SENGUNTHAR ENGINEERING COLLEGE
(AUTONOMOUS)
NAAC Accredited with 'A' Grade,
TIRUCHENGODE- 637 205
(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956

CURRICULUM & SYLLABI

B.Tech. INFORMATION TECHNOLOGY

(CHOICE BASED CREDIT SYSTEM)

REGULATIONS – 2023

(REVISION II)

(I - VIII SEMESTER)

(For the students admitted from the Academic year 2025-2026 onwards.
From (III to VIII Semesters) only applicable for the students admitted the Academic Year during 2023-24 and 2024-25)

Note: The regulations hereunder are subject to amendments as may be decided by the Academic Council of the Sengunthar Engineering College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

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Estd : 2001

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Chairman - BoS

DEAN (ACADEMICS)
SENGUNTHAR ENGINEERING COLLEGE
TIRUCHENGODE-637 205

PRINCIPAL
SENGUNTHAR ENGINEERING COLLEGE
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DEPARTMENT

OF

INFORMATION TECHNOLOGY

REGULATIONS 2023

(REVISED)

CURRICULUM AND SYLLABI

FOR B. Tech. INFORMATION TECHNOLOGY

(For the Students admitted in the Academic Year 2023 – 2024 onwards)

FIRST SEMESTER

TO

EIGHT SEMESTER

Estd : 2001

INDEX			
UNDER GRADUATE B.Tech. – INFORMATION TECHNOLOGY PROGRAMMES			Page No.
I	**SCHEME FOR CURRICULUM**		
	Curriculum 1 - 8 Semester	----	9-16
	List of Humanities and Social Sciences Courses	----	17
	List of Basic Sciences Courses	----	17
	List of Engineering Science Courses	----	18
	List of Professional Core	----	18
	List of Professional Electives	----	19-21
	List of Open Electives	----	21-23
	General Electives	----	23
	Elective - Management	----	23
	List of Employability Enhancement Courses	----	24
	List of Mandatory Courses	----	24-25
	Credit Summary	----	26
II	**SCHEME FOR SYLLABI**		
	I Semester Syllabi	----	27-51
	II Semester Syllabi	----	52-83
	III Semester Syllabi	----	84-105
	IV Semester Syllabi	----	106-124
	V Semester Syllabi	----	125-135
	VI Semester Syllabi	----	136-145
	VII Semester Syllabi	----	146-149
	VIII Semester Syllabi	----	150-153
	Professional Elective - I	----	154-160
	Professional Elective - II	----	170-186

	Professional Elective - III	----	187-201
	Professional Elective - IV	----	202-214
	Professional Elective - V	----	215-228
	Professional Elective - VI	----	229-242
	Open Elective - I	----	243-274
	Open Elective - II	----	275-305
	Open Elective - III	----	306-335
	General Electives	----	336-348
	Elective - Management	----	349-371
	Mandatory Course - I	----	372-380
	Mandatory Course - II	----	381-391
III	**MINOR DEGREE / HONOURS**	----	
	a. MULTIMEDIA	----	392-406
	Credit Summary	----	407
	b. CLOUD COMPUTING	----	408-422
	Credit Summary	----	423

CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students admitted in the Academic Year 2023-2024 onwards)

B.Tech. – INFORMATION TECHNOLOGY

VISION

- To be a pioneering centre in Information Technology by offering contemporary education that shapes professionals and entrepreneurs in advanced technologies.

MISSION

- To equip students with the skills and ethical responsibility needed to effectively tackle digital challenges as competent professionals.
- To provide industry-aligned curriculum and training while supporting interdisciplinary research in emerging IT fields.
- To establish a tech hub that encourages collaboration and outreach programs to solve real-world problems through innovation.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can be

- Apply computing solutions and emerging technologies to analyze, design, develop, test, and validate IT-based solutions for real-world problems.
- Excel in various engineering roles within the global computational industry and contribute to organizations of international repute.
- Obtain additional qualifications that enhance their career prospects in IT industries and to support sustainable development of the society.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1	**Engineering knowledge**	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	**Design/development of solutions**	Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5).

PO4	Conduct investigations of complex problems	Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO5	Modern tool usage	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	The engineer and society	Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7	Environment and sustainability	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	Ethics	Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	Individual and team work	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10	Communication	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Project management and finance	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOME (PSOs)

Students can have the:

PSO1	Analyze, design, code and test complex engineering problems in areas like full-stack and machine learning.
PSO2	Demonstrate strong problem-solving skills, develop software applications, and implement IT solutions that address industry needs while adhering to ethical and professional standards.

MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course Name	PO											PSO	
			1	2	3	4	5	6	7	8	9	10	11	1	2
I	I	23HST101 - Professional English	1	1	1.5	2	1	-	-	1.8	3	1.5	2	-	-
		23MAT101 - Matrices and calculus	3	3	2	-	-	-	-	-	-	-	2	-	-
		23PHT102 - Applied Physics for Computer Engineering	3	3	1	1	-	-	-	-	-	-	-	-	-
		23CYT101 - Engineering Chemistry	2.2	2.0	2.6	1.8	1.8	1.8	1.5	1.7	1.3	1.3	1.3	-	-
		23HST102 - தமிழர்மரபு/ Heritage of Tamils	-	-	-	-	-	-	2	1	2	-	1	-	-
		23GEE101 - Programming in C	2.8	2.8	2.5	1.8	3.0	–	1.0	1.0	1.3	1.0	2.0	3.0	2.7
		23PHL101- Applied Physics for Computer Engineering Laboratory	3	3	1	1	-	-	-	-	-	-	-	-	-
		23CYL101- Engineering Chemistry Laboratory	3	3	2	1	1	2	1	1	2	-	-	-	-
		23EEC101 - Soft Skills & Life Skills	1.25	1.60	1.00	1.00	3.00	1.40	2.00	2.60	2.80	2.60	2.00	-	-
		23MDC101 - Induction Program (2 Weeks)	-	-	-	-	-	-	-	-	-	-	-	-	-
	II	23MAT203 - Mathematical Foundations of Computing	3	3	2	2	1	1	-	-	-	-	1	-	1
		23PHT202 - Advanced Physics for Computer Engineering	3	2	1	1	-	-	-	-	-	-	-	-	-
		23CYT201 - Environmental Science and Sustainability	2	1.4	3	2	2.7	3	3	2	2.6	2.4	2.2	-	-
		23CSt201 -PC Hardware Services and Networking	3.0	2.6	2.0	1.6	2.8	1.6	1.3	1.3	1.0	1.0	2.2	3.0	2.8
		23HST202-தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	2	1	-	-	1	-	-
		23HSE201-English for Engineers: Theory and Practice	1	2	-	2	1	2	1.5	2.3	3	2	1.6	-	-
		23EEE202 - Basic Electrical And Electronics Engineering	3	3	3	3	3	-	1	3	3	-	3	1.8	1.2
		23CSL201-Reverse Engineering Laboratory	3	3	3	2	3	1	1	2	2	1	2	3	3
		23EEC201 – Indian Language (Except Mother Tongue) / Foreign Language													
		Hindi	-	-	-	-	-	1.0	1.3	1.6	2.8	-	1.6	-	-
		German	-	-	-	-	-	1	1.5	1.7	3	-	1.6	-	-
		Japanese	-	-	-	-	1.4	1.6	1.0	0.2	2.6	-	1.0	-	-
		23MDC201 – Aptitude Skills	-	-	-	-	-	-	-	-	-	-	-	-	-
II	III	23MAT303 - Discrete Mathematics	3	3	2	2	1	1	-	-	-	-	1	-	1
		23ECT303–Analog and Digital Communication	2.8	2.4	2.8	2.4	1.8	-	-	-	-	-	-	2.4	2.0
		23ECT302- Digital Principles and Computer Architecture	3	2.8	2.8	2.2	2	2	-	-	-	2	1.8	3	1.4

		23CSE301-Object Oriented Programming	3.0	2.3	2.8	1.7	2.8	1.3	1.0	1.3	1.3	1.5	2.2	3.0	3.0
		23CSE302 - Data Structures and Algorithm	3.0	3.0	2.8	2.5	3.0	1.3	1.0	1.3	1.0	1.0	2.3	3.0	3.0
		23GEE301-Problem Solving and Python Programming	2.8	2.7	2.2	1.5	2.8	0.0	1.0	1.0	1.5	1.0	2.0	3.0	2.8
		23EEC301 - Professional Development	-	-	-	-	-	-	-	-	-	-	-	-	-
	IV	23ITT401-Object Oriented Software Design	3	1	1	2	2	-	-	3	1	2	3	2	1
		23CCT401- Operating Systems and security	3	2.8	2.6	2.4	2.8	2.2	1	0.2	0.2	1	2.8	2.4	2
		23CSE401-Artificial Intelligence and Machine Learning	3.0	3.0	3.0	2.8	3.0	1.3	1.0	1.2	1.2	1.3	2.7	3.0	3.0
		23CSE402-Database Management Systems	3.0	3.0	2.8	2.7	3.0	1.3	1.0	1.2	1.2	1.2	2.7	3.0	3.0
		23ECE404-Embedded Systems and IoT	2.5	2.3	2.5	2.3	2.2	1.0	0.3	-	-	-	-	2.3	2.0
		23EEC401-Online Certification Courses	-	-	-	-	-	-	-	-	-	-	-	-	-
III	V	23CST402 – Automata Theory	3	3	1.6	2.8	2.8	0	0	0.8	0.8	0.8	2	3	1.2
		Professional Elective I													
		23ITP501-Image and Video Analytics	2.6	2.8	2.4	2.4	1.8	-	-	-	2.0	2.0	1.6	2.8	2.6
		23ITP502 - Computer Vision	3	2.2	2.8	2.8	2.6	-	-	-	2.0	2	1.6	3	2.6
		23CSP501-Data Warehousing and Mining	2.8	2.8	2.0	3.0	2.8	–	–	2.0	1.0	–	2.2	2.8	2.2
		23CSP502-Exploratory Data Analysis	3	2.6	2	1.8	2.4	1.4	0	1	1.2	1	2.4	2.8	2.4
		23CSP503-Recommender Systems	2.8	2.6	2	2	2.4	1.2	1	1	1.4	1.2	2.4	2.8	2.8
		23CSP504-Text and Speech Analysis	3	2.6	2	2	2.8	1	0	1	1.2	1.3	2.8	3	2.8
		Professional Elective II													
		23ITP503-TCP/IP Design and Implementation	3	2.4	2.6	2	2.6	-	-	-	2	2	-	3	2.8
		23CSP508-Cloud Services Management	2.2	2.4	2.6	2.6	2.6	1.8	1.2	2	1.6	1.2	2	2.6	2.4
		23ADT501-UI and UX Design	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	2.2	2.6
		23CSP510-SoftwareTesting and Automation	2.4	2	2.8	2.4	2.4	1	0	0	1.4	2	1.8	2.8	2.2
		23CSP511-Web Application Security	2.8	2.4	2.4	2.4	2.4	1.4	2	1.4	1.2	2	1.8	3	2.8
		23CSP512-DevOps	3	2	2.8	2.8	2.8	1.2	1	1	1	2	2	3	3
		Professional Elective III													
		23ITP504-Human Computer Interaction	2.2	2.2	2.2	2.0	1.8	0.0	0.0	0.0	2.2	2.2	1.0	1.6	1.8
		23ITP505-StorageTechnologies	1.8	1.8	1.8	2.2	2.4	–	–	–	1.8	1.4	2.2	2.2	2.4
		23CSP513-Virtualization	3	2.4	2.6	2.6	2.6	1.4	1	1	1.6	1	1	3	2.6
		23CSP514-Software Defined Networks	3	2.4	2.4	2.2	2.2	1.4	1.4	1	1.6	1.6	1.6	3	2.6
		23CSP515-Stream Processing	3	2.6	2.4	2.8	2.2	1	1	-	1.8	1.6	1.8	2.8	2.6
		23CSP516-Security and Privacy in Cloud	3.0	2.8	2.6	2.0	2.8	2.8	2.4	1.6	1.8	1.8	1.8	2.8	2.8
		23ITE501- Full Stack Web Development	3.0	2.8	2.5	1.8	2.7	2.0	3.0	3.0	2.0	2.3	3.0	3.0	3.0

		23CSE501 – Computer Networks	3.0	2.8	2.8	2.3	3.0	1.5	1.0	1.2	1.3	1.3	2.5	3.0	3.0
		23EEC501-Industrial Training	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mandatory Course – I													
		23MDC501 - Introduction to Women and Gender Studies	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC502 - Elements of Literature	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC503 - Film Appreciation	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC504 - Disaster Risk Reduction and Management	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC505 - Constitution of India	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC501 - Introduction to Women and Gender Studies	-	-	-	-	-	-	-	-	-	-	-	-	-
		Professional Elective IV													
		23ITP601-Digital Forensics	2.6	2.8	2.4	2.4	2.0	2.2	-	-	-	-	-	3.0	2.6
		23ITP602-Information Security	3.0	2.8	2.5	2.8	2.8	1.4	2.2	1.0	1.0	–	2.4	3.0	2.8
		23CSP601-Hacking Techniques	2.6	2.8	2.2	2.6	3	1.8	-	2.2	2	1.4	-	2.8	2.2
		23CSP602-Social Network Security	3.0	2.8	2.4	2.4	2.6	2.4	2.2	1.5	1.6	1.0	2.8	3.0	2.8
		23CSP603-Engineering Secure Software Systems	3	3	2.8	2.6	2.4	1.6	2	1.5	1.8	1.4	2	2.8	2.4
		23CCP601 – Cryptocurrency and Block chain Technologies	3	2.8	2.6	2.6	2.8	1.6	1.2	2	1.8	1.2	2.2	2.8	2.6
		Professional Elective V													
		23ITP603 - Game Development	2.2	2.2	1.6	1.6	2.2	-	-	-	-	-	-	2	2.2
		23CSP604 - Augmented Reality / Virtual Reality	3	3	2.6	2.4	2.4	1.8	1.3	3	2	1.4	-	2.4	2
		23CSP605 - Robotics Process And Automation	2.8	2.8	2.6	2	2.6	1.6	1.5	2	2	1.8	2	2.8	2.6
VI		23ADP602 -Neural Networks And Deep Learning	2.6	2	2.8	2.2	3	1	-	-	2	1	2	2.8	2.6
		23CCP502 - Computer Hardware and System Essentials	3	3	2.6	2.5	2.8	2	-	-	0.4	0.4	2.2	3	3
		23CCP602 – Cyber Physical System Security	2.6	2.8	2.2	2	2.7	2.5	3.0	–	2.0	2.0	2.2	2.4	2.2
		Professional Elective VI													
		23ITP604 – Information Assurance Security	2.6	2.8	1.8	1.6	2.2	1	3	–	2	2	2.2	2.4	2.2
		23CSP610 - Optimization Techniques	3	3	2.4	2.2	2.4	1.3	1	2	2	1.2	2	2.8	2.2
		23CSP401 -Distributed Computing	3	3	3	2	1.6	2	1	1	2	2	2	2	1
		23CSP612 - Ethics And AI	1.8	2.6	2	1.3	1.5	3	3	2.4	1.8	1.6	2	1.8	1.6
		23ADP502 - Knowledge Engineering	2	2	2	2	-	-	-	-	2	2	2	2	1
		23CSP608 - Soft Computing	3	2.8	2.4	2.2	2	1.2	1	2	1.8	1.2	2	2.8	2.2
		Open Elective-I													
		23MEO601 Introduction to Industrial Engineering	3	3	2	-	-	-	-	-	-	-	2	-	-

		23ECO602 Fundamentals of Electronic Devices and Circuits	3	3	3	3	2.8	2.4	-	-	-	-	2.4	-	-
		23EEO603 Electric Vehicle Technology	3	3	3	3	3	-	-	-	-	-	2	-	-
		23EEO604 Renewable Energy System	3	3	3	3	3	1	1	-	1	-	2	-	-
		23MEO605 CNC Machining Technology	3	3	2	2	3	-	-	-	-	-	1	-	-
		23MAO606 Graph Theory	3	2.8	2.3	1	-	-	-	-	-	-	1.4	-	-
		23CEO607 Environmental and Social Impact Assessment	3.0	3.0	2.4	2.0	2.0	2.2	3.0	–	–	–	2.3	-	-
		23PMO608 Pharmaceutical Nanotechnology	2.4	2.6	2.4	2.8	2.4	1.8	2	1	-	1	2.2	-	-
		23RAO609 Fundamentals of Robotics	3.0	2	-	2.8	3.0	2.0	1.0	2.0	2.0	2.3	2.0	-	-
		23CSO610 Introduction to Drone Technologies	2.6	2.8	2.4	1.8	3	-	-	1.5	-	-	2.6	-	-
		23MDO611 Hospital Management	1	2.4	2	1.5	2	1.6	1.4	1.0	1.0	1.6	1.4	-	-
		23CSO612 Cyber Forensics and Ethical Hacking	3	2.6	1.75	2.25	2.6	1.6	2.2	1	1.5	1	2	3	2.6
		NCC Airforce Level -1	2.5	2.3	2.2	2.0	2.0	3.0	2.8	2.3	2.6	2.25	2.0	–	–
		NCC Airforce Level -3	2	2	2.5	-	-	2.5	3	2.5	2.5	2	2	-	-
		23CSE601- Cloud Computing	3.0	2.8	2.8	2.3	2.8	2.3	1.5	1.8	1.3	2.3	3.0	3.0	3.0
		23ITE601- Mobile computing	2.8	2.5	2.5	1.7	2.7	2.0	-	-	-	2.0	2.0	2.8	2.7
		23EEJ601 Project Work – Phase I	3	3	3	3	3	3	3	3	3	3	3	3	3
		Mandatory Course – II													
		23MDC601 - Well Being with Traditional Practices- Yoga, Ayurveda and Siddha	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC602 - History of Science and Technology in India	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC603 - Political and Economical Thought for a Human Society	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC604 - State, Nation Building and Politics in India	-	-	-	-	-	-	-	-	-	-	-	-	-
		23MDC605 - Industrial Safety	-	-	-	-	-	-	-	-	-	-	-	-	-
IV	VII	23HST701 - Human Values and Ethics	2	2.3	-	3	-	3	3	1	1.5	-	1.6	1	1
		Elective-Management													
		23MGT701 Principles of Management	1.6	1	1	1.5	1.5	1	1	2	3	1	1	-	-
		23MGT702 Total Quality Management	3	2	2	-	1	-	-	-	-	-	2	2	1
		23MGT703 Engineering Economics and Financial Accounting	2	2.8	1.7	1	2.0	1.4	1	1	1.2	3	1.2	-	-
		23MGT704 Human Resource Management	1	2	1.5	2	1.5	1.2	1.8	2.2	1.6	1.5	2	-	-
		23MGT705 Knowledge Management	2	2.4	1.7	1.3	1.6	1.3	2.0	1.3	1.5	1.7	2.2	-	-
		23MGT706 Industrial Management	1	2	1	-	1.5	1.3	1.3	1.5	1.5	3.7	1.3	-	-

	23MGT707 Supply Chain management	1.8	2	1.8	1.5	1.5	1.4	1	1	1.5	2	2.2	1	1
	23MGT708 e-Waste Management	1.8	2.4	2.4	1.8	1.4	2	1.2	1.3	1.8	2	1.8	-	-
	Open Elective-II													
	23MEO703 -Fundamentals of Mechatronics	3	2	2	-	-	-	-	-	-	-	1	-	-
	23CEO704 Remote Sensing Concepts	3	-	1	1	2	-	-	-	2	1	1	-	-
	23MEO704 Nano Technology	3	2	2	-	-	-	-	-	-	-	1	-	-
	23MDO705 Ultrasound Principles and its Medical Applications	2.2	2.4	1.8	1.8	2.7	1.2	1.0	-	1	1	1.2	-	-
	23PMO706 Intellectual Property Rights	2.4	2.2	2.2	1.2	2.2	1.8	1.6	2	1	1	1.8	-	-
	23RAO707 Mobile Robots	3	3	2.8	2.6	2.8	1.2	1	1	1.6	-	1.6	-	-
	23ECO708 Energy Technology	2.2	2	1.8	3	3	1	1	1	1	1.6	3	-	-
	23EEO709 Sensors , Actuators and its Applications	3	3	3	3	3	-	-	-	-	-	2	-	-
	23MAO710 Operations Research	2.8	3	2.4	1.8	2	1	-	-	-	-	2	-	-
	23CSO711 Introduction to Cyber Security	3.0	2.6	2.4	2.3	2.5	2.0	2.0	2.5	1.6	2.0	2.0	-	-
	23MEO712 Smart Maufaturing	2.0	2.6	2.5	2.0	2.6	-	1.5	-	-	-	1.5	-	-
	NCC Airforce Level -2	2.5	2.5	2.2	2.3	2.5	2.8	2.5	2.3	2.5	2.3	2.0	–	–
	NCC Airforce Level -4	2	2	-	-	-	3	2	3	2	2	1	-	-
	Open Elective-III													
	23CSO715 Fundamentals of Block chain Technology	2.8	2.5	2.3	1.7	2.8	1	1	2	1.3	2	2.2	-	-
	23EEO716 Electrical, Electronic and Magnetic Materials	3	3	3	3	3	-	-	-	-	-	2	-	-
	23CEO717 Geographical Information System	3	2	2	-	3	2	-	-	2	2	1	-	-
	23ECO718 VLSI Design	3	3	3	2	2	1.6	1	-	1	1	1	-	-
	23MDO719 Wearable Technology	2.2	2.4	1.8	1.75	2.25	1.5	1.0	-	-	-	1.4	-	-
	23MEO720 Marine Vehicles	3	2	2	2	3	-	-	-	-	-	-	-	-
	23RAO721 Robotics process Automation	3	2.8	2.4	2.4	2.8	1.2	–	–	1.2	1.2	1.2	–	–
	23MGO722 Cost Management of Engineering Projects	3	3	3	-	1	-	1	1	1	1	1.5	2.6	3
	23MDO723 Medical Waste Management	2	2.4	1.8	1.75	1.8	2.8	2	1	1	1.2	1.2	-	-
	23MAO714 Advanced Numerical Methods	3	3	2.4	1.4	2	-	-	-	-	-	2	-	-

		23MDO724 Lifestyle Diseases	2	2.4	1.8	1.5	2	2.2	1.2	1	1	1.2	1.4	-	-
		23EEJ701 Project Work – Phase II	3	3	3	3	3	3	3	3	3	3	3	3	3
IV	VIII	23EEJ801 Product Development	3	3	3	3	3	3	3	3	3	3	3	3	3
		23EEC801 Internship	-	-	-	-	-	-	-	-	-	-	-	-	-

CURRICULUM
FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech. - INFORMATION TECHNOLOGY - FIRST SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23HST101	Professional English	HS	3	0	0	3	40	60	100
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23PHT102	Applied Physics for Computer Engineering	BS	3	0	0	3	40	60	100
23CYT101	Engineering Chemistry	BS	3	0	0	3	40	60	100
23HST102	தமிழர்மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100
EMBEDDED COURSE									
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
PRACTICALS									
23PHL101	Applied Physics for Computer Engineering Laboratory	BS	0	0	2	1	60	40	100
23CYL101	Engineering Chemistry Laboratory	BS	0	0	2	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC101	Soft Skills & Life Skills	EEC	1	0	0	1	100	-	100
MANDATORY COURSE									
23MDC101	Induction Program (2 Weeks)	MC	-	-	-	-	-	-	-
TOTAL CREDITS IN SEMESTER - I			21						

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P : Practical
C : Credit Point
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CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech. - INFORMATION TECHNOLOGY - SECOND SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23MAT203	Mathematical Foundations of Computing	BS	3	1	0	4	40	60	100
23PHT202	Advanced Physics for Computer Engineering	BS	3	0	0	3	40	60	100
23CYT201	Environmental Science and Sustainability	HS	3	0	0	3	40	60	100
23CST201	PC Hardware Services and Networking	PC	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100
EMBEDDED COURSE									
23HSE201	English for Engineers: Theory and Practice	HS	3	0	2	4	50	50	100
23EEE202	Basic Electrical and Electronics Engineering	ES	3	0	2	4	50	50	100
PRACTICALS									
23CSL201	Reverse Engineering Laboratory	PC	0	0	4	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC201	Indian Language (Except Mother Tongue) /Foreign Language	EEC	0	0	4	2	100	-	100
MANDATORY COURSE									
23MDC201	Aptitude Skills	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER - II			26						

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CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech.- INFORMATION TECHNOLOGY - THIRD SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23MAT303	Discrete Mathematics	BS	3	1	0	4	40	60	100
23ECT302	Digital Principles and Computer Architecture	ES	3	0	0	3	40	60	100
23ECT303	Analog and Digital Communication	ES	3	0	0	3	40	60	100
EMBEDDED COURSE									
23CSE301	Object Oriented Programming	PC	3	0	2	4	50	50	100
23CSE302	Data Structures and Algorithms	PC	3	0	2	4	50	50	100
23GEE301	Problem Solving and Python Programming	ES	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
TOTAL CREDITS IN SEMESTER - III			23						

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CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech. - INFORMATION TECHNOLOGY - FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23ITT401	Object Oriented Software Design	PC	3	0	0	3	40	60	100
23CCT401	Operating System and Security	PC	3	1	0	4	40	60	100
EMBEDDED COURSE									
23CSE401	Artificial Intelligence and Machine Learning	PC	3	0	2	4	50	50	100
23CSE402	Database Management Systems	PC	3	0	2	4	50	50	100
23ECE404	Embedded Systems and IoT	ES	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC401	Online Certification Courses	EEC	3	0	0	3	100	-	100
TOTAL CREDITS IN SEMESTER - IV			22						

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EEC : Employability Enhancement Courses
MC : Mandatory Courses
L : Lecture
T : Tutorial
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CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech. - INFORMATION TECHNOLOGY - FIFTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23CST402	Automata Theory	PC	3	1	0	4	40	60	100
	Professional Elective I	PE	3	0	0	3	40	60	100
	Professional Elective II	PE	3	0	0	3	40	60	100
	Professional Elective III	PE	3	0	0	3	40	60	100
EMBEDDED COURSE									
23ITE501	Full Stack Web Development	PC	3	0	2	4	50	50	100
23CSE501	Computer Networks	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC501	Industrial Training	EEC	0	0	4	2	100	-	100
MANDATORY COURSE									
	Mandatory Course-I	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER - V			23						

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PE : Professional Elective
OE : Open Elective
GE : General Elective
EEC : Employability Enhancement Courses
MC : Mandatory Courses
L : Lecture
T : Tutorial
P : Practical
C : Credit Point
CIA : Continuous Internal Assessment
ESE : End Semester Examination
TOT : Total

CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech.- INFORMATION TECHNOLOGY -SIXTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
	Professional Elective IV	PE	3	0	0	3	40	60	100
	Professional Elective V	PE	3	0	0	3	40	60	100
	Professional Elective VI	PE	3	0	0	3	40	60	100
	Open Elective – I/ NCC I L1/L3	OE	3	0	0	3	40	60	100
EMBEDDED COURSE									
23ITE601	Mobile Computing	PC	3	0	2	4	50	50	100
23CSE601	Cloud Computing	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEJ601	Project Work-Phase I	EEC	0	0	8	4	60	40	100
MANDATORY COURSE									
	Mandatory Course-II	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER- VI			24						

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PE : Professional Elective
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GE : General Elective
EEC : Employability Enhancement Courses
MC : Mandatory Courses
L : Lecture
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CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech. - INFORMATION TECHNOLOGY - SEVENTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100
	Elective-Management	GE	3	0	0	3	40	60	100
	Open Elective – II / NCC II L2 / L4	OE	3	0	0	3	40	60	100
	Open Elective - III	OE	3	0	0	3	40	60	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEJ701	Project Work-Phase II	EEC	0	0	8	4	60	40	100
TOTAL CREDITS IN SEMESTER - VII			16						

HS : Humanities and Social Sciences
BS : Basic Sciences
ES : Engineering Sciences
PC : Professional Core
PE : Professional Elective
OE : Open Elective
GE : General Elective
EEC : Employability Enhancement Courses
MC : Mandatory Courses
L : Lecture
T : Tutorial
P : Practical
C : Credit Point
CIA : Continuous Internal Assessment
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CURRICULUM

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

B.Tech. - INFORMATION TECHNOLOGY - EIGHTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
EMPLOYABILITY ENHANCEMENT COURSE									
23EEJ801	Product Development	EEC	0	0	12	6	60	40	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100
TOTAL CREDITS IN SEMESTER - VIII			8						

HS	:	Humanities and Social Sciences
BS	:	Basic Sciences
ES	:	Engineering Sciences
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
GE	:	General Elective
EEC	:	Employability Enhancement Courses
MC	:	Mandatory Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
TOT	:	Total

LIST OF HUMANITIES AND SOCIAL SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HST101	Professional English	HS	3	0	0	3	40	60	100
23HST102	தமிழர்மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100
23HSE201	English for Engineers: Theory and Practice	HS	3	0	2	4	50	50	100
23CYT201	Environmental Science and Sustainability	HS	3	0	0	3	40	60	100
23HST202	தமிழரும்தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	100	-	100
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100

LIST OF BASIC SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23PHE102	Applied Physics for Computer Engineering	BS	3	0	0	3	40	60	100
23PHL101	Applied Physics for Computer Engineering Laboratory	BS	0	0	2	1	60	40	100
23CYE101	Engineering Chemistry	BS	3	0	0	3	40	60	100
23CYL101	Engineering Chemistry Laboratory	BS	0	0	2	1	60	40	100
23MAT203	Mathematical Foundations of Computing	BS	3	1	0	4	40	60	100
23PHT202	Advanced Physics for Computer Engineering	BS	3	0	0	3	40	60	100
23MAT301	Discrete Mathematics	BS	3	1	0	4	40	60	100

LIST OF ENGINEERING SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
23EEE202	Basic Electrical and Electronics Engineering	ES	3	0	2	4	50	50	100
23GEE301	Problem Solving and Python Programming	ES	3	0	2	4	50	50	100
23ECT302	Digital Principles and Computer Architecture	ES	3	0	0	3	40	60	100
23ECT303	Analog and Digital Communication	ES	3	0	0	3	40	60	100
23ECE404	Embedded Systems and IoT	ES	3	0	2	4	50	50	100

LIST OF PROFESSIONAL CORE

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23CSE201	PC Hardware Services and Networking	PC	3	0	0	3	50	50	100
23CSL201	Reverse Engineering Laboratory	PC	0	0	4	2	60	40	100
23CSE301	Object Oriented Programming	PC	3	0	2	4	50	50	100
23CSE302	Data Structures and Algorithms	PC	3	0	0	3	50	50	100
23ITT401	Object Oriented Software Design	PC	3	0	0	3	40	60	100
23CCT401	Operating System and Security	PC	3	1	0	4	40	60	100
23CSE401	Artificial Intelligence and Machine Learning	PC	3	0	2	4	50	50	100
23CSE402	Database Management Systems	PC	3	0	2	4	50	50	100
23CST402	Automata Theory	PC	3	1	0	4	40	60	100
23ITE501	Full Stack Web Development	PC	3	0	2	4	50	50	100
23CSE501	Computer Networks	PC	3	0	2	4	50	50	100
23ITE601	Mobile Computing	PC	3	0	2	4	50	50	100
23CSE601	Cloud Computing	PC	3	0	2	4	50	50	100

LIST OF PROFESSIONAL ELECTIVE COURSES

Professional Elective – I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP501	Image and Video Analytics	PE	3	0	0	3	40	60	100
23ITP502	Computer Vision	PE	3	0	0	3	40	60	100
23CSP501	Data Warehousing and Mining	PE	3	0	0	3	40	60	100
23CSP502	Exploratory Data Analysis	PE	3	0	0	3	40	60	100
23CSP503	Recommender Systems	PE	3	0	0	3	40	60	100
23CSP504	Text and Speech Analysis	PE	3	0	0	3	40	60	100

Professional Elective – II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP503	TCP/IP Design and Implementation	PE	3	0	0	3	40	60	100
23CSP508	Cloud Services Management	PE	3	0	0	3	40	60	100
23ADT501	UI and UX Design	PE	3	0	0	3	40	60	100
23CSP510	Software Testing and Automation	PE	3	0	0	3	40	60	100
23CSP511	Web Application Security	PE	3	0	0	3	40	60	100
23CSP512	DevOps	PE	3	0	0	3	40	60	100

Professional Elective – III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP504	Human Computer Interaction	PE	3	0	0	3	40	60	100
23ITP505	Storage Technologies	PE	3	0	0	3	40	60	100
23CSP513	Virtualization	PE	3	0	0	3	40	60	100

23CSP514	Software Defined Networks	PE	3	0	0	3	40	60	100
23CSP515	Stream Processing	PE	3	0	0	3	40	60	100
23CSP516	Security and Privacy in Cloud	PE	3	0	0	3	40	60	100

Professional Elective – IV

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP601	Digital Forensics	PE	3	0	0	3	40	60	100
23ITP602	Information Security	PE	3	0	0	3	40	60	100
23CSP601	Hacking Techniques	PE	3	0	0	3	40	60	100
23CSP602	Social Network Security	PE	3	0	0	3	40	60	100
23CSP603	Engineering Secure Software Systems	PE	3	0	0	3	40	60	100
23CCP601	Cryptocurrency and Block chain Technologies	PE	3	0	0	3	40	60	100

Professional Elective – V

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP603	Game Development	PE	3	0	0	3	40	60	100
23CSP604	Augmented Reality / Virtual Reality	PE	3	0	0	3	40	60	100
23CSP605	Robotic Process Automation	PE	3	0	0	3	40	60	100
23ADP601	Neural Networks and Deep Learning	PE	3	0	0	3	40	60	100
23CCP502	Computer Hardware and System Essentials	PE	3	0	0	3	40	60	100
23CCP602	Cyber Physical System	PE	3	0	0	3	40	60	100

Professional Elective – VI

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP604	Information Assurance and Security	PE	3	0	0	3	40	60	100
23CSP610	Optimization Techniques	PE	3	0	0	3	40	60	100
23CST401	Distributed Computing	PE	3	0	0	3	40	60	100
23CSP612	Ethics And AI	PE	3	0	0	3	40	60	100
23ADP503	Knowledge Engineering	PE	3	0	0	3	40	60	100
23CSP608	Soft Computing	PE	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVE COURSES

OPEN ELECTIVES – I

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
CIVIL	23CEO607 / Environmental and Social Impact Assessment	OE	3	0	0	3	40	60	100
CSE	23CSO610 / Introduction to Drone Technologies	OE	3	0	0	3	40	60	100
ECE	23ECO602 / Fundamentals of Electronic Devices and Circuits	OE	3	0	0	3	40	60	100
EEE	23EEO603 / Electric Vehicle Technology	OE	3	0	0	3	40	60	100
	23EEO604 / Renewable Energy Systems	OE	3	0	0	3	40	60	100
MECHANICAL	23MEO601 / Introduction to Industrial Engineering	OE	3	0	0	3	40	60	100
	23MEO605 / CNC Machining Technology	OE	3	0	0	3	40	60	100
MEDICAL ELECTRONICS	23MDO611 / Hospital Management	OE	3	0	0	3	40	60	100
ROBOTICS AND AUTOMATION	23RAO609 / Fundamentals of Robotics	OE	3	0	0	3	40	60	100
CSE(Cyber Security)	23CSO612 / Cyber Forensics and Ethical Hacking	OE	3	0	0	3	40	60	100
PHARMACEUTICAL TECHNOLOGY	23PMO608 / Pharamaceutical Nanotechnology	OE	3	0	0	3	40	60	100
MATHEMATICS	23MAO606 / Graph Theory	OE	3	0	0	3	40	60	100

OPEN ELECTIVE - II

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
CIVIL	23CEO704 / Remote Sensing Concepts	OE	3	0	0	3	40	60	100
ECE	23ECO708 / Energy Technology	OE	3	0	0	3	40	60	100
EEE	23EEO709 / Sensors, Actuators and its Application	OE	3	0	0	3	40	60	100
MECHANICAL	23MEO703 / Fundamentals of Mechatronics	OE	3	0	0	3	40	60	100
	23MEO704 / Nano Technology	OE	3	0	0	3	40	60	100
	23MEO712 / Smart Manufacturing	OE	3	0	0	3	40	60	100
MEDICAL ELECTRONICS	23MDO705 / Ultrasound Principles and its Medical Applications	OE	3	0	0	3	40	60	100
ROBOTICS AND AUTOMATION	23RAO707 / Mobile Robots	OE	3	0	0	3	40	60	100
CSE(Cyber Security)	23CSO711 / Introduction to Cyber Security	OE	3	0	0	3	40	60	100
PHARMACEUTICAL TECHNOLOGY	23PMO706 / Intellectual Property Rights for Pharma Industry	OE	3	0	0	3	40	60	100
MATHEMATICS	23MAO710 / Operations Research	OE	3	0	0	3	40	60	100

OPEN ELECTIVES- III

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
CIVIL	23CEO717 / Geographical Information System	OE	3	0	0	3	40	60	100
CSE	23CSO715 / Fundamentals of Blockchain Technology	OE	3	0	0	3	40	60	100
ECE	23ECO718 / VLSI Design	OE	3	0	0	3	40	60	100
EEE	23EEO716 / Electrical, Electronic and Magnetic Materials	OE	3	0	0	3	40	60	100
MECHANICAL	23MEO720 / Marine Vehicles	OE	3	0	0	3	40	60	100
MEDICAL ELECTRONICS	23MDO719 / Wearable Technology	OE	3	0	0	3	40	60	100
	23MDO723 / Medical Waste Management								

	23MDO724 / Lifestyle Diseases									
ROBOTICS AND AUTOMATION	23RAO721 / Robotics Process Automation	OE	3	0	0	3	40	60	100
MATHEMATICS	23MAO714 / Advanced Numerical Methods	OE	3	0	0	3	40	60	100
MANAGEMENT	23MGO722 / Cost Management of Engineering Projects	OE	3	0	0	3	40	60	100

GENERAL ELECTIVES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23NCCL01	NCC AIRFORCE LEVEL-1	GE	3	0	0	3	40	60	100
23NCCL02	NCC AIRFORCE LEVEL - 2	GE	3	0	0	3	40	60	100
23NCCL03	NCC ARMY WING LEVEL - 3	GE	3	0	0	3	40	60	100
23NCCL04	NCC ARMY WING LEVEL - 4	GE	3	0	0	3	40	60	100

ELECTIVE – MANAGEMENT

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MGT701	Principles of Management	GE	3	0	0	3	40	60	100
23MGT702	Total Quality Management	GE	3	0	0	3	40	60	100
23MGT703	Engineering Economics and Financial Accounting	GE	3	0	0	3	40	60	100
23MGT704	Human Resource Management	GE	3	0	0	3	40	60	100
23MGT705	Knowledge Management	GE	3	0	0	3	40	60	100
23MGT706	Industrial Management	GE	3	0	0	3	40	60	100
23MGT707	Supply Chain Management	GE	3	0	0	3	40	60	100
23MGT708	e-Waste Management	GE	3	0	0	3	40	60	100

LIST OF EMPLOYABILITY ENHANCEMENT COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23EEC101	Soft Skills & Life Skills	EEC	1	0	0	1	100	-	100
23EEC201	Indian Language (Except Mother Tongue) /Foreign Language	EEC	0	0	4	2	100	-	100
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
23EEC401	Online Certification Courses	EEC	0	0	4	2	100	-	100
23EEC501	Industrial Training	EEC	0	0	4	2	100	-	100
23EEJ601	Project Work- Phase I	EEC	0	0	8	4	60	40	100
23EEC701	Project Work- Phase II	EEC	0	0	8	4	60	40	100
23EEJ801	Product Development	EEC	0	0	12	6	60	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100

LIST OF MANDATORY COURSES

MANDATORY COURSES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDC501	Introduction to Women and Gender Studies	MC	3	0	0	0	-	-	-
23MDC502	Elements of Literature	MC	3	0	0	0	-	-	-
23MDC503	Film Appreciation	MC	3	0	0	0	-	-	-
23MDC504	Disaster Risk Reduction and Management	MC	3	0	0	0	-	-	-
23MDC505	Constitution of India	MC	3	0	0	0	-	-	-

MANDATORY COURSES - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDC601	Well Being with Traditional Practices- Yoga, Ayurveda and Siddha	MC	3	0	0	0	-	-	-
23MDC602	History of Science and Technology in India	MC	3	0	0	0	-	-	-
23MDC603	Political and Economical Thought for a Human Society	MC	3	0	0	0	-	-	-
23MDC604	State, Nation Building and Politics in India	MC	3	0	0	0	-	-	-
23MDC605	Industial Safety	MC	3	0	0	0	-	-	-

CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

CREDIT SUMMARY

B.Tech. INFORMATION TECHNOLOGY

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	4	8	–	–	–	–	3	–	15
BS	12	7	4	–	–	–	–	–	23
ES	4	4	10	4	–	–	–	–	22
GE	–	–	–	–	–	–	3	–	3
PC	–	5	8	15	12	8	–	–	48
PE	–	–	–	–	9	9	–	–	18
OE	–	–	–	–	–	3	6	–	9
EEC	1	2	1	3	2	4	4	8	25
MC	–	–	–	–	–	–	–	–	–
Total	21	26	23	22	23	24	16	8	163

SEMESTER I

23HST101 **PROFESSIONAL ENGLISH** **L T P C**
(Common to all B.E. & B.Tech. Branches) **3 0 0 3**

OBJECTIVES

- To build vocabulary proficiency and familiarity with varied lexical and contextual usages.
- To strengthen grammatical accuracy for effective sentence construction and language application.
- To develop clarity and coherence in written communication across academic and business contexts.
- To enhance oral fluency, confidence, and interactive communication skills.
- To promote efficient reading strategies for comprehension, analysis, and note-making.

UNIT I VOCABULARY **8**

Synonyms and Antonyms - Word Formation - Sentence Types (declarative, imperative, interrogative & exclamatory) - Single Word Substitutes - Use of Abbreviations and Acronyms- Homonyms and Homophones - Collocation - British and American Vocabulary.

UNIT II GRAMMAR **10**

Parts of speech - Be, Have and Do verbs - Punctuation - Tenses - Numerical Adjectives - modal verbs - Single line Definition - Direct and Indirect Speech - Gerunds and Infinitives - Same Word Used as Different Parts of Speech.

UNIT III WRITING **9**

Letter Writing - Business communications - quotations, placing orders, complaints, replies to queries from business customers - Dialogue Writing – Paragraph Writing (descriptive, narrative, expository & persuasive) - Essay Writing - Writing Instructions.

UNIT IV SPEAKING **9**

Self-introduction - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Expressing opinions and justifying opinions - Agreement / disagreement - Likes and dislikes - Tongue twisters

UNIT V READING SKILLS **9**

Reading Comprehension – Reading techniques, pre-reading, post-reading, comprehension questions (multiple choice questions or short questions) - Short Comprehension Passages, practice skimming - Scanning and Predicting - Reading the passage and taking (Note making) Notes - Scan and understand main contents of the passage.

TOTAL: 45 PERIODS

OUTCOMES

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

- Use a wide range of vocabulary in oral and written communication
- Apply grammatically correct sentences for academic and professional purposes.
- Write letters, frame paragraphs and Essays, develop conversation.
- Develop speaking skills for self-Introduction, delivering speeches and Technical Presentation
- Read and comprehend the passage, technical content and take notes

TEXT BOOKS

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

REFERENCES

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", Orient Black Swan, Chennai, First Edition, 2012.
2. MacMillan, Krishna Mohan, Meera Banerji, Developing Communication Skills, Paperback, 2019.

E-RESOURCES

1. http://www.usingenglish.com
2. https://www.khanacademy.org/humanities/grammar

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	-	-	-	1	-	-	-	2	3	-	2	-	-
2	1	-	-	-	1	-	-	-	2	3	-	2	-	-
3	-	1	2	-	1	-	-	-	2	3	1	2	-	-
4	-	-	1	-	-	-	-	-	2	3	2	2	-	-
5	1	1	-	2	1	-	-	-	1	3	-	2	-	-
AVG	1	1	1.5	2	1	-	-	-	1.8	3	1.5	2	-	-

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

Chairman - BoS

23MAT101 **MATRICES AND CALCULUS** L T P C
(Common to all B.E./ B.Tech. Branches) 3 1 0 4

OBJECTIVES

- To develop the use of matrix algebra and its properties.
- To explore the techniques of differential and integral calculus.
- To categorize methods for functions of several variables.
- To introduce the use of multiple integrals and their applications.
- To provide knowledge of vector calculus.

UNIT I MATRICES 9+3

Eigen values and Eigen vectors – Properties of Eigen values – Cayley-Hamilton theorem – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of quadratic form.

UNIT II DIFFERENTIAL AND INTEGRAL CALCULUS 9+3

Differentiation rules: Derivatives of polynomials and exponential functions – The product and quotient Rules – Derivatives of trigonometric functions – The Chain rule – Implicit differentiation – Applications of differentiation: Maximum and Minimum Values – Techniques of integration: Integration by parts – Trigonometric integrals – Integration of rational functions by partial fractions.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial derivatives – Homogeneous functions – Euler's theorem – Total derivative – Jacobians – Taylor's theorem for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV 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 integrals.

UNIT V VECTOR CALCULUS 9+3

Scalar and vector point functions – Gradient – Divergence and curl – Line integral – Surface integral – Green's theorem in a plane – Volume integral – Divergence theorem – Irrotational and Solenoidal fields.

OUTCOMES

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

- Apply matrix algebra methods to solve practical problems.
- Apply the concepts of differential and integral calculus.
- Analyze the ideas of differential calculus for functions of several variables.
- Apply multiple integral ideas in solving areas and volumes.
- Solve the engineering problems using the concepts of vector calculus.

LIST OF EXPERIMENTS

1. Computation of Eigen values and Eigenvectors.
2. Matrix addition and multiplications.
3. Calculate differentiations of simple functions.
4. Calculate integrations of simple functions.
5. Determining Maxima and minima of functions for one variable.
6. Determining Maxima and minima of functions for two variables.
7. Evaluating double integral with constant limits.
8. Evaluating triple integral with constant limits.
9. Computing Gradient, divergence and curl of point functions
10. Evaluating line integral in vector calculus.

