Different types of Oxygenators, Pumps, Pulsatile and Continuous Types, Monitoring Process, Shunting, Blood Handling System, Functioning and different types of Artificial Heart.

UNIT II CARDIAC ASSIST DEVICES **9**

Assisted through Respiration, Right and left Ventricular Bypass Pump, Auxiliary ventricle, Open Chest and Closed Chest type, Intra Aortic Balloon Pumping, Prosthetic Cardiac valves.

UNIT III ARTIFICIAL KIDNEY **9**

Indication and Principle of Haemodialysis, Dialysate, types of filter and membranes, Different types of hemodialyzers, Wearable Artificial Kidney, Implanting Type.

UNIT IV RESPIRATORY AND HEARING AIDS **9**

Ventilator and its types-Intermittent positive pressure, Breathing Apparatus Operating

Sequence, Electronic IPPB unit with monitoring for all respiratory parameters. Types of Deafness, Hearing Aids, SISI, masking techniques.

UNIT V RECENT TRENDS **9**

Transcutaneous electrical nerve stimulator, bio-feedback, Electrical safety Analyser, Latest use of assistive technology for health care Information technology, Future trends in assistive technology.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

CO1: Explain the principles and construction of artificial heart.

CO2: Discuss the various mechanical techniques that improve therapeutic technology.

CO3: Explain the functioning of the membrane or filter that cleanses the blood.

CO4: Describe the tests to assess the hearing loss and development of wearable devices for the same.

CO5: Analyze and research on electrical stimulation and bio feedback techniques in rehabilitation and physiotherapy.

TEXT BOOKS

1. Gray E Wnek, Gray L Browlin – Encyclopedia of Biomaterials and Biomedical Engineering – Marcel Dekker Inc New York 2004.
2. John.G. Webster – Bioinstrumentation – John Wiley & Sons (Asia) Pvt Ltd-2004.
3. Joseph D. Bronzino, The Biomedical Engineering Handbook, 3rd Edition: Three Volume Set, CRC Press, 2006.

REFERENCE BOOKS

1. Andreas. F. Vonracum, "Handbook of biomaterial evaluation", Mc-Millan publishers, 1980.
2. GrayEWnek, GrayLBrowlin, "Encyclopedia of Biomaterials and Biomedical Engineering" Marcel Dekker Inc New York 2004.
3. D.S. Sunder, "Rehabilitation Medicine", 3rd Edition, Jaypee Medical Publication, 2010.
4. Albert M. Cook and Webster J.G., Therapeutic Medical Devices, Prentice Hall Inc., New Jersey,1982.
5. Kolff W.J., Artificial Organs, John Wiley and Sons, New York, 1979.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2	2	1	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO3	3	2	2	1	1	-	-	-	-	-	-	-	2	2

CO4	2	3	2	2	2	-	-	-	-	-	-	-	2	3
CO5	2	2	3	3	2	-	-	-	-	-	-	-	2	3
AVG	**2.6**	**2.4**	**2.2**	**2**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**2.6**

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBT203 ROBOTICS IN MEDICINE **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To Get introduced to the fundamental of robotics and position analysis.
- Learn about Parallel robots, different types of motions and force analysis.
- Know the basics of trajectory planning, Motion control systems and actuators.

UNIT I FUNDAMENTALS AND POSITION ANALYSIS **9**

Fundamentals, Degrees of freedom, Joints, Coordinates, Reference frames, Programming modes, Collaborative robots, Position analysis – Robots as mechanisms, Conventions, Transformations, Denavit Hartenberg Representation, Degeneracy and Dextrerity, Position analysis of Articulated robot.

UNIT II PARALLEL ROBOTS, DIFFERENTIAL MOTIONS AND FORCE ANALYSIS **9**

Parallel robots, Planar and Spatial parallel robots, Differential relationships, The Jacobian, Large scale motions, Frame vs Robot, Differential motions and change, Hand frame, Operator, Jacobian and Inverse for Screw based and Parallel Robots, Differential operator, Lagarangian mechanics.

UNIT III TRAJECTORY PLANNING, MOTION CONTROL SYSTEMS AND ACTUATORS **9**

Path and Trajectory, Joint Space and Cartesian Space Descriptions and Trajectory Planning, Cartesian, Trajectory Recording, Basics, Steady state error, Root locus, Proportional, Compensators, Multiple IO systems, Characteristics of Hydraulic, Pneumatic, Electric motors, Other actuators.

UNIT IV SENSORS, IMAGE PROCESSING AND ANALYSIS WITH VISION SYSTEMS **9**

Sensor Characteristics, Micro switches, Visible and IR, Touch, Proximity, Transforms – Fourier, Hough, Resolution, Image processing, Segmentation, Region growing and splitting, Object recognition, Specialized lighting, Compression, Colour images.