TOTAL: 45+15=60 PERIODS

TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, Fourty Third Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, New Delhi, Seventh Edition, 2015.

REFERENCES

1. Bali N.P, Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, Seventh Edition, 2009.
2. Kanti B. Dutta., "Mathematical Methods of Science and Engineering – Aided with MATLAB", Cengage Learning, New Delhi, First Edition, 2013.

E-RESOURCES

1. https://nptel.ac.in/courses/111105121 - (Differential Calculus and Integral Calculus)
2. https://nptel.ac.in/courses/111107112 - (Matrix analysis)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	-	-	-	-	-	-	-	2	-	-
2	3	3	2	-	-	-	-	-	-	-	2	-	-
3	3	3	2	-	-	-	-	-	-	-	2	-	-
4	3	3	2	-	-	-	-	-	-	-	2	-	-
5	3	3	2	-	-	-	-	-	-	-	2	-	-
AVG	3	3	2	-	-	-	-	-	-	-	2	-	-

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

Chairman - B...

23HST102	HERITAGE OF TAMILS	L T P C
	(Common to all Branches)	1 0 0 1

OBJECTIVES

- To familiarize the students on extensive literature of classical Tamil.
- To analyze rock art paintings to modern art.
- To acquire knowledge on folk and martial arts.
- To apply the concepts of Thinai in Tamils.
- To realize the contribution of Tamils in Indian freedom struggle.

UNIT- I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan

UNIT- II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils..

UNIT- III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu,Oyillattam,Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils

UNIT- IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils &Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas

UNIT- V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS

TEXT BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

REFERENCE BOOKS

1. Heritage of Tamils, Published by: Yes Dee Publishing Pvt Ltd, Chennai
2. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

OUTCOMES

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

- Analyze the extensive literature Tamil and classical nature.
- Understand the heritage of sculpture, painting and musical instruments.
- Classify the folk and martial arts of Tamil people.
- Examine Thinai concepts, trade and victory of Chozha dynasty.
- Interpret the contribution of Tamils in Indian freedom struggle, Self-esteem movement and siddha medicine.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	-	2	1	2	-	1	-	-
2	-	-	-	-	-	-	2	1	2	-	1	-	-
3	-	-	-	-	-	-	2	1	2	-	1	-	-
4	-	-	-	-	-	-	2	1	2	-	1	-	-
5	-	-	-	-	-	-	2	1	2	-	1	-	-
AVG	-	-	-	-	-	-	2	1	2	-	1	-	-

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

Chairman - BoS

23HST102	தமிழர்மரபு	L T P C
	(அனைத்து துறைகளுக்கும் பொதுவானது)	1 0 0 1

நோக்கங்கள்

மாணவர்கள் கண்டிப்பாக அறியவேண்டுவன

- செம்மொழியான தமிழ்மொழியின்விரிவானஇலக்கியத்தைப்பற்றிஅறிதல்.
- பாறை ஓவியங்கள் முதல் நவீனஓவியங்கள்வரை உள்ளகலைகளைபகுப்பாய்வுசெய்தல்.
- நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகளைப் புரிந்து கொள்ளுதல்.
- தமிழர்களின் திணைக்கோட்பாடுகளைச் செயல்படுத்துதல்.
- இந்தியவிடுதலைப்போராட்டத்திற்கும் பண்பாட்டிற்கும் தமிழர்களின் பங்களிப்பை உணருதல்.

அலகு I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள்– திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி– தமிழ் செவ்விலக்கியங்கள்– சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை–சங்க இலக்கியத்தில் பகிர்தல் அறம்–திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க்காப்பியங்கள், தமிழத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வாழ்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள்வரை – சிற்பக்கலை 3

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

அலகு III நாட்டுப்புற கலைகள் மற்றும் வீரவிளையாட்டுகள் 3

தெருக்குத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி ,புலியட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக்கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும் விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அருட்கோட்பாடு – சங்ககாலத்தில் தமிழ்கத்தில் எழுத்தறிவும் கல்வியும்–சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாற்றிக்குத் தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறபகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள் ,கையழுத்துப்படிகள் – தமிழ்ப்புத்தகங்களின் அச்சு வரலாறு.

TOTAL: 15 PERIODS

முடிவுகள்

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன:

- தமிழ்மொழியின் செம்மொழி தன்மையையும் சங்க இலக்கியத்தின் முக்கியத்துவத்தையும் உணர்வார்கள்.
- தமிழர்களின் சிற்ப, ஓவிய, இசை மரபுகளை புரிந்து கொள்வார்கள்.
- நாட்டுப்புறக் கலைகளையும் வீர விளையாட்டுகளையும் வகைப்படுத்துவார்கள்.
- தமிழர்களின் திணைக்கோட்பாடுகளும் சங்ககாலவர்த்தகமும்பு ரிந்துகொள்வார்கள்.
- இந்திய விடுதலைப் போராட்டம், சுயமரியாதை இயக்கம், சித்த மருத்துவம் ஆகியவற்றில் தமிழர்களின் பங்களிப்பை விளக்குவார்கள்.

உரை மற்றும் குறிப்புபுத்தகங்கள்

1. தமிழக வரலாறு –மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியிடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் –முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை–ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	-	2	1	2	-	1	-	-
2	-	-	-	-	-	-	2	1	2	-	1	-	-
3	-	-	-	-	-	-	2	1	2	-	1	-	-
4	-	-	-	-	-	-	2	1	2	-	1	-	-
5	-	-	-	-	-	-	2	1	2	-	1	-	-
AVG	-	-	-	-	-	-	2	1	2	-	1	-	-

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

Chairman - BoS

23PHT102	APPLIED PHYSICS FOR COMPUTER ENGINEERING	L T P C
	(Common to CSE, CSE-SC, IT, AI&DS and AI&ML)	3 0 0 3

OBJECTIVES

- To introduce the fundamental principles of lasers and their general scientific and engineering applications.
- To explain the fundamentals of quantum mechanics and Schrödinger's wave equation for understanding complex physical phenomena.
- To impart knowledge of the basic concepts of integrated circuits (ICs) and digital electronic components.
- To provide an understanding of the principles and operation of magnetic and optical storage devices.
- To familiarize students with the fundamentals of nanomaterials and their various synthesis methods.

UNIT I PHOTONICS 9

Spontaneous and Stimulated Emission- Population Inversion - Derivation of Einstein's A and B coefficients – Principle and working of Laser – He Ne Laser - Direct bandgap and Indirect Bandgap Semiconductors - Semiconductor Diode Laser (Homojunction & heterojunction) - Applications of Lasers in Science, Engineering and Medicine – Working principle of Laser printer.

UNIT II QUANTUM PHYSICS 9

Black Body Radiation – Planck's theory (derivation) – Electron Diffraction – Wave function and its Physical significance – Schrödinger's wave equation: Time Independent and Time Dependent Equations – Particle in a One-Dimensional Box - Scanning Electron Microscope - Transmission Electron Microscope - Quantum Tunneling – Scanning Tunneling Electron Microscope

UNIT III FUNDAMENTALS OF DIGITAL ELECTRONICS AND LOGIC DESIGN 9

INTEGRATED ELECTRONICS: Introduction of ICs - Steps in Fabrication of Monolithic IC's – General applications of IC's.

DIGITAL ELECTRONICS AND LOGIC DESIGN : Number System and Representation - Programs - Boolean Algebra and Logic Gates – Demorgan's Theorem - Gate Level Minimization - Combinational Logic Circuits - Flip-Flops and Sequential Circuits.

UNIT IV DATA STORAGE MATERIALS 9

PRIMARY STORAGE: Random Access Memory (RAM)– Static RAM – Dynamic RAM – Read only Memory (ROM) - **SECONDARY STORAGE** : Magnetic Disc Memories –Hard Disk Drive and Solid State Drive - **TERTIARY STORAGE** : Optical Data Storage Devices: Principle-Disc data storage-Structure and Operating Principle of CD-ROM – DVD - Blu-ray Disc - **OFF-LINE STORAGE** : Floppy Disk – Zip diskette – USB Flash drive – Memory card – **FUTURE STORAGE DEVICES (QUALITATIVE)** : Holographic data storage - DNA digital data storage - Helium Drives

UNIT V INTRODUCTION TO NANO SCIENCE & NANOELECTRONICS 9

NANO SCIENCE: Emergence of Nanoscience - Role of Particle Size - quantum structures: Quantum Well, Quantum Wire And Quantum Dot- Properties at Nano scale (optical, electronic and magnetic) - Synthesis of Nanomaterials : Physical Vapour Deposition (PVD) - Pulsed Laser Deposition (PLD).

NANO-ELECTRONICS: Single electron transistors, Spintronics - Nanotechnology in Computer Science.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental principles of lasers and their applications.
- Analyze the principles of quantum mechanics and Schrödinger's wave equation to identify complex physical phenomena.
- Apply the concept of digital electronics to design various logic gates.
- Analyze the working principles of different storage media and storage devices.
- Analyze the properties of nanomaterial's and various synthesis methods.

TEXT BOOKS

1. K.G.Aswani, "A Textbook of Material Science", S. Chand & Company ltd, (2001).
2. M.Arumugam," Semiconductor Physics and Optoelectronics", Anuradha Agencies, 2019.
3. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology"-, Academic Press, 2012.

REFERENCES

1. Avadhanulu M.N & Kshirsagar P.G "Textbook of Engineering Physics". S.Chand, 2006.
2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009
3. C.N.R. Rao, P.J. Thomas and G.U. Kulkarni, "Nanocrystals: Synthesis, Properties and Applications", Springer (2007).

E-RESOURSES

1. https://archive.nptel.ac.in/courses/122/107/122107035/
2. https://nptel.ac.in/courses/118102003

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	1	1	-	-	-	-	-	-	-	-	-
2	3	3	1	1	-	-	-	-	-	-	-	-	-
3	3	3	1	1	-	-	-	-	-	-	-	-	-
4	3	3	1	1	-	-	-	-	-	-	-	-	-
5	3	3	1	1	-	-	-	-	-	-	-	-	-
AVG	3	3	1	1	-	-	-	-	-	-	-	-	-

1- Low 2-Medium 3-High '--'–No Correlatio

Chairman - BoS

23CYT101 ENGINEERING CHEMISTRY L T P C
(Common to CSE, EEE, ECE, CSE (CS), MDE, AIDS, IT, PT& CSE(AIML)) 3 0 0 3

OBJECTIVES

- To introduce the characteristics of water and water treatment methods for industrial applications.
- To familiarize students with the types, properties, and applications of polymers and related materials.
- To employ the principles of phase rule, alloy formation, and heat treatment methods.
- To discuss the synthesis, characterization, and applications of nanomaterials.
- To apply electrochemical principles to understand corrosion mechanisms and corrosion control methods.

UNIT I WATER TECHNOLOGY 9

Introduction - Characteristics – Hardness – Estimation of hardness by EDTA method – Alkalinity and its estimation - Boiler feed water – Requirements –Boiler troubles (Scale and Sludge) – Internal conditioning (colloidal, phosphate, calgon and carbonate conditioning methods) – External conditioning – Zeolite process, Demineralization process – Desalination of brackish water by reverse osmosis-Nano filtration - Municipality water treatment - Break point chlorination.

UNIT II POLYMER CHEMISTRY 9

Introduction - Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting plastic. Functionality – Degree of polymerization. Types of polymerization: Addition Condensation and Copolymerization, Properties of polymers: Glass transition temperature, Tacticity- Molecular weight – Weight average, Number average and Poly dispersity index- Preparation, properties and uses of PVC, Nylon 6,6, Polyethylene - Rubbers – Types – Vulcanization of rubber – Plastics – Moulding constituents of plastics – Moulding of plastics - Compression, injection and blow moulding- Biodegradable polymers-Conducting polymers.

UNIT III PHASE RULE AND ALLOYS 9

Phase rule - Explanation of terms involved – One component system – Water system – Condensed phase rule – Construction of phase diagram by thermal analysis – Simple eutectic systems (Lead – Silver system only). Alloys: Introduction – Definition- Properties of alloys- Significance of alloying, functions and effect of alloying elements - Ferrous alloys – Nichrome and stainless steel – Heat treatment of steel, non-ferrous alloys – Brass and bronze.

UNIT IV CHEMISTRY OF NANO MATERIALS 9

Nano chemistry – Basics (Surface area to volume ratio - Quantum confinement – 0D, 1D, 2D& 3D) - Distinction between molecules, nanoparticles and bulk materials- Characterization of nanomaterials

using EDX and HR-TEM. Synthesis of nano materials: Top down approach - Ball milling - Bottom up approach - Sol-gel method, Chemical vapour deposition - Properties of nanomaterials and Applications of nanomaterials (Nano products of today).

UNIT V ELECTROCHEMISTRY, CORROSION AND ITS CONTROL 9

Introduction- Electrochemical cells, applications of electrochemical series-Reference Electrode-standard calomel electrode, ion selective electrode, glass electrode, Potentiometric titration - Redox titration, Conductometric titration- Strong acid vs Strong base. Corrosion – Types – Chemical Corrosion – Electrochemical Corrosion (galvanic and differential aeration) - Factors influencing corrosion – Material selection and design aspects-Control methods of corrosion –sacrificial anodic and impressed current cathodic protection.

OUTCOMES

- Explain the quality parameters of water and suitable methods for removing impurities for domestic and industrial applications.
- Compare various types of polymers based on their polymerization processes, properties, and engineering applications.
- Apply the principles of phase rule to explain alloy formation and its engineering applications.
- Employ the basic concepts of nano chemistry in engineering applications.
- Analyze the causes of corrosion and recommend suitable prevention and control methods

TOTAL:45 PERIODS

TEXT BOOKS

1. Jain P.C and Monika Jain, "Engineering Chemistry", seventeenth Edition, Dhanpet Rai Publishing Company (P) Ltd. New Delhi, 2015.
2. Viswanathan B, "Nanomaterials" Alpha Science International Ltd, 2009.
3. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, Second Edition, 2017.

REFERENCES

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/104105084
2. http://library.iitbbs.ac.in/open-access-e-resources.php

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	1	3	-	1	-	3	-	-	-	-	-	-
2	1	2	2	2	1	1	-	2	1	2	1	-	-
3	3	3	3	2	2	2	1	1	2	1	1	-	-
4	2	2	2	1	2	2	1	-	1	1	1	-	-
5	3	2	3	2	3	2	1	2	1	-	2	-	-
AVG	2.20	2	2.6	1.75	1.8	1.75	1.5	1.66	1.25	1.33	1.25	-	-

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

Chairman - BoS

23GEE101	PROGRAMMING IN C (Common to all B.E. & B.Tech Branches)	L T P C 3 0 2 4

OBJECTIVES

- To impart fundamental knowledge of C programming concepts, syntax, data types, operators, control structures, and program development.
- To develop students understanding of arrays, strings, searching, and sorting techniques for solving computational problems.
- To train students in designing modular programs using functions, recursion, pointers, and parameter passing mechanisms.
- To familiarize students with structures, unions, dynamic memory allocation, and their applications in software development.
- To enable students to perform file handling operations and develop efficient C programs using sequential and random file processing.
- To develop C programs to solve real-world programming problems.

UNIT I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms – Structure of C program – C programming: Data Types– variables–Storage classes – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions –Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements – Pre-processor directives – Compilation process.

Coding practices :

1. Develop a program to find the largest of three numbers using nested if statements.
2. Develop a program to generate multiplication tables using loops.

Problem - solving assignments :

1. Write a program to calculate the area and perimeter of a rectangle, circle, and triangle.
2. Write a program to calculate simple interest and compound interest.

UNIT II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode – Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) – String operations: length, compare, concatenate, copy –Sorting – Selection sort, Insertion sort, Merge sort, quick sort –Searching – linear and binary search.

Coding practices :

1. Develop a program to perform matrix addition and transpose using two-dimensional arrays.
2. Write a program to sort an array using Insertion Sort.

Problem - solving assignments :

1. Develop a program to perform matrix operations such as addition and transpose using two-dimensional arrays.
2. Write a program to search for an element in an array using Linear Search and Binary Search.

UNIT III FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function call, Built–in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions – Pointers – Pointer operators – Arrays and pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

Coding practices :

1. Develop a recursive program to generate the Fibonacci series.
2. Develop a program to implement a scientific calculator using built-in mathematical functions.

Problem - solving assignments :

1. Write a program to perform arithmetic operations using user-defined functions.
2. Write a program to swap two numbers using pass-by-value and pass-by-reference.

UNIT IV STRUCTURES AND UNION 9

Structure – Example Programs – Nested structures – Pointer in Structures – Array of structures Example Program using structures and pointers – Self referential structures – Dynamic memory allocation, Union- Storage classes.

Coding practices :

1. Develop a program to generate an employee salary slip using structures and pointers.
2. Develop a program using nested structures to represent student academic details.

Problem - solving assignments :

1. Write a program to store and display employee details using an array of structures.
2. Develop a program to demonstrate dynamic memory allocation using structures.

UNIT V FILE PROCESSING 9

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

Coding practices :

1. Write a program to create, write, and read a text file.
2. Develop a program to copy the contents of one file to another.

Problem - solving assignments :

1. Write a program to create, write, and read student records using sequential file processing.
2. Write a program to implement command-line arguments for performing arithmetic operations or

file processing.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Programs using I/O statements, expressions and decision–making constructs.
2. Write a program to find whether the given year is leap year or Not.
3. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
4. Check whether a given number is Armstrong number or not?
5. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
    a) 5 if it is a perfect cube.
    b) 4 if it is a multiple of 4 and divisible by 6.
    c) 3 if it is a prime number.
6. Populate an array with height of persons and find how many persons are above the average height.
7. From a given paragraph perform the following using built–in functions:(i)Find the total number of words.(ii) Capitalize the first word of each sentence.(iii)Replace a given word with another word.
8. Solve towers of Hanoi using recursion.
9. Locate and Display the Contents of an Array using Pointers.
10. Generate salary slip of employees using structures and pointers.
11. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 +15 = 60 PERIODS

OUTCOMES

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

- Explain the fundamental concepts of C programming and develop programs using data types, operators, expressions, and control structures.
- Develop C programs using arrays, strings, searching, and sorting techniques to solve computational problems.
- Construct modular C programs by applying functions, recursion, pointers, and parameter passing techniques.
- Develop applications using structures, unions, pointers, and dynamic memory allocation for efficient data organization and manipulation.
- Analyze file processing techniques using sequential and random access methods to perform data storage and retrieval operations.

- Develop reliable software solutions using C programming for real-world applications.

TEXT BOOKS

1. E.Balagurusamy,"Programming in ANSI C", Tata McGraw Hill, Eighth Edition, 2019.
2. Kernighan, B.W and Ritchie,D.M,"The C Programming Language", Second Edition, Pearson Education, 2006.

REFERENCES

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt.Ltd., First Edition, 2011.

E – RESOURCES

1. https://nptel.ac.in/courses/106/105/106105085/ (Introduction to C Programming)
2. https://nptel.ac.in/courses/106/106/106106210/ (File operations)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	–	3	–	–	–	–	–	2	3	2
2	3	3	2	1	3	–	–	–	–	–	2	3	3
3	3	3	3	2	3	–	–	–	–	–	2	3	3
4	3	3	3	2	3	–	–	–	1	–	2	3	3
5	2	3	2	2	3	–	–	–	1	–	2	3	2
6	3	3	3	2	3	–	1	1	2	1	2	3	3
AVG	2.8	2.8	2.5	1.8	3	-	1	1	1.3	1	2	3	2.7

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

Chairman - BoS

23PHL101 APPLIED PHYSICS FOR COMPUTER ENGINEERING LABORATORY L T P C

(Common to CSE, CSE-SC, IT AI&DS and AI&ML) **0 0 2 1**

OBJECTIVES

- To understand and apply the fundamental principles of lasers, quantum mechanics, nanomaterials, digital circuits, and storage devices

LIST OF EXPERIMENTS

(Any Eight experiments to be conducted)

1. Determination of wavelength of laser.
2. Determination of particle Size lycopodium powder using laser.
3. Fibre Optics: Determination of Numerical Aperture and Acceptance angle.
4. Determination of velocity of ultrasonic in liquid.
5. Verification of truth tables of logic gates using IC's: (OR, AND, NOT, XOR, NOR and NAND)
6. Verification of Universal NOR & NAND gates.
7. Determination of Young's modulus - Uniform bending.
8. Determination of bandgap of a given semiconductor diode.
9. Determination of Kinetic Energy - Photoelectric Effect.(Virtual).
10. Determination of frequency of an electrically driven tuning fork- Melde's string method (Virtual)

TOTAL: 15 PERIODS

OUTCOMES

Upon completion of this course, students will be able to;

- Demonstrate an understanding of the principles of lasers, quantum mechanics, nanomaterials, digital circuits, and storage devices.

TEXT BOOK

- Indu Prakash and Ramakrishna, "A Text Book of Practical Physics", Sultan Chand & Sons, (2006).

REFERENCE

- R.K. Shukla and Anchal Srivastava, "Practical Physics", New Age International Publishers, (2011).

Mapping of Cos-Pos & PSOs

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
1	3	3	1	1	-	-	-	-	-	-	-	-	-

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

Chairman - BoS

23CYL101 **ENGINEERING CHEMISTRY LABORATORY** L T P C

(Common to CSE, CSE (CS), AI&DS, AI&ML and IT) 0 0 2 1

OBJECTIVE

- To inculcate practical skills in the determination of water quality parameters and instrumental analysis.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of sodium and potassium present in water using flame photometer.
7. Conductometric Precipitation Titration using $BaCl_2$ and Na_2SO_4.
8. Conductometric titration of strong acid vs strong base.
9. Estimation of Ferrous ions by Potentiometric Titration.
10. Estimation of copper content in the brass by Iodometry.

OUTCOME

Upon completion of the course, Students will be able to

- Determine the water quality parameters and perform quantitative chemical analysis bypH metery, flame photometry, conductometry and potentiometry.

TOTAL: 15 PERIODS

TEXT BOOKS

1. J. Mendham, R. C. Denney, J. D. Barnes, and M. J. K. Thomas, *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed. Pearson Education, 2015.

REFERENCES

1. B. K. Sharma, Instrumental Methods of Chemical Analysis, Goel Publishing House, 2005.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1	1	2	1	1	2	-	-	-	-

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

Chairman - BoS

23EEC101 **SOFTSKILLS & LIFE SKILLS** L T P C
(Common to all First year / First Semester B.E., B.Tech., Branches) 1 0 0 1

OBJECTIVES

- To understand the Universal Human Values
- To have an overview on Life skills required in their profession
- To manage the behavior with emotional intelligent skills
- To learn professional Skills required for 21st century
- To formulate and implement effective leadership strategies.

UNITI UNIVERSAL HUMAN VALUES 3

Understanding harmony in the human being - understanding harmony in the family and society - understanding harmony in the nature and existence - understanding of harmony on professional ethics

UNIT II LIFE SKILLS 3

Soft Skills – Positive Attitude - Empathy - Effective Communication - Decision-Making Skills - Communication Skills - Problem Solving - Critical Thinking- Analytical thinking

UNIT III EMOTIONAL SKILLS 3

Self-Awareness - Interpersonal Relationship - Stress – Stress management - Focus and Self Control - Positive Thinking – Anger management

UNIT IV PROFESSIONAL SKILLS 3

21st century skills – Hard Skills - General computer skills - Spreadsheet proficiency - Career Skills - developing a long- term career plan – Team Work -- Time management

UNIT V LEADERSHIP SKILLS 3

Leadership, Levels of Leadership, Making of a leader, Types of leadership, describing a leadership style.

TOTAL: 15 PERIODS

OUTCOMES

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

- Treat and respect the human beings with harmony,
- Develop the capabilities needed to utilize their potential wherever required.
- Control their emotional feelings and manage the stress.
- Explore the career & professional skills.
- Become highly confident as a leader and find new ways of influencing the teams they lead.

TEXT BOOKS

1. Life Skills for Er.gineers, McGraw Hill Education (India) Private Ltd., 2016
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Sydänmaanlakka Pentti. "Intelligent leadership and leadership competencies". Dissertation Series.

REFERENCES

1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxford Publishers.
2. Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd.

E-RESOURSES

1. https://uhv.org.in/
2. https://nptel.ac.in

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	1	1	0	0	0	2	2	3	2	1	0	-	-
2	1	3	1	1	0	1	0	2	3	3	1	-	-
3	0	1	0	0	0	1	0	3	3	3	1	-	-
4	2	2	1	1	3	1	0	2	3	3	3	-	-
5	1	1	1	0	0	2	0	3	3	3	3	-	-
AVG	1	1.6	0.6	0.4	0.6	1.4	0.4	2.6	2.8	2.6	1.6	-	-

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

Chairman - BoS

23MDC101 INDUCTION PROGRAMME (2 Weeks)

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character."

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

Physical Activity

This would involve a daily routine of physical activity with games and sports etc.

Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, make decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students

exposure to people who are socially active or in public life.

Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References: Guide to Induction program from AICTE

Chairman - BoS

SEMESTER II

23MAT203	MATHEMATICAL FOUNDATIONS OF COMPUTING	L T P C
	[Common to CSE, CSE (CS), CSE (AI&ML), IT, and AI&DS]	3 1 0 4

OBJECTIVES

- To explore techniques for solving ordinary differential equations and recurrence relations.
- To compose the purpose of using Laplace transforms to create a new domain in which problems can be handled more easily.
- To develop the concepts of solving algebraic, transcendental and system of linear equations.
- To introduce the numerical techniques of interpolation and integration.
- To provide the knowledge of congruences and classical theorems in number theory.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS AND RECURRENCE RELATIONS 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Legendre's linear equations – Simultaneous linear equations with constant coefficients – Recurrence relations: Solving linear homogeneous recurrence relations with constant coefficients.

UNIT II LAPLACE TRANSFORMS 9+3

Definition – Conditions for existence – Transforms of elementary functions – Properties of Laplace transforms – Transform of Periodic functions – Transforms of derivatives and integrals – Multiplication by t^n and division by 't' – Evaluation of integrals by Laplace transforms – Inverse transforms – Convolution theorem – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations by Newton Raphson method – Solution of simultaneous algebraic equations by Gauss elimination, Gauss Jordan and Gauss Seidel methods – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.

UNIT IV INTERPOLATION AND NUMERICAL INTEGRATION 9+3

Interpolation with equal intervals: Newton's forward interpolation formula – Newton's backward interpolation formula – Interpolation with unequal intervals: Lagrange's interpolation formula – Divided differences – Newton's divided difference formula – Numerical integration: Trapezoidal rule – Simpson's one-third rule – Numerical double integration by Trapezoidal rule.

UNIT V CONGRUENCES AND CLASSICAL THEOREMS 9+3

Congruences – Linear Congruences – The Chinese Remainder Theorem – 2 x 2 Linear Systems – Wilson's Theorem – Fermat's Little Theorem – Euler's Theorem.

OUTCOMES

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

- Apply appropriate techniques to solve ordinary differential equations and recurrence relations.

- Solve engineering problems using the concept of Laplace transforms.
- Compute the numerical solution of algebraic, transcendental and system of linear equations.
- Apply the numerical techniques of interpolation and integration.
- Analyze the concepts of congruences and classical theorems in number theory.

LIST OF EXPERIMENTS

1. Solving ordinary differential equations.
2. Compute homogeneous recurrence relations.
3. Calculate Laplace Transform of simple functions.
4. Calculate Inverse Laplace transform of a given function.
5. Solution of simultaneous algebraic equations by Gauss Seidel method.
6. Find the Eigen values of a matrix by Power method.
7. Illustrate Lagrange's interpolation formula.
8. Evaluation of line integral by Simpson's one-third rule.
9. Determine congruence relations.
10. Solving problems in Chinese Remainder Theorem.

TOTAL: 45+15 PERIODS

TEXT BOOKS

1. Grewal B.S.,"Higher Engineering Mathematics", Khanna Publishers, Forty fourth Edition, 2022.
2. Grewal,B.S., "Numerical Methods in Engineering and Science", Khanna Publishers, Eleventh Edition, 2023.

REFERENCES

1. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, Tenth Edition, 2016.
2. Thomas Koshy, "Elementary Number Theory with Applications", Elsevier Publishers, Second Edition, 2007.

E-RESOURCES

1. https://archive.nptel.ac.in/courses/111/102/111102129/ (Transforms)
2. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods)
3. http://nitttrc.edu.in/nptel/courses/video/106108227/L58.html (Congruences)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	1	1	-	-	-	-	1	-	1
2	3	3	2	2	1	1	-	-	-	-	1	-	1
3	3	3	2	2	1	1	-	-	-	-	1	-	1
4	3	3	2	2	1	1	-	-	-	-	1	-	1
5	3	3	2	2	1	1	-	-	-	-	1	-	1
AVG	3	3	2	2	1	1	-	-	-	-	1	-	1

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

Chairman - BoS

23PHT202 ADVANCED PHYSICS FOR COMPUTER ENGINEERING L T P C
(Common to CSE, CSE-SC, IT and AI&DS) 3 0 0 3

OBJECTIVES

- To provide knowledge on semiconductor physics and technologies used in Computer Engineering.
- To explain the working principles of magnetic devices and sensors applied in computer systems.
- To impart understanding of optical phenomena in display device fabrication and nanoelectronic devices.
- To teach the fundamentals of fiber optics and data transmission systems.
- To introduce emerging technologies in Computer Engineering.

UNIT I SEMICONDUCTORS & TECHNOLOGIES 9

Elemental and Compound Semiconductors – Intrinsic Semiconductor & Extrinsic Semiconductor – Intrinsic Carrier Concentration Derivation– Semiconductor Devices for Computer (Diodes and Transistors) - MOSFET- basic operation and fabrication - Latest developments in semiconductor technology – system on chip.

UNIT II MAGNETIC DEVICES & SENSORS 9

Ferromagnetism and their Properties - Domain Theory of Ferromagnetism – Hard and Soft magnetic Materials - Magnetic Storage Devices.- Modern Hard Disk Drive technologies. SENSORS – Classification of Sensors – Types of Sensors - Sensors in Internet of Things (IOT) – Image sensors (CCD & CMOS)

UNIT III DISPLAY DEVICES & NANOELECTRONIC DEVICES 9

Introduction - Electroluminescence Process - Liquid Crystal Display - TFT-LCD – LED Display - - Touch screen Display - Organic LED display – Micro LED display - Quantum Dots Display .

Nanoelectronic Devices : Nanoscale MOSFETs - Nano and Micro Opto -Electro-Mechanical Systems (NOEMS/MOEMS).

UNIT IV FIBER OPTICS & DATA TRANSMISSION SYSTEMS 9

Principle and Propagation of Light in an Optical Fibers - Fiber Optics: Principle, Acceptance Angle - Numerical Aperture,— types of Optical Fibers (Material, Refractive Index, Mode) – Fiber Optic Communication Systems – Bluetooth - Wi-Fi – Li-Fi – Infrared Data Transfer – Satellite data transmission and reception.

UNIT V EMERGING TECHNOLOGIES 9

Quantum Computing - 3D Printing - 5G & 6G Cellular Communications - Explainable Artificial Intelligence(AI) - Biometrics - Cloud Computing - Quantum Cryptography - Robotic Process Automation - Wearable Computing Virtual Reality(VR) – Augmented Reality (AR) – Mixed Reality (MR)..

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the principles of semiconductors and their applications in computer engineering technologies.
- Describe the working of magnetic devices and sensors used in computer systems.
- Explain optical phenomena in display devices and the basics of nanoelectronic devices.
- Describe the fundamentals of fiber optic communication and data transmission systems.
- Identify and explain emerging technologies in Computer Engineering.

TEXT BOOKS

1. Rajendran V. "Engineering Physics". Tata McGraw Hill Publications, 2015.
2. S. M. Sze, M. K. Lee , :Semiconductor Physics and Devices" Wiley , 2021.
3. Brajesh Kumar Kaushik, "Nanoelectronics: Devices, Circuits and Systems (Micro and Nano Technologies)" , Elsevier, 2018.

REFERENCES

1. Simon M. Sze, Kwok K. Ng , "Physics of Semiconductor Devices", Wiley-Interscience, 2016.
2. Takao Kuroda , "Essential Principles of Image Sensors", CRC Press, 2021.
3. B.P. Pal , "Fundamentals of Fibre Optics in Telecommunication and Sensor Systems" New Age International Private Limited, 2023.

E – RESOURCES

1. https://novapublishers.com/shop/internet-of-everything-smart-sensing-technologies/
2. https://www.ukri.org/news/revealed-the-50-new-technologies-that-could-shape-the-future/

Mapping of COS- POS & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	-	-	-	-	-	-	-	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	-
3	3	2	1	1	-	-	-	-	-	-	-	-	-
4	3	2	1	1	-	-	-	-	-	-	-	-	-
5	3	2	1	1	-	-	-	-	-	-	-	-	-
AVG	3	2	1	1	-	-	-	-	-	-	-	-	-

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

Chairman - BoS

23CYT201 ENVIRONMENTAL SCIENCE AND SUSTAINABILITY L T P C
(Common to All B.E /B.Tech Branches) 3 0 0 3

OBJECTIVES

- To familiarize students with the concepts of environment, ecosystems, biodiversity, and their conservation.
- To create awareness about environmental pollution, individual responsibilities in pollution prevention, and basic disaster management.
- To impart knowledge about major social and environmental issues, environmental protection laws, and green chemistry principles.
- To analyze population-related issues, human health, social welfare, and the role of information technology in environmental and human health.
- To develop an understanding of sustainability concepts, climate change issues, and sustainable management practices for addressing environmental challenges

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – Need for public awareness - Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (d) aquatic ecosystems (oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity –Value of biodiversity – Threats to biodiversity – Endangered and endemic species of India – Conservation of biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

Activity: Biodiversity in and around the campus and report submission.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution – Solid waste management: causes, effects and control measures of municipal solid wastes - E-waste – Role of an individual in prevention of pollution - Pollution case studies – Disaster management: floods, earthquake and cyclone.

Activity: Local pollution case study and report submission.

UNIT III SOCIAL ISSUES AND THE ENVIRONMENT 9

Water conservation, rain water harvesting, watershed management – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Green Chemistry and principles - Environment production act – Air (Prevention and Control of Pollution) act –Water (Prevention and control of Pollution) act

Activity: Creating environmental awareness.

UNIT IV HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.

Activity: Visit to local primary health center.

UNIT V SUSTAINABLE MANAGEMENT 9

Sustainability-Concept, needs and challenges-economic, social and aspects of sustainability-From unsustainability to sustainability- -Sustainable Development Goals-Targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-Case studies. Zero waste, Material Life cycle assessment, Sustainable habitat: Energy efficiency, Sustainable transports.

Activity: Field trips to local organizations or facilities with sustainable practices in place.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the basics of environment, ecosystems, biodiversity, and conservation.
- Identify major sources of pollution and understand individual responsibilities in pollution prevention and disaster management.
- Describe key social and environmental issues, environmental laws, and green chemistry principles.
- Analyze population growth, human health, social welfare, and the role of IT in environmental and health management.
- Apply sustainability concepts, climate change mitigation, and sustainable management practices to environmental challenges.

TEXT BOOKS

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, 2019.
2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", Eighth Edition, Pearson Education, 2021.
3. Allen, D. T. and Shonnard, D. R., "Sustainability Engineering: Concepts, Design and Case Studies", Third Edition, Prentice Hall, 2018.

REFERENCES

1. Erach Bharucha, "Textbook of Environmental Studies", Universities Press (I) Pvt Ltd, 2016.
2. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, 2018.
3. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/122102006/
2. https://swayam.gov.in/nd1_noc19_ge22/preview

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	3	-	-	3	3	-	-	2	1	-	-
2	2	2	3	2	3	3	3	-	-	3	3	-	-
3	2	1	3	2	2	3	3	-	2	3	3	-	-
4	2	1	3	2	3	3	3	2	3	2	2	-	-
5	2	1	3	2	3	3	3	2	3	2	2	-	-
AVG	2	1.4	3	1.6	2.2	3	3	0.8	1.6	2.4	2.2	-	-

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

Chairman - BoS

23HST202 TAMIL AND TECHNOLOGY L T P C
1 0 0 1

OBJECTIVES

- To gain knowledge about weaving and ceramic Technology
- To create a design and construction Technology
- To analyze manufacturing Technology
- To apply agriculture and irrigation Technology
- To remember scientific and scientific Tamil and Tamil computing

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtu l Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS

OUTCOMES

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

- Understand weaving under ceramic Technology.
- Develop new design and construction Technology.
- Identify the manufacturing Technology.
- Understand agriculture and irrigation.
- Knowledge of scientific Tamil and Tamil computing.

TEXT-CUM-REFERENCE BOOKS

1. தமிழகவரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருநை -ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	-	2	1	-	-	1	-	-
2	-	-	-	-	-	-	2	1	-	-	1	-	-
3	-	-	-	-	-	-	2	1	-	-	1	-	-
4	-	-	-	-	-	-	2	1	-	-	1	-	-
5	-	-	-	-	-	-	2	1	-	-	1	-	-
AVG	-	-	-	-	-	-	2	1	-	-	1	-	-

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

Chairman - BoS

23HST202	தமிழரும் தொழில்நுட்பமும்	L T P C 1 0 0 1

நோக்கம்

மாணவர்கள் கண்டிப்பாக அறியவேண்டுவன:

- நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் பற்றிய அறிவைப் பெறுதல்.
- வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பத்தை உருவாக்குதல்.
- உற்பத்தி தொழில்நுட்பத்தைப் பகுப்பாய்வு செய்தல்.
- விவசாயம் மற்றும் நீர்ப்பாசனத் தொழில்நுட்பத்தைப் பயன்படுத்துதல்.
- அறிவியல்மற்றும்அறிவியல்தமிழ்மற்றும்தமிழ்கணிப்பொறிதொடர்பானஅறி வைநினைவில்கொள்ளுதல்.

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்: 3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத்தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு- சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக்கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல் மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள்–பிரிட்டிஷ்காலத்தில் சென்னையில் இந்தோ – சரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தித் தொழில்நுட்பம்: 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சலை –இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள்,கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்குமணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் –சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்: 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்து பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3

அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின்நூலகம் – இணையத்தில் தமிழ்அகராதிகள்– சொற்குவைத் திட்டம்

TOTAL: 15 PERIODS

முடிவுகள்

பாடத்தின் முடிவில், மாணவர்கள் அறிந்துகொள்வன

- பீங்கான் மற்றும் நெசவு தொழில்நுட்பத்தைப் புரிந்து கொள்ளுதல்.
- புதிய வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பத்தைஉருவாக்குதல்.
- உற்பத்தித் தொழில்நுட்பத்தை அடையாளம் காணுதல்.
- விவசாயம் மற்றும் நீர்ப்பாசனத்தைப் புரிந்து கொள்ளுதல்.
- அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறி தொடர்பான அறிவை பெறுதல்.

உரை மற்றும் குறிப்பு புத்தகங்கள்

1. தமிழகவரலாறு - மக்களும்பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு:தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).

2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).

3. கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)

4. பொருநை -ஆற்றங்கரைநாகரீகம். (தொல்லியல்துறைவெளியீடு).

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)

10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	-	2	1	-	-	1	-	-
2	-	-	-	-	-	-	2	1	-	-	1	-	-
3	-	-	-	-	-	-	2	1	-	-	1	-	-
4	-	-	-	-	-	-	2	1	-	-	1	-	-
5	-	-	-	-	-	-	2	1	-	-	1	-	-
AVG	-	-	-	-	-	-	2	1	-	-	1	-	-

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

Chairman - BoS

23HSE201	ENGLISH FOR ENGINEERS:THEORY AND PRACTICE (Common to all B.E. & B.Tech. Branches)	L T P C 3 0 2 4

OBJECTIVES

- To strengthen grammatical accuracy for effective communication.
- To develop listening and reading comprehension skills.
- To improve writing proficiency for academic and formal purposes.
- To train in business and professional correspondence.
- To enhance speaking abilities for social and professional contexts.
- To provide practical exposure through interactive language activities.

UNIT I GRAMMAR 9

Articles - Prepositions - Conditionals - Subject verb agreement - Error Spotting - Active and Passive voice.

UNIT II LISTENING & READING 9

Syllabification – Improving Vocabulary - Reading Newspapers - Listening to Youtube Documentaries - Listening to Podcast - Listening to Motivational Movies.

UNIT III WRITING 9

Checklist - Recommendations - Formal letters – inviting guests – acceptance/declining letters

UNIT IV BUSINESS WRITING 9

E-mail writing - fixing an appointment, cancelling appointment, paper submission for seminars and conferences - Job Application Letter and Résumé.

UNIT V SPEAKING 9

Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging - Suggesting - Comparing and Contrasting - Situational Role-play.

TOTAL: 45 PERIODS

LIST OF EXERCISES

1. Stage Dynamics (Body Language and Paralanguage - Presentation)
2. Day today real time speaking exposures – Story narration, simple, general topics and incidents.
3. Group Discussion
4. Power Point Presentation (Corporate Skills & Public Speaking)
5. Loud Reading
6. Picture Description
7. Interview Skills (Mock Interview & Interview Etiquette)
8. Case Study Report

TOTAL: 15 PERIODS

OUTCOMES

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

- Use correct grammar in speech and writing.
- Understand and interpret information from various audio and reading sources.
- Write clear, structured, and formal documents.
- Prepare professional emails, résumés, and job-related letters.
- Communicate effectively in group discussions and presentations.
- Apply communication skills confidently in real-time situations.

TEXT BOOKS

1. S. Sumant, Maven Learning Private Limited, "Technical English II"
2. Joshi, Manmohan, Soft Skills, First Edition. Bookboon, 2017.

REFERENCES

1. Dr K Elango, Dr. Veena Selvam, Dr. Sujatha Priyadarshini, "Resonance English for Engineers and Technologists", Cambridge University Press, First Edition, 2013.
2. Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.

E-RESOURCES

1. https://www.fluentu.com/Blog/english/english-small-talk
2. https://www.britishcouncil.com

EXTENSIVE READING

1. Stephen R. Covey, " The 7 Habits of Highly Effective People", Simon & Schuster, 2019.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	2	-	-	3	3	3	-	-
2	-	-	-	-	-	2	-	1	3	3	3	-	-
3	-	-	-	-	-	2	-	1	3	3	3	-	-
4	-	-	-	-	-	1	-	1	3	3	3	-	-
5	-	-	-	-	-	2	-	1	3	3	3	-	-
6	-	-	-	-	-	-	-	3	3	-	-	-	-
AVG	-	-	-	-	-	1.50	-	1.16	3.00	3.00	3.00	-	-

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

Chairman - BoS

23CST201 PC HARDWARE SERVICES AND NETWORKING L T P C
(Lab Embedded Theory Course) 3 0 2 4

OBJECTIVES

- To impart the students with fundamental components of a motherboard, memory devices and their functionalities.
- To enable students to understand operation of IO devices, interfaces and common troubleshooting techniques.
- To train the students in the BIOS setup functions, Power management, and necessary precautions of PC maintenance.
- To foster the students in troubleshooting techniques for diagnosing, and resolving hardware-related issues.
- To familiarize students with the fundamentals of data communication, computer networking concepts.

UNIT I MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES 9

Introduction: Hardware, Software and Firmware. Mother board, IO and memory expansion slots, SMPS-Processors: Architecture and block diagram of multicore Processor, Features of new processor-chipsets (Concepts only). Bus Standards: Overview and features of PCI, AGP, PCMCIA Primary Memory-Secondary Storage-Removable Storage.

Problem - Solving Assignments:

1. Identify the motherboard type.
2. Explain how you will verify chipset compatibility.

UNIT II I/O DEVICES AND INTERFACE 9

Keyboard: Signals –mechanical keyboards–troubleshooting - wireless Keyboard. Mouse: types, connectors, operation of Optical mouse and Troubleshooting. Printers: Types of printers- Dot Matrix, Inkjet Laser, MFP (Multi Function Printer) and Thermal printer-I/O Ports: Serial, Parallel, USB, Game Port and HDMI. Displays: Principles of LED, LCD and TFT Displays-Modem: Working principle. Power Supply: Servo Stabilizers, online and offline UPS - working principles.

Problem - Solving Assignments:

1. Keyboard Not Working Issue ,USB keyboard is not detected.List troubleshooting steps.
2. A system consumes 400W power.Suggest suitable UPS capacity.

UNIT III MAINTENANCE OF DESKTOP 9

Bios-setup: Standard CMOS setup, Advanced BIOS setup, Power management, advanced chipset features, PC Bios communication– upgrading BIOS, Flash BIOS -setup. POST: Definition – IPL hardware – POST Test sequence – beepcodes. Diagnostic Software and Viruses: Computer Viruses – Precautions –Anti-virus Software – identifying the signature of viruses – Firewalls and latest

diagnostic software's.

Problem - Solving Assignments:

1. A system shows unwanted pop-ups and slow performance.Suggest antivirus and firewal solutions.
2. A new processor is not detected.Explain BIOS update process.

UNIT IV TROUBLESHOOTING OF DESKTOP AND LAPTOPS 9

Laptop: Types of laptop –block diagram – working principles–configuring laptops and power settings -SMD components, ESD and precautions. Laptop components: Adapter – types, Battery – types, Laptop Mother Board - block diagram, Laptop Keyboard and Touchpad. Installation and Troubleshooting: Formatting, Partitioning and Installation of OS – Trouble Shooting Laptop Hardware problems - Preventive maintenance techniques for laptops.

Problem - Solving Assignments:

1. During Windows installation, hard disk not detected, Identify reasons.
2. Laptop Not ChargingCheck adapter, battery, charging port.

UNIT V COMPUTER NETWORK DEVICES 9

Data Communication: Components of a data communication. Data flow: simplex – half duplex – full duplex; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology. Networks: Definition -Types of Networks: LAN – MAN – WAN –CAN – HAN – Internet – Intranet –Extranet, Client-Server, Peer To Peer Networks. Network devices: Features and concepts of Switches –Routers(Wired and Wireless) – Gateways.

Problem - Solving Assignments:

1. Two systems cannot communicate.Check IP configuration.
2. Compare Star and Mesh topology for a bank network.

OUTCOMES

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

- Explain the functionalities of computer hardware components, motherboard, memory devices
- Demonstrate operation, configuration, and troubleshooting of input/output devices.
- Analyze BIOS setup functions and virus prevention techniques for system maintenance.
- Analyze hardware and software issues in desktop and laptop and use troubleshooting techniques to solve the issues.
- Explain the principles of data communication, network topologies, and networking devices.

TEXT BOOKS

1. David A. Patterson and John L. Hennessy ,"Computer Organization and Design", Fifth Edition, 2013.
2. Mike Meyers, "CompTIA A+ Certification All-in-One Exam Guide", Tenth Edition, 2019.

REFERENCES

1. Tanenbaum, A. S., & Van Steen, M. "Computer Networks", Pearson, Second Edition,2014.
2. Patterson, D. A., & Hennessy, J. L. (2017). "Computer Organization and Design: The Hardware/Software Interface". Morgan Kaufmann,2017

E – RESOURCES

1. https://www.netacad.com/
2. https://www.edx.org/learn/operating-systems/ibm-hardware-and-operating-systems

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	2	1	–	–	1	–	2	3	2
2	3	3	2	2	3	1	1	1	1	–	2	3	3
3	3	3	2	2	3	2	2	1	1	–	2	3	3
4	3	3	3	2	3	2	1	2	1	1	3	3	3
5	3	2	2	1	3	2	1	1	1	–	2	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.6	2.0	1.6	2.8	1.6	1.3	1.3	1.0	1.0	2.2	3.0	2.8

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

Chairman - BoS

23EEE202 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
(Common to AIDS, CSE, CSE-CS, IT, Robotics, PT) 3 0 2 4

OBJECTIVES

- To enhance the basic concepts of DC and AC electrical circuits and fundamental circuit laws.
- To impart knowledge on the construction, working principles, and applications of basic electrical machines.
- To instruct the operation and characteristics of basic semiconductor devices.
- To familiarize the fundamentals of number systems and basic digital logic circuits in digital world.
- To instruct the principles of electrical measuring instruments and power measurement.
- To provide knowledge on basic electrical and electronic concepts through simple hands-on experiments.

UNIT I ELECTRICAL CIRCUITS 9

DC circuits: Circuit components: Conductor, Resistor, Inductor, Capacitor - Ohm's Law - Kirchhoff's Laws - Independent and Dependent sources - Nodal analysis, Mesh analysis with Independent sources only (Steady state) – Thevenin's theorem – Maximum Power Transfer theorem.
Introduction to AC circuits and parameters: Waveforms, Average value, RMS value, Instantaneous power, real power, reactive power and apparent power, power factor - Steady state analysis of RL, RC & RLC circuits.

UNIT II ELECTRICAL MACHINES 9

DC Generators: Construction and working principle, EMF equation, Types and applications – DC Motors: Working principle, Types and applications - Construction, Working principle and applications: Single phase transformer, Three phase alternator and Three phase induction motor – BLDC Stepper Motor – PMSM.

UNIT III ANALOG ELECTRONICS 9

PN junction diodes and its applications - Zener diode: structure, operation, Zener diode as regulator – Biasing of BJT - JFET, SCR, MOSFET, IGBT - Types, VI characteristics.

UNIT IV DIGITAL ELECTRONICS 9

Review of number systems, binary codes, Combinational logic - Representation of logic functions - SOP and POS forms, K-map representations - Minimization using K maps - Half adder, Full adder – Multiplexer, Demultiplexer.

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

Operating principle and Types of Moving coil and Moving iron meters - Measurement of power and Energy meter - Data acquisition.

LIST OF EXPERIMENTS

1. Verification of KVL & KCL.
2. Load test on DC shunt motor.
3. Characteristics of PN and zener diodes
4. Characteristics of BJT.
5. Half wave and full wave rectifiers
6. Verifications of Half adder and Full adder.
7. Measurement of power and Energy meter.

TOTAL : 45+15=60 PERIODS

OUTCOMES

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

- Apply the basic electrical laws and theorems to analyze simple DC and AC circuits.
- Explain the working principles and applications of DC machines, transformers and motors.
- Analyze the characteristics and applications of diodes and semiconductor devices.
- Apply the digital logic concepts to design and analyze simple combinational circuits.
- Examine the operation of electrical instruments and basic data acquisition systems.
- Analyze the basic electrical and electronics concepts by performing simple hands-on laboratory experiments and interpreting the results

TEXT BOOKS

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education, Second Edition, 2020.
2. S. K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.

REFERENCES

1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", McGraw Hill Education,Fourth Edition,2019.
2. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2021.

E-RESOURCES

1. https://nptel.ac.in/courses/108108076 - (Basics of Electrical Technology).
2. https://www.digimat.in/nptel/courses/video/108105112/L01.html - (Fundamentals of Electrical Engineering).

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	-	1	-	-	-	3	-	-
2	3	3	3	3	3	-	1	-	-	-	3	-	-
3	3	3	3	3	3	-	1	-	-	-	3	-	-
4	3	3	3	3	3	-	1	-	-	-	3	-	-
5	3	3	3	3	3	-	1	-	-	-	3	-	-
6	3	3	3	3	3	-	1	3	3	-	3	-	-
AVG	3	3	3	3	3	-	1	3	3	-	3	-	-

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

Chairman - BoS

23CSL201 REVERSE ENGINEERING LABORATORY L T P C
0 0 4 2

OBJECTIVES

To provide practical exposure in computer hardware components, motherboard analysis, peripheral troubleshooting, network configuration, and operating system installation for effective computer maintenance.

LIST OF EXPERIMENTS

1. Identify the different components of a computer.
2. Assemble and reassemble the different components of a computer like CPU, RAM, GPU, Motherboard, Storage Devices, etc.
3. Analyze the peripheral devices such as SATA, USB, PCIe and observe the bus signals and transactions when troubleshooting.
4. Identify the mechanical vs. electronic failures in storage devices.
5. Study about the mother board layout and identify the components in it. Trace the signal paths between CPU, RAM, and storage.
6. Demonstrate the signed and unsigned boot in a system to understand secure boot flow, trust anchors, and how UEFI Secure Boot prevents unauthorized images.
7. Study about the Ethernet cable types. Using a cable tester crimp the RJ-45plugs and RJ-45 pinouts.
8. Configure static IPs, subnet mask, gateway, understand subnet calculation and host ranges.
9. Configure default gateway and basic static routes to connect separate subnets.
10. Install various operating systems (Windows, Linux, etc.) on your system and learn about partitioning, formatting and installing.

OUTCOMES

- Implement troubleshooting techniques, and configure computer hardware, networking components, boot processes, and operating systems to perform effective system maintenance and reverse engineering tasks.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	2	3	1	1	2	2	1	2	3	3

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

Chairman - BoS

23EEC201

INDIAN LANGUAGE (EXCEPT MOTHER TONGUE) / FOREIGN LANGUAGE

(Common to all B.E. & B.Tech. Branches)

L T P C
0 0 4 2

OBJECTIVES

- To learn the Hindi alphabet, pronunciation, and basic writing.
- To understand and use basic Hindi grammar correctly.
- To develop basic reading, writing, listening, and speaking skills in Hindi.
- To use Hindi for simple everyday communication.
- To prepare learners to successfully clear the Hindi Examination.

UNIT I वर्णमालाएवंमूलभूतव्याकरण (ALPHABET AND BASIC GRAMMAR) 5

Hindi Vowels (स्वर)- Hindi Consonants (व्यंजन) -Matras (मात्राएँ)- Barakhadi (बारहखड़ी)-Word Formation (शब्दनिर्माण)- Gender (लिंग)- Number (वचन)- Basic Sentence -Formation (सरलवाक्यरचना)

UNIT II शब्दभंडारएवंव्याकरण (VOCABULARY AND GRAMMAR) 7

Nouns (संज्ञा)- Pronouns (सर्वनाम) -Adjectives (विशेषण) -Verbs (क्रिया) -Tenses (काल– Present, Past, Future) - Opposite Words (विलोमशब्द) -Synonyms (पर्यायवाची) -One-word Substitutions (अनेकशब्दोंकेलिएएकशब्द)

UNIT III पठनएवंलेखनकौशल (READING AND WRITING SKILLS) 7

Reading Simple Hindi Passages -Comprehension (गद्यांश) -Paragraph Writing (अनुच्छेदलेखन)- Letter Writing (पत्रलेखन)- Dialogue Writing (संवादलेखन) -Picture Description (चित्रवर्णन) -Dictation Practice (श्रुतिलेख)

UNIT IV दैनिकजीवनमेंहिंदी (HINDI FOR EVERYDAY COMMUNICATION) 7

Greetings and Introductions -Family Members (परिवार)- Days, Months, Seasons -Numbers (१–१००) - Time and Date - Colours, Fruits, Vegetables - Shopping Conversations - School and Classroom Vocabulary -Common Everyday Conversations

UNIT V साहित्यएवंपुनरावृत्ति (LITERATURE AND REVISION) 4

Simple Poems (कविताएँ)- Short Stories (लघुकथाएँ)- Proverbs and Idioms (मुहावरेएवंलोकोक्तियाँ– basic) - Moral Stories - Translation (English/Tamil to Hindi – Simple Sentences) - Revision of Grammar - Model Question Papers and Practice Tests

TOTAL: 30 PERIODS

OUTCOMES

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

1. Write basic Hindi words and sentences.
2. Apply fundamental Hindi grammar in simple communication.

3. Develop basic reading, writing, listening, and speaking skills in Hindi.
4. Use Hindi confidently in day-to-day conversations.
5. Develop proficiency required to successfully clear the Hindi Examination.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	-	-	-	3	-	1	-	-
2	-	-	-	-	-	-	1	1	3	-	1	-	-
3	-	-	-	-	-	-	1	2	3	-	2	-	-
4	-	-	-	-	-	1	2	2	3	-	1	-	-
5	-	-	-	-	-	-	-	-	2	-	3	-	-
AVG	-	-	-	-	-	1.0	1.3	1.6	2.8	-	1.6	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

P. Kaliya
Chairman - BoS

23EEC201 **INDIAN LANGUAGE**

(EXCEPT MOTHER TONGUE) / FOREIGN LANGUAGE L T P C

(Common to all B.E. & B.Tech. Branches) 0 0 4 2

OBJECTIVES

- To learn the German alphabet, pronunciation, and basic communication.
- To understand and use basic German grammar and vocabulary.
- To communicate in German in simple everyday situations.
- To develop basic reading, writing, listening, and speaking skills in German.
- To apply basic German language skills confidently through practice and revision.

UNIT I INTRODUCTION TO GERMAN LANGUAGE 6

German alphabet and pronunciation – Greetings - Self-introduction (Name, age, nationality, profession) - Numbers (0–100) -Days, months, seasons, and dates - Basic classroom expressions - Personal pronouns -Verb **sein** (to be) -Simple sentence formation

UNIT II BASIC GRAMMAR AND VOCABULARY 7

Definite and indefinite articles (der, die, das; ein, eine) - Nouns and gender - Singular and plural forms - Verb conjugation (regular verbs) - Present tense - Question words (Wer, Was, Wo, Wann, Wie, Warum) - Negation (nicht, kein) - Vocabulary: Family, occupations, countries, languages, colors

UNIT III EVERYDAY COMMUNICATION 7

Daily routine - Time and clock reading - Food and beverages - Shopping conversations - Asking for and giving directions -Making simple requests -Modal verbs (möchten, können) -Vocabulary: Home, school, transportation, weather

UNIT IV READING, WRITING, LISTENING, AND SPEAKING SKILLS 5

Reading short dialogues - Listening to simple conversations - Writing short paragraphs - Describing people, places, and objects - Introducing family and friends

UNIT V PRACTICAL APPLICATIONS AND REVISION 5

Travel and tourism vocabulary - At the restaurant - At the railway station and airport - Revision of grammar topics - Translation of simple sentences (English to German and German to English)

TOTAL: 30 PERIODS

OUTCOMES

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

- Identify the German alphabet and pronounce basic German words correctly.
- Use basic German vocabulary and simple grammar in sentences.
- Practice in simple German for everyday situations.

- understand basic German texts and conversations.
- Apply basic German language skills confidently in simple real-life situations.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	-	-	-	3	-	1	-	-
2	-	-	-	-	-	-	1	1	3	-	1	-	-
3	-	-	-	-	-	-	1	2	3	-	2	-	-
4	-	-	-	-	-	1	2	2	3	-	1	-	-
5	-	-	-	-	-	-	-	-	2	-	3	-	-
AVG	-	-	-	-	-	1.0	1.3	1.6	2.8	-	1.6	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

P. Kaliyan
Chairman - BoS

23EEC201 INDIAN LANGUAGE

(EXCEPT MOTHER TONGUE) / FOREIGN LANGUAGE L T P C

(Common to all B.E. & B.Tech. Branches) 0 0 4 2

OBJECTIVES

- To learn the Japanese writing system, pronunciation, and basic vocabulary.
- To understand and use basic Japanese grammar and sentence patterns.
- To communicate in Japanese in simple everyday situations.
- To develop basic reading, writing, listening, and speaking skills in Japanese.
- To apply basic Japanese language skills confidently through practice and real-life communication.

UNIT I WRITING SYSTEMS & PRONUNCIATION 5

Hiragana chart reading and writing - Katakana chart reading and writing - Basic pronunciation rules (long vowels, double consonants) – Numbers - Colours, body parts, pets description

UNIT II KANJI & BASIC GRAMMAR 7

First 50 Kanji (Numbers, Time & Days, Basic Directions & People) - Topic marker は (wa) - Identification sentences: Noun + です (desu) - Possession particle の (no) - Inclusion particle も (mo) - Subject marker が (ga) - Direction particles へ (he) and に (ni) - Self-introductions and greetings (Aisatsu) - Numbers, prices, shopping terms - Days, months, relative time - Family members and occupations

UNIT III KANJI & FUNCTIONAL GRAMMAR 8

Next 50 Kanji (Nature, Core Verbs, Adjectives & Nouns) - Verb groups (Group 1, Group 2, Group 3) - Masu forms (Present, Past, Positive & Negative) - Te-form (~て): requests, connecting sentences, continuous actions (~ている) - Adjective conjugation (い & な adjectives) - Desires (~たい) and Invitations (~ましょう)

UNIT IV VOCABULARY & FUNCTIONAL COMMUNICATION 5

Action verbs (daily routine, hobbies) - Adjectives for people, food, and places - Positional words (inside, outside, next to, between) - Transport, travel, and location vocabulary - Simple conversations in everyday situations

UNIT V READING & LISTENING COMPREHENSION 5

Reading short sentences in Hiragana, Katakana, and basic Kanji - Understanding classroom instructions - Listening to slow, clear daily-life conversations - Understanding simple shopping dialogues

TOTAL: 30 PERIODS

OUTCOMES

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

- Identify the Japanese writing system and pronounce basic Japanese words correctly.
- Use basic Japanese vocabulary and simple grammar in sentences.
- Communicate in simple Japanese for everyday situations.
- Read, write, listen to, and understand basic Japanese texts and conversations.
- Apply basic Japanese language skills confidently in simple real-life situations.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	1	1	-	1	2	-	-	-	-
2	-	-	-	-	1	2	-	2	2	-	-	-	-
3	-	-	-	-	2	2	1	2	3	-	1	-	-
4	-	-	-	-	2	2	1	3	3	-	1	-	-
5	-	-	-	-	1	1	1	2	3	-	1	-	-
AVG	-	-	-	-	1.4	1.6	1.0	0.2	2.6	-	1.0	-	-

P. Kaliye
Chairman - BoS

23MDC201 **APTITUDE SKILLS** L T P C
(Common to all Branches) 3 0 0 0

OBJECTIVES

- To introduce the basics concepts and techniques of numbers, Highest common factor and Least common multiple.
- To develop the use of decimal fraction and problems on ages.
- To introduce the basic concepts of time, work, distance, calendar and clock.
- To explain the student with the concept of simple and compound interest.
- To provide the knowledge of polynomial and quadratic equations.

UNIT I NUMBERS, HIGHEST COMMON FACTOR AND LEAST COMMON MULTIPLE 9

Numbers and their basic classification – Types of number – Basic operations of numbers – Progression – Tests of divisibility – Highest common factor – Least common multiple

UNIT II DECIMAL FRACTION AND PROBLEMS BASED ON AGES 9

Decimal fraction – Types of fraction – Comparison of fractions – Inserting fractions in between two given fractions – Relation between decimal fraction and normal fraction – Conversion of a decimal fraction into a vulgar fraction – Types of decimals – Conversion of mixed recurring decimal into a vulgar fraction – Standard form of decimal – Problems based on ages.

UNIT III TIME, WORK, DISTANCE, CALENDER AND CLOCK 9

General rule for time and work – General rule for work and wages – Speed – Unit of speed – Average speed – Some useful relations – Problems on Trains – Calendars and clocks – Odd days – Ordinary year – Leap year.

UNIT IV SIMPLE INTEREST, COMPOUND INTEREST AND ELEMENTARY ALGEBRA 9

Simple interest – Compound interest – Some useful relations – Difference between compound interest and simple interest – Short cut methods to solve special types of problems – Elementary Algebra and averages

UNIT V POLYNOMIAL AND QUADRATIC EQUATIONS 9

Polynomial introduction – Degree of a polynomial – Types of polynomial – Operations on polynomial – Remainder and factor theorem – Quadratic equation – Pure Quadratic equation – Discriminant – Roots of the Quadratic equations – Solution of Quadratic equation – Framing of a Quadratic equation – Special types of roots.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply basic concepts and techniques highest common factor and least common multiple on numbers.

- Apply the concept of decimal fraction and problems on ages.
- Apply the concept of time, work, distance, calendar and clock.
- Develop proficiency in simple interest, compound interest and basic algebraic skills.
- Explain the concepts and properties of polynomial and quadratic equations.

TEXT BOOKS

1. Agarwal R.S., "Quantitative Aptitude", S. Chand & Company Ltd, New Delhi, 2012.

2. Dinesh Khattar, "Quantitative Aptitude for competitive examinations ", Pearson India Education Services Pvt. Ltd., New Delhi, 2019.

REFERENCES

1. Praveen R.V., "Quantitative Aptitude and Reasoning", PHI Learning Private Limited, Delhi, 2013.

2. Gupta P, "A unique Approach to Quantitative Aptitude ", Unique Publishers (I) Pvt. Ltd, New Delhi, 2017.

E-RESOURCES

1. https://youtube.com/playlist?list=RDQM5XI256aOq24
2. https://youtu.be/KE7tQf9spPg

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SEMESTER III

23MAT303	DISCRETE MATHEMATICS [Common to CSE, CSE (CS), IT and AI&DS]	L T P C 3 1 0 4

OBJECTIVES

- To provide knowledge of logic and proofs.
- To explore generating functions, mathematical induction, and counting techniques.
- To introduce the basics of graph theory.
- To explain algebraic structures and their properties.
- To introduce the concepts of lattices and Boolean algebra.

UNIT I LOGIC AND PROOFS 9+3

Propositional logic – Propositional equivalences – Predicates and quantifiers – Nested quantifiers – Rules of inference – Introduction to proofs – Normal forms.

UNIT II INDUCTION AND COUNTING 9+3

Mathematical induction – Strong induction and well-ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Binomial coefficients – Generating functions – Inclusion and exclusion principle

UNIT III GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Representing Graphs and Graph Isomorphism – Euler and Hamilton paths – Trees: Introduction to Trees.

UNIT IV ALGEBRAIC STRUCTURES 9+3

Algebraic systems – Semi groups and monoids – Groups: Definitions and examples – Subgroups and homeomorphisms – Cosets and Lagrange's theorem – Normal subgroups – Definitions and examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 9+3

Lattices as partially ordered sets: Definitions and examples – Some properties of lattices – Lattices as algebraic systems – Sub lattices, direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Analyze the concept of logic and proofs.
- Apply the basic concepts of induction and counting techniques in Combinatorics area.
- Develop the application of graph theory.
- Classify the concepts and properties of algebraic structures such as groups, rings and fields.

- Develop the real-time applications using lattices.

TEXT BOOKS

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", Seventh Edition, McGraw Hill Education (India) Private Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, Thirtieth Reprint, 2011.

REFERENCES

1. Ralph P Grimaldi and B.V Ramana., "Discrete and Combinatorial Mathematics: An Applied Introduction", Fifth Edition, Pearson Education limited, 2014.
2. Satinder Bal Gupta., "Discrete Mathematics and structures ", University science press, New Delhi, Fifth Edition, 2008.

E-RESOURCES

1. https://nptel.ac.in/courses/106106183 (Discrete Mathematics)
2. https://nptel.ac.in/courses/106108227 (Discrete Mathematics)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	1	1	-	-	-	-	1	-	1
2	3	3	2	2	1	1	-	-	-	-	1	-	1
3	3	3	2	2	1	1	-	-	-	-	1	-	1
4	3	3	2	2	1	1	-	-	-	-	1	-	1
5	3	3	2	2	1	1	-	-	-	-	1	-	1
AVG	3	3	2	2	1	1	-	-	-	-	1	-	1

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

Chairman - BoS

23ECT302 DIGITAL PRINCIPLES AND COMPUTER ARCHITECTURE L T P C
3 0 0 3

OBJECTIVES

- To introduce the fundamentals of digital circuits and simplification methods.
- To discuss about various combinational digital circuits using logic gates.
- To examine the design procedures for synchronous and asynchronous sequential circuits.
- To gain knowledge on addressing modes, instructions and its operations.
- To summarize the memory hierarchies, cache memories and bus architecture

UNIT I INTRODUCTION TO DIGITAL CIRCUITS 9

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

UNIT II COMBINATIONAL CIRCUITS 9

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

UNIT III SEQUENTIAL CIRCUITS 9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of synchronous & asynchronous circuits – Design Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV COMPUTER ARCHITECTURE AND REGISTERS 9

Basics of a computer system: Evolution, Ideas, Technology, Performance, Power wall, Uniprocessors to Multiprocessors. Addressing and addressing modes. Instructions: Operations and Operands, Representing instructions, Logical operations, control operations.

UNIT V MEMORY AND I/O ORGANIZATION 9

Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply the different methods used for simplification of Boolean expressions.
- Design various combinational digital circuits using logic gates.
- Analyze synchronous and asynchronous sequential circuits.
- Examine the addressing modes and instructions used in computer.
- Develop the memory design and bus architectures.

TEXT BOOKS

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson, Fifth Edition, 2014.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann / Elsevier, Fifth Edition, 2014.

REFERENCES

1. S.Salivahanan and S.Arivazhagan, "Digital Electronics", Vikas Publishing House pvt Ltd ,First Edition, 2012.
2. John P. Hayes, "Computer Architecture and Organization", Tata McGraw Hill, Third Edition, 2012.

E-RESOURCES

1. https://nptel.ac.in/courses/108105132 (Digital electronics)
2. https://nptel.ac.in/courses/106102062 (Computer Architecture)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	2	-	-	-	2	2	2	1
2	3	3	3	2	2	2	-	-	-	2	1	2	1
3	3	3	3	2	2	2	-	-	-	2	2	2	1
4	3	2	3	2	2	2	-	-	-	2	2	2	2
5	3	3	3	3	2	2	-	-	-	2	2	2	2
AVG	3	2.8	2.8	2.2	2	2	-	-	-	2	1.8	2	1.4

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

Chairman - BoS

23ECT303 ANALOG AND DIGITAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES

- To introduce the concepts of Analog Modulation.
- To gain knowledge on various pulse modulation techniques.
- To discuss about various digital communication techniques.
- To inculcate the concept of information theory and coding.
- To facilitate the sequence in spread spectrum and multiple access.

UNIT I ANALOG MODULATION 9

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Super heterodyne receivers.

UNIT II PULSE MODULATION 9

Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder – Time Division Multiplexing, Frequency Division Multiplexing.

UNIT III DIGITAL MODULATION AND TRANSMISSION 9

Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers.

UNIT IV INFORMATION THEORY AND CODING 9

Measure of information – Entropy – Source coding theorem – Shannon-Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding.

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS 9

PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronization and tracking – Multiple Access – FDMA, TDMA, CDMA.

TOTAL: 45 PERIODS

OUTCOMES

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

- Discuss the concepts of Analog Modulation.
- Develop the Pulse modulation and Multiplexing.
- Design the digital modulation and transmission techniques.
- Analyze Source and Error control coding.
- Examine the sequences along with multiple access techniques. .

TEXT BOOKS

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", Third Edition, TMH 2007.
2. S. Haykin, "Digital Communications", Fourth Edition,John Wiley, 2005.

REFERENCES

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", Third Edition, Oxford University Press, 2007.
2. H P Hsu, "Analog and Digital Communications", Schaum Outline Series, TMH, 2006.

E – RESOURCES

1. https://nptel.ac.in/courses/117/105/117105143/ (Analog Communication).
2. https://nptel.ac.in/courses/117/102/117102059/(Introduction to Communication Engineering)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	1	-	-	-	-	-	-	2	1
2	2	3	3	2	2	-	-	-	-	-	-	2	2
3	3	3	3	3	2	-	-	-	-	-	-	3	2
4	3	2	3	3	2	-	--	-	-	-	-	3	3
5	3	2	3	2	2	-	-	-	-	-	-	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.8	2.4	2.8	2.4	1.8	-	-	-	-	-	-	2.4	2.0

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

Chairman - BoS

23CSE301 OBJECT ORIENTED PROGRAMMING LT P C
3 0 2 4

OBJECTIVES

- To teach the fundamental concepts of Object-Oriented Programming and the basics of Java programming language for developing simple applications.
- To inculcate the knowledge on packages, inheritance, interfaces, method overloading, and method overriding to design reusable and modular Java programs.
- To train the student in developing Java applications using exception handling and multithreading techniques to create reliable and concurrent programs.
- To utilize Java I/O streams, file handling, generic classes, and generic methods for efficient data processing and type-safe programming.
- To explore interactive Graphical User Interface (GUI) applications using JavaFX controls, layouts, menus, and event handling mechanisms.
- To implement object-oriented programming concepts and Java technologies to develop complete software solutions for real-world problems.

UNIT I INTRODUCTION TO OOP AND JAVA 9

Overview of OOP– Object oriented programming paradigms–Features of Object Oriented Programming–Java Buzzwords – Overview of Java – Data Types, Variables and Arrays–Operators – Control Statements – Programming Structures in Java – Defining classes in Java –Constructors-Methods-Access specifiers –Static members-Java Doc comments.

Problem Solving Assignments:

1. Differentiate between Procedural Programming and Object-Oriented Programming.
2. Explain the four major features of OOP with real-life examples.

Coding Exercises:

1. Write a program to display your personal details (Name, Roll No, Department).
2. Write a program to calculate the sum of two numbers entered by the user.
3. Write a program to swap two numbers without using a third variable.
4. Write a program to convert temperature from Celsius to Fahrenheit.

UNIT II INHERITANCE, PACKAGES AND INTERFACES 9

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

Problem Solving Assignments:

1. Compare Method Overloading and Method Overriding.

2. Analyze advantages of interfaces in software development.

Coding Exercises:

1. Create a Calculator class with overloaded add() methods.
2. Return a Student object with highest marks.
3. Create Bank class with static interest rate.
4. Create a static nested class.
5. Invoke parent constructor using super().

UNIT III EXCEPTION HANDLING AND MULTITHREADING 9

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

Problem Solving Assignments:

1. Explain the Exception Handling mechanism in Java with a flow diagram.
2. Why is exception handling preferred over normal error checking?

Coding Exercises:

1. Create student mark validation using multiple catch.
2. Handle division and array access in nested blocks.
3. Create a menu-driven exception handling program.
4. Create thread by extending Thread class.

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. Strings: Basic String class, methods and String Buffer Class.

Problem Solving Assignments:

1. Analyze the advantages of Java Stream-based I/O.
2. Analyze the advantages and disadvantages of console-based applications.

Coding Exercises:

1. Read marks of five subjects and calculate average.
2. Store and retrieve employee records from a file.
3. Create a generic Queue class
4. Find maximum value using bounded types.
5. Generic method to find maximum of two values.

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 – ScrollPane.Layouts–FlowPane–HBoxandVBox–BorderPane–StackPane–GridPane.Menus–Basics – Menu–Menu bars– Menu Item.

Problem Solving Assignments:

1. What is an Event in JavaFX? Explain the Event-Driven Programming model.
2. Explain the purpose of ToggleGroup.

Coding Exercises:

1. Display a message when a button is clicked.
2. Display selected CheckBoxes.
3. Build Student Department Selector.
4. Create Login Form using TextField and PasswordField.

LIST OF EXPERIMENTS

1. Write a Java program to check whether the given string is palindrome or not.
2. Develop a Java application to generate Electricity bill.
3. Develop a java application to implement currency converter using packages.
4. Design a Java interface for ADT Stack. Implement this interface using array.
5. Write a program to perform string operations using ArrayList.
6. Write a Java program to implement user defined exception handling.
7. Write a java program that implements a multi–threaded application.
8. Write a java program to find the maximum value from the given type of elements using a generic function.
9. Develop a mini project for any application using Java concepts.

TOTAL : 45 +15=60 PERIODS

OUTCOMES

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

- Explain object-oriented concepts such as classes, objects, constructors, methods, and access specifiers to solve programming problems.
- Develop Java programs using inheritance, packages, interfaces, method overloading, and method overriding for software reusability.
- Implement exception handling mechanisms and multithreaded programming techniques to build reliable Java applications.
- Apply file handling, string manipulation, collections, and generic programming concepts in Java

applications.

- Design GUI applications using JavaFX controls, layouts, and event-driven programming techniques.
- Develop complete Java-based software solutions by integrating OOP concepts, exception handling, file processing, multithreading, and GUI components.

TEXTBOOKS

1. Herbert Schildt, "Java: The Complete Reference", Eleventh Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing Java FX8 Programming", First Edition, McGraw Hill Education, New Delhi, 2015

REFERENCES

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, Eleventh Edition, Prentice Hall,2018.
2. Reema Therja, "Programming in C", Oxford University Press, Second Edition, 2016

E-RESOURCES

1. https://nptel.ac.in/courses/106/105/106105085/ (Programming methodology and data structure)
2. https://nptel.ac.in/courses//106/105/106106210/ (Stack Operations)

Mapping of COs-POs & PSOs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	–	–	1	1	–	2	3	3
2	3	2	3	1	3	–	1	1	1	–	2	3	3
3	3	3	3	2	3	1	1	1	1	–	2	3	3
4	3	2	3	2	3	–	–	1	1	–	2	3	3
5	3	2	3	2	3	1	1	2	2	1	2	3	3
6	3	3	3	2	3	2	1	2	2	2	3	3	3
AVG	**3.0**	**2.3**	**2.8**	**1.7**	**2.8**	**1.3**	**1.0**	**1.3**	**1.3**	**1.5**	**2.2**	**3.0**	**3.0**

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

Chairman - BoS

23CSE302 DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the fundamental concepts of linear and non-linear data structures, Abstract Data Types (ADTs), and their implementation methodologies.
- To impart the knowledge on stack and queue concepts along with their applications .
- To foster the tree-based data structures and their applications in efficient data organization, searching, and storage.
- To familiarize about graph representations and algorithms for addressing connectivity, shortest path, and optimization problems.
- To familiarize learners with algorithm analysis techniques including complexity analysis, asymptotic notations, and recurrence relations.
- To develop programming skills through the implementation and analysis of data structures, searching, sorting, and graph algorithms.

UNIT I LIST 9

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT – Radix Sort – Multilists.

PROBLEM SOLVING ASSIGNMENTS:

1. Design and implement a Student Record Management System using List ADT. The system should store, update, search, and delete student records using different list implementations.
2. Develop applications using Polynomial ADT, Radix Sort, and Multilists to solve mathematical and data processing problems.

CODING EXERCISES:

1. Write a program to implement a Singly Linked List with the following operations:

- Create a linked list
- Insert a node at the beginning
- Insert a node at the end
- Insert a node at a specific position
- Delete a node
- Search for an element
- Reverse the linked list

- Display the list

2. Write a program to implement a Doubly Linked List with the following operations:

- Insert a node at the beginning
- Insert a node at the end
- Delete a node
- Search for an element
- Display elements in forward direction
- Display elements in reverse direction

UNIT II STACKS AND QUEUES 9

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions- Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop a customer service management system using Queue to manage customer requests in a bank, hospital, or service center.
2. Develop an application that uses Stack ADT to implement undo operations and browser back navigation.

CODING EXERCISES:

1. Write a program to convert an infix expression into postfix expression using a stack.
2. Write a program to implement Queue ADT using an array and perform enqueue, dequeue, and display operations.

UNIT III TREES 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.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop a database indexing system using B-Tree and B+ Tree structures to efficiently store and retrieve large amounts of data.
2. Design and implement an Employee Database Management System using a Binary Search Tree. The system should efficiently store and retrieve employee information.

CODING EXERCISES

1. Write a program to implement Tree ADT with the following operations:

- Create a tree

- Insert nodes
- Delete nodes
- Search an element
- Display tree elements

2. Write a program to perform Heap Sort using Binary Heap.

UNIT IV GRAPHS 9

Graph Definition – Representation of Graphs – Types of Graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm.

PROBLEM SOLVING ASSIGNMENTS:

1. Design and implement a Network Routing System using graph data structures to find the shortest path between different network nodes.

2. Develop a City Road Map Optimization System using Minimum Spanning Tree algorithms to minimize the total construction cost while connecting all cities.

CODING EXERCISES:

1. Write a program to perform Depth First Traversal (DFS) of a graph using recursion.

2. Write a program to find the shortest route between two cities using Dijkstra's Algorithm.

UNIT V ALGORITHM ANALYSIS 9

Time and space complexity - Asymptotic Notations and its properties Best case, Worst case and average case analysis – Recurrence relation: substitution method – Mathematical analysis for Recursive and Non-recursive algorithms.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop a system to analyze the performance of various searching and sorting algorithms using asymptotic notations.

2. Analyze recursive algorithms using recurrence relations and substitution method.

CODING EXERCISES:

1. Write a program to implement Binary Search and calculate the number of comparisons for different input sizes.

2. Write a program to compare the execution time of Bubble Sort and Selection Sort for different input sizes.

LIST OF EXPERIMENTS

1. a. Array implementation of Stack, Queue and Circular Queue ADTs array implementation of Stack.
   b. Array implementation of Queue.
   c. Array implementation of circular Queue.
2. Implementation of singly linked list.
3. a.Linked list implementation of Stack and Linear Queue ADTs Linked list implementation of Stack
   b. Linked list implementation of linear queue.
4. Implementation of Polynomial Manipulation using Linked list.
5. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion.
6. Implementation of Binary Search Trees.
7. Implementation of AVL Trees.
8. Implementation of Heaps using Priority Queues.
9. a. Implementation of Dijkstra's Algorithm.
   b. Implementation of Prim's Algorithm.
10. a. Implementation of Linear Search.
    b. Implementation of Binary Search.
11. a. Implementation of Insertion Sort.
    b. Implementation Selection Sort.

TOTAL: 45 + 15 = 60 PERIODS

OUTCOMES:

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

- Explain and implement Abstract Data Types, List ADT, linked lists, polynomial representation, radix sort, and multilists for solving data organization problems.
- Apply stack and queue data structures for expression conversion, expression evaluation, function call management, scheduling, and other computational applications.
- Design the tree-based data structures including binary trees, binary search trees, AVL trees, heaps, B-Trees, and B+ Trees for efficient searching and storage.
- Apply graph representations and algorithms such as BFS, DFS, Topological Sorting, Dijkstra's Algorithm, Prim's Algorithm, and Kruskal's Algorithm to solve network and optimization problems.
- Analyze algorithm performance using time complexity, space complexity, asymptotic analysis, best/worst/average case analysis, and recurrence relations for developing efficient algorithms.

- Implement and analyze the linear and non-linear data structures, searching, sorting, and graph algorithms using appropriate programming techniques to solve computational problems.

TEXT BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2005.
2. Kamthane, "Introduction to Data Structures in C", First Edition, Pearson Education, 2007

REFERENCES

1. Langsam, Augenstein and Tanenbaum, "Data Structures Using C and C++", Second Edition, Pearson Education, 2015.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006.

E-RESOURCES

1. https://archive.nptel.ac.in/courses/106/106/106106127/(Data structures and algorithms)
2. https://archive.nptel.ac.in/courses/106/102/106102064/(Introductionto data structure)

Mapping of COs-POs & PSOs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	3	1	–	1	1	–	2	3	3
2	3	3	3	2	3	1	–	1	1	–	2	3	3
3	3	3	3	2	3	1	–	1	1	1	2	3	3
4	3	3	3	3	3	2	–	2	1	1	2	3	3
5	3	3	3	3	3	1	–	1	1	–	3	3	3
6	3	3	3	3	3	2	1	2	1	1	3	3	3
AVG	**3.0**	**3.0**	**2.8**	**2.5**	**3.0**	**1.3**	**1.0**	**1.3**	**1.0**	**1.0**	**2.3**	**3.0**	**3.0**

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

Chairman - BoS

23GEE301	PROBLEM SOLVING AND PYTHON PROGRAMMING	L T P C
	(Lab Embedded Theory Course)	3 0 2 4

OBJECTIVES

- To impart the fundamentals of computational thinking, algorithm design, and problem-solving techniques for developing efficient software solutions.
- To develop students proficiency in Python programming using data types, expressions, operators, statements, and debugging techniques.
- To enable students to apply control structures, functions, recursion, and string manipulation for solving computational problems.
- To train students to use lists, tuples, dictionaries, and advanced data processing techniques for structured programming.
- To inculcate the knowledge of file handling, exception handling, modules, packages, and data visualization for developing robust Python applications.
- To develop the students in analytical, programming, and computational skills through coding practices, and to solve real-world problems using Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems –Algorithms, building blocksofalgorithms(statements,state,controlflow,functions),notation(pseudo code, flow chart, 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, guess an integer number in a range, Towers of Hanoi.

Coding practices:

1. Develop Algorithm and flowchart to find the greatest of three numbers.
2. Develop Algorithm and flowchart to find a minimum number in a List.

Problem-solving Assignments:

1. Develop Algorithm and Flowchart to solve Towers of Hanoi Problem.
2. Develop Algorithm, Pseudo code and flowchart for finding factorial of a given number using recursion.

UNIT II DATA TYPLS, 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

Coding practices:

1. Develop python program to find area of a Circle
2. Develop python program to convert Fahrenheit to Celsius.

Problem-solving Assignments:

1. Develop Python program to find Quadratic Equation
2. Develop Python program to find Student mark statement based on 5 subjects.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-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.

Coding practices:

1. Develop python program to find GCD of a given number.
2. Develop python program to find factorial of a number.
3. Develop Python program to find sum of array of given numbers.

Problem-solving Assignments:

1. Develop Python program to find whether an element is found in the List by using (A) Linear Search and (B) Binary Search method
2. Develop Python program to print Fibonacci Series

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

Coding practices:

1. Develop python program for Insertion Sorting & Selection Sorting.
2. Develop python program for Histogram

Problem-solving Assignments:

1. Develop Python program for student mark statement using List
2. Develop Python program to print Retail bill statement

UNIT V FILES,MODULES,PACKAGES & DATAVISUALIZATION 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 – Importing Matplotlib – Introduction to plotting – visualizing errors – Histograms.

Coding practices:

1. Develop python program to append the contents of one file to another.
2. Develop python program to copy contents of one file to another file using command Line Arguments

Problem-solving Assignments:

1. Develop a python program for calculator using python packages.
2. Develop a suitable python program to demonstrate each case in Exceptional Handling.
3. Develop a suitable python program using Matplotlib for Visualizing Errors.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops.(Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number In a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)

10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)

TOTAL : 45 +15 = 60 PERIODS

OUTCOMES

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

- Analyze computational problems to develop effective problem-solving strategies.
- Apply python constructs to develop programs for python applications.
- Apply control structures and functions to solve computational problems.
- Apply Python built-in data structures such as lists, tuples, and dictionaries to process and manipulate data efficiently.
- Analyze the operations of file handling, exception handling, modules, packages, and data visualization techniques for real-world applications.
- Implement python programs for solving various computational problems.

TEXTBOOKS

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", O'Reilly Publishers, Second Edition, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", BCS Learning & Development Limited, First Edition,2017.

REFERENCES

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, First Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", First Edition, Notion Press, 2021.

E – RESOURCES

1. https://nptel.ac.in/courses/106104074(Introduction to Algorithms)
2. https://archive.nptel.ac.in/courses/106/106/106106182/ (Joy of Computing)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1	2	–	–	–	–	–	2	3	2
2	3	2	2	–	3	–	–	–	–	–	2	3	3
3	3	3	2	1	3	–	–	–	–	–	2	3	3
4	3	2	2	–	3	–	–	–	–	–	2	3	3
5	2	3	2	2	3	–	–	–	1	–	2	3	3
6	3	3	3	2	3	–	1	1	2	1	2	3	3
AVG	2.8	2.7	2.2	1.5	2.8	–	1.0	1.0	1.5	1.0	2.0	3.0	2.8

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

Chairman - BoS

23EEC301	PROFESSIONAL DEVELOPMENT	L T P C 0 0 2 1

OBJECTIVES

To be proficient in important Microsoft Office tools: MS WORD, EXCEL and POWERPOINT.

- 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 presentability 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.
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

MS WORD: **10 Hours**

1. Create and format a document
2. Working with tables
3. Working with Bullets and Lists
4. Working with styles, shapes, smart art, charts
5. Inserting objects, charts and importing objects from other office tools
6. Creating and Using document templates
7. Inserting equations, symbols and special characters
8. Working with Table of contents and References, citations
9. Insert and review comments
10. Create bookmarks, hyperlinks, endnotes footnote
11. Viewing document in different modes
12. Working with document protection and security
13. Inspect document for accessibility

MS EXCEL: **10 Hours**

1. Create worksheets, insert and format data
2. Work with different types of data: text, currency, date, numeric etc.
3. Split, validate, consolidate and Convert data
4. Sort and filter data
5. Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc,)

6. Work with Lookup and reference formulae
7. Create and Work with different types of charts
8. Use pivot tables to summarize and analyze data
9. Perform data analysis using own formulae and functions.
10. Combine data from multiple worksheets using own formulae and built-in functions to generate results
11. Export data and sheets to other file formats
12. Working with macros
13. Protecting data and Securing the workbook

MS POWERPOINT: **10 Hours**

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

TOTAL: 30 PERIODS

OUTCOMES

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

- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements.
- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding.
- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

Chairman - BoS

SEMESTER IV

23ITT401	OBJECT ORIENTED SOFTWARE DESIGN	L T P C 3 0 0 3

OBJECTIVES

- To familiarize students with the concepts and life cycle models of software development.
- To train students in Software Requirement Specification and Use case model.
- To develop skills in software design, testing techniques, maintenance, and reengineering.
- To impart knowledge on Unified Process, use cases, and UML diagrams..
- To aquire knowledge on GRASP, software quality assurance, and object-oriented testing practices.

UNIT I INTRODUCTION 9

Software engineering concepts – Development activities – Software lifecycle models - Classical waterfall - Iterative waterfall – Prototyping – Evolutionary - Spiral – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management

Coding Exercises:

1. Implement a Python program to simulate the Classical Waterfall model phases for a simple project.
2. Create a project scheduling tool using PERT/CPM algorithms to calculate critical path.
3. Write a configuration management system using Git commands to track software versions.

Problem-solving Assignments:

1. Develop a risk management tool that identifies, prioritizes, and tracks project risks with mitigation strategies.
2. Design an estimation model comparing COCOMO and Function Point Analysis for a sample project.

UNIT II SOFTWARE REQUIREMENT SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modeling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modeling – Data Flow Diagram.

Coding Exercises:

1. Create a Python program to generate UML Use Case diagrams from textual requirements.
2. Implement a Finite State Machine simulator for system behavior modeling.
3. Write a DFD (Data Flow Diagram) generator that parses process specifications into visual

diagrams.

Problem-solving Assignments:

1. Develop a complete SRS document for a Library Management System using UML diagrams.
2. Design a Petri Net model for a banking transaction system and simulate its execution.

UNIT III DESIGN, TESTING & MAINTENANCE 9

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns –Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking-Maintenance and Reengineering-BPR model Reengineering process model-Reverse and Forward Engineering.

Coding Exercises:

1. Implement unit testing framework using JUnit/Pytest for a sample banking application.
2. Create a code coverage tool that measures statement, branch, and path coverage.
3. Write a symbolic execution engine for simple arithmetic expressions.

Problem-solving Assignments:

1. Design and implement black box and white box test cases for an e-commerce checkout module.
2. Develop a reengineering tool that converts procedural code to object-oriented design using BPR model.

UNIT IV UNIFIED PROCESS AND USE CASE DIAGRAMS 9

Introduction to OOAD with OO Basics - Unified Process - UML diagrams - Use Case - Case study - the Next Gen POS system, Inception -Use case Modeling - Relating Use cases - include, extend and generalization - When to use Use-cases - Class Diagram- Aggregation and Composition - Relationship between sequence diagrams and use cases

Coding Exercises:

1. Implement a Use Case modeling tool supporting include, extend, and generalization relationships.
2. Create a sequence diagram generator from use case scenarios using PlantUML.
3. Write a class diagram validator checking aggregation, composition, and association rules.

Problem-solving Assignments:

1. Apply Unified Process to develop inception phase artifacts for NextGen POS system.
2. Design complete UML diagrams (use case, class, sequence) for an online booking system.

UNIT V DESIGN PATTERNS & TESTING 9

GRASP: Designing objects with responsibilities - Creator - Information expert - Low Coupling - High Cohesion - Controller Design Patterns - creational - factory method - structural - Bridge - Adapter - behavioural - Strategy - observer - Applying GoF design patterns - Mapping design to code-object

Oriented Methodologies - Software Quality Assurance - Impact of object orientation on Testing - Develop Test Cases and Test Plans

Coding Exercises:

1. Implement GRASP patterns (Creator, Information Expert, Low Coupling) in a sample inventory system.
2. Create Factory Method, Bridge, and Strategy design patterns for a graphics rendering application.
3. Develop Observer pattern for real-time stock price monitoring system.