UNIT V FUZZY CONTROL AND APPLICATIONS IN MEDICINE **9**

Fuzzy control - Crisp vs Fuzzy, Sets, Inference rules, Defuzzification, Simulation, Applications in Biomedical Engineering and rehabilitation, Nanobots in medicine, Cardiac and abdominal procedures with tele operated robots, Orthopedic surgery with cooperative robots

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Describe the fundamental of robotics and position analysis.

CO2: Outline the functioning of parallel robots, different types of motions and force analysis.

CO3: Portray the basics of trajectory planning, Motion control systems and actuators.

CO4: Recognize and explain the use of various sensors and vision systems in robotics.

CO5: Employ Fuzzy control in robotics and apply it to Robotics in Medicine.

TEXT BOOKS

1. S.B. Niku, Introduction to Robotics, Analysis, Control, Applications, Pearson Education, 2020.
2. Robert Schilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India, 2003.
3. Fu Gonzales and Lee, “Robotics”, Mc Graw Hill, 1987.

REFERENCE BOOKS

1. Grover, Wiess, Nagel and Oderey, Industrial Robotics, McGraw Hill, 2012.
2. Klafter, Chmielewski and Negin, Robot Engineering, Prentice Hall Of India, 1989.
3. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications, 2003.
4. Bijay K. Ghosh, NingXi, T.J.Tarn, Controlling Robotics and Automation Sensor –Based integration, Academic Press, 1999.
5. Mikell P. Groover, Mitchell Weiss, Industrial robotics, technology, Programming and Applications, McGraw Hill International Editions, 1986.

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Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	2	3	2	-	1	2	-	-	2	-	3	2
CO2	3	3	3	3	2	-	1	2	-	-	2	-	3	2
CO3	3	3	3	3	3	-	2	2	-	-	2	-	3	3
CO4	3	3	2	3	2	-	2	3	-	-	2	-	3	3
CO5	3	3	2	3	2	-	2	2	-	-	2	-	3	3
AVG	**3**	**3**	**2.4**	**3**	**2.2**	**-**	**1.6**	**2.2**	**-**	**-**	**2**	**-**	**3**	**2.6**

1-Low, 2-Medium, 3-High, ‘-’ - No Correlation

24OBT204 INTRODUCTION TO DSP ARCHITECTURE **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To introduce architectural features of programmable DSP Processors of TI and Analog Devices.
- To give practical examples of DSP Processor architectures for better understanding.
- To develop the programming knowledge using Instruction set of DSP Processors.

UNIT I INTRODUCTION TO DIGITAL SIGNAL PROCESSING **9**

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time- invariant systems, Digital filters, Decimation and interpolation.

UNIT II ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES **9**

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT III PROGRAMMABLE DIGITAL SIGNAL PROCESSORS **9**

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming.

UNIT IV ANALOG DEVICES FAMILY OF DSP DEVICES **9**

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

UNIT V INTERFACING MEMORY **9**

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TOTAL:45 PERIODS

COURSE OUTCOMES

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

CO1: Classify RFID systems based on frequency, architecture and performance.
CO2: Define standards for RFID technology.
CO3: Illustrate the operation of various components of RFID systems.
CO4: Describe the privacy and security issues in RFID Systems.
CO5: Discuss the construction and applications of RFID enabled sensor.

TEXT BOOKS

1. Digital Signal Processing S. Srinivasan, Thomson Publications, 2004.

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2. A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009.
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan,Sen M. Kuo, Wiley-IEEE Press, 2007.

REFERENCE BOOKS

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI.
5. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3	2	2	3	2	3	2	1	2	2	3	2
CO2	2	3	2	3	2	3	2	2	3	1	2	2	2	3
CO3	2	3	3	2	2	2	3	2	2	2	3	3	2	2
CO4	3	2	2	3	3	2	2	3	1	3	2	2	2	3
CO5	2	2	3	3	2	3	3	2	2	1	3	3	3	3
AVG	2.4	2.4	2.6	2.6	2.2	2.6	2.4	2.4	2.2	1.6	2.4	2.4	2.4	2.6

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBT205 IMAGE PROCESSING TECHNIQUES **L T P C**

3 0 0 3

COURSE OBJECTIVES

- To become familiar with digital image fundamentals.
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To study the image segmentation and representation techniques.

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

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COURSE OUTCOMES

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

CO1: Explain 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: Explore the restoration concepts and filtering techniques.

CO4: Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

CO5: Comprehend image compression concepts.