Problem-solving Assignments:

1. Apply GoF design patterns to refactor a monolithic e-commerce system into modular architecture.
2. Create comprehensive test plans and test cases for an object-oriented banking application with 90% code coverage.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain software engineering concepts, development activities, and software lifecycle models..
- Design Software Requirement Specifications and develop use case models.
- Apply software design, testing, maintenance, and reengineering techniques.
- Apply the concept of Unified Process, use cases, and UML diagrams for software development.
- Analysis design pattern and testing practices.

TEXT BOOKS

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education ,Third Edition, 2005.
2. Bernd Bruegge, Alan H Dutoit, "Object-Oriented Software Engineering", Pearson Education, Second Edition, , 2004.
3. Len Bass, Ingo Weber and Liming Zhu," DevOps: A Software Architect's Perspective", Pearson Education, 2016

REFERENCES

1. Rajib Mall," Fundamentals of Software Engineering", PHI Learning Pvt. Ltd., Third edition, 2009.
2. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Addison Wesley, Third edition, 2003.

E -RESOURCES

1. https://nptel.ac.in/courses/106/105/106105182 (Software Models)
2. https://onlinecourses.nptel.ac.in/noc20_cs84/preview (OO models)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	-	-	-	1	3	3	3	2	2
2	3	1	1	3	1	-	-	1	2	1	3	2	3
3	3	1	2	1	1	-	-	2	1	1	3	1	1
4	3	1	3	1	-	-	-	2	1	2	1	2	2
5	3	1	1	2	2	-	-	3	1	2	3	2	1
AVG	3	1	1	2	2	-	-	3	1	2	3	2	1

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

Chairman - BoS

23CCT401	OPERATING SYSTEMS AND SECURITY (Common to CSE-CS and IT)	L T P C 3 1 0 4

OBJECTIVES

- To familiarize students with the architecture and internal workings of operating systems
- To impart knowledge on process management concepts in operating systems including scheduling, synchronization, threads, and deadlock handling.
- To provide students with comprehensive knowledge of main memory and mass storage management in operating systems.
- To inculcate students with knowledge of secure systems and verifiable security goals.
- To familiarize students with security features, protection mechanisms, and vulnerabilities of UNIX and Windows operating systems.

UNIT I OPERATING SYSTEM OVERVIEW 9

Computer-System Organization—Architecture—Operating-System Operations—Resource Management – Security and Protection – Distributed Systems – Kernel Data Structures – Operating- System Services—System Calls—System Services—Why Applications Are Operating System Specific – Operating-System Design and Implementation - Operating-System Structure – Building and Booting an Operating System .

Problem Solving Assignments:

1. Analyze different operating system structures
2. Compare monolithic, layered, and micro kernel architectures

UNIT II PROCESS MANAGEMENT 9

Process Concept – Process Scheduling – Operation on Processes, Inter-process Communication – Threads—Overview—Multithreading models—Threading issues; CPU Scheduling—Scheduling criteria, Scheduling algorithms; Process Synchronization – critical- section problem, Synchronization hardware, Mutex locks, Semaphores, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Detection, Recovery.

Problem Solving Assignments:

1. Compare different CPU scheduling algorithms
2. Analyze deadlock handling techniques

UNIT III MEMORY MANAGEMENT AND FILE SYSTEMS 9

Main Memory—Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation— Virtual Memory—Demand Paging, Page Replacement, Allocation,

Thrashing; Allocating Kernel Memory. Mass Storage system - HDD Scheduling - File concept, Access methods, Directory Structure, Sharing and Protection; File System Structure, Directory implementation, Allocation Methods, Free Space Management.

Problem Solving Assignments:

1. Evaluate performance of memory allocation techniques
2. Analyze file system allocation strategies

UNIT IV SECURE SYSTEMS AND VERIFIABLE SECURITY GOALS 9

Security Goals– Trustand Threat Model–Access Control Fundamentals–Protection System– Reference Monitor–Secure Operating System Definition–Assessment Criteria– Information Flow – Information Flow Secrecy Models – Denning's Lattice Model – Bell Lapadula Model – Information Flow Integrity Models – Biba Integrity Model – Low-Water Mark Integrity – Clark Wilson Integrity.

Problem Solving Assignments:

1. Analyze secrecy and integrity models
2. Compare different security assessment criteria

UNIT V SECURITY IN OPERATING SYSTEMS 9

UNIX Security–UNIX Protection System–UNIX Authorization–UNIX Security Analysis– UNIX Vulnerabilities—Windows Security—Windows Protection System—Windows Authorization— Windows Security Analysis – Windows Vulnerabilities – Address Space Layout Randomizations – Retrofitting Security into a Commercial Operating System – Introduction to Security Kernels.

Problem Solving Assignments:

1. Compare UNIX and Windows security mechanisms
2. Analyze common operating system vulnerabilities

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the architecture and internal workings of operating systems, including the structure, components, and services.
- Analyze process management in operating systems, including scheduling algorithms, synchronization mechanisms, multithreading, and deadlock handling.
- Demonstrate understanding of memory, file, and mass storage management in operating

systems, including allocation, access methods, and I/O management.

- Apply principles of secure system design and evaluate verifiable security goals, including access control, protection mechanisms, and integrity models.
- Explain the security features, protection mechanisms, and vulnerabilities of UNIX and Windows operating systems, including system hardening and mitigation techniques.

TEXTBOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", JohnWiley & Sons, Inc., Tenth Edition, 2021.
2. TrentJaeger,"Operating System Security",Morgan &Claypool Publishers series,2008.

REFERENCES

1. Morrie Gasser," Building A Secure Computer System",VanNostr and Reinhold,NewYork, Second Edition ,2008.
2. Charles Pfleeger, Shari Pfleeger,Jonathan Margulies, "Security in Computing", Prentice Hall, New Delhi, Fifth Edition 2015.

E – RESOURCES

1. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-cs72/(AllocationMethod)
2. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-cs74/(SystemSecurity)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	1	-	-	-	-	2	2	1
2	3	3	3	2	3	2	-	-	-	-	3	2	2
3	3	3	2	3	3	2	1	-	-	1	3	2	1
4	3	3	3	3	3	3	2	-	-	2	3	3	3
5	3	3	3	3	3	3	2	1	1	2	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2.8	2.6	2.4	2.8	2.2	1	0.1	0.1	1.6	2.8	2.4	2

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

Chairman - BoS

23CSE401 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING L T P C
(Lab Embedded Theory Course) 3 0 2 4

OBJECTIVES

- To familiarize the students on artificial intelligence concepts, problem-solving techniques and search algorithms.
- To impart inference techniques for reasoning under uncertainty.
- To enable students to understanding on genetic algorithms for solving optimization problems.
- To train the students on FOIL for knowledge acquisition and machine learning
- To develop the students understanding in graphical models of machine learning algorithms.
- To implement the AI and Machine learning Models to solve real-world computational problems.

UNIT I INTRODUCTION 9

Introduction – Definition- Problem Solving Methods – Search Strategies – Informed – Uninformed – Heuristics – Local Search Algorithms – Constraint Satisfaction Problems – Game Playing.

Coding practices:

1. Develop a program that models a problem environment and computes a solution by systematically exploring possible states until a goal condition is reached.
2. Implement a solution that uses knowledge-based guidance to improve search efficiency and compare its performance with a basic solution approach.
3. Create a program that simulates intelligent decision-making for solving constrained or competitive problems and evaluates the quality of the obtained solution.

Problem-solving Assignments:

1. Analyze alternative solution approaches for the same problem and evaluate their effectiveness based on efficiency and quality of results.
2. Solve a decision-making problem involving constraints or competitive situations and justify the correctness and optimality of the chosen solution.

UNIT II KNOWLEDGE INFERENCE 9

Knowledge representation -Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian theory-Bayesian Network-De mpster - Shafer theory.

Coding practices:

1. Develop a program to represent domain knowledge and apply reasoning to derive conclusions from the given facts.
2. Implement a reasoning mechanism that infers new information from available knowledge and evaluates the confidence of the derived results.
3. Create a program that handles uncertainty in decision-making and produces conclusions based on probabilistic or belief-based inputs.

Problem-solving Assignments:

1. Apply logical reasoning techniques to derive conclusions from the available knowledge and explain the inference process used to reach the results.
2. Solve a decision-making problem under uncertainty and justify the conclusions obtained based on confidence or belief measures.

UNIT III NEURAL NETWORKS AND DEEP LEARNING AND GENETIC ALGORITHMS 9

Illustrative Examples: Face Recognition Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning – Parallelizing Genetic Algorithms.

Coding practices:

1. Develop a program that applies an evolutionary approach to optimize a solution for a given problem and evaluates its performance over multiple iterations.
2. Implement a search-based program that explores a large solution space to identify high-quality solutions using adaptive improvement techniques.
3. Create a program that demonstrates learning through iterative evolution and compares the efficiency of sequential and parallel execution models.

Problem-solving Assignments:

1. Analyze a given pattern-recognition or optimization problem and formulate an evolutionary-based solution to improve accuracy or performance.
2. Examine the impact of learning and parallel execution on solution quality and computational efficiency in evolutionary problem solving.

UNIT IV LEARNING SET OF RULES 9

Introduction – Sequential Covering Algorithms – Learning First-Order Rules – learning Sets of First-Order Rules: FOIL – Induction as Inverted Deduction – Inverting Resolution.

Coding practices:

1. Develop a program that learns logical rules from a given set of examples and represents the learned knowledge in a structured form.

2. Implement an algorithm that derives general rules from specific observations and evaluates the correctness of the learned rules.
3. Create a program that generates and refines rule sets through an inductive process and tests their effectiveness on unseen data.

Problem-solving Assignments:

1. Formulate a problem where general knowledge must be inferred from specific instances and justify the reasoning process used to obtain valid rules.
2. Evaluate the effectiveness of the learned rule set by testing it on unseen examples and discussing its accuracy and limitations.

UNIT V GRAPHICAL MODELS 9

Introduction – Geberative Models – d-Separation – Belief Propagation – Learning the Structure of Graphical Models – Hidden Markov Model.

Coding practices:

1. Implement an algorithm that updates beliefs based on observed evidence and analyzes how information flows through the model
2. Create a program that learns patterns from sequential data and predicts future states based on past observations.
3. Develop a program that represents probabilistic relationships among variables and performs inference to compute outcome probabilities.

Problem-solving Assignments:

1. Analyze a problem involving uncertain data and design a probabilistic model to represent the relationships between variables.
2. Apply reasoning techniques to update beliefs based on observed evidence and evaluate the accuracy of the inferred outcomes.

TOTAL : 45+15 = 60 PERIODS

OUTCOMES

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

- Use appropriate search algorithms for problem solving
- Apply appropriate algorithm for inference.
- Analyze neural networks and genetic algorithms approaches to solve optimization problems.
- Apply set of rules for machine learning decisions.
- Design systems that use appropriate graph models of machine learning.

- Implement various models in Artificial Intelligence to solve real world problem

TEXT BOOKS

1. S. Russell and P. Norvig, "Artificial Intelligence – A Modern Approach", FourthEdition, Prentice Hall,2020.

2. M.Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", First Edition, Jones and Barlett Publishers, Inc., 2008.

REFERENCES

1. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2013.

2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009.

E-RESOURCES

1. https://nptel.ac.in/courses/106/105/106105152/ (Different Types of Learning)
2. https://nptel.ac.in/courses/106/106/106106202/ (Learning Problem)

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	2	3	1	–	1	1	–	2	3	3
2	3	3	3	3	3	1	1	1	1	–	2	3	3
3	3	3	3	3	3	1	–	1	1	1	3	3	3
4	3	3	3	3	3	1	1	1	1	1	3	3	3
5	3	3	3	3	3	2	1	1	1	1	3	3	3
6	3	3	3	3	3	2	1	2	2	2	3	3	3
AVG	3.0	3.0	3.0	2.8	3.0	1.3	1.0	1.2	1.2	1.3	2.7	3.0	3.0

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

Chairman - BoS

23CSE402 DATABASE MANAGEMENT SYSTEMS L T P C
3 0 2 4

OBJECTIVES

- To impart the fundamentals of data models, relational algebra and SQL.
- To familiarize the database system using ER diagrams and normalization techniques.
- To develop the comprehensive knowledge of transaction processing, concurrency control techniques and recovery procedures.
- To enable the student to understand the internal storage structures using different file and indexing techniques for database design.
- To foster the knowledge on different database structures and information retrieval techniques.
- To provide practical exposure in relational database design, SQL programming and database connectivity for real world application development.

UNIT I: RELATIONAL DATABASES 9

Introduction: Database System Application-Purpose of Database System – Views of data -Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Embedded SQL– Dynamic SQL

Coding Exercises:

1. Create SQL scripts using DDL commands to create and modify relational tables.
2. Write SQL queries using DML commands to insert, update, delete, and retrieve data.
3. Implement basic relational algebra operations using SQL queries.

Problem-Solving Assignments:

1. Analyze a real-world application and design its relational schema with appropriate keys.
2. Convert given relational algebra expressions into equivalent SQL queries.

UNIT II : DATABASE DESIGN 9

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model –ER Design Issues - Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form- Join Dependencies and Fifth Normal Form

Coding Exercises:

1. Draw ER diagrams for given problem statements using database design tools.
2. Convert ER diagrams into relational schemas with constraints.
3. Normalize unnormalized tables up to 3NF and BCNF.

Problem-Solving Assignments:

1. Design a complete database schema for a real-world system (Library, Hospital, Banking).
2. Analyze functional dependencies and perform lossless decomposition.

UNIT III : TRANSACTIONS

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

Coding Exercises:

1. Write SQL programs demonstrating COMMIT, ROLLBACK, and SAVEPOINT.
2. Simulate concurrent transactions and observe isolation issues.
3. Implement simple locking behavior using transaction blocks.

Problem-Solving Assignments:

1. Analyze given schedules and determine their serializability.
2. Identify deadlock scenarios and propose suitable prevention techniques.

UNIT IV : PHYSICAL STORAGE AND INDEXING TECHNIQUES 9

Overview of Physical Storage Media - Magnetic Disks - RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Measure the Cost Estimation.

Coding Exercises:

1. Create indexed tables and analyze query performance.
2. Implement SQL queries using indexed attributes and compare execution cost.
3. Simulate hashing techniques using simple programs.

Problem-Solving Assignments:

1. Compare different indexing techniques and justify their use in specific scenarios.
2. Estimate query execution costs for given query plans.

UNIT V : ADVANCED TOPICS 9

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object- based Databases: Object Database Concepts, Object-Relational features - XML Databases: XML Hierarchical Model, purpose of XML -Information Retrieval: IR Concepts and Advantages.

Coding Exercises:

1. Write XML documents and query them using basic XML techniques.
2. Implement object-relational features using user-defined types.
3. Simulate distributed database queries using multiple schemas.

Problem-Solving Assignments:

1. Design a distributed database architecture for a multi-branch organization.
2. Compare relational, object-relational, and XML databases for specific applications.

LIST OF EXPERIMENTS

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Implement Relational model to entitle ann strong and weak entities.
3. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
4. Views, Sequences, Synonyms.
5. Database Programming: Implicit and Explicit Cursors.
6. Procedures and Functions.
7. Triggers.
8. Exception Handling.
9. Database Design using ER modelling, normalization and Implementation for any application. 10. Database Connectivity with Front End Tools.
11. Case Study using real life database applications.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Explain the fundamentals of data models, relational algebra and SQL.
- Apply ER diagrams and normalization techniques in database applications.
- Analyze transaction processing, concurrency control techniques and recovery procedures for database transactions.
- Analyze the internal storage structures and indexing techniques for improving the database design.
- Analyze the different database structures and information retrieval techniques for efficient data management.
- Implement SQL programming and database connectivity for real world application development.

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, -Database System Concepts, Sixth Edition, Tata McGraw Hill,2011.

2. Ramez Elmasri, Shamkant B.Navathe,-Fundamentals of Database Systems, Sixth Edition, Pearson Education,2011.

REFERENCES

1. C.J.Date,A.Kannan,S.Swamynathan,"An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, "Database Management Systems", 4th Edition, McGraw–Hill College Publications, 2015.

E-RESOURCES

1. https://nptel.ac.in/courses/106/105/106105175/ (Introduction to DBMS)
2. https://nptel.ac.in/courses/106/106/106106093/ (Conceptual Designs)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	3	1	–	1	1	–	2	3	3
2	3	3	3	2	3	1	1	1	1	1	2	3	3
3	3	3	3	3	3	1	1	1	1	1	3	3	3
4	3	3	3	3	3	1	–	1	1	1	3	3	3
5	3	3	3	3	3	2	1	1	1	1	3	3	3
6	3	3	3	3	3	2	1	2	2	2	3	3	3
AVG	3.0	3.0	2.8	2.7	3.0	1.3	1.0	1.2	1.2	1.2	2.7	3.0	3.0

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

Chairman - BoS

23ECE404 **EMBEDDED SYSTEMS AND IoT** L T P C
(Lab Embedded Theory Course) 3 0 2 4

OBJECTIVES

- To introduce the Concepts of 8086 & 8085 addressing modes.
- To enhance the Assembly language programming and interfacing.
- To discuss the layers of IoT and specifications .
- To gain knowledge on electrostatic transducer and Ultrasonic Sensors.
- To impact knowledge on Raspberry pi 3 and IP address.
- To familiarize the concept 8086 programs and the Raspberry pi interfacing.

UNIT I THE 8085 & 8086 MICROPROCESSOR 9

Introduction to Microprocessor (8085, 8086) 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 MICROCONTROLLER & ITS INTERFACING 9

Architecture of 8051 - Special Function Registers (SFRs) - I/O Pins Ports and Circuits – Instruction set- Addressing modes-Assembly language programming. Programming8051Timers- Serial Port Programming-Interrupts Programming-LCD&Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation- Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

UNIT III LAYERS OF IoT 9

Purpose and requirement specification, IoT level specification, Functional view specification, Operational view specification, Device and component integration, Pillars of Embedded IoT and Physical Devices: The internet of devices.

UNIT IV SENSORS AND TRANSDUCERS 9

Principles – Classification – Parameters – Characteristics – Environmental Parameters (EP) – Characterization. -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors: Electrostatic Transducer– Force/Stress Sensors Using Quartz Resonators – Ultrasonic Sensors.

UNIT V RASPBERRY PI 3 AND ITS CONFIGURATION 9

Raspberry Pi 3 - Rpi3 introduction and installing the Raspbian Stretch OS, Headless - Computer and Rpi3 configuration to connect through SSH via Ethernet, Headless - connecting Rpi3 remotely without Ethernet cable via SSH, IP address, Rpi 3 - Testing the GPIO pins through Scripts.

LIST OF EXPERIMENTS

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations.
2. Move a data block without overlap.
3. Ascend'ng Descending Order.
4. Stepper motor control.
5. Keyboard and Display.
6. A/D and D/A interface and Waveform Generation.

Raspberry Pi and Interfacing Experiments

1. Coding simple programs in Python.
2. Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.
3. Raspberry Pi interact with online services through the use of public APIs and SDKs.
4. Understanding the connectivity of Raspberry-Pi with IR sensor. Write an application to detect obstacle and notify user using LEDs.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Analyze the concepts of 8086 & 8085 architecture.
- Discuss the different interfacing peripheral devices.
- Describe the characteristics and standards relating to IoTs.
- Discuss the classification of sensors and Transducers.
- Analyze the Raspberry Pi 3 and its configuration.
- Design 8086 processors and Raspberry Pi programs.

TEXTBOOKS

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin Mc Kinlay,"The 8051 Microcontroller and Embedded Systems:Using Assembly and C",Second Edition, Pearson education,2011.
2. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, "Internet of Things", Second Edition, John Wiley and Sons,2020.

REFERENCES

1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.
2. Cuno Pfister, "Getting Started with the Internet of Things", First Edition, Shroff Publisher/Maker Media, 2011.

E-RESOURCES

1. https://nptel.ac.in/courses/108/105/108105102/ (Microprocessors and Microcontrollers)
2. https://freevideolectures.com/course/4638/nptel - introduction - internet things (Interoperability in IoT, Introduction to Arduino Programming)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	1	-	-	-	-	-	-	2	1
2	3	3	2	2	2	-	--	-	-	-	-	2	2
3	2	2	3	3	3	2	1	-	-	-	-	3	2
4	2	2	2	2	2	1	1	-	-	-	-	2	2
5	2	2	3	2	3	-	-	-	-	-	-	2	2
6	3	3	3	3	2	-	-	-	-	-	-	3	3
AVG	2.5	2.3	2.5	2.3	2.2	1.0	0.3	-	-	-	-	2.3	2.0

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

Chairman - BoS

23EEC401 ONLINE COURSE COMPLETION L T P C
3 0 0 3

Students may be permitted to study online courses (NPTEL, SWAYAM or any Proctored Assessment Certification Courses) with 3 credits during the 4th semester curriculum for all B.E./B.Tech. Programmes. Such courses offered to students shall be recommended by the Department Academic Committee (DAC). The DAC shall ensure that the courses offered are not core courses in their respective curriculum.

The number of credits and transfer of credits are based on the procedure explained in following Table. The mapping of marks with grades is applicable only if the student passes the course as per the guidelines of NPTEL.

S.No.	No. of Weeks	Credits
1	4	1
2	8	2
3	12	3
4	16	4

Chairman - BoS

SEMESTER V

23CST402	AUTOMATA THEORY	L T P C
		3 1 0 4

OBJECTIVES

- To enable students to understand the hierarchy of formal languages and their classifications.
- To train students to construct appropriate automata for given language patterns and derive their equivalent regular expressions.
- To guide students in formulating context-free grammars and related computational models for specified languages.
- To impart knowledge on the structure and functional phases of a compiler.
- To develop students' skills in applying various parsing and optimization techniques used in compiler design.

UNIT I AUTOMATA FUNDAMENTALS 9+3

Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Memory required to recognize a Language – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions – Minimal Finite Automata.

Problem-Solving Assignments:

1. Construct DFA and NFA for given languages and convert NFA to equivalent DFA.
2. Minimize a given DFA and analyze its state reduction.

UNIT II REGULAR EXPRESSION AND REGULAR LANGUAGES 9+3

Regular Languages and Regular Expressions – Kleene's Theorem – Pumping Lemma for Regular Languages – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages.

Problem-Solving Assignments:

1. Derive regular expressions for given finite automata and vice versa.
2. Apply the Pumping Lemma to prove that a given language is not regular.

UNIT III CONTEXT FREE GRAMMARS AND PUSH DOWN AUTOMATA 9+3

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata – Normal Forms- Turing Machines Programming Techniques for TM.

Problem-Solving Assignments:

1. Construct CFGs and PDAs for given languages and verify their equivalence.
2. Identify ambiguity in grammars and convert grammars into normal forms.

UNIT IV INTRODUCTION TO COMPILERS 9+3

The structure of compiler – Lexical analysis: Role of Lexical analyzer – Input buffering – Specification and recognition of tokens –The lexical analyzer generator Lex. Finite Automata – Regular Expressions to Automata – Minimizing DFA- Semantic Analysis- Intermediate Code Generation- Optimization- Code Generation.

Problem-Solving Assignments:

1. Design lexical analyzers for simple programming language constructs.
2. Analyze sample code to generate intermediate representations and optimized code.

UNIT V OPTIMIZATION TECHNIQUES 9+3

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers – LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator.

Problem-Solving Assignments:

1. Construct parsing tables (LL, SLR, LR, LALR) for given grammars.
2. Compare top-down and bottom-up parsing techniques for efficiency and ambiguity handling.

TOTAL:60 PERIODS

OUTCOMES

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

- Implementation of automata, regular expression for any pattern.
- Apply the context free grammar for any construct.
- Design Pushdown automata for any language.
- Understand the different phases of compiler.
- Design a lexical analyzer for a sample language.

TEXT BOOKS

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Pearson Education, Second Edition ,2003.
2. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, "Compilers: Principles, Techniques and Tools", Dorling Kindersley(India) Pvt Ltd., 2011.

REFERENCES

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation",Second Edition ,PHI, 2003.

2. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence–based Approach", Morgan Kaufmann Publishers, 2002.

E – RESOURCES

1. https://nptel.ac.in/courses/106/104/106104028/ (Automata Theory)
2. https://nptel.ac.in/courses/106/108/106108052/ (Compiler Design)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	1	–	1	1	–	2	3	3
2	3	3	2	3	3	1	–	1	1	–	2	3	3
3	3	3	3	3	3	1	1	1	1	–	2	3	3
4	3	3	3	3	3	2	1	1	1	1	3	3	3
5	3	3	3	2	3	3	1	1	1	2	3	3	3
AVG	3.0	3.0	2.6	2.6	2.8	1.6	1.0	1.0	1.0	1.5	2.4	3.0	3.0

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

Chairman - BoS

23ITE501	FULL STACK WEB DEVELOPMENT	L T P C 3 0 2 4

OBJECTIVES

- To gain knowledge about the fundamental concept of HTML to structure web content.
- To explore the different CSS style sheets for designing web pages.
- To develop dynamic and interactive web applications using JavaScript.
- To foster the students with modern web development frameworks like REACT JS and NODE JS.
- To explore SQL, NoSQL and Mongo DB database techniques to develop web applications.
- To develop web application services using basic and advanced web development frameworks.

UNIT I HTML 9

Introduction to HTML-Browsers and HTML-Editor's Offline and Online-Tags, -Attribute and Elements-Doctype Element-Comments-Headings, Paragraphs, and Formatting Text-Lists and Links-Images and Tables.

Coding Exercises:

1. Develop a student registration form using input fields, radio buttons, checkboxes, and submit button.
2. Design a college profile webpage using headings, paragraphs, bold, italic, and underline tags.
3. Insert images with alt text and create a table to display student marks.

Problem-Solving Assignments:

1. Analyze a faulty HTML file and identify syntax, nesting, and attribute errors. Submit a corrected version with justification.
2. Convert a given unstructured text document into a properly structured HTML document using headings, lists, tables, and links.

UNIT II CSS 9

Introduction CSS-Applying CSS to HTML-Selectors, Properties and Values-CSS Colors and Backgrounds-CSS Box Model-CSS Margins, Padding, and Borders-CSS Text and Font Properties-CSS General Topics.

Coding Exercises:

1. Design a webpage layout using CSS box model concepts (margin, padding, border) without using tables.
2. Develop a responsive webpage using CSS properties that adapts to desktop and mobile screens.
3. Create a styled navigation bar using CSS

Problem-Solving Assignments:

1. Refactor a given CSS file to remove redundancy, improve readability, and follow naming conventions.
2. Identify and fix layout breakage issues caused by incorrect CSS selector usage and box model calculations.

UNIT III JAVASCRIPT 9

Introduction to JavaScript-Applying JavaScript (internal and external)-Understanding JS Syntax-Introduction to Document and Window Object-Variables and Operators-Data Types and Num Type Conversion-Math and String Manipulation-Objects and Arrays-Date and Time-Conditional Statements-Switch Case –Looping in JS-Functions

Coding Exercises:

1. Develop a JavaScript-based interactive application (calculator / quiz / number game) using functions, loops, and conditions.
2. Create a dynamic webpage where elements are created, updated, and removed using JavaScript DOM methods.
3. Write a JavaScript program to display alert and prompt messages.

Problem-Solving Assignments:

1. Implement JavaScript-based form validation for login and registration pages without using libraries.
2. Debug a given JavaScript program containing logical, syntactical, and runtime errors and document the corrections.

UNIT IV ReactJS AND NodeJS

Introduction and Templating using JSX-Components,Lifecycle, State and Props-Rendering List and Portals-Error Handling and Routers-Redux and Redux Saga-Immutable.js-Service Side Rendering-Unit Testing-Webpack-Node js Overview and Basics-Node js Console and Command Utilities-Node js Modules and Concepts-Node js Events and Node js with Express js-Node js Database Access

Coding Exercises:

1. Write a Node.js program to print system information.
2. Build a to-do list app using React
3. Design a Node.js application using multiple modules for routing, logic, and database access.

Problem-Solving Assignments:

1. Implement a React application demonstrating state updates using user interaction (counter, voting system).

2. Connect a React frontend with a Node.js backend and exchange data using REST APIs.

UNIT V MangoDB and Applications 9

SQL and NoSql Concepts-Create and Manage MongoDB-Migration of Data into MongoDB-MongoDB with PHP-MongoDB with NodeJS-Services Offered by MongoDB-Developing a Python Application-Connect MongoDB with Python.

Coding Exercises:

1. Develop a Python application to connect MongoDB, retrieve data, and generate reports.
2. Design a MongoDB schema for a real-world application (student management / e-commerce / library system).
3. Connect MongoDB with Node.js and perform queries.

Problem-Solving Assignments:

1. Identify the CRUD Implementation Taskto Create, Read, Update, and Delete operations using MongoDB.
2. Analyze how to Migrate relational data into MongoDB and justify the schema design choices.

LIST OF EXPERIMENTS

1. Write a program to create a simple webpage using HTML.
2. Write a program to create a website using HTML CSS and JavaScript
3. Write a program to build a Chat module using HTML CSS and JavaScript
4. Write a program to create a simple calculator Application using React JS
5. Write a program to create a voting application using React JS
6. Write a program to create and Build a Password Strength Check using Jquery
7. Write a program to create and Build a star rating system using Jquery
8. Create a Simple Login form using React JS
9. Using the CMS users must be able to design a web page using the drag and drop method.
10. Create a project on Grocery delivery application

TOTAL: 45+15 = 60 PERIODS

OUTCOMES

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

- Explain the fundamental concept of HTML to structure web content effectively.
- Design web pages using CSS by incorporating layout and responsive design.
- Develop dynamic and interactive web applications using JavaScript.
- Analyze modern web development frameworks like REACT JS and backend technologie using NODE JS.

- Apply Mongo DB database interaction techniques to develop applications leveraging SQL and NoSQL.
- Implement web application services using basic and advanced web development frameworks.

TEXT BOOKS

1. Chris Northwood," The Full stack developer: Your Essential guide to the everyday skills Expected of a Modern full Stack Developer",Apress,First Edition,2022.
2. Riaz Ahmed, "Full Stack Web Development for Beginners:complete E-commerce project",First Edition, Independent publication,2021.

REFERENCES

1. Flask, By Jack Chan, Ray Chung, Jack Huang"Python API Development Fundamentals: Develop a full-stack web application with Python",First Edition,2019.
2. Edwin Ross Torres,"Full Stack Web Development: Round One – Begin!",Second Edition, 2020.

E-RESOURCES

1. https://archive.nptel.ac.in/courses/106/106/106106156/ (Full Stack Web Development)
2. https://www.digimat.in/nptel/courses/video/106106156/L01.html (Introduction to Modern Application

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	2	-	-	-	-	-	3	3	3
2	3	3	2	1	2	-	-	-	-	-	3	3	3
3	3	3	3	2	3	-	-	-	-	-	3	3	3
4	3	3	3	2	3	2	-	-	-	3	3	3	-
5	3	3	3	3	3	-	-	-	2	2	3	3	3
6	3	3	3	2	3	2	3	3	2	2	3	3	3
AVG	3.0	2.8	2.5	1.8	2.7	2.0	3.0	3.0	2.0	2.3	3.0	3.0	3.0

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

Chairman - BoS

23CSE501	COMPUTER NETWORKS (Common to CSE, CSE-CS, IT and AI&DS).	L T P C 3 0 2 4

OBJECTIVES

- To introduce the concepts of fundamentals and layering in networks.
- To gain knowledge about data link layer and media access protocols mechanism.
- To familiarize the students with functions of network layer and various routing protocols.
- To impart the knowledge on functions and protocols of the Transport layer.
- To train the students to understand the application layer protocols and its function.
- To implement the protocols and network algorithms in data communication.

UNIT I INTRODUCTION AND PHYSICAL LAYER 9

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

Coding Practices:

1. Develop a program to simulate layered network communication and analyze data flow across layers.
2. Implement a simulation comparing circuit switching and packet switching techniques.

Problem-Solving Assignments:

1. Analyze different network types and justify their suitability for specific applications.
2. Compare OSI and TCP/IP models with respect to functionality and performance.

UNIT II DATA-LINK LAYER & MEDIA ACCESS 9

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols HDLC– PPP – Media Access Control – Wired LANs: Ethernet – Introduction to Wireless LANs – IEEE802.11, Bluetooth — Connecting Devices.

Coding Practices:

1. Implement framing, error detection, and flow control mechanisms.
2. Develop a basic wireless communication model demonstrating MAC layer functionality.

Problem-Solving Assignments:

1. Analyze the efficiency of different MAC protocols under varying network loads.
2. Evaluate wired and wireless LAN technologies based on performance and scalability.

UNIT III NETWORK LAYER

Network Layer Services – Packet switched networks – Performance – IPV4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

Coding Practices:

1. Implement IPv4 and IPv6 address allocation and packet forwarding logic.

2. Simulate Distance Vector and Link State routing algorithms.

Problem-Solving Assignments:

1. Analyze routing algorithm performance under dynamic network conditions.
2. Compare IPv4 and IPv6 addressing schemes and justify the need for IPv6.

UNIT IV TRANSPORT LAYER 9

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.– Congestion Control and Techniques.

Coding Practices:

1. Implement UDP and TCP socket-based communication applications.
2. Simulate TCP congestion control mechanisms such as slow start and congestion avoidance.

Problem-Solving Assignments:

1. Analyze reliability and performance differences between TCP and UDP.
2. Evaluate congestion control techniques under varying traffic conditions.

UNIT V APPLICATION LAYER 9

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

Coding Practices:

1. Develop an HTTP client-server application to transfer web resources.
2. Implement FTP and Email protocol simulations.

Problem-Solving Assignments:

1. Analyze application layer protocol behavior and performance.
2. Evaluate security considerations in remote access and network management protocols.

LIST OF EXPERIMENTS

1. Learn to use commands like tcp dump, netstat, ifconfig, nslookup and trace route. Captureping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like:
   a. Echo client and echo server b. Chat c. File Transfer
4. Write a program for congestion control using Leaky Bucket Algorithm.
5. Simulation of DNS using UDP sockets.
6. Write a code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/I 'DP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.

TOTAL : 45+15 = 60 PERIODS

OUTCOMES

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

- Explain the fundamental concepts of networks, their types, and the layered architecture models
- Analyze the functionalities of the Data-Link Layer and Media Access protocols, including wired and wireless communication.
- Apply the network layer concepts, including IPv4/IPv6 addressing and routing algorithms.
- Analyze the transport layer protocols and their mechanisms like flow control, congestion control and reliable data delivery.
- Utilize the various application layer protocols in network communication.
- Implement the networking protocols and algorithms for effective data communication

TEXT BOOKS

1. Behrouz A Forouzan "Data Communication and Networking", Mcgraw Hill, Fourth Edition, 2016.
2. William Stallings, "Data and Computer Communications", Pearson Education, Tenth Edition, 2013.

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers Inc., Fifth Edition, 2012.
2. Nader F. Mir, "Computer and Communication Networks", Prentice Hall, Second Edition,2014.

E – RESOURCES

1. https://nptel.ac.in/courses/106/106/106106091/ (Introduction to Computer Networks)
2. https://nptel.ac.in/courses/106/105/106105082/ (Computer Networks)

Mapping of COs-POs & PSO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1	3	1	–	1	1	–	2	3	3
2	3	3	3	2	3	1	1	1	1	–	2	3	3
3	3	3	3	3	3	1	1	1	1	1	3	3	3
4	3	3	3	3	3	2	1	1	1	1	3	3	3
5	3	2	3	2	3	2	1	1	2	1	2	3	3
6	3	3	3	3	3	2	1	2	2	2	3	3	3
AVG	3.0	2.8	2.8	2.3	3.0	1.5	1.0	1.2	1.3	1.3	2.5	3.0	3.0

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

Chairman - BoS

23EEC501	INDUSTRIAL TRAINING	L T P C 0 0 4 2

Students shall undergo Industrial Training for duration of four weeks carrying 2 credits during the Fifth Semester for all B.E./B.Tech. Programmes. The industry/organization shall be selected with the approval of the Head of the Department. Alternatively, the concerned department may arrange industrial training through an industry expert relevant to the student's discipline of study.

A faculty member nominated by the Head of the Department shall act as the faculty coordinator and shall be responsible for the periodic monitoring and evaluation of the student's progress during the training period.

Duration of Industrial Training	Credits
2 Weeks	1
4 Weeks	2

*1 week of Industrial Training = 40 hours.

Chairman - BoS

SEMESTER VI

23ITE601	MOBILE COMPUTING	L T P C 3 0 2 4

OBJECTIVES

- To explore the basic concepts of mobile computing.
- To introduce basics of mobile telecommunication system.
- To familiarize students with the network layer protocols and Ad–Hoc networks.
- To impart knowledge on basis of transport and application layer protocols.
- To introduce the various applications of Mobile OS.
- To develop sample mobile applications using mobile platform development.

UNIT I INTRODUCTION 9

Introduction to Mobile Computing – Mobile Computing Applications – Generations of Mobile Communication Technologies – Characteristics of Mobile computing – Structure of Mobile Computing Application – MAC Protocols – SDMA – TDMA – FDMA – CDMA.

Coding Exercises:

1. Develop a simulation model illustrating mobile computing architecture
2. Implement a comparison program for multiple MAC protocols
3. Create a module demonstrating multiple access techniques (TDMA, FDMA, CDMA)

Problem-Solving Assignments:

1. Analyze the evolution of mobile communication technologies
2. Compare different MAC protocols in terms of efficiency and scalability

UNIT II MOBILE TELECOMMUNICATION SYSTEM 9

Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS – UMTS – Architecture – Handover – Security.

Coding Exercises:

1. Simulate GSM network architecture components
2. Implement a frequency allocation and handover scenario
3. Develop a mobility management workflow model

Problem-Solving Assignments:

1. Compare GSM, GPRS, and UMTS architectures
2. Analyze security challenges in cellular communication systems

UNIT III MOBILE NETWORK LAYER 9

Mobile IP – Key Mechanism in Mobile IP – DHCP – Ad Hoc – Proactive protocol – DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing – ZRP, Multicast Routing – ODMRP, Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

Coding Exercises:

1. Implement Mobile IP address binding simulation
2. Simulate routing protocols (DSDV, AODV)
3. Create a basic VANET routing model

Problem-Solving Assignments:

1. Evaluate routing protocol performance in MANETs
2. Analyze security threats in Ad-Hoc networks

UNIT IV MOBILE TRANSPORT AND APPLICATION LAYER 9

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

Coding Exercises:

1. Simulate Mobile TCP performance under mobility
2. Develop a simple WAP-based application
3. Create WML pages for mobile access

Problem-Solving Assignments:

1. Compare Mobile TCP with traditional TCP
2. Analyze the role of WAP in mobile communication

UNIT V MOBILE PLATFORMS AND APPLICATIONS 9

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

Coding Exercises:

1. Develop an Android application using basic UI components
2. Implement database connectivity in a mobile application
3. Create a mobile payment simulation module

Problem-Solving Assignments:

1. Compare mobile operating systems based on architecture and features
2. Analyze security issues in mobile commerce applications

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Develop an application that uses GUI components ,Font and Colors
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager.

6. Implement an application that uses Multi-threading.
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs(Mini Project)

TOTAL: 45+15 = 60 PERIODS

OUTCOMES

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

- Apply the basics of mobile telecommunication systems.
- Apply the various of telecommunication systems in wireless networks.
- Understand the functionality of mobile IP and Router perfects for MANET.
- Analyze the functionality of Transport and Application layers.
- Analyze the android/blackberry/ios/Windows SDK mobile application.
- Implement mobile applications that perform data storage and retrieval using databases.

TEXT BOOKS

1. Jochen Schiller,Mobile Communications", Pearson India, Third Edition 2015.
2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, New Delhi, Second Edition 2015.

REFERENCES

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", Tata McGraw Hill, Second Edition 2015.
2. Theodore S.Rappaport," Wireless Communications – Principles and Practice", Pearson Education India, Second Edition 2015.

E – RESOURCES

1. https://nptel.ac.in/courses/106/106/106106147/ (Introduction to Mobile Computing)
2. https://nptel.ac.in/courses/117/102/117102062/ (Wireless Communication)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	-	-	-	-	-	-	2	2
2	3	3	2	2	2	2	-	-	-	-	-	3	3
3	3	3	3	2	3	2	-	-	-	-	-	3	3
4	3	2	2	2	3	2	-	-	-	-	-	3	3
5	2	2	3	1	3	2	-	-	-	-	-	3	2
6	3	3	3	2	3	2	-	-	-	2	2	3	3
AVG	2.8	2.5	2.5	1.7	2.7	2.0	-	-	-	2.0	2.0	2.8	2.7

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

Chairman - BoS

23CSE602 CLOUD COMPUTING L T P C
3 0 2 4

OBJECTIVES

- To impart fundamental knowledge of cloud computing concepts, architecture and deployment models
- To develop students' understanding of cloud service models, virtualization technologies, and resource management techniques.
- To train students in designing secure cloud infrastructures using networking, identity management, monitoring, and disaster recovery mechanisms.
- To enable students to develop cloud-native applications using microservices, containers, serverless computing, and DevOps practices.
- To familiarize students with leading cloud platforms, Infrastructure as Code (IaC), cloud storage, databases, and cost optimization techniques.
- To foster the students to real-world cloud computing case studies, industry tools, and hands on cloud environment development.

UNIT I CLOUD COMPUTING FOUNDATIONS 9

Definition of Cloud Computing (NIST)- Cloud Evolution- Deployment Models- (Public, Private, Hybrid, Community)- Characteristics of Cloud-Cloud Economics- Total Cost of Ownership (TCO), Service Level Agreements (SLA)-Cloud Architecture- Shared Responsibility Model- Cloud Regions and Availability Zones.

Coding Exercises:

1. Develop a simple program to calculate and compare Total Cost of Ownership (TCO) for on-premise vs cloud infrastructure.
2. Create a simulation that maps application components to the shared responsibility model.

Problem-Solving Assignments:

1. Analyze an organization's IT requirements and recommend an appropriate cloud deployment model with justification.
2. Evaluate cloud adoption benefits using SLA and cloud economic parameters.

UNIT II CLOUD SERVICES 9

Defining IaaS – PaaS – SaaS – IdaaS – CaaS – Platforms – using virtualization techniques – load balancing and virtualization – understanding hypervisors – machine imaging – porting applications – capacity planning – exploring platform as a service.

Coding Exercises:

1. Develop a basic virtual machine or container configuration script using a cloud platform simulator.
2. Implement a load-balancing logic simulation to distribute incoming requests.

Problem-Solving Assignments:

1. Classify real-world applications under suitable cloud service models with justification.
2. Compare virtualization techniques and justify their use in different cloud scenarios

UNIT III CLOUD INFRASTRUCTURE & SECURITY 9

Cloud Networking- Virtual Private Cloud (VPC)- Identity and Access Management (IAM)- Data Encryption- Cloud Security Best Practices- Monitoring and Logging- Disaster Recovery- Backup Strategies- Mobile Cloud Computing.

Coding Exercises:

1. Develop a basic IAM policy simulation for role-based access control.
2. Create a monitoring script to log resource usage and generate alerts.

Problem-Solving Assignments:

1. Identify security threats in a given cloud architecture and recommend mitigation strategies.
2. Design a disaster recovery and backup plan for a cloud-based application.

UNIT IV CLOUD-NATIVE APPLICATIONS 9

Service Oriented Architecture (SOA)- Microservices Architecture- RESTful Web Services- API Management- Container Orchestration (Kubernetes)- Serverless Computing- CI/CD Pipelines, DevOps in Cloud.

Coding Exercises:

1. Develop a simple RESTful API for a cloud-native application.
2. Implement a basic CI/CD pipeline workflow using cloud DevOps tools.

Problem-Solving Assignments:

1. Compare monolithic and microservices architectures for cloud deployment.
2. Design a cloud-native application architecture using containers and serverless services.

UNIT V CLOUD PLATFORMS & CASE STUDIES 9

Amazon Web Services (AWS)- Microsoft Azure- Google Cloud Platform (GCP)- Infrastructure as Code (IaC)- Terraform Basics- Cloud Databases- Cloud Storage-Cost Optimization- Real-Time Industry Case Studies.

Coding Exercises:

1. Write a Terraform script to provision basic cloud infrastructure resources.
2. Implement a program to compare cloud storage and database service costs.

Problem-Solving Assignments:

1. Analyze an organization's IT requirements and recommend an appropriate cloud deployment model with justification.
2. Evaluate cloud adoption benefits using SLA and cloud economic parameters.

LIST OF EXPERIMENTS

1. Installation and Configuration of Hadoop.
2. Cloud Storage and File Management using Hadoop HDFS
3. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
4. Implementation of Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual Box and Guest OS.
5. Cloud Service Deployment using Google App Engine.
6. Create and Deploy Containers using Kubernetes (Minikube).
7. Case Study: AWS Architecture Design
8. Implement CI/CD Pipeline using GitHub Actions / Jenkins.

TOTAL: 45+15 = 60 PERIODS

OUTCOMES

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

- Explain fundamental concepts, architecture and deployment models of cloud computing
- Analyze cloud service models, virtualization technologies, hypervisors, and resource provisioning techniques for different cloud applications
- Design secure cloud infrastructures by applying networking and security mechanisms
- Develop cloud-native applications using microservices, RESTful services, containers, Kubernetes, serverless computing, and DevOps practices
- Analyze the cloud platforms, Infrastructure as Code (Terraform), cloud databases, cloud storage, and cost optimization strategies to recommend suitable cloud
- Implement cloud based solutions for real-time industry case studies considering performance and security.

TEXT BOOKS

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley,First Edtion, First Edition, 2011.
2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2015.

REFERENCES

1. Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", Pearson, First Edition, 2013.
2. Rajkumar Buyya, "Mastering Cloud Computing", McGraw-Hill, Second Edition, 2024.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc20_cs20/preview (Cloud Computing)
2. https://onlinecourses.nptel.ac.in/noc26_cs55 (Introduction to Cloud Computing)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	2	1	1	1	2	3	3	3
2	3	3	3	2	3	2	1	1	1	2	3	3	3
3	3	3	3	3	3	2	3	2	1	2	3	3	3
4	3	3	3	3	3	2	1	2	2	2	3	3	3
5	3	3	3	2	3	3	1	2	1	3	3	3	3
6	3	3	3	3	3	3	2	3	2	3	3	3	3
AVG	3.0	2.8	2.8	2.3	2.8	2.3	1.5	1.8	1.3	2.3	3.0	3.0	3.0

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

Chairman - BoS

23EEJ601 PROJECT WORK – PHASE I L T P C
0 0 8 4

OBJECTIVES

- To develop knowledge to formulate a real world problem and projects goals.
- To identify the various tasks of the project to determine standard procedures.
- To identify and learn new tools, algorithms and techniques.
- To understand the various procedures for validation of the product and analysis the cost effectiveness.
- To understand the guideline to Prepare report for oral demonstrations.

PROCESS DESCRIPTION

- For Project work out of 100 marks, the maximum marks for Continuous Internal Assessment is fixed as 60 and the End Semester Examination (project report evaluation and viva voce examination) carries 40 marks. Project work may be assigned to a single student or to a group of students, not exceeding 4 per group.
- The project work shall be undertaken by students either in industry or in the college.
- The total credit for project work in semester VI is 4.
- There shall be three reviews (Zeroth Review,(Review I and Review II, each 100 marks)) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of three members in the review committee.
- The committee shall consist of the Supervisor, Project Coordinator and one of the faculty members.
- Sixty percentage of Project work to be completed in this Project Work - Phase I.
- The student(s) is expected to submit the project report on or before the last working day of the semester. The ESE for the project work shall consist of the evaluation of the final project report submitted by the student or students of the project group by an external examiner, followed by a viva-voce examination conducted separately for each student by a committee consisting of the external examiner and an internal examiner (other than supervisor). The project coordinator shall be the internal examiner. The COE shall appoint the External Examiner for the ESE of the Project Work. The project report shall be submitted as per the approved guidelines given by Controller of Examinations.

OUTCOMES

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

- Formulate real-world problems.
- Design and express technical solutions using appropriate tools and techniques.

- Test and validate prototypes for efficiency and cost-effectiveness, and present their work effectively through reports and oral demonstrations.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
Mapping outcome	3	3	3	3	3	3	3	3	3	3	3	3	3

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

Chairman - BoS

SEMESTER VII

23HST701	HUMAN VALUES AND ETHICS	L T P C
		3 0 0 3

OBJECTIVES

- To introduce students to the core democratic values such as equality, liberty, justice, pluralism, and citizen participation through key world democratic movements.
- To familiarize students with the concept of secular values and the interpretation of secularism in the Indian context, emphasizing state neutrality and non-discrimination.
- To develop scientific values by introducing scientific thinking, methods of inquiry, hypothesis testing, skepticism, empiricism, and rationalism.
- To sensitize students to social ethics by applying ethical reasoning to issues such as gender bias, violence, social discrimination, and inclusive practices.
- To impart an understanding of scientific ethics by emphasizing transparency, fairness, and the social responsibility of scientists in the application of scientific inventions.

UNIT I DEMOCRATIC VALUES 9

Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World Democracies: French Revolution, American Independence, Indian Freedom Movement.

UNIT II SECULAR VALUES 9

Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices. Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani.

UNIT III SCIENTIFIC VALUES 9

Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, Validating facts using evidence based approach – Skepticism and Empiricism –Rationalism and Scientific Temper.

UNIT IV SOCIAL ETHICS 9

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

UNIT V SCIENTIFIC ETHICS 9

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.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain fundamental democratic values and analyze their application in the French Revolution, American Independence, and Indian Freedom Movement.
- Explain secularism in India and demonstrate an understanding of religious neutrality, acceptance of all faiths, and non-discriminatory practices.
- Apply scientific methods and evidence-based reasoning to analyze problems, validate facts, and demonstrate scientific temper.
- Analyze social problems using ethical frameworks and identify constitutional protections and policies that promote equity and inclusion.
- Evaluate ethical issues in scientific practices and demonstrate responsible decision-making for the societal use of scientific advancements.

TEXT 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.

REFERENCES

1. John R. Shook, "The Oxford Handbook of Secularism", Oxford University Press, 2017.
2. Gabriel A. Almond and Sidney Verba, "The Civic Culture: Political Attitudes and Democracy in Five Nations", Princeton University Press,2016.
3. Dr.E.Gnanasekaran, "Human values and ethics", Lakshmi Pubication, 2021

E-RESOURCES

1. https://nptel.ac.in/courses/109104068 (Exploring Human Values)
2. https://nptel.ac.in/courses/109106117 (Ethical Theory)

Mapping of COs-POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	-	-	-	-	-	3	3	-	2	-	2	1	1
2	-	-	-	-	-	3	3	-	2	-	2	1	1
3	2	3	-	3	-	-	-	-	-	-	2	1	1
4	-	2	-	-	-	3	3	1	1	-	1	1	1
5	-	2	-	-	-	3	3	1	1	-	1	1	1
AVG.	2	2.3	-	3	-	3	3	1	1.5	-	1.6	1	1

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

Chairman - BoS

23EEJ701 PROJECT WORK - PHASE - II L T P C
0 0 8 4

OBJECTIVES

- To develop knowledge to formulate a real world problem and projects goals.
- To identify the various tasks of the project to determine standard procedures.
- To identify and learn new tools, algorithms and techniques.
- To understand the various procedures for validation of the product and analysis the cost effectiveness.
- To understand the guideline to Prepare report for oral demonstrations.

PROCESS DESCRIPTION

- Continuation of Project Work – Phase I.
- For Project work out of 100 marks, the maximum marks for Continuous Internal Assessment is fixed as 60 and the End Semester Examination (project report evaluation and viva voce examination) carries 40 marks.
- The total credit for project work in semester VII is 4.
- There shall be two reviews (Review I and Review II, each 100 marks) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of three members in the review committee.
- The committee shall consist of the Supervisor, Project Coordinator and one of the faculty members.
- The student is expected to submit the project report on or before the last working day of the semester. The project report shall be submitted as per the approved guidelines given by Controller of Examinations. The COE shall appoint an External Examiner for the ESE of the Project Work. The ESE for the project work shall be evaluated by both the external examiner and an internal examiner. The project coordinator shall be the internal examiner.

OUTCOMES

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

- Formulate real-world problems.
- Design and express technical solutions using appropriate tools and techniques.
- Test and validate prototypes for efficiency and cost-effectiveness, and present their work effectively t' rough reports and oral demonstrations.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
Mapping outcome	3	3	3	3	3	3	3	3	3	3	3	3	3

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

Chairman - BoS

SEMESTER VIII

23EEJ801 PRODUCT DEVELOPMENT L T P C
0 0 12 6

OBJECTIVES

- To convert the completed project into a functional product or working prototype.
- To improve the product by incorporating necessary modifications.
- To prepare the required technical documents for the developed product.
- To understand the basic aspects of product quality, usability and maintenance.
- To develop professional skills through product demonstration and presentation.

COURSE DESCRIPTION

This course is to develop a product to meet the real time needs and suitable to market delivery. The product development is desirable to be the continuation of the Capstone Project completed in Project Work – Phase II. Students shall enhance the completed project into a functional product or working prototype by improving its design, performance and usability wherever applicable. The course emphasizes testing, refinement, documentation and presentation of the developed product. Students are encouraged to demonstrate the final outcome before the evaluation committee.

PROCESS DESCRIPTION

- The Product Development course shall be based on the Capstone Project completed during Project Work – Phase II.
- Students shall improve the completed project by incorporating suitable modifications and documentation to develop a functional product or working prototype, wherever applicable.
- The work may be carried out individually or in groups not exceeding four students.
- The total credits for Product Development in Semester VIII shall be 6.
- For Product Development, the maximum marks shall be 100, of which Continuous Internal
- Assessment (CIA) carries 60 marks and the End Semester Examination (ESE) carries 40 marks.
- There shall be three reviews during the semester by a Review Committee duly constituted by the Head of the Department.
- The Review Committee shall consist of:
  - Supervisor
  - Product Development Coordinator
  - One Senior faculty member

Review I

- Progress of product development
- Design improvements
- Implementation status

Review II

- Performance improvements
- Action taken on previous review suggestions.
- Documentation progress

Review III

- Final product or prototype demonstration
- Technical documentation
- Presentation
- Students shall submit a Product Development Report as per the guidelines prescribed by the Controller of Examinations.
- The End Semester Examination shall consist of product/prototype demonstration, report evaluation and viva-voce examination.
- The End Semester Examination shall be jointly evaluated by both an External Examiner and an Internal Examiner.

OUTCOMES

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

- Develop a functional product or working prototype based on the completed project.
- Improve the product to meet the intended requirements.
- Prepare technical documentation for the developed product.
- Explain the basic aspects of product quality, maintenance and future improvements.
- Demonstrate the developed product effectively through presentation and viva-voce.

Assessment Scheme

- For Product Development, out of 100 marks, the maximum marks for Continuous Internal Assessment (CIA) is fixed as 60 and the End Semester Examination (ESE) carries 40 marks.
- Continuous Assessment shall be based on the progress of product development, technical contribution, documentation and presentations made during the three reviews conducted by the Review Committee constituted by the Head of the Department.
- The End Semester Examination shall consist of the evaluation of the Product Development Report, demonstration of the developed product/prototype or the work completed, and Viva-Voce Examination.
- The evaluation shall focus on the student's critical thinking, skills and understanding of the work carried out, technical knowledge, documentation, presentation and overall contribution.
- The End Semester Examination shall be jointly evaluated by an External Examiner appointed by the Controller of Examinations and an Internal Examiner nominated by the Head of the Department.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
Mapping outcome	3	3	3	3	3	3	3	3	3	3	3	3	3

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

Chairman - BoS

23EEC801 INTERNSHIP L T P C
0 0 4 2

Students shall undergo internship of 4 weeks with 2 credits during 8th semester curriculum for all B.E. / B.Tech Programmes. The industry / organization is to be selected with the approval of Head of the Department. One faculty member approved by the Head of the department shall be responsible for the periodic monitoring and evaluation of the students' progress in the course.

Duration of Industrial Training	Credits
2 Weeks	1
4 Weeks	2

*1 week of Industrial Training = 40 hours.

Chairman - BoS

PROFESSIONAL ELECTIVE - I

Professional Elective – I

23ITP501	IMAGE AND VIDEO ANALYTICS	L T P C
	(Common to CSE, CSE-CS, IT and AI&DS)	3 0 0 3

OBJECTIVES

- To impart knowledge of the fundamentals of image processing techniques for computer vision.
- To inculcate image pre-processing techniques for image enhancement and analysis.
- To familiarize students with various object detection techniques and machine learning approaches.
- To equip students with knowledge of object recognition mechanisms for computer vision applications.
- To foster students to video analytics techniques and their real-world applications

UNIT I INTRODUCTION 9

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop an image representation system that converts color images into grayscale and stores them using suitable image data structures for efficient image analysis.
2. Design a computer vision application to classify images based on different image representation techniques and hierarchical image data structures.

UNITII IMAGE PRE-PROCESSING 9

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi-spectral images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop an image enhancement system using image smoothing, edge detection, and image restoration techniques to improve the quality of noisy images.
2. Explain the image pre-processing pipeline for an Automatic Number Plate Recognition (ANPR) system using filtering, edge detection, and image enhancement techniques.

UNITIII OBJECT DETECTION USING MACHINE LEARNING 9

Object detection–Object detection methods– Deep Learning frame work or Object detection–bounding box approach-Intersection over Union(IoU)–Deep Learning Architectures-R-CNN- Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures

PROBLEM SOLVING ASSIGNMENTS:

1. Develop a real-time object detection system using YOLO or Faster R-CNN to identify and classify objects from images or live video streams.
2. Analyze the automated quality inspection system for manufacturing industries using deep learning-based object detection to identify defective products

.UNITI V FACE RECOGNITION AND GESTURE RECOGNITION 9

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet-Gesture Recognition.

PROBLEM SOLVING ASSIGNMENTS:

- Develop a smart attendance management system using FaceNet or DeepFace to automatically recognize students and record attendance.
- Design a gesture recognition system to control smart home appliances using real-time hand gesture recognition techniques.

UNIT V VIDEOANALYTICS 9

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3.

PROBLEM SOLVING ASSIGNMENTS:

1. Write the architecture and workflow of a video analytics system for intelligent traffic monitoring using ResNet and Inception v3.
2. Analyze the performance of ResNet, GoogleNet, and Inception v3 architectures for real-time video analytics in terms of accuracy, speed, and computational complexity.

OUTCOMES

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

- Explain image processing techniques, image representations, and image data structures for computer vision applications.
- Apply image pre-processing techniques such as smoothing, edge detection, image restoration, and frequency domain processing to enhance image quality.
- Design object detection systems using machine learning and deep learning architectures such as R-CNN, Faster R-CNN, and YOLO.
- Develop face recognition and gesture recognition systems using DeepFace, FaceNet, and

related computer vision techniques.

- Analyze deep learning-based video analytics techniques using ResNet, GoogleNet, Inception Networks, and video processing methods to solve real-world intelligent vision problems.

TEXTBOOK

1. Milan Sonka, Vaclav Hlavac, Roger Boyle," Image Processing, Analysis, and Machine Vision", Fourth edition, Thomson Learning, 2019.
2. Vaibhav Verdhan,(2021,Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras, Apress 2021.

REFERENCES

1. Richard Szeliski,"Computer Vision:Algorithms and Applications",Springer Third Edition, Verlag London Limited,2019.
2. CaifengShan,FatihPorikli,TaoXiang,ShaogangGong,"Video Analytics for Business Intelligence", Springer, Second Edition,2019.

E RESOURCES

1. https://nptel.ac.in/courses/117/105/117105135/
2. https://www.coursera.org/learn/image-processing

Mapping of COs-POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	1	-	-	-	2	1	1	3	2
2	2	3	2	2	1	-	-	-	1	1	1	3	2
3	3	2	3	3	2	-	-	-	2	2	2	3	3
4	2	2	2	2	2	-	-	-	2	2	2	2	3
5	3	2	3	3	3	-	-	-	3	1	2	3	3
AVG	2.6	2.2	2.4	2.4	1.8	-	-	-	2.0	1.4	1.6	2.8	2.6

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

Chairman - BoS

23ITP502	COMPUTER VISION	L T P C
	(Common to CSE, CSE-CS, IT and AI&DS)	3 0 0 3

OBJECTIVES

- To introduce fundamental concepts of image formation, image processing, geometric transformations, filtering, and frequency-domain techniques.
- To foster the knowledge on feature detection, feature matching, edge and line detection, and image segmentation techniques.
- To develop understanding of feature-based alignment, pose estimation, structure from motion, and motion estimation techniques.
- To impart knowledge of 3D reconstruction, depth estimation, surface representations, and texture recovery techniques.
- To familiarize students with image-based rendering, object recognition, face recognition, and scene understanding techniques.

UNIT I INTRODUCTION TO IMAGE FORMATION AND PROCESSING **9**

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop an image preprocessing system that performs grayscale conversion, noise removal, image enhancement, and geometric transformations to improve image quality for computer vision applications.
2. Design an image filtering application that applies spatial and frequency domain techniques (Fourier Transform, pyramids, and wavelets) for image enhancement and compression.

UNIT II FEATURE DETECTION, MATCHING AND SEGMENTATION **9**

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge –Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop an image analysis system that detects key feature points, edges, and lines using suitable feature detection algorithms for object identification.
2. Design an image segmentation application that separates foreground objects from the background using graph-based, region-based, or clustering-based segmentation techniques.

UNIT III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION **9**

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration -

Triangulation-Two-frame structure from motion -Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion – Spline- based motion - Optical flow - Layered motion.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop a feature-based image alignment system that matches corresponding points between multiple images and generates a panoramic image.
2. Design a motion estimation application that tracks moving objects in video sequences using optical flow and motion estimation techniques.

UNIT IV 3D RECONSTRUCTION 9

Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedo sos.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop a 3D reconstruction system that generates a three-dimensional model of an object from multiple 2D images using feature matching and triangulation.
2. Design a depth estimation application that reconstructs object surfaces and textures using point-based or volumetric representation techniques.

UNIT V IMAGE-BASED RENDERING AND RECOGNITION 9

View interpolation Layered depth images - Light fields and Lumi graphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

PROBLEM SOLVING ASSIGNMENTS:

1. Develop an intelligent object recognition system that detects and classifies objects, faces, or scenes from images using computer vision techniques.
2. Design an image-based rendering application that generates novel views of a scene using depth information, light fields, or view interpolation methods.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply image formation and processing techniques to enhance and analyze digital images.
- Apply appropriate feature detection, matching, and segmentation techniques for image analysis.

- Analyze feature-based alignment and motion estimation techniques for image and video applications.
- Develop 3D reconstruction solutions using appropriate depth, geometric, and representation techniques.
- Analzye image-based rendering and recognition techniques for object, face, instance, category, and scene understanding

TEXTBOOKS

1. Richard Szeliski, Computer Vision: Algorithms and Applications", Springer-Texts in Computer Science, Second Edition, 2022.

2. D.A.Forsyth Ponce "Computer Vision: A Modern Approach Pearson Education, Second Edition, 2018.

REFERENCES

1. Richard Hartley and Andrew Z is serman, "Multiple View Geometry in Computer Vision" Second Edition, Cambridge University Press, March, 2018.

2. Christopher M.Bishop." Pattern Recognition and Machine Learning", Second Edition, Springer,2018

E RESOURCES

1. https://nptel.ac.in/courses/106/105/106105216/(computer-vision)
2. https://www.nptelvideos.com/topics/(computer-vision)

Mapping of COS – POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	-	-	-	1	2	1	3	2
2	3	2	3	3	3	-	-	-	2	2	1	3	3
3	3	2	3	3	3	-	-	-	2	2	2	3	3
4	3	2	3	3	3	-	-	-	2	2	2	3	2
5	3	2	3	3	2	-	-	-	3	2	2	3	3
AVG	3	2.2	2.8	2.8	2.6	-	-	-	2.0	2	1.6	3	2.6

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

Chairman - BoS

23CSP501	DATA WAREHOUSING AND MINING	L T P C
		3 0 0 3

OBJECTIVES

- To impart fundamental knowledge of data warehousing concepts, architectures, multidimensional data models, for decision support systems
- To develop students understanding of data preprocessing, statistical analysis, data visualization, measures used in data mining..
- To enable students to analyze and discover meaningful patterns, associations, and correlations using frequent pattern mining techniques
- To train students to analyze, and compare various clustering, classification, and outlier detection algorithms for data analysis.
- To provide exposure on WEKA and other data mining tools for implementing data mining techniques in real-world applications

UNIT I DATA WAREHOUSING AND ON-LINE ANALYTICAL PROCESSING 9

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

UNIT II INTRODUCTION TO DATA MINING 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques– Issues – applications- Data Objects and attribute types - Statistical description of data - Data Preprocessing – Data Visualization - Data similarity and dissimilarity measures.

UNIT III DATA MINING - FREQUENT PATTERN ANALYSIS 9

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining.

UNIT IV CLUSTERING 9

Clustering Techniques – Cluster analysis - Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data-Clustering with constraints - Outlier analysis - outlier detection methods.

UNIT V CLASSIFICATION AND WEKA TOOLS 9

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Support Vector

Machines – Lazy Learners - Introduction to WEKA - The Explorer – Getting started - Exploring the explorer - Learning algorithms.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the concepts of data warehousing, OLAP architecture, multidimensional data models, and decision support systems.
- Apply appropriate data preprocessing, statistical analysis, visualization techniques to prepare datasets for effective data mining.
- Analyze frequent patterns, association rules, and correlations to discover meaningful knowledge from large datasets.
- Analyze the clustering, classification, and outlier detection techniques for solving data mining problems.
- Use data mining algorithms and WEKA tools to interpret the results for data analytics applications.

TEXT BOOKS

1. Jiawei Han, Micheline Kamber and Jian Pei ,"Data Mining Concepts and Techniques", Elsevier, Third Edition, 2011.
2. Alex Berson and Stephen J. Smith,"Data Warehousing, Data Mining & OLAP", Tata McGraw —Hill Edition,Tenth Edition,2017.

REFERENCES

1. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2016.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar,"Introduction to Data Mining", Pearson Education, 2017.

E – RESOURCES

1. https://onlinecourses.swayam2.ac.in/cec24_cs12/preview (Data Mining)
2. https://onlinecourses.nptel.ac.in/noc24_mg98/preview(Data analysis & Decision making)

Chairman - BoS

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	–	–	2	–	–	–	–	–	2	2	2
2	3	3	2	3	3	–	–	–	1	–	2	3	2
3	3	3	2	3	3	–	–	–	1	–	2	3	2
4	3	3	2	3	3	–	–	–	1	–	2	3	2
5	2	3	2	3	3	–	–	2	1	–	3	3	3
AVG	2.8	2.8	2.0	3.0	2.8	–	–	2.0	1.0	–	2.2	2.8	2.2

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

Chairman - BoS

23CSP502	EXPLORATORY DATA ANALYSIS	L T P C
	(Common to CSE, CSE-CS, IT and AI&DS)	3 0 0 3

OBJECTIVES

- To impart the fundamental concepts, principles, and significance of Exploratory Data Analysis (EDA) in data science and decision-making.
- To develop students' proficiency in using Python libraries, particularly Pandas and Matplotlib, for data manipulation and visualization.
- To enable students to perform univariate and bivariate exploratory data analysis using appropriate statistical and graphical techniques\
- To provide knowledge of multivariate and time series data exploration methods to extract meaningful insights from complex datasets.
- To train students to apply exploratory data analysis techniques and visualization tools for solving real-world data analytics problems.

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 UNIVARIATE ANALYSI 9

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread -Scaling and Standardizing — Inequality.

UNIT IV BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - HandlingSeveral Batches - Scatterplots and Resistant Lines.

UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS 9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-

based indexing – Visualizing – Grouping – Resampling.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the data transformation techniques and software tools used in Exploratory Data Analysis for effective data analysis.
- Apply Python libraries such as Pandas and Matplotlib for data manipulation, preprocessing, aggregation, and visualization of datasets.
- Perform univariate exploratory data analysis using descriptive statistics, distribution analysis, scaling, and standardization techniques.
- Analyze relationships between variables using bivariate analysis techniques
- Apply multivariate and time series exploratory data analysis techniques to visualize, interpret, and extract meaningful insights from real-world datasets

TEXT BOOKS

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packet Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O Reilly, First Edition,2017.

REFERENCES

1. Eric Pimpler, "Data Visualization and Exploration with R", Geospatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly publications, 2019.

E – RESOURCES

1. https://onlinecourses.swayam2.ac.in/cec24_ma20/preview (Data Analysis)
2. https://onlinecourses.nptel.ac.in/noc24_mg98/preview(Data analysis & Decision making)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	2	1	-	-	1	-	2	2	2
2	3	2	2	2	3	1	-	1	1	1	3	3	3
3	3	3	2	2	2	1	-	-	1	1	2	3	2
4	3	3	2	2	2	2	-	-	1	1	2	3	2
5	3	3	3	2	3	2	-	1	2	2	3	3	3
AVG	3	2.6	2	1.8	2.4	1.4	-	1	1.2	1	2.4	2.8	2.4

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

Chairman - BoS

23CSP503	RECOMMENDER SYSTEMS (Common to CSE, CSE-CS, IT and AI&DS)	L T P C 3 0 0 3

OBJECTIVES

- To impart the basic techniques and problems in the field of recommender systems.
- To develop students to understand the concepts of collaborative recommendation system and attacks on it.
- To Enable students to understand and implement content-based recommendation techniques
- To Provide comprehensive understanding of knowledge-based recommendation system for developing intelligent solutions
- To Train students to design, implement, and evaluate recommender systems using appropriate performance metrics and real-world datasets

UNIT I INTRODUCTION 9

Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses; covariance matrices. Recommender Systems Functions, Applications of recommendation systems, Issues with recommender system.

UNIT II COLLABORATIVE RECOMMENDATION 9

User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, model-based and preprocessing-based approaches. Attacks on collaborative recommender systems: Attack dimensions, Attack types, Countermeasures, Privacy aspects – distributed collaborative filtering.

UNIT III CONTENT- BASED RECOMMENDATION 9

High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

UNIT IV KNOWLEDGE BASED RECOMMENDATION 9

Knowledge-based recommendation: Introduction, Knowledge representation and reasoning, interacting with constraint-based recommenders, Interacting with case-based recommenders. Hybrid recommendation approaches: Opportunities for hybridization, Monolithic hybridization design, Parallelized hybridization design, Pipelined hybridization design.

UNIT V EVALUATING RECOMMENDER SYSTEM 9

Introduction, General properties of evaluation research, Evaluation designs, Evaluation on

historical datasets, Error metrics, Decision-Support metrics, User-Centered metrics.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the mathematical foundations, applications, and challenges of recommender systems.
- Analyze collaborative recommendation techniques, security attacks, and suitable countermeasures in recommender systems.
- Apply content-based recommendation techniques by constructing user profiles using feature extraction and classification methods.
- Design knowledge-based and hybrid recommender systems for solving real-world recommendation problems.
- Analyze the performance of recommender systems using appropriate decision-support metrics and user-centered evaluation methods

TEXT BOOKS

1. Jannach D., Zanker M. and FelFering A., "Recommender Systems: An Introduction", Cambridge University, First Edition, 2011.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., "Recommender Systems Handbook", Springer, Tenth Edition, 2019.

REFERENCES

1. Manouselis N., Drachsler H., Verbert K., Duval E., "Recommender Systems For Learning", Springer, First Edition, 2013.
2. Erwin Kreyzig, "Advanced Engineering Mathematics", Wiley, Tenth Edition, 2011.

E – RESOURCES

1. https://www://tryolabs.com/blog/introduction-to-recommender-systems
2. https://www://kaggle.com/code/iambideniz/hybrid-recommender-system

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	2	1	-	-	1	-	2	3	2
2	3	3	2	2	2	2	1	1	1	1	2	3	3
3	3	2	2	2	3	1	-	1	1	1	2	3	3
4	3	3	3	2	3	1	1	1	2	2	3	3	3
5	2	3	2	3	2	1	-	1	2	2	3	2	3
AVG	2.8	2.6	2	2	2.4	1.2	1	1	1.4	1.2	2.4	2.8	2.8

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

Chairman - BoS

23CSP504 **TEXT AND SPEECH ANALYSIS** **L T P C**

(Common to CSE, CSE-CS, IT and AI&DS) **3 0 0 3**

- To Impart the fundamental concepts of Natural Language Processing (NLP), text preprocessing techniques for text representation.
- To Develop students' understanding of modern text classification techniques using word embeddings and deep learning models.
- To Enable students to understand intelligent question-answering systems, chatbots, and dialogue systems using natural language processing techniques.
- To Provide comprehensive knowledge of text-to-speech synthesis techniques, speech processing, and speech synthesis models
- To Train students to develop speech recognition and text processing applications using state-of-the-art deep learning techniques

UNIT I NATURAL LANGUAGE BASICS **9**

Foundations of natural language processing – Language Syntax and Structure - Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model.

UNIT II TEXT CLASSIFICATION **9**

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – Fast Text model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models.

UNIT III QUESTION ANSWERING AND DIALOGUE SYSTEMS **9**

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems – evaluating dialogue systems.

UNIT IV TEXT-TO-SPEECH SYNTHESIS **9**

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing – Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems.

UNIT V AUTOMATIC SPEECH RECOGNITION **9**

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts of Natural Language Processing, text preprocessing

techniques for text analytics.

- Apply word embedding techniques and deep learning models for text classification, summarization, and topic modeling tasks.
- Analyze question-answering systems, chatbots, and dialogue systems using information retrieval and language modeling techniques.
- Apply text-to-speech synthesis techniques, including text normalization, prosody generation, and deep learning-based speech synthesis models.
- Develop automatic speech recognition systems using acoustic modeling, feature extraction approaches for speech processing applications.

TEXT BOOKS

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 2022.
2. Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", A Press, 2018.

REFERENCES

1. Lawrence Rabiner, Biing-Hwang Juang, B. Yegna narayana, "Fundamentals of Speech Recognition" Pearson, First Edition, 2009.
2. Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc24_hs103/preview (Natural language processing)
2. https://onlinecourses.swayam2.ac.in/imb24_mg115/preview (Deep Learning)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	3	1	-	--	1	1	3	3	3
2	3	3	2	2	3	1	-	1	1	1	3	3	3
3	3	2	1	1	2	1	-	-	1	-	2	3	2
4	3	3	3	3	3	1	-	1	2	2	3	3	3
5	3	3	2	2	3	1	-	1	1	1	3	3	3
AVG	3	2.6	2	2	2.8	1	0	1	1.2	1.3	2.8	3	2.8

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

Chairman - BoS

PROFESSIONAL ELECTIVE - II

Professional Elective – II

23ITP503	TCP/IP DESIGN AND IMPLEMENTATION	L T P C 3 0 0 3

OBJECTIVES

- To inculcate the TCP/IP applications.
- To acquire knowledge about components and protocols of TCP/IP and its link to the Internet.
- To equip students with the TCP/IP layers, components and functions.
- To familiarize the variety of TCP/IP services.
- To impart the knowledge in Troubleshooting methodologies in TCP/IP network.

UNIT I OVERVIEW OF TCP/IP APPLICATIONS 9

Web browsers and servers –Telnet –File Transfer Protocol - Electronic Mail - Network Management.

Problem Solving Assignment:

1. Analyze the security and operational issues in Telnet, FTP, and E-mail services.
2. Recommend secure alternatives or protocols to address these problems.

UNIT II TCP/IP STRUCTURE AND ADDRESSING 9

Internet Protocol Suite - Internet Protocol Addressing - Creating Subnets - Address Resolution - Domain Name System - Internet Control Message Protocol.

Problem Solving Assignment:

1. Analyze the possible causes related to DNS resolution and Address Resolution Protocol (ARP).
2. Explain how DNS and ARP work together during the process of accessing a website.
3. Recommend troubleshooting steps to restore successful communication between clients and the web server.

UNIT III TCP/IP PROTOCOLS 9

Internet Group Management Protocol - Internet Protocol - Internet Protocol Routing - User Datagram Protocol - Transmission Control Protocol and Connection Establishment - Transmission Control Protocol and Data Transmission - Routing Protocols

Problem Solving Assignment:

1. Analyze the routing issues and identify possible causes of inefficient packet forwarding.
2. Compare suitable routing protocols and recommend the most appropriate protocol for the network.

3. Design an efficient routing strategy to improve network performance and minimize routing loops.

UNIT IV TCP/IP APPLICATIONS WORK 9

TCP/IP routing - Trivial File Transfer Protocol - Virtual Private Networking - Related information for TCP/IP - TCP/IP setup - TCP/IP applications, protocols, and services

Problem Solving Assignment:

1. Analyze the TCP/IP configuration and identify possible addressing and routing errors.
2. Design a correct TCP/IP setup, including IP addressing, subnet mask, default gateway.
3. Recommend routing changes to ensure seamless communication between the branch office and the central server.

UNIT V TROUBLESHOOTING A TCP/IP NETWORK 9

Troubleshooting Principles – TCP/IP troubleshooting – WINICFG – Ping – Trace route - Nbstat and Netstat - Address Resolution Protocol.

Problem Solving Assignment:

1. Use Traceroute to identify delays or failures along the communication path.
2. Analyze active network connections using NETSTAT to detect abnormal or unauthorized connections.
3. Propose suitable troubleshooting steps to improve network performance and reliability.

TOTAL: 45 PERIODS

OUTCOMES

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

- Understand the fundamental concept of the TCP/IP applications.
- Analyze the TCP/IP components and protocols with necessary link.
- Identify the protocols used to transport data over the Internet.
- Apply a variety of TCP/IP services.
- Analyze Troubleshooting methodologies in TCP/IP.

TEXT BOOKS

1. Douglas," Internetworking with TCP / IP", Vol.2 design implementation and internals, Third Edition, 2018.
2. Mansfield Niall ,"Practical TCP/IP designing, using, and troubleshooting TCP/IP networks on Linux and Windows", Third Edition, 2019.

REFERENCES

1. Held, Gilbert, "Managing TCP/IP networks, Techniques, tools, and security", Wiley Publication,Third Edition,2019.

2. Hunt, Craig, Beijing Sebastopol," Windows NT TCP/IP network administration by CA," O'Reilly Publication, Fourth Edition,2020.

E-RESOURCES

1. https://archive.nptel.ac.in/courses/106/105/106105167(TCP/IP Design)
2. https://onlinecourses.nptel.ac.in/noc21_ar17/preview(TCP/IP Design)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	-	-	-	-	-	-	3	2
2	3	3	2	2	2	-	-	-	-	-	-	3	3
3	3	3	3	2	3	-	-	-	-	-	-	3	3
4	3	2	3	2	3	-	-	-	-	-	-	3	3
5	3	2	3	3	3	-	-	-	2	2	-	3	3
AVG	3	2.4	2.6	2	2.6	-	-	-	2	2	-	3	2.8

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

Chairman - BoS

23CSP508	CLOUD SERVICES MANAGEMENT (Common to CSE, CSE-CS, IT and AI&DS)	L T P C 3 0 0 3

OBJECTIVES

- To Introduce the fundamental concepts, service models, deployment models, and ecosystem of cloud service management.
- To Develop students' understanding of cloud service strategies, capacity planning, and cloud service architecture for effective business adoption.
- To train the students in cloud service lifecycle, service design, migration, deployment, and operational management in enterprise environments
- To provide comprehensive understanding of cloud service economics, pricing models, procurement strategies, and cost optimization techniques for cloud-based services
- To Equip students with the principles of cloud governance, value assessment, and performance measurement for effective management of cloud services

UNIT I CLOUD SERVICE MANAGEMENT FUNDAMENTALS 9

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

UNIT II CLOUD SERVICES STRATEGY 9

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

UNIT III CLOUD SERVICE MANAGEMENT 9

Cloud Service Reference Model, Cloud Service Life Cycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management

UNIT IV CLOUD SERVICE ECONOMICS 9

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

UNIT V CLOUD SERVICE GOVERNANCE & VALUE 9

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud

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

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain cloud-design skills to build and automate business solutions using cloud technologies.
- Describe theoretical foundation leading to excellence and excitement towards adoption of cloud-based services.
- Apply Cloud services and technologies to solve real world problems.
- Analyze and compare various cloud service pricing models.
- Analyze the Cloud Governance Framework, and evaluate the value of cloud services.

TEXT BOOKS

1. Enamul Haque,"Cloud Service Management and Governance: Smart Service Management in Cloud" Era ,Enel Publications, First Edition,2020.
2. Thomas Erl, Ricardo Puttini, Zaigham Mohammad ,"Cloud Computing: Concepts, Technology & Architecture",Prentice Hall Service Tech Press, First Edition, 2013.

REFERENCES

1. Praveen Ayyappa, "Economics of Cloud Computing", LAP Lambert Academic Publishing,First Edition, 2014.
2. Rajkumar Buyya, Christian Vechhiola, S.Thamarai Selvi,"Mastering Cloud Computing Foundations and Applications Programming",MK Publication, First Edition,2013.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc24_cs118/preview (Cloud Computing)
2. https://nptel.ac.in/courses/106104182 (Cloud computing and Distributed system)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	1	1	-	1	1	2	3	3
2	2	2	2	2	2	2	1	-	1	1	2	2	2
3	2	2	3	3	3	2	1	-	2	1	2	3	3
4	2	3	3	3	3	1	1	-	2	1	2	3	2
5	2	2	2	2	2	3	2	2	2	2	2	2	2
AVG	2.2	2.4	2.6	2.6	2.6	1.8	1.2	2	1.6	1.2	2	2.6	2.4

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

Chairman - BoS

23ADT501	UI AND UX DESIGN (Common to CSE, CSE-CS, IT and AI& DS)	L T P C 3 0 0 3

OBJECTIVES

- To teach the fundamentals of design thinking.
- To familiarize the knowledge on UI design principles and elements.
- To foster UX design process and user research.
- To train the students in wireframing, prototyping and usability testing.
- To impart the knowledge on user stories, personas, and information architecture.

UNIT I FOUNDATIONS OF DESIGN 9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.

UNIT II FOUNDATIONS OF UI DESIGN 9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviours and Principles — Branding - Style Guides.

UNIT III FOUNDATIONS OF UX DESIGN 9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.

UNIT IV WIREFRAMING, PROTOTYPING AND TESTING 9

Sketching Principles - Sketching Red Routes - Responsive Design — Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.

UNIT V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE 9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain problem statements to guide their design process.
- Analyze and evaluate existing interfaces based on visual and UI principles, identifying strengths and areas for improvement.
- Develop a comprehensive understanding of the key components that constitute User Experience.
- Construct Wireframe, Prototype and Testing.
- Identify and write clear problem statements to address user needs effectively.

TEXT BOOKS

1. Joel Marsh, "UX for Beginners", O'Reilly , 2022.
2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services", O'Reilly, 2021.

REFERENCES

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface", O'Reilly, Third Edition, 2020.
2. Steve Schoger, Adam Wathan "Refactoring UI", 2018.

E – RESOURCES

1. https://www.nngroup.com/articles/
2. https://www.interaction-design.org/literature

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	1	1	3	1	-	-	-	3	3	2	3	3
2	2	3	1	3	2	-	-	-	1	2	2	1	2
3	1	3	3	2	2	-	-	-	2	3	1	1	3
4	1	2	3	3	1	-	-	-	3	2	1	3	3
5	1	2	3	2	1	-	-	-	2	1	1	3	2
AVG	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	2.2	2.6

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

Chairman - BoS

23CSP510	SOFTWARE TESTING AND AUTOMATION (Common to CSE, CSE-CS, IT and AI&DS)	L T P C 3 0 0 3

OBJECTIVES

- To Impart the fundamental concepts, principles, and life cycle of software testing to build a strong foundation in software quality assurance
- To Develop students' understanding of test planning, test strategies, resource management for effective software testing processes
- To Enable students to design, execute, and evaluate software test cases using appropriate testing techniques
- To Familiarize students with advanced software testing approaches, including performance, security, compatibility, Agile, web, and mobile application testing
- To Provide comprehensive knowledge of automated software testing using Selenium and automation frameworks for testing modern software applications

UNIT I FOUNDATIONS OF SOFTWARE TESTING 9

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V- model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

UNIT II TEST PLANNING 9

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNIT III TEST DESIGN AND EXECUTION 9

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNIT IV ADVANCED TESTING CONCEPTS 9

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

UNIT V TEST AUTOMATION AND TOOLS 9

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the fundamentals, principles, life cycle, and various levels of software testing used in software quality assurance.
- Develop comprehensive test plans, define testing strategies, prepare test schedules, and manage defect reporting using standard testing practices.
- Design, execute, and evaluate software test cases using valuate software test cases using appropriate testing techniques and methodologies..
- Apply advanced testing methodologies to assess software quality and Agile-based software development.
- Analyze automated testing of web applications using Selenium WebDriver and testing frameworks to improve software testing efficiency and reliability.

TEXT BOOKS

1. Yogesh Singh, "Software Testing", Cambridge University Press, First Edition, 2012.
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" – Second Edition, 2018.

REFERENCES

1. Glenford J. Myers, Corey Sandler, Tom Badgett, "The Art of Software Testing",John Wiley & Sons, Inc., Third Edition , 2012.
2. Elfriede Dustin, Thom Garrett, Bernie Gaurf," Implementing Automated Software Testing", Pearson Education, First Edition,2009

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc24_cs91/preview (Software Testing)
2. https://onlinecourses.nptel.ac.in/noc24_cs119/preview (Software Engineering)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	3	2	2	1	-	-	1	2	2	3	2
2	2	2	3	2	2	1	-	-	2	2	1	3	2
3	3	2	3	3	3	1	-	-	1	2	2	3	2
4	2	2	2	2	2	1	-	-	1	2	2	2	2
5	2	2	3	3	3	1	-	-	2	2	2	3	3
AVG	2.4	2	2.8	2.4	2.4	1	-	-	1.4	2	1.8	2.8	2.2

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

Chairman - BoS

23CSP511	WEB APPLICATION SECURITY (Common to CSE, CSE-CS, IT and AI&DS)	L T P C 3 0 0 3

OBJECTIVES

- To Impart the fundamental concepts, principles, threats, and security mechanisms involved in securing web applications.
- To Provide knowledge of secure software development life cycle models, security testing, and best practices for the secure development and deployment of web applications
- To Enable students to understand and implement secure API design, authentication, authorization, and microservice security techniques.
- To Familiarize students with vulnerability assessment methodologies, penetration testing techniques used to identify and mitigate web application vulnerabilities.
- To Develop students' understanding of web application attacks, ethical hacking techniques, and security tools for protecting web applications.

UNIT I FUNDAMENTALS OF WEB APPLICATION SECURITY 9

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation

UNIT II SECURE DEVELOPMENT AND DEPLOYMENT 9

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNIT III SECURE API DEVELOPMENT 9

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 9

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT V HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite,etc.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the fundamentals of web application security, authentication, authorization, and common web security threats.
- Apply secure software development practices, security testing methods, and secure deployment frameworks to develop resilient web applications.
- Design secure APIs using appropriate authentication, authorization, and security controls for modern web and microservice applications.
- Analyze web applications by performing vulnerability assessments and penetration testing using standard methodologies and security assessment tools.
- Analyze common web application attacks and utilize ethical hacking tools to identify, analyze, and recommend mitigation strategies for web security vulnerabilities

TEXT BOOKS

1. Andrew Hoffman, "Web Application Security: Exploitation and Countermeasures for Modern Web Applications, O'Reilly Media, Inc. ", First Edition, 2020
2. Neil Madden, "API Security in Action", Manning Publications Co., NY, USA, First Edition, 2020.

REFERENCES

1. Ravi Das and Greg Johnson, "Testing and Securing Web Applications", Taylor & Francis Group, LLC,2021.
2. Prabath Siriwardena, "Advanced API Security" ,A press Media LLC, USA,2020.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc24_cs91/preview (Software Testing)
2. https://onlinecourses.nptel.ac.in/noc24_cs119/preview (Software Engineering)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	1	2	2	1	3	-	-	-	-	-	-	-	-
2	2	1	2	1	3	-	-	-	-	-	-	-	-
3	1	1	1	2	3	-	-	-	-	-	-	-	-
4	1	2	1	1	2	-	-	-	-	-	-	-	-
5	1	2	2	2	2	-	-	-	-	-	-	-	-
AVG	1.2	1.6	1.6	1.4	2.6	-	-	-	-	-	-	-	-

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

Chairman - BoS

23CSP512	DEVOPS (Common to CSE, CSE-CS, IT and AI&DS)	L T P C 3 0 0 3

OBJECTIVES

- To Introduce the fundamental concepts, principles, practices of DevOps and version control systems.
- To Provide knowledge of build automation tools such as Maven and Gradle for software management.
- To Enable students to understand Continuous Integration (CI) using Jenkins and DevOps automation practices.
- To Familiarize students with configuration management and infrastructure automation using Ansible and YAML-based playbooks.
- To Develop students' skills in building cloud-based DevOps pipelines using Azure DevOps and GitHub for modern software delivery.

UNIT I INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

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 Artifacts, 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, Builda sample code, Modify azure-pipelines.yaml file.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain DevOps concepts, cloud platforms, and version control systems to support collaborative software development.
- Apply build automation techniques using Maven and Gradle for dependency management, and software packaging.
- Analyze Continuous Integration, and Continuous Deployment (CI/CD) pipelines using Jenkins and related DevOps tools.
- Develop and automate configuration management tasks using Ansible, YAML playbooks.
- Design cloud-based DevOps pipelines using GitHub and Azure DevOps to automate software build and deployment processes.

TEXT BOOKS

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition,2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014.

REFERENCES

1. Mitesh Soni," Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.

E – RESOURCES

1. https://www.coursera.org/specializations/devops
2. https://www.amazon.com/Phoenix-Project-DevOps-Helping-Business/dp/1942788290

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	3	1	1	-	1	2	2	3	3
2	3	2	3	3	3	1	1	1	1	2	2	3	3
3	3	2	3	3	3	1	1	-	1	2	2	3	3
4	3	2	3	3	2	1	1	1	1	2	2	3	3
5	3	2	3	3	3	2	1	1	1	2	2	3	3
AVG	3.0	2.0	2.8	2.8	2.8	1.2	1.0	1.0	1.0	2.0	2.0	3.0	3.0

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

PROFESSIONAL ELECTIVE - III

23ITP504	HUMAN COMPUTER INTERACTION	L T P C
	(Common to CSE, CSE-CS, IT and AI&DS)	3 0 0 3

OBJECTIVES

- To introduce the fundamental concepts of Human-Computer Interaction.
- To provide students with the knowledge of interactive design principles, software development processes for developing user-centered interactive systems.
- To familiarize students with HCI models, cognitive theories for designing interactive systems.
- To impart knowledge on mobile platforms, application frameworks, and types of mobile applications.
- To acquire knowledge and practical skills to design efficient and user-friendly web interfaces using interaction techniques.

UNIT I FOUNDATIONS OF HCI 9

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II DESIGN & SOFTWARE PROCESS 9

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III MODELS AND THEORIES 9

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI 9

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT V WEB INTERFACE DESIGN 9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.

TOTAL:45 PERIODS

OUTCOMES

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

- Design effective dialog for HCI.
- Explain the importance of interactive design, usability engineering, iteractive design and prototyping
- Analyze the different types of models.
- Explain the structure and components of mobile ecosystem, including platforms and application frameworks.
- Design process flows and virtual page structures for smooth, task-oriented navigation in web applications.

TEXT BOOKS

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", Pearson Education, Third Edition , 2004.
2. Brian Fling, "Mobile Design and Development",O'Reilly Media Inc., First Edition 2009
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

REFERENCES

1. Yvonne Rogers, Helen Sharp, Jenny Preece, "Interaction Design: Beyond Human-Computer Interaction," Third Edition, Wiley, 2011.
2. Ben Shneiderman, Catherine Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction," Fifth Edition, Addison-Wesley, 2009.