TEXT BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, ‘Digital Image Processing’, Pearson, 3rd Edition,2010.
2. Anil K. Jain, ‘Fundamentals of Digital Image Processing’, Pearson, 2002.
3. G. R. Sinha and B. C. Patel, Medical Image Processing Concepts and Applications, PHI, 2014.

REFERENCE BOOKS

1. Kenneth R. Castleman, 'Digital Image Processing', Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, 'Digital Image Processing using MATLAB', Pearson Education, Inc., 2011.
3. D,E. Dudgeon and 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.

Mapping of COs with POs and PSOs

COs	POs												PSOs	
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CO1	3	3	2	2	2	3	2	2	1	2	2	2	3	2
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CO4	3	3	3	2	2	2	2	3	2	3	2	3	3	3
CO5	2	2	3	2	3	3	2	2	1	3	3	3	3	3
AVG	2.4	2.6	2.6	2.4	2.2	2.6	2.4	2.4	1.6	2.6	2.4	2.6	3	2.4

1-Low, 2-Medium, 3-High, '-' - No Correlation

24OBT206 WIRELESS SENSOR NETWORKS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To understand the fundamentals of wireless sensor network.
- To gain knowledge on the MAC and Routing Protocols of WSN.
- To acquire knowledge on the protocols required for developing real time applications using WSN and 6LOWPAN.

UNIT I INTRODUCTION **9**

Principle of Wireless Sensor Network -Introduction to wireless sensor networks- Challenges, Comparison with ad hoc network, Node architecture and Network architecture, design principles, Service interfaces, Gateway, Short range radio communication standards-IEEE 802.15.4, Zigbee and Bluetooth. Physical layer and transceiver design considerations.

UNIT II MAC AND ROUTING PROTOCOLS **9**

MAC protocols – fundamentals, low duty cycle protocols and wakeup concepts, contention and Schedule-based protocols - SMAC, BMAC, TRAMA, Routing protocols – Requirements, Classification -SPIN, Directed Diffusion, COUGAR, ACQUIRE, LEACH, PEGASIS.

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UNIT III 6LOWPAN **9**

6LoWPAN Architecture - protocol stack, Adaptation Layer, Link layers – Addressing, Routing - MeshUnder - Route-Over, Header Compression - Stateless header compression - Context- based header compression, Fragmentation and Reassembly , Mobility – types, Mobile IPv6, Proxy Home Agent, Proxy MIPv6, NEMO –Routing – MANET, ROLL, Border routing.

UNIT IV APPLICATION **9**

Design Issues, Protocol Paradigms -End-to-end, Real-time streaming and sessions, Publish/subscribe, Web service paradigms, Common Protocols -Web service protocols, MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol (CAP),Service discovery, Simple network management protocol (SNMP), Real-time transport and sessions, Industry- Specific protocols.

UNIT V TOOLS **9**

TinyOS – Introduction, NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, TOSSIM, Contiki – Structure, Communication Stack, Simulation environment – Cooja simulator, Programming.

TOTAL:45 PERIODS

ssssCOURSE OUTCOMES

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

CO1: Design solutions for WSNs applications.
CO2: Develop efficient MAC and Routing Protocols.
CO3: Design solutions for 6LOWPAN applications.
CO4: Develop efficient layered protocols in 6LOWPAN.
CO5: Use Tiny OS and Contiki OS in WSNs and 6LOWPAN applications.

TEXT BOOKS

1. V. Daniel Hunt, Alber Puglia, Mike Puglia, “RFID: A guide for radio frequency identification”, Wiley & Sons, Inc., Publication, 2011.
2. Roy Want, RFID Explained, Springer 2022.
3. Amin Rida, Li Yang, Manos M. Tentzeris, RFID Enabled Sensor Artech House, 2010.

REFERENCE BOOKS

1. Holger Karl, Andreas willing, “Protocol and Architecture for Wireless Sensor Networks”, John Wiley Publication, 2006.
2. Anna Forster, “Introduction to Wireless Sensor Networks”, Wiley, 2017.
3. Zach Shelby Sensi node and Carsten Bormann, “ 6lowpan: The Wireless Embedded”.
4. Philip Levis, “Tiny OS Programming”, 2006 –www.tinyos.net.
5. The Contiki Operating System. http://www.sics.se/contiki.

Mapping of COs with POs and PSOs

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CO3	3	3	3	2	3	2	3	2	2	3	3	3	3	3
CO4	2	3	3	3	2	3	3	3	2	2	3	3	3	3
CO5	2	3	2	3	3	3	2	3	1	3	3	3	3	3
AVG	**2.6**	**3**	**2.6**	**2.6**	**2.2**	**2.8**	**2.6**	**2.6**	**1.8**	**2.4**	**3**	**2.6**	**3**	**3**

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