E-RESOURCES

1. https://nptel.ac.in/courses/106103115
2. https://archive.nptel.ac.in/courses/106/106/106106177/

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	1	-	-	-	2	3	1	2	1
2	3	1	2	2	1	-	-	-	1	2	1	2	2
3	2	3	2	3	1	-	-	-	3	1	1	1	1
4	1	2	3	3	3	-	-	-	3	3	1	1	3
5	2	3	3	1	3	-	-	-	2	2	1	2	2
AVG	2.2	2.2	2.2	1.8	1.8	-	-	-	2.2	2.2	1	1.6	1.8

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

Chairman - BoS

23ITP505	STORAGE TECHNOLOGIES	L T P C
	(Common to CSE, CSE-CS, IT and AI&DS)	3 0 0 3

OBJECTIVES

- To impart knowledge the fundamental concepts of Information storage and third platform technologies.
- To foster knowledge of intelligent storage systems, RAID configurations, and storage architectures.
- To train students in storage networking and virtualization technologies.
- To enable students to understand various backup and recovery strategies.
- To acquire knowledge of security and security controls in storage infrastructure.

UNIT I STORAGE SYSTEMS 9

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center

UNIT II INTELLIGENT STORAGE SYSTEMS AND RAID 9

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale- out storage Architecture.

UNIT III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 9

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of

FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT IV BACKUP, ARCHIVEAND REPLICATION 9

Introduction to Business Continuity, Backup architecture, Backup targets and methods,

Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT V SECURING STORAGE INFRASTRUCTURE 9

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

TOTAL:45 PERIODS

OUTCOMES

Upon completion of this course, the Students will be able to:

- Explain the fundamental concepts of Information storage and third platform technologies.
- Analysis the intelligent storage systems, RAID configurations, and storage architectures.
- Apply storage networking and virtualization technologies..
- Explain various backup and recovery strategies.
- Analysis security requirements and security controls for securing storage envirnoments.

TEXT BOOKS

1. Marc Farley, "Storage Networking Fundamentals: An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems," Cisco Press, 2013
2. Tate, J., Beck, P., Ibarra, H. H., Kumaravel, S., & Miklas, L. "Introduction to Storage Area Networks." 9th Edition, IBM Redbooks, December 2017.

REFERENCES

1. Gerardus Blokdyk,Storage Technologies A Complete Guide - 2019 Edition Paperback – June 12, 2021.
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM – Redbooks, December 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/106108058
2. https://nptel.ac.in/courses/113105102

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	1	2	1	3	3	-	-	-	1	1	1	1	2
2	3	1	2	3	3	-	-	-	3	2	3	2	3
3	1	1	3	2	2	-	-	-	3	1	1	2	3
4	3	2	1	2	2	-	-	-	1	1	3	3	2
5	1	3	2	1	2	-	-	-	1	2	3	3	2
AVG	1.8	1.8	1.8	2.2	2.4	-	-	-	1.8	1.4	2.2	2.2	2.4

1-Low 2-Medium 3-High'-'–No Correlation.

Chairman - BoS

23CSP513	VIRTUALIZATION (Common to CSE, CSE-CS and IT)	L T P C 3 0 0 3

OBJECTIVES

- To Introduce the fundamental concepts, architectures, types, and benefits of virtualization in modern computing environments.
- To Provide knowledge of server and desktop virtualization technologies, virtual machine architectures, and virtualization platforms.
- To Familiarize students with network virtualization concepts, architectures, and technologies for efficient network resource management.
- To Enable students to understand storage virtualization techniques, memory virtualization, and virtualized storage infrastructures.
- To Develop practical knowledge of industry-standard virtualization platforms and tools for deploying and managing virtualized computing environments.

UNIT I INTRODUCTION TO VIRTUALIZATION 9

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors.

UNIT II SERVER AND DESKTOP VIRTUALIZATION 9

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization — Uses of Virtual Server Consolidation — Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization.

UNIT III NETWORK VIRTUALIZATION 9

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization-VLAN-WAN Architecture-WAN Virtualization.

UNIT IV STORAGE VIRTUALIZATION 9

Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping Risks ofStorage Virtualization-SAN-NAS-RAID.

UNIT V VIRTUALIZATION TOOLS 9

VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM- Google Virtualization- Case study.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the concepts, architectures, types, benefits, and limitations of virtualization and hypervisor technologies.
- Apply server and desktop virtualization techniques to create, configure, and manage virtual machines using appropriate virtualization platforms.
- Analyze network virtualization architectures and technologies, including VLANs, WAN virtualization, and related networking solutions.
- Analyze storage virtualization techniques, memory virtualization, and storage infrastructures for efficient resource utilization.
- Develop virtualization solutions using industry-standard tools and Google virtualization platforms

TEXT BOOKS

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill ,New Delhi, First Edition,2010.
2. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach, First Edition,2010.

REFERENCES

1. Nick Marshall by "Mastering VMware vSphere 7",First Edition,2020.
2. Matthew Portnoy by "Virtualization Essentials", First Edition,2016.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_cs15/preview (Virtualization)
2. https://archive.nptel.ac.in/courses/102/106/102106022/ (Downstream processing)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	2	1	1	-	1	1	1	3	2
2	3	2	2	2	2	1	1	-	1	1	1	3	2
3	3	3	3	3	3	1	1	-	2	1	1	3	3
4	3	2	3	3	3	2	1	1	2	1	1	3	3
5	3	3	3	3	3	2	1	1	2	1	1	3	3
AVG	3	2.4	2.6	2.6	2.6	1.4	1	1	1.6	1	1	3	2.6

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

Chairman - BoS

23CSP514	SOFTWARE DEFINED NETWORKS	L T P C
	(Common to CSE, CSE-CS and IT)	3 0 0 3

OBJECTIVES

- To Impart the concepts, architecture, and operational principles of Software Defined Networking (SDN).
- To Provide knowledge of SDN data plane, control plane, OpenFlow protocol, and SDN controller architectures
- To Enable students to understand the design and implementation of SDN-based network applications and services.
- To Familiarize students with Network Function Virtualization (NFV) concepts, architectures, and deployment models.
- To Develop students' understanding of NFV infrastructure, orchestration, and real-world applications integrating SDN and NFV technologies

UNIT I SDN: INTRODUCTION 9

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane , Control plane and Application Plane.

UNIT II SDN DATA PLANE AND CONTROL PLANE 9

Data Plane functions and protocols – Open FLow Protocol - Flow Table - Control Plane Functions- Southbound Interface, Northbound Interface – SDN Controllers - Ryu, Open Daylight, ONOS - Distributed Controllers.

UNIT III SDN APPLICATIONS 9

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring -- Security – Data Center Networking.

UNIT IV NETWORK FUNCTION VIRTUALIZATION 9

Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture.

UNIT V NFV FUNCTIONALITY 9

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the concepts, architecture, and significance of Software Defined Networking (SDN
- Analyze the functions of SDN data plane, control plane, OpenFlow protocol, southbound

and northbound interfaces, and SDN controllers.

- Design SDN-based network applications for traffic engineering, network monitoring, security, and data center networking.
- Apply Network Function Virtualization (NFV) concepts to implement virtualized network services and virtualization techniques.
- Analyze NFV infrastructure, orchestration, and real-world use cases by integrating SDN and NFV technologies

TEXT BOOKS

1. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud",Pearson Education, First Edition, 2015.
2. Flavio Bonomi, Rodolfo D. R. C. G. E. de Oliveira by "Software Defined Networks: A Comprehensive Approach", First Edition,2013.

REFERENCES

1. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan Kauffman, First edition, 2016.
2. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow",O'Reilly Media, Second Edition, 2017.

E – RESOURCES

1. https://archive.nptel.ac.in/courses/106/105/106105183/ (Computer Networks)
2. https://onlinecourses.nptel.ac.in/noc23_cs35/preview (Advanced Computer Networks)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	2	1	1	-	1	1	1	3	2
2	3	3	3	2	2	1	1	-	1	1	1	3	3
3	3	3	3	3	3	1	1	1	2	2	2	3	3
4	3	2	2	2	2	2	2	1	2	2	2	3	2
5	3	2	2	2	2	2	2	1	2	2	2	3	3
AVG	3.0	2.4	2.4	2.2	2.2	1.4	1.4	1.0	1.6	1.6	1.6	3.0	2.6

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

Chairman - BoS

23CSP515	STREAM PROCESSING	L T P C
	(Common to CSE, CSE-CS and IT)	3 0 0 3

OBJECTIVES

- To Impart the fundamental concepts, architectures, and strategies of data processing and stream processing systems.
- To Provide knowledge of real-time data processing techniques, streaming architectures, and analytics frameworks for processing continuous data streams
- To Enable students to understand data models, query languages, and database technologies used for managing structured, semi-structured, and graph data.
- To Familiarize students with event-driven stream processing using Apache Kafka and its APIs for developing scalable streaming applications..
- To Develop students' ability to provide real-time stream processing applications using Spark Streaming for analytics and decision-making

UNIT I FOUNDATIONS OF DATA SYSTEMS 9

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

UNIT II REAL-TIME DATA PROCESSING 9

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage.

UNIT III DATA MODELS AND QUERY LANGUAGES 9

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many-to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher QueryLanguage, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT IV EVENT PROCESSING WITH APACHE KAFKA 9

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API.

UNIT V REAL-TIME PROCESSING USING SPARK STREAMING 9

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation,

Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the principles of data processing, data management strategies, and the differences between batch and stream processing systems.
- Analyze real-time data processing architectures, streaming models, and modern frameworks used for continuous data analytics.
- Apply appropriate data models and query languages to manage and retrieve data efficiently in relational, NoSQL, and graph databases.
- Develop event-driven data processing applications using Apache Kafka by implementing producers, consumers, and streaming APIs.
- Design real-time analytics applications using Apache Spark Structured Streaming and stream processing operations.

TEXT BOOKS

1. Tyler Akidau, Slava Chemyak, Reuven Lax, "Streaming Systems: The What, Where, When and How of Large-Scale Data Processing" by O'Reilly publication, First Edition, 2018.
2. Flink, Storm and Kafka ,"Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing" using Apache Spark, , Packet Publishing,First Edition,2017.

REFERENCES

1. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media,First Edition,2017.
2. Chris Poelker and R. James MacDonald by "Resources for Learning Stream Data Processing", Second Edition,2009.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_bt27/preview (Stream Processing)
2. https://archive.nptel.ac.in/courses/102/106/102106022/ (Downstream processing)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	2	1	-	1	-	1	1	1	2	2
2	3	2	2	3	2	1	1	-	2	1	2	3	2
3	3	3	3	3	2	1	1	-	2	2	2	3	3
4	3	3	3	3	3	1	1	-	2	2	2	3	3
5	3	3	3	3	3	1	1	-	2	2	2	3	3
AVG	3.0	2.6	2.4	2.8	2.2	1.0	1.0	-	1.8	1.6	1.8	2.8	2.6

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

Chairman - BoS

23CSP516	SECURITY AND PRIVACY IN CLOUD (Common to CSE, IT and AI&DS)	L T P C 3 0 0 3

OBJECTIVES

- To introduce the fundamental concepts, principles, and security services essential for securing cloud environments.
- To provide knowledge of cloud security architecture, design principles, and data protection mechanisms in cloud infrastructures
- To enable students to understand identity management, authentication, authorization, and access control techniques for secure cloud environments.
- To familiarize students with cloud security design patterns and secure deployment models for protecting cloud resources and services.
- To develop students comprehensive knowledge on cloud security monitoring and security management techniques for ensuring compliance and operational security

UNIT I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non-repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9

Security design principles for Cloud Computing - Comprehensive data protection - End-to- end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key

UNIT III ACCESS CONTROL AND IDENTITY MANAGEMENT 9

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention

UNIT IV CLOUD SECURITY DESIGN PATTERNS 9

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.

UNIT V MONITORING, AUDITING AND MANAGEMENT 9

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious

traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts of cloud security, and core security services used to protect cloud computing environments.
- Analyze cloud security architectures, virtualization strategies, data protection mechanisms in cloud infrastructures.
- Apply identity and access management techniques, including authentication, authorization, role-based access control, and identity federation, to secure cloud services.
- Design secure cloud solutions by applying cloud security design patterns, resource access controls, and secure deployment practices.
- Analyze cloud environments using monitoring, auditing, incident response, and security management mechanisms to ensure secure and reliable cloud operations

TEXT BOOKS

1. Raj Kumar Buyya , James Broberg, Andrzej Goscinski, "Cloud Computing: Principles and Paradigms", First Edition, 2011.
2. Dave shackleford, "Virtualization Security, SYBEX a wiley Brand, First Edition, 2013.

REFERENCES

1. Mark C. Chu-Carroll "Code in the Cloud, CRC Press,First Edition, 2011
2. Rajkumar Buyya, Christian Vechhiola, S. ThamaraiSelvi "Mastering Cloud Computing", First Edition, 2018.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc24_cs118/preview (Cloud Computing)
2. https://nptel.ac.in/courses/106105167 (Cloud Security)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	2	2	1	1	1	1	2	2
2	3	3	2	2	3	3	3	2	2	2	2	3	3
3	3	3	3	2	3	3	2	1	2	2	2	3	3
4	3	3	3	3	3	3	2	2	2	2	2	3	3
5	3	3	3	2	3	3	3	2	2	2	2	3	3
AVG	3.0	2.8	2.6	2.0	2.8	2.8	2.4	1.6	1.8	1.8	1.8	2.8	2.8

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

Chairman - BoS

PROFESSIONAL ELECTIVE - IV

23ITP601	DIGITAL FORENSICS	L T P C
		3 0 0 3

OBJECTIVES

- To gain knowledge about the fundamental concepts of digital forensics and digital evidence.
- To enable students to explore investigation methods used in digital crimes and procedures for collecting digital evidence.
- To inculate the knowledge of digital forensic readiness concepts and organizational practices
- To explore digital evidence from iOS devices using appropriate forensic procedures and tools.
- To enhance students with digital evidence techniques from Android devices using suitable forensic.

UNIT I INTRODUCTION TO DIGITAL FORENSICS 9

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase.

UNIT II DIGITAL CRIME AND INVESTIGATION 9

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence.

UNIT III DIGITAL FORENSIC READINESS 9

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics.

UNIT IV iOS FORENSICS 9

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – Mobil Edit – iCloud.

UNIT V ANDROID FORENSICS 9

Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – Mobil Edit – Android App Decompiling.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply the fundamental concepts of digital forensics.
- Understand the various types of digital crimes and investigation methods

- Analyze the digital forensic readiness practices, framework and standard.
- Analyze the digital evidence from iOS devices using appropriate forensic tools.
- Analyze the digital evidence from Android devices using suitable forensic procedures and tools.

TEXT BOOKS

1. Eoghan Casey, "Digital Evidence and Computer Crime", Academic Press,Third Edition ,2017.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, Fourth Edition ,2016.

REFERENCES

1. Brian Carrier, "File System Forensic Analysis", Addison-Wesley, Fourth Edition 2015.
2. Nilanjan Dey et al.," Cyber Forensics", CRC Press, Second Edition 2016.

E–RESOURCES

1. https://nptel.as.in/courses/167/108/165265456 (Digital Forensics)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	1	2	–	–	–	–	–	3	2
2	3	3	2	2	2	2	–	–	–	–	–	3	2
3	3	3	3	2	2	2	–	–	–	–	–	3	3
4	2	3	2	3	2	3	–	–	–	–	–	3	3
5	2	3	3	3	3	2	–	–	–	–	–	3	3
AVG	2.6	2.8	2.4	2.4	2.0	2.2	-	-	-	-	-	3.0	2.6

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

Chairman - BoS

23ITP602	INFORMATION SECURITY	LT P C 3 0 0 3

OBJECTIVES

- To introduce the principles, issues, challenges, and mechanisms of information security.
- To foster cryptographic techniques for securing data communication.
- To familiarize students with authentication, hash functions, and digital signatures.
- To inculcate knowledge of IP, transport, and web security mechanisms.
- To impart knowledge on Identify, analyze, and mitigate common security attacks and vulnerabilities.

UNIT I – INTRODUCTION TO INFORMATION SECURITY 9

Security Principles and Attacks – Basic Number Theory – Fundamentals of Cryptography – Steganography – Cryptanalysis – Code Breaking – Block Ciphers and Stream Ciphers – Classical Ciphers: Substitution Cipher – Transposition Cipher – Caesar Cipher – Playfair Cipher – Hill Cipher.

UNIT II – CRYPTOGRAPHY AND KEY MANAGEMENT 9

Symmetric Key Cryptography – Public Key Cryptography – Principles of Public Key Cryptosystem– Classical Cryptographic Algorithms – RC4 – RSA – Distribution of Public Keys – Key Management – Diffie-Hellman Key Exchange.

UNIT III – HASH FUNCTIONS AND AUTHENTICATION 9

Hash Functions – One Way Hash Functions – SHA (Secure Hash Algorithm) – Authentication Requirements – Authentication Functions – Kerberos – Message Authentication Codes – Digital Signatures – Digital Certificates.

UNIT IV – IP AND WEB SECURITY 9

IP and Web Security Overview – SSL (Secure Socket Layer) – TLS (Transport Layer Security) – SET (Secure Electronic Transaction) – Intrusion Detection Systems – Firewalls – Types of Firewalls – Firewall Functionality and Policies.

UNIT V – SECURITY ATTACKS AND COUNTERMEASURES 9

Phishing Attacks and Types – Buffer Overflow Attack – Session Hijacking – Hacking – Types of Hackers – Foot printing – Scanning (Port, Network, Vulnerability) – Sniffing in Shared and Switched Networks – Sniffing Detection and Prevention – Spoofing.

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the security principles, attacks, and cryptographic foundations.

- Analyze the encryption and key management techniques.
- Apply hash functions and authentication mechanisms to secure data.
- Analyze IP and web security protocols for secure data communication.
- Analyze vulnerabilities, security threats and implement suitable counter measures.

TEXT BOOKS

1. William Stallings, Cryptography and Network Security, Pearson Education.2015
2. Atul Kahate, Cryptography and Network Security, McGraw Hill Education.2015

REFERENCES

1. Kevin Mandia, Chris Prosise, Incident Response and Computer Forensics, Tata McGraw Hill.
2. Matt Bishop, Computer Security Art and Science, Pearson/PHI, 2015.

E RESOURCES

1. NPTEL – Cryptography and Network Securityhttps://nptel.ac.in/courses/106/105/106105031/
2. NPTEL – Introduction to Information Securityhttps://nptel.ac.in/courses/106/106/106106141/

Mapping of COs- POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	–	–	2	1	2	–	–	–	2	3	2
2	3	3	2	2	3	1	2	–	–	–	2	3	3
3	3	3	3	3	3	1	2	1	1	–	2	3	3
4	3	3	3	3	3	2	2	1	1	–	3	3	3
5	3	3	2	3	3	2	3	1	1	–	3	3	3
AVG	3.0	2.8	2.5	2.8	2.8	1.4	2.2	1.0	1.0	–	2.4	3.0	2.8

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

Chairman - BoS

23CSP601	HACKING TECHNIQUES	L T P C
		3 0 0 3

OBJECTIVES

- To impart fundamental knowledge of ethical hacking concepts, attacker methodologies and cyber threat landscapes.
- To familiarize the students in reconnaissance, scanning, exploitation, and post-exploitation techniques used by attackers.
- To develop the students' comprehensive understanding of various hacking methodologies and tools.
- To enable the students with the ability to analyze, detect, and mitigate common security vulnerabilities.
- To train the students in basic penetration testing, documentation and report the security assessments.

UNIT I INTRODUCTION TO ETHICAL HACKING 9

Hacker types, motives, and attack vectors - Ethical hacking process and phases - Cyber Kill Chain, MITRE ATT & CK basics - Information security principles : CIA, AAA, non- repudiation - Threats, vulnerabilities, exploits - Legal and ethical issues : IT Act, cyber laws, responsible disclosure.

UNIT II FOOTPRINTING, SCANNING & ENUMERATION 9

Footprinting & Reconnaissance : Passive & active information gathering - OSINT Techniques: search engines, social networks, WHOIS, DNS - Website & email footprinting. Network Scanning & Enumeration : Scanning types: port, network, vulnerability scanning - Enumeration methods: NetBIOS, SNMP, LDAP, DNS enumeration - Tools: Nmap, Zenmap, OpenVAS, Nessus.

UNIT III HACKING TECHNIQUES AND TOOLS 9

Social Engineering, Injection - Cross — Site Scripting (XSS), Broken Authentication and Session Management, Cross-Site Request Forgery- Security Misconfiguration - Insecure Cryptographic Storage — Failure to Restrict URL Access, Tools: Comodo, Open VAS, Nexpose, Nikto, Burp Suite, etc.

UNIT IV WEB, NETWORK & WIRELESS ATTACKS 9

Web Application Hacking : OWASP TOP 10 overview - SQL Injection, XSS, CSRF - Session hijacking - File inclusion, command injection. Network & Wireless Attacks : Sniffing & MITM attacks - ARP spoofing, MAC spoofing - Wi-Fi security: WEP, WPA/WPA2/WPA3 - Wireless attacks: Evil Twin, de authentication - Tools: Wireshark, Ettercap, Aircrack-ng, Burp Suite.

UNIT V PENETRATION TESTING & REPORTING 9

Penetration testing process & methodologies (PTES, OSSTMM) - Vulnerability Assessment vs. Pen Testing - Phases of penetration testing - Exploitation with Metasploit basics - Security hardening: system, network, application - Reporting: documentation, risk assessment, CVSS scoring - Recommendations & mitigation techniques.

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain ethical hacking principles, attacker types, and phases of attacks.
- Analyze the foot printing and scanning activities using appropriate techniques and tools.
- Apply hacking techniques and tolls to identify the behavior of malware types including trojans, backdoors, worms, and rootkits.
- Examine the vulnerabilities in networks, wireless systems and web applications.
- Analyze penetration testing and generate security assessment reports using mitigation strategies.

TEXTBOOKS

1. Harold F.Tipton and Micki Krause, "Information Security Management Handbook", CRC Press, Sixth Edition, 2007.
2. Dafydd Stuttard & Marcus Pinto, "The Web Application Hacker's Handbook", Wiley, Second Edition, 2009.

REFERENCES

1. Stuart McClure, Joel Scambray, and George Kurtz, " Hacking Exposed: Network Security Secrets & Solutions" , McGraw-Hill, Seventh Edition, 2010.
2. Jon Erickson, "Hacking: The Art of Exploitation", No Starch Press, Second Edition, 2012.

E - RESOURCES

1. https://nptel/courses/video/106105217 (Ethical Hacking)
2. https://nptel.ac.in/courses/106105162 (Network Security)

Mapping of COs – POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	3	3	2	-	3	2	1	-	2	1
2	2	3	2	3	3	1	-	1	2	1	-	3	2
3	3	3	2	2	3	2	-	2	1	1	-	3	2
4	3	3	2	2	3	2	-	2	2	1	-	3	3
5	2	3	3	3	3	2	-	3	3	3	-	3	3
AVG	2.6	2.8	2.2	2.6	3.0	1.8	-	2.2	2	1.4	-	2.8	2.2

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

Chairman - BoS

23CSP602	SOCIAL NETWORK SECURITY	L T P C
		3 0 0 3

OBJECTIVES

- To familiarize the students with fundamentals, and architecture of social networks, Semantic Web, and Social Network Analysis.
- To impart knowledge on privacy, security, and ethical issues in online social networks and associated threat models
- To inculcate data extraction, community detection, and mining techniques for social network analysis
- To explore human behavior prediction in social networks while addressing privacy and trust concerns.
- To familiarize the students with access control, authentication, and identity management frameworks to ensure security and privacy.

UNIT I FUNDAMENTALS OF SOCIAL NETWORKING 9

Historical overview of privacy and security - Major paradigms for understanding privacy and security - Introduction to Semantic Web - Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis - Development of Social Network Analysis.

UNIT II SECURITY, PRIVACY & THREAT LANDSCAPE IN SOCIAL NETWORKS 9

Evolution of Privacy and Security in Online Social Systems – Threat Models in Social Networking – Contextual Influences on Privacy Attitudes and User Behaviour – Identity, Anonymity and De-Anonymization Issues – API Abuse and Third-Party Application Risks – Privacy Leakage, Metadata Harvesting – Ethical & Legal Challenges in Social Networks – Security Design Principles for Social Platforms.

UNIT III EXTRACTION AND MINING IN SOCIAL NETWORKING DATA 9

Definition of community - Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities - social network infrastructures - Big data and Privacy

UNIT IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES 9

Understanding and predicting human behavior for social communities - User data Management - Inference and Distribution - Enabling new human experiences - Reality mining - Context -Awareness

- Privacy in online social networks - Trust in online environment - Neo4j, Nodes, Relationships, Properties.

UNIT V ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT 9

Understand the access control requirements for Social Network - Roles based Access Control - Host, storage and network access control options - Firewalls - Authentication and Authorization - Identity & Access Management - Single Sign–on - Identity providers and service consumers - The role of Identity provisioning

TOTAL = 45 PERIODS

OUTCOMES

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

- Explain the fundamentals, evolution, and architecture of social networks and Semantic Web.
- Classify the privacy, security, and ethical issues in social networks and related threat models.
- Analyze data extraction, community detection and mining techniques on social network datasets.
- Develop human behavior prediction and trust models in social networks while addressing privacy concerns.
- Analyze secure access control and identity management frameworks for social networking platforms.

TEXT BOOKS

1. Peter Mika, "Social Networks and the Semantic Web", Springer, First Edition, 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Application", Springer, First Edition, 2010

REFERENCES

1. Alessandro Acquisti, "Digital Privacy: Theory, Technologies, and Practices", CRC Press, First Edition, 2007.
2. Mathew O. Jackson, "Social and Economic Networks", Princeton University Press, First Edition, 2008.

E – RESOURCES

1. https://nptel.ac.in/courses/106106146 (Privacy and security)
2. http://nptel/courses/video/106106169 (social networks)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	1	1	–	1	–	2	3	2
2	3	3	2	2	2	3	3	1	2	–	3	3	3
3	3	3	2	3	3	2	1	2	1	–	3	3	3
4	3	3	3	3	3	3	3	2	2	1	3	3	3
5	3	3	3	3	3	3	3	1	2	1	3	3	3
AVG	3.0	2.8	2.4	2.4	2.6	2.4	2.2	1.5	1.6	1.0	2.8	3.0	2.8

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

Chairman - BoS

23CSP603 **ENGINEERING SECURE SOFTWARE SYSTEMS** **L T P C**

3 0 0 3

OBJECTIVES

- To familiarize the students with secure software engineering principles and the importance of security across the software development lifecycle (SDLC).
- To enhance the students to identify, analyze, and mitigate software vulnerabilities in design, code, and deployment.
- To teach secure coding practices for preventing common software attacks such as injection, buffer overflow, and insecure API use.
- To impart hands-on exposure to threat modeling, static and dynamic code analysis tools.
- To train students to design, implement, and test secure software systems following industry standards and best practices.

UNIT I NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS 9

Software Assurance and Software Security – Threats to software security – Sources of software insecurity — Benefits of Detecting Software Security — Properties of Secure Software – Memory Based Attacks: Low-Level Attacks Against Heap and Stack – Defense Against Memory-Based Attacks.

UNIT II SECURE SOFTWARE DESIGN 9

Requirements Engineering for secure software – SQUARE process Model – Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content – Stack Inspection — Policy Specification Languages — Vulnerability Trends — Buffer Overflow — Code Injection – Session Hijacking. Secure Design.

UNIT III SECURITY RISK MANAGEMENT 9

Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management

UNIT IV SECURITY TESTING 9

Traditional Software Testing – Comparison – Secure Software Development Life Cycle – Risk Based Security Testing — Prioritizing Security Testing With Threat Modeling — Penetration Testing – Planning and Scoping – Enumeration – Remote Exploitation – Web Application Exploitation Exploits and Client Side Attacks.

UNIT V SECURE PROJECT MANAGEMENT 9

Governance and security – Adopting an enterprise software security framework – Security and project management – Maturity of Practice

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the principles of secure software engineering, SDLC models and software assurance.
- Identify software vulnerabilities using threat modeling and risk assessment techniques.
- Apply secure coding practices to prevent common software attacks and misuse.
- Utilize static and dynamic analysis tools to detect and fix security flaws in software.
- Develop secure software systems that comply with security standards, policies and best practices.

TEXT BOOKS

1. Julia H. Allen, "Software Security Engineering", Pearson Education, First Edition, 2008.
2. Evan Wheeler, "Security Risk Management: Building an Information Security Risk Management Program from the Ground Up", Syngress Publishing, First Edition, 2011.

REFERENCES

1. Robert C. Seacord, "Secure Coding in C and C++", Addison-Wesley Professional, First Edition, 2005.
2. Jon Erickson, "Hacking: The Art of Exploitation", No Starch Press, Second Edition, 2008.

E – RESOURCES

1. https://nptel.ac.in/courses/106106199 (Secure Systems engineering)
2. https://nptel.ac.in/courses/noc26_cs 71 (Information Security)

Mapping of COs – POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	2	2	2	2	1	1	-	2	2
2	3	3	3	2	2	2	2	-	1	1	-	3	2
3	3	3	3	3	2	1	2	-	2	1	-	3	3
4	3	3	2	2	3	1	1	-	2	1	-	3	2
5	3	3	3	3	3	2	3	1	3	3	2	3	3
AVG	3	3	2.8	2.6	2.4	1.6	2	1.5	1.8	1.4	2	2.8	2.4

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

Chairman - BoS

23CCP602 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES **L T P C**

3 0 0 3

OBJECTIVES

- To explore the core concepts and architecture of Blockchain technology.
- To acquire knowledge of crypto currencies such as Bitcoin and Ethereum, including their transactions, mining, smart contracts, and decentralized applications.
- To impart knowledge about digital tokens, blockchain wallets, and development frameworks.
- To acquire knowledge about the role of Linux and Unix environments in deploying and managing enterprise blockchain networks.
- To explore modern blockchain platforms and frameworks and their applications.

UNIT I OVERVIEW OF BLOCKCHAIN 9

Why Blockchain – The Structure of Blockchain – Data Structure of Blockchain – Data Distribution in Blockchain – Block Validation. Block Validators: Consensus – Proof of Work – Proof of Stake – Proof of Activity – Proof of Elapsed Time – Proof of Burn.

UNIT II CRYPTOCURRENCY 9

Bitcoin: Bitcoin Working – Bitcoin Transactions – Bitcoin Mining – Value of Bitcoin – Community, Politics and Regulations – Advantages – Disadvantages. Ethereum: Overview – Decentralized Application. Components of Ethereum: Smart contracts – Ether – Ethereum Clients – Ethereum Virtual Machine – Ether scripter

UNIT III DEVELOPMENT FRAMEWORKS 9

Digital Tokens: Overview – Initial Coin Offering – OmiseGO – EOS – Tether. Meta Mask: Wallet Seed – Meta Mask Transactions. Mist: Overview – Mist wallet. Truffle: Features of Truffle – Development Truffle boxes – Community truffle box.

UNIT IV HYPERLEDGER 9

Linux& Unix: Hyper ledger Fabric: Introduction – Fabric v/s Ethereum -- Hyper ledger Iroha – Features of Iroha. Hyper ledger Sawtooth: Components of sawtooth – Proof of Elapsed time.

UNIT V BLOCKCHAIN PLATFORMS 9

Multichain – HydraChain. Future Blockchain: IOTA – Corda – Chain Core.Block chain Framework: CoCo Framework – Tierion – BigchainDB.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the architecture, components, and consensus mechanisms of Blockchain technology.

- Analyze the working of Bitcoin and Ethereum, including cryptocurrency transactions, mining, smart contracts, and decentralized applications.
- Develop blockchain applications using digital tokens, blockchain wallets, and development frameworks.
- Analyze Linux and Unix environments for enterprise blockchain platforms for secure blockchain deployment.
- Examine modern blockchain platforms and frameworks for real-world blockchain applications.

TEXTBOOKS

1. Josh Thompson, "'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming", Create Space Independent Publishing Platform, 1st Edition, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Gold feder. "Bitcoin and cryptocurrency technologies: a comprehensive introduction". 1st Edition, Princeton University Press, 2016.

REFERENCES

1. Antony Lewis, The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them, Mango Publishig group, 2018
2. Tiana Laurence, Introduction to Blockchain Technology, 1st Edition, Van Haren Publishing, 2019.
3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 1st Edition, 2015.

E-REFERENCE

1. https://nptel.ac.in/courses/106105235
2. https://nptel.ac.in/courses/106105184

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	1	1	–	1	–	2	2	2
2	3	3	3	2	3	2	1	–	2	–	2	3	2
3	3	2	3	3	3	1	1	2	2	2	2	3	3
4	3	3	2	3	3	2	1	2	2	2	2	3	3
5	3	3	3	3	3	2	2	2	2	2	3	3	3
AVG	3	2.8	2.6	2.6	2.8	1.6	1.2	2	1.8	2	2.2	2.8	2.6

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

Chairman - BoS

PROFESSIONAL ELECTIVE - V

PROFESSIONAL ELECTIVE - V

23ITP603	GAME DEVELOPMENT	L T P C 3 0 0 3

OBJECTIVES

- To enable students to understand the basics of 2D and 3D graphics for game development.
- To familiarize the students with stages of game development and design principle.
- To foster the students to understand the game engine design & rending techniques.
- To train students to develop the gaming environment.
- To acquire knowledge on Pygame to develop game environment

UNIT I 3D GRAPHICS FOR GAME DESIGN 9

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models –.Animation– Controller Based Animation.

UNIT II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

UNIT III GAME ENGINE DESIGN 9

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding.

UNIT IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development–Unity–Unity Scripts –Mobile Gaming, Game Studio,Unity Single player and Multi-Player games.

UNIT V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.

TOTAL: 45 PERIODS

OUTCOMES

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

- Understand the concepts of 2D and 3d Graphics
- Apply the various game design documents using gaming design principles.
- Apply the gaming engines design and rending techniques using game environment.
- Apply recent gaming environments using development frameworks.

- Analyze a simple game application using Pygame

REFERENCES

1.SanjayMadhav,"GameProgramming Algorithms and Techniques:APlatform Agnostic Approach", Addison Wesley,Fourth Edition 2015.

2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress,Second Edition 2016.

TEXTBOOKS

1. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", CRC Press,Second Edition 2015.

2. JungHyunHan,"3D Graphics for Game Programming",ChapmanandHall/CRC, Fourth Edition 2016.

E RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs77/preview (Gaming Development)
2. https://onlinecourses.nptel.ac.in/noc24_cs109/previewn (Gaming Design)

Mapping of COs-POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	2	-	-	-	-	-	-	2	2
2	1	2	2	1	2	-	-	-	-	-	-	2	2
3	1	1	1	2	1	-	-	-	-	-	-	2	2
4	3	3	1	3	3	-	-	-	-	-	-	2	3
5	3	3	2	1	3	-	-	-	-	-	-	2	3
AVG	**2.2**	**2.2**	**1.6**	**1.6**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2.2**

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

Chairman - BoS

23CSP604 **AUGMENTED REALITY / VIRTUAL REALITY** L T P C

3 0 0 3

OBJECTIVES

- To impart the fundamental concepts, components, and technologies used in Virtual Reality (VR) and Augmented Reality (AR).
- To inculcate knowledge on geometric, physical, and behavioral modeling essential for VR applications.
- To train students in VR programming environments, toolkits, and scene-graph-based development.
- To introduce learners to various real-world applications of VR across medicine, military, manufacturing, robotics, business, and entertainment.
- To foster with AR fundamentals, computer vision methods, interaction techniques, and wearable AR devices.

UNIT I INTRODUCTION 9

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR- AR Technologies-Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System

UNIT II VR MODELING 9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT III VR PROGRAMMING 9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT IV APPLICATIONS 9

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications–

Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics– Information Visualization – VR in Business

UNIT V AUGMENTED REALITY 9

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation-Navigation-Wearable devices.

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the principles of VR/AR, their components, input/output devices and human sensory interfaces.
- Apply geometric, kinematic, and physical modeling concepts to construct VR scenes and environments.
- Develop simple VR applications using standard VR toolkits and scene-graph programming frameworks.
- Analyze the role of VR in various fields such as healthcare, military, manufacturing, robotics, entertainment, and education.
- Analyze AR technologies, computer-vision methods, interaction techniques and wearable AR systems.

TEXT BOOKS

1. Grigore Burdea & Philippe Coiffet, "Virtual Reality Technology", John Wiley & Sons, Second Edition, 2003.

2. Alan Craig, William Sherman, Jeffrey Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, First Edition, 2009.

REFERENCES

1. John Vince, "Virtual Reality Systems", Pearson Education, First Edition, 2011.

2. Jason Jerald, "The VR Book: Human - Centered Design for Virtual Reality", CM Books, First Edition, 2015.

E - RESOURCES

1. https://nptel.ac.in/courses/106/106/106106131/(Computer Graphics and Virtual Reality)
2. https://nptel.ac.in/courses/106/107/106107168/(Virtual Reality (VR) and Augmented Reality (AR)

Mapping of COS – POS & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	2	2	1	3	1	1	-	2	1
2	3	3	3	2	2	1	-	-	2	1	-	3	2
3	3	3	3	2	3	1	-	-	3	2	-	3	3
4	3	3	2	2	2	3	2	3	2	2	-	1	2
5	3	3	2	3	3	2	1	-	2	1	-	3	2
AVG	3	3	2.6	2.4	2.4	1.8	1.3	3	2	1.4	-	2.4	2

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

Chairman - BoS

23CSP605 **ROBOTICS PROCESS AND AUTOMATION** L T P C

3 0 0 3

OBJECTIVES

- To impart the fundamental concepts of Robotic Process and Automation
- To familiarize the students in key RPA design and development strategies and methodologies
- To train the students on exception Handling, Debugging, and Logging operations in RPA
- To foster the students with hands-on skills in robot programming, simulation, and deployment in automated environments.
- To enable the students to analyze, troubleshoot, and optimize robotic workflows for efficiency, safety, and resource utilization.

UNIT I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION 9

Emergence of Robotic Process Automation (RPA) - Evolution of RPA - Differentiating RPA from Automation- Benefits of RPA - Application areas of RPA - Components of RPA - RPA Platforms - Robotic Process Automation Tools - Domains in Activities - Workflow Files.

UNIT II AUTOMATION PROCESS ACTIVITIES 9

Sequence - Flowchart & Control Flow - Sequencing the Workflow - Activities - Flowchart- Control Flow for Decision Making - Data Manipulation - Variables - Collection – Arguments - Data Table - Clipboard Management - Finding the Control - Waiting for a Control - Act on a Control – Ui Explorer - Handling Events.

UNIT III APP INTEGRATION, RECORDING AND SCRAPING 9

App Integration - Recording - Scraping - Selector - Workflow Activities - Recording Mouse and Keyboard Actions - Scraping Data from Website - Writing to CSV - Process Mining.

UNIT IV EXCEPTION HANDLING AND CODE MANAGEMENT 9

Exception handling - Common exceptions - Logging - Debugging techniques - Collecting crash dumps - Error reporting - Code management and maintenance - Project organization - Nesting workflows - Reusability - Templates - Commenting techniques - State Machine.

UNIT V DEVOPS 9

Publishing using publish utility - Orchestration Server - Control bots - Orchestration Server to deploy bots - License management - Publishing and managing updates - RPA Vendors - Open-source RPA - Future of RPA.

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the fundamentals of Robotic Process Automation and identify business processes suitable

for automation.

- Apply map existing manual processes and redesign them for effective RPA implementation.
- Design software bots using leading RPA tools.
- Analyze the automation workflows involving data extraction, validation, exception handling, and logging.
- Analyze RPA solutions with enterprise applications, databases, web services, and APIs.

TEXTBOOKS

1. Gerardus Blokdyk, "RPA Robotic Process Automation A Complete Guide," 5STARCooks, First Edition, 2020.
2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems," Apress, First Edition, 2020.

REFERENCES

1. Christian Kirschniak, "Robotic Process Automation (RPA) – Digitization and Automation of Processes," Springer Gabler, First Edition, 2021.
2. Klaus Rüdiger (Editor), "Blockchain and Robotic Process Automation Forum", Springer, First Edition, 2020.

E - RESOURCES

1. https://nptel.ac.in/courses/108/105/108105186/ (Introduction to robotics)
2. https://nptel.ac.in/courses/108/108/108108063/ (Industrial automation)

Mapping of COs – POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	2	2	3	1	2	-	2	2
2	2	3	3	2	2	2	2	-	2	2	-	3	3
3	3	3	3	2	3	1	1	-	2	2	-	3	3
4	3	2	2	2	3	1	-	-	2	1	-	3	2
5	3	3	3	2	3	2	1	1	3	2	2	3	3
AVG	2.8	2.8	2.6	2	2.6	1.6	1.5	2	2	1.8	2	2.8	2.6

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

Chairman - BoS

23ADP602	NEURAL NETWORKS AND DEEP LEARNING	L T P C
		3 0 0 3

OBJECTIVES:

- To impart basic knowledge of deep neural networks.
- To foster knowledge of associative memory and unsupervised learning networks.
- To train students to use CNN architectures for different applications.
- To enable students to analyze the basic computations used in deep learning and train neural networks.
- To acquire knowledge of autoencoders and generative models for suitable applications.

UNIT I INTRODUCTION 9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction-Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network.

UNIT II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 9

Training Algorithms for Pattern Association-Auto associative Memory Network-Hetero associative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Auto associative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT III THIRD-GENERATION NEURAL NETWORKS 9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT IV DEEP FEED FORWARD NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT V RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Introduction –Recursive Neural Networks –Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image compression, Natural Language Processing. Complete Autoencoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply Convolution Neural Network for image processing.
- Understand the basics of associative memory and unsupervised learning networks.
- Apply CNN and its variants for suitable applications.
- Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.
- Apply auto encoders and generative models for suitable applications.

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	3	2	3	1	-	-	2	1	-	2	2
2	3	1	2	1	-	-	-	-	-	1	2	-	1
3	3	3	3	3	3	1	-	-	2	1	-	2	2
4	3	3	3	3	3	-	-	-	2	-	2	2	2
5	1	1	3	2	3	-	-	-	2	-	-	1	1
AVG	2.6	2	2.8	2.2	3	1	-	-	2	1	2	2.8	2.6

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

Chairman - BoS

23CCP502 COMPUTER HARDWARE AND SYSTEM ESSENTIALS L T P C

3 0 0 3

OBJECTIVE

- To impart knowledge of the fundamental components of a computer system and their functions.
- To provide an understanding of system software and its role in computer operation.
- To explain the functions and services of an operating system in managing computer resources.
- To introduce the fundamentals of digital logic and logic circuits.
- To familiarize students with the various digital circuit building blocks and their applications.

UNIT I COMPONENTS OF COMPUTER SYSTEM 9

Computer Memory - Secondary storage device types – Sequential Access device – Direct Access device- Magnetic disks - Optical disks - memory storage devices . Ports: Serial and Parallel Ports – Specialized Expansion Ports: SCSI, USB, MIDI - Expansion Slots and Boards - PC Cards - Plug and Play - HDMIports - networking ports.

UNIT II SYSTEM SOFTWARE 9

Bootstrap module – configuration - OS loading – typical Linux virtual machine - Installing a Linux virtual machine - Using package manager to install/update software. Understanding disk partitions and obtaining partition information using system tools - Obtaining essential system resource utilization and information using system tools and proc file system: disk utilization - memory utilization - process information – CPU utilization.

UNIT III OPERATING SYSTEM 9

Functions of Operating System - Basics of popular operating system (LINUX, WINDOWS) – Kernel prompt - Shell commands. User Interface - Operating System Simple Setting: Changing System Date and Time, Changing Display Properties, To Add or Remove a Windows Component, Changing Mouse Properties, Adding and removing Printers. File and Directory Management: Creating and renaming of files and directories, Common utilities. Interrupts statements in various OS and its uses.

UNIT IV LOGIC CIRCUITS 9

Variables and functions – Inversion – Truth tables - Logic Gates and Networks - Boolean algebra - Synthesis using gates - Design examples - Optimized implementation of logic functions- Karnaugh map - Strategy for minimization - Minimization of product of sums forms –Incompletely specified functions- Multiple output circuits-Tabular method for minimization.

UNIT V COMBINATIONAL CIRCUIT BUILDING BLOCKS 9

Multiplexers - Decoders - Encoders, Sequential circuit building blocks: Flip flops - SR, JK, D and T-Registers - Counters- sequential circuit design from state diagram.

TOTAL : 45 PERIODS

OUTCOMES

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

- Describe the working principles of different computing devices.
- Identify the PC and laptop hardware components.
- Explain the core functions of an operating system.
- Design and construct the simple logic circuits using basic logic gates.
- Explain the role and functions of fundamental circuits.

TEXT BOOKS

1. Irv Englander, " The Architecture of Computer Hardware, System Software and Networking, An Information Technology Approach", 6th Edition, John Wiley & Sons,2021.

2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design",3rd Edition, McGraw Hill Education, 2017.

REFERENCES

1. Morris Mano,Cilett MD, "Digital Design with Introduction to the Verilog HDL",5th Edition,Pearson Education,2015.

2. Silberschatz A, Gagne G, Galvin PB, " Operating system concepts", 9th Edition, Wiley, 2012.

E- RESOURCES

1. https://onlinecourses.swayam2.ac.in/cec24_cs10/preview(computer Fundamentals)
2. https://onlinecourses.nptel.ac.in/noc24_cs108(operating system)

Mapping of COs-POs &PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1	2	-	-	-	-	-	2	3	3
2	3	3	3	2	3	-	-	-	-	-	2	3	3
3	3	3	3	3	3	-	-	-	-	-	2	3	3
4	3	3	3	3	3	-	-	-	-	-	2	3	3
5	3	3	2	3	3	2	-	-	2	2	3	3	3
AVG	3	3	2.6	2.5	2.8	2	-	-	2	2	2.2	3	3

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

Chairman - BoS

23CCP605 **CYBER PHYSICAL SYSTEM SECURITY** L T P C
3 0 0 3

OBJECTIVES

- To impart the fundamental concepts and principles of Cyber Physical Systems.
- To acquire knowledge about the cyber physical system components.
- To familiarize students with synchronous and asynchronous models used in Cyber Physical Systems.
- To impart knowledge of the security challenges and protection mechanisms in Cyber Physical Systems.
- To equip students with essential tools to implement CPS for different application domain.

UNIT I INTRODUCTION 9

Introduction: Cyber-Physical System, Key Features of CPS, Application Domains of CPS, Basic principles of design and validation of CPS, Challenges in CPS

UNIT II CYBER PHYSICAL SYSTEM PLATFORM 9

CPS HW platforms, Processors, Sensors and Actuators, CPS Network - Wireless, CAN, Automotive Ethernet, Scheduling Real Time CPS tasks, Synchronous Model and Asynchronous Model

UNIT III SYNCHRONOUS AND ASYNCHRONOUS MODEL 9

Reactive Components, Components Properties, Components Composing, Synchronous Designs and Circuits, Asynchronous Processes and operations, Design Primitives in Asynchronous Process, Coordination Protocols in Asynchronous **Process, Leader Election.**

UNIT IV SECURITY OF CYBER-PHYSICAL SYSTEMS 9

Introduction to CPS Securities, Basic Techniques in CPS Securities, Cyber Security Requirements, Attack Model and Countermeasures, Advanced Techniques in CPS Securities

UNIT V CPS APPLICATION 9

Health care and Medical Cyber-Physical Systems, Smart grid and Energy Cyber Physical Systems, WSN based Cyber-Physical Systems, Smart Cities.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts, principles, and architecture of Cyber Physical Systems.
- Analyze the components and functional architecture of Cyber Physical Systems.

- Analyze the synchronous and asynchronous models used in the design and operation of Cyber Physical Systems..
- Analyze the security challenges, vulnerabilities, and protection mechanisms in Cyber Physical Systems.
- Examine the selection of appropriate tools and technologies for implementing Cyber Physical System solutions in different application domains.

TEXTBOOKS

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems: A Cyber-Physical Systems Approach", 2011.
2. R. Alur, "Principles of Cyber-Physical Systems," MIT Press, 2015
3. Raj Rajkumar, Dionisio de Niz and Mark Klein, "Cyber-Physical Systems", Addison-Wesley,2017

REFERENCES

1. Rajeev Alur, "Principles of Cyber-Physical Systems", MIT Press, 2015.
2. Fei Hu, "Cyber-Physical Systems", CRC Press 2013.

E-RESOURCE

1. https://onlinecourses.nptel.ac.in/noc23_cs62/preview(Foundation of cyber physical system)
2. https://nptel.ac.in/courses/106106199 (Secure system engineering)

Mapping of COs-POs &PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	–	–	–	–	–	–	–	–	2	2	1
2	3	3	2	2	3	–	–	–	–	–	2	3	2
3	3	3	2	2	2	–	–	–	–	–	2	2	2
4	2	3	2	2	3	2	3	–	–	–	2	3	3
5	2	3	3	2	3	3	–	–	2	2	3	2	3
AVG	2.6	2.8	2.2	2	2.7	2.5	3.0	–	2.0	2.0	2.2	2.4	2.2

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

Chairman - BoS

PROFESSIONAL ELECTIVE VI

PROFESSIONAL ELECTIVE VI

23ITP604	INFORMATION ASSURANCE AND SECURITY	L T P C
		3 0 0 3

OBJECTIVES:

- To inculcate knowledge in the basics of Information Security
- To impart knowledge in legal, ethical and professional issues in Information Security
- To familiarize the principles and applications aspects of risk management
- To equip students with aware of various standards in this area.
- To expose students to recent technological aspects of Information Security

UNIT I INTRODUCTION 9

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II SECURITY INVESTIGATION 9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT III SECURITY ANALYSIS 9

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem

UNIT IV LOGICAL DESIGN 9

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V PHYSICAL DESIGN 9

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access ControlDevices, Physical Security, Security and Personnel

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand and explain the fundamental concepts, principles, and mechanisms of

Information Security to protect information assets effectively.

- Analyze legal, ethical, and professional practices related to Information Security in real-world organizational scenarios.
- Identify, assess, and manage risks by applying appropriate risk management frameworks and security controls.
- Apply internationally recognized Information Security standards and best practices for compliance and governance.
- Analyze emerging trends in Information Security and assess their impact on modern security challenges.

TEXT BOOK:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", VikasPublishing House, New Delhi, 2015

2. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3CRCPress LLC, 2017.

REFERENCES :

1. Stuart McClure, Joel Scrambray, George Kurtz," Hacking Exposed", Tata McGraw-Hill, 2017
2. Matt Bishop," Computer Security Art and Science", Pearson/PHI, 2018.

E-RESOURCES

1. https://nptel.ac.in/courses/106/106/106106129/ (Information Security Technologies)
2. http://www.nptelvideos.com/course.php?id=427 (Information Security.

Mapping of COs-POs &PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	–	–	–	–	–	–	–	–	2	2	1
2	3	3	2	2	3	–	–	–	–	–	2	3	2
3	3	3	2	2	2	–	–	–	–	–	2	2	2
4	2	3	2	2	3	2	3	–	–	–	2	3	3
5	2	3	3	2	3	3	–	–	2	2	3	2	3
AVG	2.6	2.8	1.8	1.6	2.2	1	3	–	2	2	2.2	2.4	2.2

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

Chairman - BoS

23CSP610 **OPTIMIZATION TECHNIQUES** **L T P C**
3 0 0 3

OBJECTIVES

- To impart the fundamentals of optimization and develop the ability to formulate mathematical optimization problems.
- To familiarize the students with linear programming techniques for solving real-world optimization problems.
- To enable students to apply single-variable optimization methods for efficient solution search.
- To develop skills in solving multivariable and constrained optimization problems using classical and numerical techniques.
- To familiarize students with intelligent optimization methods like GA, PSO, SA, and GP for solving complex engineering problems.

UNIT I INTRODUCTION TO OPTIMIZATION 9

Introduction to Classical Methods & Linear Programming Problems Terminology, Design Variables, Constraints, Objective Function, Problem Formulation. Calculus method, Kuhn Tucker conditions, Method of Multipliers

UNIT II LINEAR PROGRAMMING PROBLEM 9

Linear Programming Problem, Simplex method, Two-phase method, Big-M method, duality, Integer linear Programming, Dynamic Programming, Sensitivity analysis.

UNIT III SINGLE VARIABLE OPTIMIZATION PROBLEMS 9

Optimality Criterion, Bracketing Methods, Region Elimination Methods, Interval Halving Method, Fibonacci Search Method, Golden Section Method. Gradient Based Methods: Newton-Raphson Method, Bisection Method, Secant Method.

UNIT IV MULTIVARIABLE AND CONSTRAINED OPTIMIZATION TECHNIQUES 9

Multi Variable and Constrained Optimization Technique, Optimality criteria, Direct search Method, Simplex search methods, Hooke-Jeeve's pattern search method, Powell's conjugate direction method, Gradient based method, Cauchy 's Steepest descent method, Newton 's method, Conjugate gradient method. Kuhn - Tucker conditions, Penalty Function, Concept of Lagrangian multiplier, Complex search method, Random search method

UNIT V INTELLIGENT OPTIMIZATION TECHNIQUES 9

Introduction to Intelligent Optimization, Genetic Algorithm: Types of reproduction operators,

crossover & mutation, Simulated Annealing Algorithm, Particle Swarm Optimization (PSO), Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP- Virtual Functions.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain optimization problems using classical methods and linear programming concepts.
- Apply linear programming techniques such as simplex, duality, and dynamic programming to solve decision-making problems.
- Analyze modular solutions using functions, recursion, and pointers.
- Solve multivariable and constrained optimization problems using direct search, gradient-based, and advanced numerical techniques.
- Analyze intelligent optimization algorithms such as GA, PSO, SA, and GP for complex real-world optimization tasks.

TEXT BOOKS

1. S. S. Rao, "Engineering Optimization: Theory and Practice", Wiley India Pvt. Ltd., Ninth Edition, 2020.
2. F. S. Hillier and G. J. Lieberman, "Introduction to Operations Research", McGraw-Hill Education, Tenth Edition, 2019.

REFERENCES

1. Xin-She Yang, "Nature-Inspired Optimization Algorithms", Elsevier Academic Press, Second Edition, 2020.
2. James Kennedy and Russell Eberhart, "Particle Swarm Optimization", Morgan Kaufmann Publishers, Second Edition, 2020.

E-RESOURCES

1. https://nptel.ac.in/courses/106105173 (Engineering Optimization)
2. https://nptel.ac.in/courses/112104031 (Operations Research)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	1	-	3	1	1	-	2	1
2	3	3	2	2	2	1	-	-	2	1	-	3	2
3	3	3	3	1	2	-	-	-	2	1	-	3	3
4	3	3	2	3	3	1	-	-	2	1	-	3	2
5	3	3	3	3	3	2	1	1	3	2	2	3	3
AVG	3	3	2.4	2.2	2.4	1.3	1	2	2	1.2	2	2.8	2.2

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

Chairman - BoS

23CST401	DISTRIBUTED COMPUTING	L T P C
		3 0 0 3

OBJECTIVES

- To impart the knowledge on the computation and communication models of distributed systems.
- To familiarize the students about the issues of synchronization and collection of information in distributed systems.
- To equip the students in the distributed mutual exclusion and distributed deadlock detection techniques.
- To expose the agreement protocols and fault tolerance mechanisms in distributed systems.
- To explore the cloud computing models and the underlying concepts.

UNIT I INTRODUCTION 9

Introduction: Definition-Relation to Computer System Components – Motivation – Message -Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.

UNIT II LOGICAL TIME AND GLOBAL STATE 9

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Algorithms.

UNIT III DISTRIBUTED MUTEX AND DEADLOCK 9

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala's Algorithm — Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm.

UNIT IV CONSENSUS AND RECOVERY 9

Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System (Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery.

UNIT V CLOUD COMPUTING 9

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud

Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts and components of distributed systems.
- Analyze logical time, synchronization and global state in distributed systems.
- Apply algorithms for mutual exclusion, deadlock detection and fault tolerance in distributed environments.
- Analyze consensus algorithms and recovery mechanisms for fault tolerance in distributed systems.
- Analyze cloud computing models, architecture and apply virtualizations.

TEXT BOOKS

1. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, First Edition 2011.
2. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc- Graw Hill Publishers First Edition 2017.

REFERENCES

1. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Pearson Education, Fifth Edition, 2012.
2. Coulouris George, Dollimore Jean, "Distributed Operating Systems: Concepts and Design", Pearson Education, Fifth Edition, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/106106107/(Distributed coordination)
2. https://nptel.ac.in/courses/106/106/106106168/ (Basic distributed algorithms)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	2	1	-	-	-	-	-	-	2	1
2	3	3	3	2	1	-	-	-	-	-	-	2	1
3	3	3	3	2	1	-	-	-	-	-	-	2	1
4	3	3	3	2	2	-	-	-	-	-	-	2	1
5	3	3	3	2	3	2	1	1	2	2	2	2	1
AVG	3	3	3	2	1.6	2	1	1	2	2	2	2	1

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

Chairman - BoS

23CSP612	ETHICS AND AI	L T P C
		3 0 0 3

OBJECTIVES

- To introduce the fundamentals of morality and ethics in AI and their diverse societal impacts.
- To familiarize the students with international ethical initiatives and real-world ethical issues in AI applications.
- To foster AI standards, regulations, and processes for addressing ethical concerns in system design.
- To impart the knowledge on roboethics, moral theories, and ethical responsibilities in robotics and ICT.
- To enable students to explore the challenges, opportunities, and societal implications of AI in various sectors.

UNIT I INTRODUCTION 9

Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust.

UNIT II ETHICAL INITIATIVES IN AI 9

International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles, Warfare and weaponization.

UNIT III AI STANDARDS AND REGULATION 9

Model Process for Addressing Ethical Concerns During System Design – Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations – Ontological Standard for Ethically Driven Robotics and Automation Systems.

UNIT IV ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS 9

Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology – Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy.

UNIT V AI AND ETHICS- CHALLENGES AND OPPORTUNITIES 9

Challenges – Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the foundational concepts of morality and ethics in AI and their societal impacts.
- Identify global ethical initiatives and ethical concerns through real-world AI case studies.

- Apply AI standards, regulations, and processes to address ethical issues in system design.
- Explain roboethics, moral theories and ethical responsibilities in robotics and ICT.
- Analyze key ethical challenges, opportunities and societal impacts of AI across domains.

TEXT BOOKS

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, Fourth Edition, 2021.
2. Wendell Wallach and Colin Allen, "Moral Machines: Teaching Robots Right From Wrong ", Oxford University Press, Second Edition, 2009.

REFERENCES

1. Virginia Dignum, "Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way", Springer, First Edition, 2019.
2. Patrick Lin, Keith Abney and Ryan Jenkins, "Robot Ethics 2.0: From Autonomous Cars to Artificial Intelligence", Fourth Edition, 2017.

E - RESOURCES

1.https://nptel.ac.in/courses/112108298(Ethics in Engineering Practice)

2.https://onlinecourses.nptel.ac.in/noc25_cs118/preview(Responsible Artificial Intelligence)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	-	-	-	3	3	3	1	1	-	1	1
2	2	3	1	1	-	3	3	2	2	2	-	2	2
3	2	3	3	2	2	3	3	2	2	2	2	3	2
4	1	2	-	-	-	3	3	3	1	1	-	1	1
5	2	3	2	1	1	3	3	2	3	2	2	2	2
AVG	**1.8**	**2.6**	**2**	**1.3**	**1.5**	**3**	**3**	**2.4**	**1.8**	**1.6**	**0.8**	**1.8**	**1.6**

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

Chairman - BoS

23ADP502	KNOWLEDGE ENGINEERING	L T P C 3 0 0 3

OBJECTIVES

- To impart the fundamental concepts and principles of Knowledge Engineering, including its role and significance in knowledge-based systems.
- To develop students' proficiency in methodologies and modeling techniques for agent design and development.
- To enable students to design and develop ontologies for effective knowledge representation in specific domains.
- To provide knowledge of reasoning techniques using ontologies and rules for knowledge-based problem solving.
- To train students to analyze learning concepts, rule learning, and knowledge-based learning approaches for developing intelligent systems.

UNIT I REASONING UNDER UNCERTAINTY 9

Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning Knowledge Engineering.

UNIT II METHODOLOGY AND MODELING 9

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.

UNIT III ONTOLOGIES – DESIGN AND DEVELOPMENT 9

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.

UNIT IV REASONIING WITH ONTOLOGIES AND RULES 9

Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNIT V LEARNING AND RULE LEARNING 9

Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement –

Overview – Rule Generation and Analysis – Hypothesis Learning.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts and principles of Knowledge Engineering.
- Apply methodologies and modeling techniques for Agent Design and Development.
- Design ontologies for effective knowledge representation.
- Apply reasoning techniques using ontologies and rules for knowledge-based problem solving.
- Analyze learning concepts and rule learning techniques.

TEXT BOOKS

1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 – Chapter 8, 9)

2. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018

REFERENCES

1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.

2. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.

E – RESOURCES

1. https://nptel.ac.in/courses/106106140

2. https://onlinecourses.nptel.ac.in/noc24_cs14/preview

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	1	2	2	-	-	-	-	3	2	3	1	1
2	2	2	3	1	-	-	-	-	2	2	2	3	1
3	1	3	2	2	-	-	-	-	2	2	1	1	1
4	1	3	3	3	-	-	-	-	3	2	3	2	3
5	3	1	2	2	-	-	-	-	3	3	2	2	1
AVG	2.0	2.0	2.4	2.0	-	-	-	-	2.6	2.2	2.2	1.8	1.4

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

Chairman - BoS

23CSP608 **SOFT COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES

- To impart the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To foster the mathematical background for carrying out the optimization associated with neural network learning
- To train the students on various evolutionary Algorithms.
- To familiarize the students with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
- To teach case studies utilizing the above and illustrate the Intelligent behavior of programs based on soft computing

UNIT I INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC 9

Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems

UNIT II NEURAL NETWORKS 9

Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks

UNIT III GENETIC ALGORITHMS 9

Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function

UNIT IV NEURO FUZZY MODELING 9

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability

UNIT V APPLICATIONS 9

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamentals of fuzzy logic operators and inference mechanisms
- Apply neural network architecture for AI applications such as classification and clustering
- Analyze the functionality of Genetic Algorithms in Optimization problems.
- Analyze the hybrid techniques involving Neural networks and Fuzzy logic
- Apply soft computing techniques in real world applications

TEXT BOOKS

1. SaJANG, J.-S. R., SUN, C.-T., & MIZUTANI, E. Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,2015.

2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python, 2020

REFERENCES

1. roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.

2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003

E – RESOURCES

1. https://archive.nptel.ac.in/courses/106/105/106105173/
2. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	1	1	1	3	1	1	-	2	1
2	3	3	2	2	2	1	-	-	2	1	-	3	2
3	3	3	2	2	2	1	-	-	1	1	-	3	2
4	3	3	3	2	2	1	-	-	2	1	-	3	3
5	3	3	3	3	3	2	1	1	3	2	2	3	3
AVG	3.0	2.8	2.4	2.2	2.0	1.2	1.0	2.0	1.8	1.2	2.0	2.8	2.2

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

Chairman - BoS

OPEN ELECTIVES - I

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
CIVIL	23CEO607 / Environmental and Social Impact Assessment	OE	3	0	0	3	40	60	100
CSE	23CSO610 / Introduction to Drone Technologies	OE	3	0	0	3	40	60	100
ECE	23ECO602 / Fundamentals of Electronic Devices and Circuits	OE	3	0	0	3	40	60	100
EEE	23EEO603 / Electric Vehicle Technology	OE	3	0	0	3	40	60	100
	23EEO604 / Renewable Energy Systems	OE	3	0	0	3	40	60	100
MECHANICAL	23MEO601 / Introduction to Industrial Engineering	OE	3	0	0	3	40	60	100
	23MEO605 / CNC Machining Technology	OE	3	0	0	3	40	60	100
MEDICAL ELECTRONICS	23MDO611 / Hospital Management	OE	3	0	0	3	40	60	100
ROBOTICS AND AUTOMATION	23RAO609 / Fundamentals of Robotics	OE	3	0	0	3	40	60	100
CSE(Cyber Security)	23CSO612 / Cyber Forensics and Ethical Hacking	OE	3	0	0	3	40	60	100
PHARMACEUTICAL TECHNOLOGY	23PMO608 / Pharamaceutical Nanotechnology	OE	3	0	0	3	40	60	100
MATHEMATICS	23MAO606 / Graph Theory	OE	3	0	0	3	40	60	100

OPEN ELECTIVE – I

23CEO607 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT **L T P C**

3 0 0 3

OBJECTIVES

- To explore the Rio principles of environmental impact assessment.
- To enhance the screening and scoping in EIA.
- To develop the environmental monitoring plan and EIA report preparation.
- To inculcate the baseline monitoring of socio economic environment.
- To instruct the EIA case studies pertaining to infrastructure projects.

UNIT I INTRODUCTION 9

Impacts of Development on Environment – Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle – EIA Notification and Legal Framework.

UNIT II ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks Checklist Methods - Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing- Environmental Clearance.

UNIT IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis.

UNIT V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems- Airports - Dams and Irrigation projects - Power plants.

TOTAL: 45 PERIODS

OUTCOMES

OUTCOMES

Upon completion of the course, Students will be able to

- Examine the impacts of development on environment.
- Analyze the scoping and screening of developmental projects for environmental and social assessments.
- Construct the environmental management plans and EIA reports.
- Apply the economic valuation of environmental impacts and cost benefit analysis.
- Identify the EIA case studies pertaining to Infrastructure Projects.

TEXT BOOKS

1. Canter, R.L, "Environmental impact Assessment ", Second Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
2. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers, First Edition, 2009.

REFERENCES

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" Conceptual and Methodological Advances, Edward Elgar Publishing, 2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme, 2002.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II",Blackwell Science New York, 1998.

E-RESOURCES

1. https://nptel.ac.in/courses/124107160 (Environmental Impact Assessment)
2. https://onlinecourses.nptel.ac.in/noc25_ch24/preview (Environmental Quality Monitoring & Analysis)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	–	2	3	–	–	–	–	-	-
2	3	3	2	2	–	2	3	–	–	–	–	-	-
3	3	3	3	2	2	2	3	–	–	–	2	-	-
4	3	3	2	2	–	2	3	–	–	–	3	-	-
5	3	3	3	2	2	3	3	–	–	–	2	-	-
AVG	3.0	3.0	2.4	2.0	2.0	2.2	3.0	–	–	–	2.3	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23CSO610 INTRODUCTION TO DRONE TECHNOLOGIES LT P C

3 0 0 3

OBJECTIVES

- To introduce the fundamental concepts, vocabulary, and historical evolution of drone technology.
- To impart the process of assembling a multirotor drone using appropriate components and tools.
- To familiarize the students with drone flight operations, management tools, and the role of sensors in UAV systems.
- To impart the application of drones in filming and panoramic imaging.
- To foster the principles of drone swarm technology in drone applications.

UNIT I INTRODUCTION TO DRONE TECHNOLOGY 9

Drone Concept-Vocabulary Terminology-History of drone-Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses-Drone business through entrepreneurship-Opportunities/applications for entrepreneurship and Employability.

UNIT II DRONE DESIGN, FABRICATION AND PROGRAMMING 9

Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts -Function of the component parts -Assembling a drone- The energy sources- Level of autonomy-Drones configurations -The methods of programming drone- Download program – Install program on computer-Running Programs-Multi rotor stabilization-Flight modes-Wi-Fi connection.

UNIT III DRONE FLYING AND OPERATION 9

Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment-Drone controls Flight operations –management tool –Sensors-Onboard storage capacity-Removable storage devices-Linked mobile devices and applications.

UNIT IV DRONE COMMERCIAL APPLICATIONS 9

Choosing a drone based on the application-Drones in the insurance sector-Drones in delivering mail, parcels and other cargo-Drones in agriculture-Drones in inspection of transmission .ines and power distribution -Drones in filming and panoramic picturing.

UNIT V FUTURE DRONES AND SAFETY 9

The safety risks-Guidelines to fly safely –Specific aviation regulation and standardization-Drone License-Miniaturization of drones-Increasing autonomy of drones-The use of drones in swarms.

TOTAL: 45 PERIODS

OUTCOMES

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

- Understand the fundamental concepts, terminology, and historical development of drone technology.
- Design a multirotor drone using appropriate components and tools.
- Analyze the drone flight operations and UAV management tools.
- Utilize the drones for effective filming and panoramic photography through appropriate flight and camera control.
- Apply the principles of drone swarm technology to evaluate coordinated control and collaborative UAV applications.

TEXTBOOKS

1. Daniel Tal and John Altschuld, "Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation", John Wiley & Sons, First Edition, 2021
2. Terry Kilby and Belinda Kilby, "Make: Getting Started with Drones, Maker Media,Inc.", Sheroff Publishers and Distributors Pvt Ltd, First Edition, 2015

REFERENCES

1. John Baichtal,"Building Your Own Drones:A Beginners' Guide to Drones, UAVs, and ROVs", Que Publishing, First Edition, 2016
2. Zavrsnik," Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance", Springer, First Edition, 2018.

E-RESOURCES

1. http://www.digimat.in/nptel/courses/video/101108661/L50.html (Fundamentals of Drone Technologies)
2. http://www.digimat.in/nptel/courses/video/101108661/L38.html (Drone Technology Commercial Application)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	3	-	-	-	-	-	3	-	-
2	3	3	3	2	3	-	-	-	-	-	3	-	-
3	3	3	2	2	3	-	-	-	-	-	3	-	-
4	2	3	2	2	3	-	-	1	-	-	2	-	-
5	2	3	3	2	3	-	-	2	-	-	2	-	-
AVG	2.6	2.8	2.4	1.8	3	-	-	1.5	-	-	2.6	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23ECO602 FUNDAMENTALS OF ELECTRONIC DEVICES AND CIRCUITS LT P C

3 0 0 3

OBJECTIVES

- To introduce fundamental knowledge of semiconductors and devices and its applications.
- To discuss the operation and characteristics of Bipolar Junction Transistor.
- To expose the various types of oscillators and FET.
- To inculcate the operation of power semiconductor devices.
- To impact knowledge on optoelectronic devices and wave shaping circuits.

UNIT I SEMICONDUCTOR AND DIODES 9

Semiconductor - Definition, classification, intrinsic and extrinsic N type & p type – drift current &diffusion current diodes – PN junction diode – forward and reverse bias characteristics – specification – zener diode construction & working Principle -characteristics - zener break down - avalanche break down.

Rectifier – introduction-classification of rectifiers-half wave rectifier-full wave Rectifier (center tapped, bridge) - (no mathematical equations) – comparison – Applications - filters-C, LC and PI filters.

UNIT II BIPOLAR JUNCTION TRANSISTOR 9

Transistor – NPN and PNP transistor – operation-transistor as an amplifier- transistor as a switch – CB,CE,CC configurations – characteristics - comparison between three configurations in terms of input impedance, output impedance, current gain, voltage gain – negative feedback Concept, effect of negative feedback – types of negative feedback connections.

UNIT III TRANSISTOR OSCILLATORS AND FET 9

Transistor oscillators – Classifications – Condition for oscillations (Barkhausen criterion) – General form of Hartley Oscillator – Colpitts Oscillator – RC Phase shift oscillator.

Field Effect Transistor – construction – working principle of FET – difference Between FET and BJT – classification of FET – characteristics of FET – Applications.

UNIT IV SCR, DIAC, TRIAC 9

SCR – introduction – working – VI-characteristics -comparison between SCR and transistor – SCR as a switch, controlled rectifier. TRIAC working principle, Characteristics –DIAC –characteristics – DIAC as bi- directional switch. Applications of SCR,TRIAC and DIAC.

UNIT V OPTOELECTRONIC DEVICES AND WAVE SHAPING CIRCUITS 9

Classification of optoelectronic devices – symbols, Characteristics, working of LDR, LED, 7 segment LED and LCD– opto coupler - Photo transistor. Clipper, Clamper Circuits and waveforms only – Astable, Monostable Multivibrators and Schmitt trigger using transistors.

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Understand the concept of semiconductor, diodes and its applications.
- Discuss the various biasing circuits using BJT.
- Explain the oscillator circuits and Field Effect Transistor.
- Analyze the operation of power semiconductor devices and its applications.
- Explain the operation of optoelectronic devices and wave shaping circuits.

TEXT BOOKS

1. Robert L. Boylestad, Louis Nashelsky "Electronic Devices and Circuits Theory", Prentice Hall Publications, Tenth Edition, 2009.
2. S.Salivahanan,N.Suresh kumar, , "Electronic Devices and Circuits", McGraw Hill, Fifth Edition, 2022.

REFERENCE

1. G.S.N. Raju, "Electronic Devices and Circuits", I.K. International Publications, New Delhi, First Edition, 2006.
2. A.P Godse, U.A Bakshi , "Electronic Devices and Circuits", Technical Publications, 2010.

E-RESOURCES

1. https://nptel.ac.in/courses/108108122 - (Fundamentals of Semiconductor Devices).
2. https://onlinecourses.nptel.ac.in/noc21_ee86 - (Microelectronics: Devices To Circuits).

Mapping of COs - POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	2	-	-	-	-	3	-	-
2	3	3	3	3	2	3	-	-	-	-	2	-	-
3	3	3	3	3	3	2	-	-	-	-	3	-	-
4	3	3	3	3	3	2	-	-	-	-	2	-	-
5	3	3	3	3	3	3	-	-	-	-	2	-	-
AVG	3	3	3	3	2.8	2.4	-	-	-		2.4	-	-

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

Chairman - BoS

23EEO603 ELECTRIC VEHICLE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES

- To impart knowledge on the basic concepts and working of electric vehicles.
- To familiarize with battery types, parameters, and battery pack design for electric vehicles.
- To instruct on DC and AC electrical machines used in electric vehicle applications.
- To develop understanding of electric vehicle drive train components and regenerative braking.
- To foster awareness of hybrid electric vehicle types, configurations, and component sizing.

UNIT I ELECTRIC VEHICLES 9

Introduction - Components - Vehicle mechanics - Roadway fundamentals - Vehicle kinetics Dynamics of vehicle motion Propulsion System Design

UNIT II BATTERY 9

Basics - Types - Parameters Capacity, Discharge rate, State of charge, state of discharge, Depth of discharge - Technical characteristics - Battery pack design Properties of batteries

UNIT III DC & AC ELECTRICAL MACHINES 9

Motor and engine rating - Requirements - DC machines - Three phase AC machines- Induction machines - Permanent magnet machines - BLDC Motor Switched reluctance machines

UNIT IV ELECTRIC VEHICLE DRIVE TRAIN 9

Transmission configuration - Components - Gears - Differential - Clutch - Brakes Regenerative braking - Motor sizing

UNIT V HYBRID ELECTRIC VEHICLES 9

Types - Series - Parallel and series - Parallel configuration - Design - Drive train Sizing of components.

TOTAL: 45 PERIODS

OUTCOMES

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

- Analyze the basic concepts and working of electric vehicles.
- Apply the battery types, parameters inbattery pack design.
- Explain the DC and AC electrical machines used in electric vehicles.
- Identify the electric vehicle drive train components and regenerative braking.
- Examine the hybrid electric vehicle types, configurations, and component sizing.

TEXT BOOKS

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, Second Edition, 2017.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, First Edition, 2015.

REFERENCES

1. Iqbal Hussain, "Electric & Hybrid Vehicles - Design Fundamentals", CRC press, Second

2. T. Denton, "Electric and Hybrid Vehicles", Routledge, Second Edition, 2020.

E-RESOURCES

1. https://nptel.ac.in/courses/108103009 - (Hybrids and Electric Vehicle)
2. http://nptel.ac.in/courses/108103009/ - (Electric Vehicle)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	-	-	-	-	-	2	-	-
2	3	3	3	3	3	-	-	-	-	-	2	-	-
3	3	3	3	3	3	-	-	-	-	-	2	-	-
4	3	3	3	3	3	-	-	-	-	-	2	-	-
5	3	3	3	3	3	-	-	-	-	-	2	-	-
AVG	3	3	3	3	3	-	-	-	-	-	2	-	-

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

Chairman - BoS

23EEO604 **RENEWABLE ENERGY SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES

- To impart knowledge on renewable energy sources and their role in sustainable energy development.
- To familiarize with the working and applications of wind energy systems.
- To develop understanding of solar photovoltaic and solar thermal energy systems.
- To instruct on biomass, geothermal, and hydroelectric energy systems.
- To get knowledge on other renewable energy sources and energy storage systems.

UNIT I RENEWABLE ENERGY SOURCES **9**

Environmental consequences of fossil fuel use - Importance of Renewable Sources (RE) of energy - Sustainable design and development - Types of RE sources - Limitations of RE sources - Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY **9**

Power in the wind - Types of wind power plants(wpps) - Components of wpps - Working of wpps - Siting of wpps - Grid integration issues of wpps.

UNIT III SOLAR PV AND THERMAL SYSTEMS **9**

Solar radiation - Radiation measurement - Solar thermal power plant - Central receiver power plants - Solar ponds - Thermal energy storage system with pcm - Solar photovoltaic systems - Basic principle of spv conversion - Types of pv systems -Maximum power point tracking - Best free solar pv system simulation.

UNIT IV BIOMASS ENERGY **9**

Introduction - Bio mass resources - Energy from bio mass - Conversion processes - Biomass cogeneration - Environmental benefits - Geothermal energy - Basics - Direct use - Geothermal electricity - Mini/micro hydro power - Classification of hydropower schemes - Classification of water turbine - Turbine theory - Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES **9** Tidal energy - Energy from the tides - Barrage and non barrage tidal power systems - Wave energy - Energy from waves - Wave power devices - Ocean thermal energy conversion (OTEC) - Hydrogen production and storage - Fuel cell - Principle of working - Various types - Construction and applications - Energy storage system - Hybrid energy systems.

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the importance and types of renewable energy sources.
- Analyze the working and components of wind energy systems.
- Discuss how solar photovoltaic and solar thermal systems work.
- Determine biomass, geothermal, and hydroelectric energy systems.
- Examine tidal, wave, ocean thermal, fuel cell, and hybrid energy systems.

TEXT BOOKS

1. Scott Grinnell, "Renewable Energy & Sustainable Design", Cengage Learning, USA, Second Edition, 2016.

2. Richard A. Dunlap, "Sustainable Energy", Cengage Learning India Private Limited, Second Edition, 2015.

REFERENCES

1. ShobhNath Singh, "Non-conventional Energy resources", Pearson Education India, Second Edition, 2015.
2. Bradley A. Striebig, Adebayo A.Ogundipe and Maria Papadakis, "Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, First Edition, 2016.

E-RESOURCES

1. https://nptel.ac.in/courses/108/108/108108078/ - (Renewable Energy Systems)
2. https://nptel.ac.in/courses/108/105/108105058/-(Non-Conventional Energy resources)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	1	1	-	1	-	2	-	-
2	3	3	3	3	3	1	1	-	1	-	2	-	-
3	3	3	3	3	3	1	1	-	1	-	2	-	-
4	3	3	3	3	3	1	1	-	1	-	2	-	-
5	3	3	3	3	3	1	1	-	1	-	2	-	-
AVG	3	3	3	3	3	1	1	-	1	-	2	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23MEO601 INTRODUCTION TO INDUSTRIAL ENGINEERING L T P C

3 0 0 3

OBJECTIVES

- To enable students to grasp the fundamental concepts, scope, and role of Industrial Engineering in manufacturing and service systems.
- To expose students to plant location, facility layout, and production planning concepts relevant to real-world industries.
- To develop analytical ability to apply work study, method study, and ergonomics principles in industrial environments.
- To equip students with foundational knowledge of statistical quality control and its application in process improvement.
- To prepare the concept of Production and Operations Management in creating and enhancing a firm"s competitive advantages.

UNIT I INTRODUCTION 9

Concepts of Industrial Engineering – History and development of Industrial Engineering –Roles of Industrial Engineer – Applications of Industrial Engineering – Production Management Vs Industrial Engineering – Production System – Input Output Model – Productivity – Factors affecting Productivity – Increasing Productivity of resources – Kinds of Productivity measures.

UNIT II PLANT LOCATION AND LAYOUT 9

Factors affecting Plant location – Objectives of Plant Layout – Principles of Plant Layout – Types of Plant Layout – Methods of Plant and Facility Layout – Storage Space requirements – Plant Layout procedure – Line Balancing methods.

UNIT III WORK SYSTEM DESIGN & ERGONOMICS 9

Need – Objectives – Method Study procedure – Principles of Motion Economy – Work Measurement procedures – Time Study –Work sampling- Ergonomics and its areas of application in the work system - Physical work load and energy expenditure, Anthropometry – measures – design procedure, Work postures-sitting, standing.

UNIT IV STATISTICAL QUALITY CONTROL 9

Definition and Concepts – Fundamentals – Control Charts for variables – Control Charts for attributes – Acceptance Sampling- O.C curve –Single sampling plan- Double sampling plan.

UNIT V PRODUCTION PLANNING AND CONTROL 9

Forecasting –Techniques – Types of production – Process planning – Economic Batch Quantity– Loading – Scheduling and control of production.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply the concepts of productivity and productivity measurement approaches.
- Examine appropriate location models for various facility types and design various facility layouts.
- Analyze and conduct method study and time study to improve the efficiency of the system.
- Examine the quality of processes using control charts in manufacturing/service industries.
- Examine sufficient knowledge and skill for Planning strategies and Material Requirement Plan (MRP).

TEXTBOOKS

1. Martand Telsang, "Industrial Engineering and Production Management", S. Chand and Company, 2016.
2. Khanna O. P., and Sarup A., "Industrial Engineering and Management", Dhanpat Rai Publications, New Delhi, 2020,
3. George Kanwaty, "Introduction to Work Study ", ILO, Geneva, 2016,

REFERENCES

1. Ravi Shankar, 2019, "Industrial Engineering and Management", Galgotia Publications & Private Limited.
2. Norberd Lloyd Enrick., "Industrial Engineering Manual for Textile Industry", Wiley Eastern (P) Ltd., New Delhi, 2018,
3. Enrick N. L., "Time study manual for Textile industry", Wiley Eastern (P) Ltd.,2019,

E-RESOURCES

1. https://nptel.ac.in/courses/112107292 (Principles of Industrial Engineering)
2. https://onlinecourses.nptel.ac.in/noc25_me181/preview- (Industrial Engineering and Operations Research)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	-	-	-	-	-	-	-	2	-	-
2	3	3	2	-	-	-	-	-	-	-	2	-	-
3	3	3	2	-	-	-	-	-	-	-	2	-	-
4	3	3	2	-	-	-	-	-	-	-	2	-	-
5	3	3	2	-	-	-	-	-	-	-	2	-	-
AVG.	3	3	2	-	-	-	-	-	-	-	2	-	-

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

Chairman - BoS

23MEO605 CNC MACHINING TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES

- To introduce students to the fundamentals of computer graphics, CAD systems, geometric transformations, and viewing techniques used in computer-aided design.
- To provide knowledge on geometric modeling techniques, assembly modeling, graphics standards, and product data exchange standards used in CAD applications.
- To explain the construction, components, control systems, and operational features of CNC machines and advanced machining centres.
- To familiarize students with manual and computer-aided CNC part programming techniques using APT, CAM packages, and canned cycles.
- To develop an understanding of Computer-Aided Manufacturing (CAM), Computer Integrated Manufacturing (CIM), manufacturing planning and control, automation, lean production, and Just-in-Time (JIT) manufacturing concepts.

UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS 9

Product cycle - Design process - sequential and concurrent engineering - Computer-aided design - CAD system architecture - Computer graphics - coordinate systems - 2D and 3D transformations homogeneous coordinates - Line drawing - Clipping - viewing transformation.

UNIT II GEOMETRIC MODELING 9

Geometric Modeling - types - Wireframe, surface and solid modeling - Boundary Representation, constructive solid geometry - Graphics standards - assembly modeling - use of software packages - Data exchange standards - IGES, STEP, CALS, etc. - communication standards.

UNIT III CNC MACHINES 9

NC, CNC & DNC - types of CNC - constructional features - drives and control systems - feedback devices - Interchangeable tooling system - preset & qualified tools - ISO specification - Machining center - Turning center - CNC EDM - CNC wire cut EDM.

UNIT IV CNC PROGRAMMING 9

Manual part programming - steps involved - sample program in lathe & milling. - Computer-aided part programming - APT - CAM package - canned cycles - Programming.

UNIT V FUNDAMENTALS OF CAM 9

Brief introduction to CAM - Manufacturing Planning, Manufacturing control - Concurrent Engineering - CIM concepts - Computerized elements of CIM system - Types of production Basic Elements of an Automated system - Levels of Automation - Lean Production and Just-In-Time Production.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Analyze the principles of computer graphics, CAD system architecture, coordinate systems, geometric transformations, and viewing techniques used in computer-aided design.
- Examine geometric modeling techniques, assembly modeling approaches, graphics standards, and data exchange standards for engineering design applications.
- Compare the constructional features, control systems, tooling arrangements, and operational characteristics of CNC machines and advanced machining centres.
- Classify CNC programming techniques, including manual part programming, computer-aided part programming, APT, CAM packages, and canned cycles for manufacturing applications.
- Differentiate the concepts of CAM, CIM, manufacturing planning and control, automation, lean production, and Just-in-Time (JIT) production in modern manufacturing systems.

TEXTBOOKS

1. Mikell P. Groover, "Automation, Production Systems, and Computer-Integrated Manufacturing, Pearson Education", Fifth Edition, 2023.
2. Ibrahim Zeid, "Mastering CAD/CAM", McGraw-Hill Education, Third Edition, 2021.
3. P. N. Rao, "CAD/CAM: Principles and Applications", McGraw-Hill Education (India), Fourth Edition, 2022.

REFERENCES

1. M. P. Groover and Emory W. Zimmers Jr., "CAD/CAM: Computer-Aided Design and Manufacturing", Pearson Education, Second Edition (Reprint), 2020
2. M. P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", John Wiley & Sons, Eigth Edition, 2025
3. Ibrahim Zeid and R. Sivasubramanian, "CAD/CAM: Theory and Practice", McGraw Hill Education, Second Edition, 2020.

E-RESOURCES

1. https://nptel.ac.in/courses/112102103 (Overview of CNC machines)
2. http://www.digimat.in/nptel/courses/video/112104289/L20.html (CNC Part Programming)

Mapping of COs-POs &PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	3	-	-	-	-	-	1	-	-
2	3	3	2	2	3	-	-	-	-	-	1	-	-
3	3	3	2	2	3	-	-	-	-	-	1	-	-
4	3	3	2	2	3	-	-	-	–	-	1	–	–
5	3	3	2	2	3	-	-	-	-	-	1	-	-
AVG.	3	3	2	2	3	-	-	-	-	-	1	-	-

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

Chairman - BoS

23MDO611 HOSPITAL MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To familiarize students with the fundamentals of hospital administration and management.
- To impart knowledge on human resource management practices in healthcare organizations.
- To explore marketing research processes and consumer behavior in healthcare services.
- To introduce hospital information systems and supportive healthcare services.
- To inculcate awareness of quality assurance, accreditation standards, and patient safety practices.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 9

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning - Current Issues in Hospital Management – Telemedicine - Bio-Medical Waste Management..

UNIT II HUMAN RESOURCE MANAGEMENT IN HOSPITAL 9

Principles of HRM — Functions of HRM — Profile of HRD Manager — Tools of HRD – Human Resource Inventory – Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines –Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer, Communication – nature, scope, barriers, styles and modes of communication.

UNIT III MARKETING RESEARCH PROCESS 9

Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations — Consumer Markets & Consumer Buyer Behaviour - Model of consumer behaviour - The buyer decision process - Model of business buyer behavior — Major types of buying situations - WTO and its implications.

UNIT IV HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES 9

Management Decisions and Related Information Requirement - Clinical Information Systems - Administrative Information Systems - Support Service Technical Information Systems — Medical Transcription, Medical Records Department – Central Sterilization and Supply Department– Pharmacy– Food Services - Laundry Services.

UNIT V QUALITY AND SAFETY ASPECTS IN HOSPITAL 9

Quality system – Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004 – Features of ISO 9001 – ISO 14000 – Environment Management Systems. NABA, JCI, NABL. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules. Health Insurance & Managing Health Care – Medical Audit – Hazard and Safety in a hospital Setup.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Examine the principles and functions of hospital administration in healthcare organizations.
- Analyze human resource management practices and their role in hospital operations.
- Apply marketing research techniques for healthcare service management.
- Utilize hospital information systems and supportive services for decision-making.
- Develop quality assurance and patient safety strategies in healthcare settings.

TEXT BOOKS

1. Gupta Joydeep Das, "Hospital Administration and Management: A Comprehensive Guide", Third Edition, 2023.
2. G.D.Kunders, "Hospitals – Facilities Planning and Management", TMH, New Delhi, Fifth Edition,Reprint 2018.

REFERENCES

1. Bruce J. Fried and Myron D.Fottler, "Human Resources in Healthcare Managing for Success",Fourth Edition, 2020.
2. James R. Langabeer, "Handbook on Health Care Operations Management",Jones & Bartlett Publishers, 2020.

E-RESOURCES

1. https://www.youtube.com/watch?v=2J-F4Fi2VRQ – (Introduction to Human Resource Management in Healthcare Settings)
2. https://www.youtube.com/watch?v=dXHJemWm1xI&pp=ygUVI2hvc3BpdGFsX2luZm9ybWF0aW9u – (Hospital Information Management Software (HIMS))

Mapping of COs, POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	1	3	1	-	-	2	1	-	-	1	1	-	-
2	1	2	2	1	-	1	2	1	1	2	1	-	-
3	1	2	3	1	1	1	1	-	1	2	1	-	-
4	1	2	2	2	3	1	1	-	1	1	2	-	-
5	1	3	2	2	2	3	2	1	1	2	2	-	-
AVG.	1	2.4	2	1.5	2	1.6	1.4	1.0	1.0	1.6	1.4	-	-

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

Chairman - BoS

23RAO609 FUNDAMENTALS OF ROBOTICS L T P C

3 0 0 3

OBJECTIVES

- To introduce the basics of robots, including anatomy, types, specifications, and applications.
- To impart knowledge on robot kinematics, including forward/inverse kinematics and transformation matrices for manipulators.
- To familiarize with robot drive systems and end effectors, including types, features, applications, and design considerations.
- To discuss sensors in robotics, including force, tactile, proximity, and their applications and safety aspects.
- To enhance understanding of robot programming and its applications in industrial and specialized fields.

UNIT I BASICS OF ROBOT 9

Robot – Definition – Robot Anatomy – Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions – Need for Robots – Different Applications.

UNIT II ROBOT KINEMATICS 9

Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices.

UNIT III ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All These Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, internal grippers and external grippers, selection and design considerations of a gripper

UNIT IV SENSORS IN ROBOTICS 9

Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance

mechanism

UNIT V PROGRAMMING AND APPLICATIONS OF ROBOT 9

Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effectors Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Identify robot types, anatomy, specifications, and applications.
- Illustrate forward and inverse kinematics of manipulators using transformation matrices.
- Analyze and select appropriate drive systems and end effectors for robotic applications.
- Apply sensor technologies and safety systems to robotic cells for reliable detection, hazard prevention, and compliant operation.
- Apply robot programming techniques and analyze their applications in industrial and specialized fields.

TEXTBOOKS

1. Ganesh.S.Hedge, "A textbook of Industrial Robotics", Lakshmi Publications, Second Edition, 2015.
2. Mikell.P.Groover, "Industrial Robotics–Technology, Programming and applications", McGraw Hill, Second Edition , 2017.

REFERENCES

1. Fu K.S. Gonalz R.C. and ice C.S.G.,"Robotics Control, Sensing, Vision and Intelligence", McGraw Hill book co., Second Edition, 2007.
2. John. J.Craig, "Introduction to Robotics: Mechanics and Control", Fourth Edition, 2022.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_me37/preview- (Fundamentals of Robotics)
2. https://archive.nptel.ac.in/courses/112/108/112108298 (Basics of Robotics)

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	-	3	3	-	1	-	2	-	1	-	-
2	3	2	-	3	3	-	-	-	2	-	2	-	-
3	3	2	-	3	3	-	-	2	2	2	2	-	-
4	3	2	-	3	3	2	-	2	2	2	2	-	-
5	3	2	-	2	3	2	-	2	2	3	3	-	-
AVG	3.0	2	-	2.8	3.0	2.0	1.0	2.0	2.0	2.3	2.0	-	-

1.Low 2-Medium 3-High '-' – No Correlation

Chairman - BoS

23CSO612 CYBER FORENSICS AND ETHICAL HACKING L T P C
3 0 0 3

OBJECTIVES

- To impart knowledge about the cyber crime and forensics.
- To acquire knowledge about forensic tools used for evidence acquisition and analysis.
- To familiarize with skills to collect, analyse, and present digital evidence following accepted forensic procedures and legal requirements.
- To impart the fundamental concepts, principles, and scope of ethical hacking in cyber security.
- To acquire the ethical hacking principles and security best practices to identify, analyze, and mitigate vulnerabilities in web applications

UNIT I INTRODUCTION TO CYBER CRIME AND FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Role of ECD and ICT in Cybercrime - Classification of Cyber Crime. The Present and future of Cybercrime - Cyber Forensics -Steps in Forensic Investigation - Forensic Examination Process - Types of CF techniques - Forensic duplication and investigation - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II FORENSICS TOOLS 9

Processing Crime and Incident Scenes – Digital Evidence - Sources of Evidence -Working with File Systems. - Registry - Artifacts - Current Computer Forensics Tools: Software/ Hardware Tools - Forensic Suite - Acquisition and Seizure of Evidence from Computers and Mobile Devices - Chain of Custody- Forensic Tools

UNIT III VALIDATING FORENSICS DATA 9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics - Analysis of Digital Evidence - Admissibility of Evidence - Cyber Laws in India.

UNIT IV ETHICAL HACKING 9

Introduction to Ethical Hacking – Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats – Sniffing – Email Tracking .

UNIT V ETHICAL HACKING IN WEB 9

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web

Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

.TOTAL: 45 PERIODS

OUTCOMES

Upon completion of this course, Students will be able to

- Understand the basics of cyber crime and computer forensics
- Apply the forensic tools for acquiring, preserving, and analyzing digital evidence
- Analyze and validate digital evidence by applying standard forensic procedure
- Apply ethical hacking methodologies to perform reconnaissance, scanning, enumeration, and vulnerability
- Analyze the security vulnerabilities in web applications, wireless networks, and mobile platform.

TEXT BOOKS

1. Bill Nelson, Amelia Phillips, Christopher Stuart, "Guide to Computer Forensics and Investigations", Cengage Learning, India, Sixth Edition, 2019.
2. CEH official "Certified Ethical Hacking Review Guide", Wiley India Edition, Version 11, 2021.
3. Dejey, S. Murugan, "Cyber Forensics", Oxford University Press, India, 2018

REFERENCES

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.
2. Marjie T.Britz, "Computer Forensics and Cyber Crime: An Introduction", Third Edition, Prentice Hall, 2013.
3. AnkitFadia " Ethical Hacking", Second Edition, Macmillan India Ltd, 2006.
4. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications, Taylor &Francis Group - 2008.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	1	1	-	-	-	1	-	-
CO2	3	2	1	2	3	1	2	1	1	-	2	-	-
CO3	3	3	1	3	3	2	3	1	2	-	2	-	-
CO4	3	3	2	2	3	2	2	1	1	-	2	-	-
CO5	3	3	3	2	3	2	3	1	2	1	3	-	-
AVG	3	2.6	1.8	2.3	2.6	1.6	2.2	1	1.5	1	2	-	-

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

Chairman - BoS

23PMO608 PHARMACEUTICAL NANOTECHNOLOGY L T P C

3 0 0 3

OBJECTIVES

- To introduce the evolution, principles, and applications of nanotechnology in drug delivery.
- To familiarize students with the principles of biopharmaceutics and pharmacokinetics.
- To provide knowledge of the principles, preparation, characterization, evaluation, and pharmaceutical applications of closed bilayered drug delivery systems.
- To develop a comprehensive understanding of programmed drug delivery systems, drug targeting strategies,
- To enhance understanding of the interactions of nanomaterials with biological systems, nanotoxicity.

UNIT I FUNDAMENTALS OF NANOTECHNOLOGY IN DRUG DELIVERY 9

Nanotechnology in Drug Delivery- Past, Present and Future- Conventional delivery of pharmaceuticals and its limitations, Significance of nano-size in Pharmacy, biotechnology and medicine, Physicochemical Principles of nano-sized Drug Delivery Systems, Biopharmaceutical, Physiological, and Clinical Considerations for Nanotechnology in Drug Delivery.

UNIT II PHARMACOKINETICS AND BIO DISTRIBUTION 9

Introduction- Definitions, concepts of Absorption, Distribution, Metabolism and excretion, concentration time profile, Bioavailability, bio pharmaceutics and pharmacokinetics in drug research. Biotransformation of drugs- Drug metabolizing enzymes, chemical pathways of Drug transformation, Phase-I and Phase-II reactions, Factors affecting drug transformation Prodrugs- Application of produg design.

UNIT III NANO CARRIERS FOR DRUG DELIVERY 9

Closed bilayered system- Introduction, structural aspects, preparation, characterization, evaluation and applications of liposomes, niosomes, erythrosomes. Polymeric Nanoparticles- Introduction, preparation, characterization, evaluation and pharmaceutical applications.

UNIT IV CONTROLLED AND TARGETED DRUG DELIVERY 9

Programmed Drug Delivery Systems- principles of sustained, controlled, pulsatile and triggered release of drug from nanoparticles. Concept of targeting- Targeting Approaches, Transport Across Biological Barriers, mechanisms of drug targeting, Ideal carrier system and approach Disease-

Related Approaches by Nanotherapeutics- nanoparticles for Cancer, Skin Diseases, Bacterial, Diseases, Parasites Diseases and Inflammatory Disease.

UNIT V NANO TOXICOLOGY AND REGULATORY ISSUES 9

Human health and safety- Interaction of nanomaterials with biological systems, Toxicology of nanoparticles- in-vitro and in-vivo, Complications with Nanotoxicity studies, environmental impact of nano-materials, Regulatory Toxicology.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply the physicochemical principles governing nano-sized drug delivery systems.
- Explain the role of biopharmaceutics and pharmacokinetics in drug discovery, development, and therapeutic optimization.
- Analyze the physicochemical properties and performance of liposomes, niosomes, erythrosomes, and polymeric nanoparticles for pharmaceutical applications.
- Explain the principles of programmed drug delivery systems, including sustained, controlled, pulsatile, and triggered drug release from nanoparticles.
- Apply appropriate approaches to assess the toxicological effects and safety of nanomaterials using in-vitro and in-vivo studies.

TEXT BOOKS

1. Padma Devarajan, Sanyog Jain, "Targeted Drug Delivery : Concepts and Design", Springer publisher, First Edition , 2015.
2. M. A. Mateescu P. Ispas-Szabo E. Assaad, "Controlled Drug Delivery", Woodhead Publishing , Second Edition, 2014

REFERENCES

1. Michael E. Aulton ,"Pharmaceutics", Churchill Livingstone Publisher , Second Edition, 2013.
2. Philippe Houdy, Marcel Lahmani, "Nanoethics and Nanotoxicology", Springer-Verlag Publisher, Second edition, 2011.

E-RESOURCES

1. https://onlinelibrary.wiley.com/doi/book/10.1002/9783527800681
2. https://www.scribd.com/document/742651789/Nano-Technology-1

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	3	2	2	-	-	-	-	2	-	-
2	2	2	2	3	2	1	2	-	-	-	2	-	-
3	2	2	2	2	2	2	3	-	-	-	2	-	-
4	2	3	3	3	3	2	1	-	-	1	2	-	-
5	3	3	3	3	3	2	2	1	-	-	3	-	-
AVG.	2.4	2.6	2.4	2.8	2.4	1.8	2	1	-	1	2.2	-	-

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

Chairman - BoS

23MAO606 GRAPH THEORY L T P C
3 0 0 3

OBJECTIVES

- To introduce the fundamental concepts of graph theory.
- To explain the properties of trees, spanning trees, and fundamental circuits.
- To explain the concepts of connectivity and planarity.
- To provide knowledge of graph coloring, covering and partitioning.
- To introduce the concepts of directed graphs and Euler digraphs.

UNIT I INTRODUCTION, PATHS AND CIRCUITS 9

Graphs introduction – Finite and Infinite graphs – Incidence and degree – Isolated vertex, Pendant vertex and Null graph – Isomorphism – Sub graphs – Walks, Paths and Circuits – Connected graphs, disconnected graphs and components – Euler graphs – Hamiltonian paths and circuits.

UNIT II TREES AND FUNDAMENTAL CIRCUITS 9

Trees – Properties of trees – Pendant vertices in a tree – Distance and centers in tree – Rooted and binary trees – Spanning trees – Fundamental circuits – Spanning trees in a weighted graph.

UNIT III CONNECTIVITY AND PLANARITY 9

Connectivity and separability – Network flows – 1-isomorphism – 2-isomorphism – Combinational and geometric graphs – Planer graphs – Kuratowski's two graphs – Different representation of a planer graph.

UNIT IV COLORING, COVERING AND PARTITIONING 9

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem

UNIT V DIRECTED GRAPH 9

Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler digraphs

OUTCOMES

Upon completion of the course, Students will be able to

- Understand the fundamental concepts of graphs, paths, circuits, Euler and Hamiltonian graphs.

- Apply tree properties and fundamental circuits to solve engineering problems.
- Analyze graph connectivity, network flows and planar graphs for modeling real-world systems.
- Apply graph coloring, matching, covering, and partitioning techniques to optimization and scheduling problems.
- Analyze directed graph and Euler digraphs in engineering applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Narsingh Deo., " Graph theory with applications to engineering and computer Science ", Prentice-Hall of India Pvt.Ltd, Fifth Edition, 2016.
2. L.R.Foulds , "Graph Theory Applications", Springer LTD, Seventh Edition, 2016.

REFERENCES

1. Kenneth H Rosen, "Discrete Mathematics and its Applications", McGraw Hill Education (India) Private Ltd., Seventh Edition,, 2011.
2. Ralph P Grimaldi and B.V Ramana., "Discrete and Combinatorial Mathematics", Pearson Education limited, Fifth Edition, 2014.

E-RESOURCES

1. https://nptel.ac.in/courses/111106102 (Graph theory)
2. https://nptel.ac.in/courses/128106001 (Graph theory)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	-	-	-	-	-	-	-	-	1	-	-
2	3	3	2	-	-	-	-	-	-	-	1	-	-
3	3	3	2	1	-	-	-	-	-	-	1	-	-
4	3	3	3	1	-	-	-	-	-	-	2	-	-
5	3	3	2	1	-	-	-	-	-	-	2	-	-
AVG	3	2.8	2.3	1	-	-	-	-	-	-	1.4	-	-

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

Chairman - BoS

OPEN ELECTIVE- II

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
CIVIL	23CEO704 / Remote Sensing Concepts	OE	3	0	0	3	40	60	100
ECE	23ECO708 / Energy Technology	OE	3	0	0	3	40	60	100
EEE	23EEO709 / Sensors, Actuators and its Application	OE	3	0	0	3	40	60	100
MECHANICAL	23MEO703 / Fundamentals of Mechatronics	OE	3	0	0	3	40	60	100
	23MEO704 / Nano Technology	OE	3	0	0	3	40	60	100
	23MEO712 / Smart Manufacturing	OE	3	0	0	3	40	60	100
MEDICAL ELECTRONICS	23MDO705 / Ultrasound Principles and its Medical Applications	OE	3	0	0	3	40	60	100
ROBOTICS AND AUTOMATION	23RAO707 / Mobile Robots	OE	3	0	0	3	40	60	100
CSE(Cyber Security)	23CSO711 / Introduction to Cyber Security	OE	3	0	0	3	40	60	100
PHARMACEUTICAL TECHNOLOGY	23PMO706 / Intellectual Property Rights for Pharma Industry	OE	3	0	0	3	40	60	100
MATHEMATICS	23MAO710 / Operations Research	OE	3	0	0	3	40	60	100

23CEO704 REMOTE SENSING CONCEPTS L T P C

3 0 0 3

OBJECTIVES

- To inculcate the concepts of remote sensing processes.
- To impart knowledge on applications of standard atmospheric profile and earth material.
- To familiarize with the orbits and platforms.
- To Instruct the various remote sensing techniques
- To enhance the elements of data interpretation.

UNIT I REMOTE SENSING AND ELECTROMAGNETIC RADIATION 9

Definition – components of RS – History of Remote Sensing – Merits and demerits of data collation between conventional and remote sensing methods - Electromagnetic Spectrum – Radiation principles - Wave theory, Planck's law, Wien's Displacement Law, Stefan's Boltzmann law, Kirchoff's law – Radiation sources: active & passive - Radiation Quantities.

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL 9

Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere – Scattering, absorption and refraction – Atmospheric windows - Energy balance equation – Specular and diffuse reflectors – Spectral reflectance & emittance – Spectroradiometer – Spectral Signature concepts – Typical spectral reflectance curves for vegetation, soil and water – solid surface scattering in microwave region.

UNIT III ORBITS AND PLATFORMS 9

Motions of planets and satellites – Newton's law of gravitation - Gravitational field and potential - Escape velocity - Kepler's law of planetary motion - Orbit elements and types – Orbital perturbations and maneuvers – Types of remote sensing platforms - Ground based, Airborne platforms and Space borne platforms – Classification of satellites – Sun synchronous and Geosynchronous satellites – Legrange Orbit.

UNIT IV SENSING TECHNIQUES 9

Classification of remote sensors – Resolution concept: spatial, spectral, radiometric and temporal resolutions - Scanners - Along and across track scanners – Optical-infrared sensors – Thermal sensors –microwave sensors – Calibration of sensors - High Resolution Sensors - LIDAR , UAV – Orbital and sensor characteristics of live Indian earth observation satellites.

UNIT V DATA PRODUCTS AND INTERPRETATION 9

Photographic and digital products – Types, levels and open-source satellite data products –- selection and procurement of data– Visual interpretation: basic elements and interpretation keys - Digital interpretation – Concepts of Image rectification, Image enhancement and Image classification.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Examine the concepts and laws related to remote sensing.
- Analyze the interaction of electromagnetic radiation with atmosphere and earth material.
- Develop the satellite orbits and different types of satellites.
- Classify the different types of remote sensors.
- Construct the concepts of interpretation of satellite imagery.

TEXT BOOKS

1. Thomas M. Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, "Remote Sensing and Image interpretation", John Wiley and Sons, Nineth Edition,2019.
2. George Joseph and C Jeganathan, "Fundamentals of Remote Sensing", Universities Press (India) Private limited, Third Edition, 2020.
1. Janza, F.Z., Blue H.M. and Johnson, J.E. "Manual of Remote Sensing. Vol. I", American Society of Photogrametry, Virginia, Fifth Edition, 2021.

REFERENCES

1. Verbyla, David, "Satellite Remote Sensing of Natural Resources", CRC Press, Third Edition, 2019
2. Paul Curran P.J. "Principles of Remote Sensing. Longman", RLBS, Eighth Edition, 2022.
3. Charles Elachi and JacobVan Zyl, "Introduction to Physics and Techniques of Remote Sensing", Wiley Publication,Second Edition, 2020.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_ce84/preview (Remote Sensing and GIS)
2. https://onlinecourses.nptel.ac.in/noc20_ce29/preview (Remote Sensing Essentials)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	-	1	1	2	-	-	-	2	1	1	-	-
2	3	-	1	1	2	-	-	-	2	1	1	-	-
3	3	-	1	1	2	-	-	-	2	1	1	-	-
4	3	-	1	1	2	-	-	-	2	1	1	-	-
5	3	-	1	1	2	-	-	-	2	1	1	-	-
AVG	3	-	1	1	2	-	-	-	2	1	1	-	-

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

Chairman - BoS

23ECO708	ENERGY TECHNOLOGY	L T P C
		3 0 0 3

OBJECTIVES

- To acquire knowledge of the basic concepts of energy, energy resources, and energy consumption.
- To familiarize the working principles of conventional power plants such as thermal, hydel, and nuclear power plants.
- To impart knowledge on the principles and applications of renewable energy sources like solar, wind, tidal, ocean, and geothermal energy.
- To enhance understanding of biomass energy conversion methods, fuel cells, and energy storage systems.
- To foster awareness of energy conservation techniques and energy auditing for improving industrial energy efficiency

UNIT I INTRODUCTION 9

Units of energy, conversion factors, general classification of energy, world energy resources and energy consumption, Indian energy resources and energy consumption, energy crisis, energy alternatives, Renewable and non-renewable energy sources and their availability. Prospects of Renewable energy sources

UNIT II CONVENTIONAL ENERGY 9

Conventional energy resources, Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants, efficiency, merits and demerits of the above power plants, combustion processes, fluidized bed combustion.

UNIT III NON-CONVENTIONAL ENERGY 9

Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, energy plantations. Wind energy, types of windmills, types of wind rotors, ocean thermal energy conversion, tidal energy conversion, geothermal energy.

UNIT IV BIOMASS ENERGY 9

Biomass energy resources, thermo-chemical and biochemical methods of biomass conversion,

combustion, gasification, pyrolysis, biogas production, ethanol, fuel cell and its types, energy storage routes like thermal energy storage, chemical, mechanical storage and electrical storage.

UNIT V ENERGY CONSERVATION 9

Energy conservation in chemical process plants, energy audit, energy saving in heat exchangers, distillation columns, dryers, ovens and furnaces and boilers, steam economy in chemical plants, energy conservation.

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply conversion factors in solving energy-related numerical problems.
- Analyze merits, demerits and combustion processes of conventional plants.
- Examine about solar, wind, tidal, wave and geothermal energy sources.
- Identify the technological basis for harnessing renewable energy sources.
- Analyze energy losses in heat exchangers, boilers and furnaces.

TEXT BOOKS

1. Rao, S. and Parulekar, B.B., Energy Technology, Khanna Publishers, 2005.
2. Nagpal, G.R., Power Plant Engineering, Khanna Publishers, 2008.

REFERENCES

1. El. Wakil, Power Plant Technology, Tata McGraw Hill, New York, 2002.
2. Sukhatme. S.P., Solar Enery - Thermal Collection and Storage, Tata McGraw hill, New Delhi, 1981.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_ch27 - (Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems)
2. https://nptel.ac.in/courses/121106014?utm_source=chatgpt.com - (NOC-Conventional Sources)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	3	2	3	3	-	-	1	1	-	3	-	-
2	3	1	3	3	-	-	1	1	-	3	3	-	-
3	2	2	2	3	3	1	-	1	1	-	3	-	-
4	2	2	1	3	3	1	1	1	-	1	3	-	-
5	2	2	1	3	3	1	1	1	-	1	3	-	-
AVG	2.2	2	1.8	3	3	1	1	1	1	1.6	3	-	-

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

Chairman - BoS

23EEO709 SENSORS, ACTUATORS AND ITS APPLICATION L T P C

3 0 0 3

OBJECTIVES

- To familiarize common types of sensor andactuators used in automotive vehicles.
- To enhance measuring equipment's for the measurement of pressure force, temperature and flow.
- To acquire new ideas in designing the sensors and actuators for automotive application
- To inculcate the operation of the sensors, actuators and electronic control.
- To develop temperature control actuators for vehicles.

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS 9

Sensors: Functions- Classifications- Main technical requirement and trends Units and standards- Calibration methods- Classification of errors- Error analysis- Limiting error- Probable error- Propagation of error- Odds and uncertainty- principle of transduction-Classification. Static characteristics- mathematical model of transducers- Zero, First and Second order transducers- Dynamic characteristics of first and second order transducers for standard test inputs .

UNIT II VARIABLE RESISTANCE AND INDUTANCE SENSORS 9

Principle of operation – construction details – Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers:- EI pick up and LVDT.

UNIT III VARIABLE AND OTHER SPECIAL SENSORS 9

Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE ACTUATORS 9

Electromechanical actuators - Fluid-mechanical actuators - Electrical machines- Direct-current machines - Three-phase machines - Single-phase alternating-current Machines - Duty-type ratings for electrical machines. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc.

UNIT V AUTOMATIC TEMPERATURE CONTROL ACTUATORS 9

Different types of actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system.

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply common types of sensor and actuators used in vehicles.
- Examine measuring equipment's for the measurement of pressure force, temperature and flow.
- Analyze the sensors and actuators for automotive application.
- Analyze the operation of the sensors, actuators and electronic control.
- Apply temperature control actuators for vehicles.

TEXT BOOKS

1. Ernest O. Doebelin Dhanesh N.Manik , "Doebelin's Measurement Systems", McGraw Hill Publishers, Seventh Edition, 2019.
2. Bosch, "Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive", Fifth Edition, 2007.

REFERENCES

1. William Ribbens, "Understanding Automotive Electronics -An Engineering Perspective," Elsevier Butterworth-Heinemann Publishers, Seventh Edition, 2012.
2. James D Halderman, "Automotive Electrical and Electronics", Prentice Hall, USA, 2013.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_ee32/preview - (Sensors and Actuators)
2. https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee41/ - (Sensors and Actuators)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	-	-	-	-	-	2	-	-
2	3	3	3	3	3	-	-	-	-	-	2	-	-
3	3	3	3	3	3	-	-	-	-	-	2	-	-
4	3	3	3	3	3	-	-	-	-	-	2	-	-
5	3	3	3	3	3	-	-	-	-	-	2	-	-
AVG	3	3	3	3	3	-	-	-	-	-	2	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23MEO703 FUNDAMENTALS OF MECHATRONICS L T P C

3 0 0 3

OBJECTIVES

- To train students in the basic concepts of mechatronics and explain the working principles of commonly used sensors and transducers.
- To teach the architecture, instruction set, and operation of the 8085 microprocessor for control applications.
- To explain and train students in interfacing techniques using 8255 PPI for applications such as ADC/DAC, temperature control, motor control, and traffic control.
- TO familiarize students with the fundamentals of Programmable Logic Controllers (PLC), including I/O processing, timers, and counters used in industrial automation.
- To train students on actuators and mechatronics system design, supported by real-time case studies.

UNITI INTRODUCTION AND SENSORS 9

Introduction to Mechatronics – Systems – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and Dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance Sensors – Strain Gauges – Eddy Current Sensor – Hall Effect Sensor –Temperature Sensors – Light Sensors.

UNIT II 8085 MICROPROCESSOR 9

Introduction – Pin Configuration - Architecture of 8085 – Addressing Modes – Instruction set, Timing diagram of 8085.

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE 9

Introduction – Architecture of 8255, Keyboard Interfacing, LED display – Interfacing, ADC and DAC Interface, Temperature Control – Stepper Motor Control – Traffic Control Interface.

UNIT IV PROGRAMMABLE LOGIC CONTROLLER 9

Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC.

UNIT V ACTUATORS AND MECHATRONICS SYSTEM DESIGN 9

Types of Stepper and Servo motors – Construction – Working Principle – Characteristics, Stages of Mechatronics Design Process – Comparison of Traditional and Mechatronics Design Concepts with

Examples – Case studies of Mechatronics Systems – Pick and Place Robot – Engine Management system – Automatic Car Park Barrier.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply basic mechatronics concepts and select suitable sensors and transducers for simple engineering applications.
- Develop basic control and interfacing programs using the 8085 microprocessor instruction set and addressing modes.
- Design real-time interfacing applications using 8255 PPI, ADC/DAC, and display devices.
- Apply PLC programming concepts with timers, counters, and I/O modules for industrial automation tasks.
- Analyze actuator performance and integrate mechatronics system designs through practical case studies such as pick-and-place robots and engine management systems.

TEXTBOOKS

1. Bolton W., "Mechatronics", Pearson Education, Seventh Edition, 2019.
2. Ramesh S Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publishing Private Limited, Sixth Edition, 2013.
3. Dr. JayashreeDeka, Mayuri Sanjay Mhaske, Ajeet Bhagwat Bhane, Kiran C,"Mechatronics", Quill Tech Publications, First Edition, 2025

REFERENCES

1. Devadas Shetty and Richard A. Kolk, "Mechatronics Systems Design", Cengage Learning, 2019.
2. NitaigourPremchandMahalik, "Mechatronics Principles, Concepts and Applications", McGraw Hill Education, 2020.
3. Smaili.A and Mrad. F, "Mechatronics Integrated Technologies for Intelligent Machines", Oxford University Press, 2018.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_me27/preview - (Mechatronics)
2. https://onlinecourses.nptel.ac.in/noc25_me179/preview- (Design of Mechatronics Systems)

Mapping of COs-POs &PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	-	-	-	-	-	-	-	1	-	-
2	3	2	2	-	-	-	-	-	-	-	1	-	-
3	3	2	2	-	-	-	-	-	-	-	1	-	-
4	3	2	2	-	-	-	-	-	-	-	1	-	-
5	3	2	2	-	-	-	-	-	-	-	1	-	-
AVG.	3	2	2	-	-	-	-	-	-	-	1	-	-

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

Chairman - BoS

23MEO704 NANOTECHNOLOGY L T P C
3 0 0 3

OBJECTIVES

- To provide an understanding of the types of nanostructures and their electronic properties
- To introduce the principles and operational aspects of high-energy ball milling and post-oxidation processes.
- To describe the role of surfactants in controlling the formation and stability of nanoparticles.
- To provide an understanding of thermal analysis methods for assessing the properties of nanomaterials.
- To focus on the emerging applications of nanomaterials in science and engineering.

UNIT I TYPES OF NANOMATERIALS 9

Zero dimensional, one-dimensional and two dimensional nanostructures, Graphene, Fullerene, Carbon nano tubes and, Quantum Dots, Nanoclusture, Zeolites minerals, Nanowires, Block Copolymers, Properties of nanomaterials - Surface properties, Electrical properties, Magnetic properties.

UNIT II PHYSICAL ROUTES 9

High energy ball mill - Chemical Vapour Deposition – Physical Vapour Deposition – Laser ablation - Pulsed laser deposition – Rapid solidification – Arc discharge method- photolysis – radiolysis - Fabrication of nanostructures and microfabrication using wet and dry etching-Lithography.

UNIT III CHEMICAL METHODS 9

Colloidal precipitation – Sol-Gel process– Chemical precipitation: Normal and Reverse reactions-Hydrothermal – Solvothermal – Sonochemical – DC and Pulsed electrodeposition and Electroless deposition – Combustion route.

UNIT IV NANOMATERIAL ANALYSIS 9

Photoluminescence Spectroscopy, Raman Spectroscopy, X-Ray Photoelectron Spectroscopy (XPS), Thermal analysis – Differential Scanning Calorimetry (DSC) – Thermogravimetric Analysis (TGA) – Differential Thermal Analysis (DTA) –Mechanical Testing- Nano Indentation -Vibrating Sample Magnetometer, Zeta Potential and Particle size measurement.

UNIT V APPLICATION OF NANOMATERIALS 9

Molecular Electronics and Nanoelectronics – Nanobots- Biological Applications – Quantum Devices

– Nanomechanics - Carbon Nanotube – Photonics- Nano structures as single electron transistor – principle and design.

OUTCOMES

Upon completion of the course, Students will be able to

- Analyze the structure, classification, and size-dependent properties of nanostructures.
- Apply wet and dry etching techniques for the fabrication of nanostructures and micro fabricated devices.
- Analyze chemical synthesis techniques to prepare nanomaterials and evaluate the influence of processing parameters on their properties.
- Explain the principles of nanomaterial characterization techniques.
- Apply the principles and applications of nanomaterials.

TEXT BOOKS

1. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties &Applications", Imperial College Press, 2015.
2. T. Pradeep, "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education, 2019.

REFERENCES

1. B.Bhushan, "Springer Handbook of Nanotechnology", Springer-Verlag Berlin Heidelberg, 2020.
2. G.A. Ozin and A.C. Arsenault, "Nanochemistry : A chemical approach to nanomaterials", Royal Society of Chemistry, 2015.

E-RESOURCES

1. https://libguides.utdallas.edu/nanotechnology-nanoscience-nanomaterials-guide/sources/books
2. https://libguides.lib.msu.edu/nanotechnology/online

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	1	2	1	1	2	1	-	-	-
2	3	2	3	2	1	2	1	1	2	1	-	-	-
3	3	2	3	3	1	2	3	1	3	2	-	-	-
4	3	2	3	3	1	2	2	1	3	1	-	-	-
5	3	1	2	2	1	2	2	1	2	2	-	-	-
AVG	3	1.8	2.6	2.4	1	2	1.8	1	2.4	1.4	-	-	-

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

Chairman - BoS

23MEO712 SMART MANUFACTURING L T P C

3 0 0 3

OBJECTIVES

- To familiarize with the concepts, architecture, and components of Smart Manufacturing systems.
- To provide knowledge of sensing, monitoring, and data acquisition technologies used in modern manufacturing environments.
- To enable application of Industrial IoT and Cyber-Physical Systems for smart manufacturing applications.
- To develop the ability to analyze manufacturing data for process monitoring and predictive maintenance.
- To equip with the knowledge of advanced Industry 4.0 technologies and their applications in smart factory implementation.

UNIT I INTRODUCTION TO SMART MANUFACTURING 9

Evolution of Manufacturing Systems, Conventional Manufacturing vs Smart Manufacturing, Industry 4.0 Concepts, Smart Factory Architecture, Digital Transformation in Manufacturing, Components of Smart Manufacturing, Intelligent Production Systems, Applications and Case Studies.

UNIT II SENSORS AND DATA ACQUISITION 9

Sensors in Manufacturing Automation, Electrical, Optical, Acoustic and Vision Sensors, Smart Sensors and Intelligent Sensors, Machine Vision Systems, Condition Monitoring, Data Acquisition Systems, Sensor Networks for Manufacturing, Shop Floor Data Collection.

UNIT III INDUSTRIAL IoT AND CYBER PHYSICAL SYSTEMS 9

Introduction to IoT and IIoT, IoT Architecture, Smart Connected Manufacturing, Cyber Physical Systems (CPS), Cloud Manufacturing, Fog and Edge Computing, Communication Protocols in Manufacturing, Cyber Security in Smart Factories.

UNIT IV DATA ANALYTICS AND DIGITAL MANUFACTURING 9

Manufacturing Data Analytics, Big Data in Manufacturing, Machine Learning Fundamentals, Predictive Maintenance, Quality Monitoring and Process Optimization, Digital Twin Concepts, Real-Time Monitoring Systems, Decision Support Systems.

UNIT V ADVANCED SMART MANUFACTURING TECHNOLOGIES 9

Additive Manufacturing and 3D Printing, Collaborative Robots (Cobots), Automated Guided Vehicles (AGVs), Flexible Manufacturing Systems, Autonomous Manufacturing, Sustainable Smart Manufacturing, Smart Supply Chain and Logistics, Future Trends in Industry 5.0.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply the concepts, architecture, and components of Smart Manufacturing systems to manufacturing scenarios.
- Analyze the role of smart and intelligent sensors in enhancing manufacturing efficiency, process monitoring, and decision-making.
- Apply the Industrial IoT and Cyber-Physical Systems to smart manufacturing applications.
- Analyze manufacturing data for process monitoring and predictive maintenance.
- Examine advanced smart manufacturing technologies for modern industrial applications.

TEXT BOOKS

1. Gilchrist, A., "Industry 4.0: The Industrial Internet of Things", Apress, First Edition, 2016.
2. Ustundag, A. and Cevikcan, E., "Industry 4.0: Managing the Digital Transformation", Springer, First Edition, 2018.
3. Jeschke, S., Brecher, C., Song, H. and Rawat, D.B., "Industrial Internet of Things: Cyber manufacturing Systems", Springer, First Edition, 2017.

REFERENCES

1. Song, H., Rawat, D.B., Jeschke, S. and Brecher, C., "Cyber-Physical Systems: Foundations, Principles and Applications", Academic Press, First Edition, 2016.
2. Buyya, R. and Dastjerdi, A.V., "Internet of Things: Principles and Paradigms", Morgan Kaufmann, First Edition, 2016.
3. Locher, D.A., "Smart Manufacturing: The Lean Six Sigma and Systems Engineering Approach", CRC Press, First Edition, 2017.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_cs95/preview (Industrial Internet of Things, Cyber Physical Systems and Data Analytics)
2. https://onlinecourses.nptel.ac.in/127101872 (Industry 4.0: Managing the Digital

Transformation)

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	-	-	1	-	-	-	-	-	1	-	-
2	2	3	-	1	3	-	-	-	-	-	-	-	-
3	2	3	2	2	3	-	-	-	-	-	1	-	-
4	2	3	-	3	3	-	1	-	-	-	2	-	-
5	1	2	3	2	3	-	2	-	-	-	2	-	-
AVG	2.0	2.6	2.5	2.0	2.6	-	1.5	-	-	-	1.5	-	-

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

Chairman - BoS

23MDO705 ULTRASOUND PRINCIPLES AND ITS MEDICAL APPLICATIONS L T P C
3 0 0 3

OBJECTIVES

- To introduce the fundamentals of ultrasound physics and instrumentation.
- To explore the interaction of ultrasound with biological tissues and image formation.
- To familiarize students with ultrasound scanning techniques.
- To impart knowledge on various ultrasound imaging modalities and Doppler principles.
- To provide knowledge on the clinical applications of diagnostic ultrasound.

UNIT I FUNDAMENTALS OF MEDICAL ULTRASOUND 9

Introduction to ultrasound in healthcare – Basic physics of sound waves – Frequency, wavelength, velocity, acoustic impedance – Piezoelectric effect and ultrasound generation – Ultrasound transducers and their working principle – Propagation of ultrasound in biological tissues – Reflection, refraction, scattering, attenuation and absorption – Safety aspects of diagnostic ultrasound.

UNIT II TISSUE INTERACTION AND IMAGE FORMATION 9

Interaction of ultrasound with biological tissues – Acoustic properties of tissues – Tissue characterization using ultrasound – Echo generation and detection – Principles of pulse-echo imaging – Factors affecting image quality – Resolution and penetration – Artifacts in ultrasound imaging – Basics of image interpretation.

UNIT III ULTRASOUND INSTRUMENTATION AND SCANNING TECHNIQUES 9

Ultrasound transducers and probes – Construction and types of probes – Functions of transmitter and receiver – Beam steering and focusing concepts – Scan conversion and image display – Signal processing basics – Image optimization controls – Scanning techniques, acoustic windows, transducer selection and patient positioning.

UNIT IV ULTRASOUND IMAGING MODALITIES 9

Modes of ultrasound display: A-mode, B-mode and M-mode – Real-time ultrasound imaging – Principles of Doppler ultrasound – Color Doppler imaging – 2D and 3D ultrasound imaging – Introduction to tissue elasticity imaging – Use of contrast agents in ultrasound – Performance parameters of ultrasound systems.

UNIT V CLINICAL APPLICATIONS OF ULTRASOUND 9

Ultrasound applications in abdomen, breast, thyroid, heart, kidney and eye – Obstetric and

gynecological ultrasound – Fetal imaging and monitoring – Musculoskeletal and vascular ultrasound – Advantages and limitations of ultrasound imaging – Emerging trends in medical ultrasound.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Identify the basic principles of medical ultrasound and transducer operation.
- Analyze the interaction of ultrasound waves with biological tissues.
- Apply appropriate scanning techniques for ultrasound image acquisition.
- Examine different ultrasound imaging modalities and their applications.
- Utilize the role of ultrasound in clinical diagnosis and healthcare practice.

TEXT BOOKS

1. Frank Miele Jr., "Ultrasound Physics and Instrumentation", Miele Enterprises, Sixth Edition, 2021.
2. Thomas L. Szabo, "Diagnostic Ultrasound Imaging: Inside Out", Academic Press, Second Edition, 2018.

REFERENCES

1. Peter Hoskins, Kevin Martin, and Abigail Thrush (Eds.), "Diagnostic Ultrasound: Physics and Equipment", CRC Press, Third Edition, 2019.
2. Yufeng Zhou (Ed.), "Principles and Applications of Therapeutic Ultrasound in Healthcare", Routledge, 2021.

E-RESOURCES

1. https://www.youtube.com/watch?v=UdDmP_CDH5I - (Medical Engineering)
2. https://www.youtube.com/watch?v=a8xcsXDez5M - (Ultra sonic Imaging Systems)

Mapping of COs, POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	-	-	1	1	-	-	1	1	-	-
2	2	3	1	2	-	1	1	-	-	1	1	-	-
3	2	2	3	1	3	1	1	-	-	1	1	-	-
4	2	2	2	2	3	1	1	-	-	1	1	-	-
5	2	3	2	2	2	2	1	-	1	1	2	-	-
AVG.	2.2	2.4	1.8	1.8	2.7	1.2	1.0	-	1	1	1.2	-	-

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

Chairman - BoS.

23RA0707 MOBILE ROBOTS L T P C
3 0 0 3

OBJECTIVES

- To introduce locomotion principles and control of mobile robots.
- To focus on kinematic modeling and constraints in mobile systems.
- To provide an understanding of robot maneuverability, holonomic constraints, and trajectory-following control strategies.
- To inculcate the principles of dynamic modeling for differential-drive and omni directional mobile robots using Lagrange methods.
- To develop the ability to classify sensors, characterize performance, and represent environmental uncertainty using statistical methods.

UNIT I INTRODUCTION TO MOBILE ROBOTS 9

Introduction – Locomotion of the Robots – Key Issues on Locomotion – Legged Mobile Roots – Configurations and Stability – Wheeled Mobile Robots – Design Space and Mobility Issues – Unmanned Aerial and Underwater Vehicles – Teleportation and Control

UNIT II MOBILE ROBOT KINEMATICS 9

Introduction; kinematic models and constraints: representing robot position, forward kinematic models, wheel kinematic constraints: fixed, caster and omni wheels, robot kinematic constraints, examples: robot kinematic models and constraints.

UNIT III MOBILE ROBOT MANEUVERABILITY 9

Degree of mobility, degree of steerability, robot maneuverability; mobile robot workspace: degrees of freedom, holonomic robots, path and trajectory considerations; motion control (kinematic control): open loop control (trajectory following), feedback control.

UNIT IV MOBILE ROBOT DYNAMICS 9

Introduction, general robot dynamic modeling - Newton-Euler and Lagrange, differential-drive Wheeled mobile robot, three-Wheel omni directional mobile robot, four mecanum-wheel omni directional robot.

UNIT V SENSORS FOR MOBILE ROBOTS 9

Sensor classification, characterizing sensor performance, wheel/motor sensors, heading sensors,

ground-based beacons, active ranging, motion/speed sensors, visionbased sensors; representing uncertainty: statistical representation.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Classify various locomotion mechanisms, including legged, wheeled, and aerial configurations, based on stability and design constraints.
- Construct forward kinematic models for mobile robots by accounting for fixed, caster, and omni-wheel constraints.
- Compare holonomic and non-holonomic maneuverability to implement effective trajectory-following and feedback motion control.
- Analyze the dynamic behavior of differential-drive and Mecanum-wheel robots using Newton-Euler and Lagrange formulations.
- Examine sensor performance and statistical uncertainty to determine the most effective sensing suite for robot localization.

TEXT BOOKS

1. Roland Siegwart, Illah R. Nourbakhsh, "Introduction to Autonomous Mobile Robots", MIT Press, Second Edition, 2011.
2. Spyros G. Tzafestas, "Introduction to Mobile Robot Control", Elsevier, Second Edition, 2014.

REFERENCES

1. Gregory Dudek, Michael Jenkin, "Computational Principles of Mobile Robotics", Cambridge University Press, Third Edition, 2023..
2. George A. Bekey, "Autonomous Robots", MIT Press, First Edition,2005..

E-RESOURCES

1. https://archive.nptel.ac.in/courses/112/106/112106298/ -(Wheeled mobile Robots)
2. https://www.mathworks.com/help/robotics/- (Robotics System Toolbox)

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	2	2	1	1	1	1	-	1	-	-
2	3	3	3	2	3	1	1	1	1	-	1	-	-
3	3	3	3	3	3	1	1	1	2	-	2	-	-
4	3	3	3	3	3	1	1	1	2	-	2	-	-
5	3	3	3	3	3	2	1	1	2	-	2	-	-
AVG	3	3	2.8	2.6	2.8	1.2	1	1	1.6	-	1.6	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23CSO711 INTRODUCTION TO CYBER SECURITY L T P C

3 0 0 3

OBJECTIVES

- To impart fundamental knowledge of cyber security concepts, cyber threats and risk management frameworks.
- To provide knowledge about computer networking fundamentals, secure protocols, and defensive mechanisms.
- To impart understanding of cryptographic techniques, hashing, digital signatures, PKI, and data security practices.
- To develop students understanding on common cyber threats, malware, web-based attacks, and appropriate mitigation approaches
- To familiarize the students with regulatory compliance standards, security practices and cloud security.

UNIT I FUNDAMENTALS OF CYBER SECURITY 9

Introduction to Cyber Security - Information Security - CIA Triad - Cyber Space - Digital Identity - Threats and Vulnerabilities - Risk Management - Types of Hackers - Cyber Crimes - Security Policies.

Problem-solving Assignments:

1. Formulate a multi-phased risk management plan applying standard methodologies onto an enterprise's daily administrative operational workflow.
2. Review an infrastructure case study to pinpoint architectural weaknesses where a lack of strong access control policies invites insider threat actions.

UNIT II NETWORK SECURITY 9

Computer Networks - OSI Model - TCP/IP Model - IP Addressing - DNS and DHCP - Firewalls - IDS and IPS - VPN - Secure Communication Protocols - Network Attacks - Wireless Security.

Problem-solving Assignments:

1. Evaluate an enterprise network topology to propose strategic placements for Network-Based Intrusion Detection Systems (NIDS) and Firewalls.
2. Map a secure remote connection framework for a cross-regional business organization utilizing Virtual Private Network (VPN) and IPSec technologies.

UNIT III CRYPTOGRAPHY AND DATA SECURITY 9

Introduction to Cryptography - Encryption and Decryption - Symmetric Cryptography - Asymmetric

Cryptography - AES - RSA - Hash Functions - Digital Signatures - Public Key Infrastructure (PKI) - Data Security.

Problem-solving Assignments:

1. Architect an end-to-end Public Key Infrastructure (PKI) distribution pipeline including Certificate Authorities (CA) to secure corporate communication.
2. Analyze the mathematical trade-offs, operational constraints, and distribution problems encountered when prioritizing asymmetric encryption over symmetric encryption schemes

UNIT IV CYBER THREATS AND MALWARE 9

Cyber Attacks - Malware - Viruses - Worms - Trojans - Ransomware - Phishing - Social Engineering - SQL Injection - Cross-Site Scripting (XSS) - DoS and DDoS Attacks.

Problem-solving Assignments:

1. Design an incident containment plan isolating system workloads immediately following a simulated multi-node enterprise Ransomware threat vector.
2. Structure a comprehensive social engineering awareness exercise framework targeted at mitigating company-wide phishing vulnerabilities.

UNIT V CYBER LAWS AND SECURITY PRACTICES 9

Cyber Ethics - Information Technology Act, 2000 - Cyber Laws - Digital Privacy - Password Security - Multi-Factor Authentication - Incident Response - Disaster Recovery - Cloud Security - Artificial Intelligence in Cyber Security.

Problem-solving Assignments:

1. Evaluate a corporate data breach scenario to identify legal responsibilities and reporting parameters defined under the Indian IT Act, 2000.
2. Structure a disaster recovery blueprint detailing backup schedules, hot-site synchronization, and integrity checks for standard cloud environments.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of this course, Students will be able to

- Explain fundamental cyber security concepts and apply basic risk management frameworks to identify security risks.
- Apply computer networking fundamentals, secure protocols, and defensive mechanisms to protect networked systems.
- Apply cryptographic techniques, hashing mechanisms, and data security methods to ensure information and ensure data security

- Analyze malware infections, system vulnerabilities, and web-based attacks and recommend appropriate mitigation measures.
- Analyze regulatory compliance requirements, Cyber Laws, and cloud security practices for securing digital environments.

TEXT BOOKS

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 8th Edition, 2020.
2. AnandShinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021.

REFERENCES

1. Chwan-Hwa (John) Wu and J. David Irwin, "Introduction to Computer Networks and Cyber Security", CRC Press, 2016.
2. Nina Godbole and SunitBelapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India, 2011.

E-RESOURCES

1. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou19_cs08

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	2	-	2	1	2	-	-	-
CO2	3	3	3	2	3	-	-	-	2	2	-	-	-
CO3	3	3	3	2	2	-	-	-	1	1	-	-	-
CO4	3	3	3	3	3	1	-	-	2	2	-	-	-
CO5	3	2	2	2	2	3	2	3	2	3	2	-	-
AVG	3.0	2.6	2.4	2.3	2.5	2.0	2.0	2.5	1.6	2.0	2.0	-	-

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

Chairman - BoS

23PMO706 INTELLECTUAL PROPERTY RIGHTS FOR PHARMA INDUSTRY **L T P C**
3 0 0 3

OBJECTIVES

- To introduce the basic concepts of Intellectual Property Rights (IPR), their protection mechanisms, and their significance in the pharmaceutical industry.
- To familiarize students with patent laws, copyright regulations, international treaties, and their role in protecting intellectual property in the pharmaceutical sector.
- To provide knowledge of patent filing, prior art search, patent applications, and international patenting for pharmaceutical innovations.
- To develop an understanding of patent administration and legal aspects of patent protection in the pharmaceutical industry.
- To enhance understanding of patent ownership, publication ethics, copyright protection, and intellectual property management in research and academia.

UNIT I INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS **9**

Concept of Intellectual Property Right , The World Intellectual Property Organization, Intellectual property protection (IPP) and intellectual property rights (IPR),Economic importance, mechanisms for protection of intellectual property-patents, copyrights, trademark, Factors affecting choice of IP protection, Penalties for violation, Role of IPR in pharmaceutical industry, Global ramifications and financial implications.

UNIT II RULES AND REGULATIONS **9**

The Patents (Amendment) Act, 2002 and The Patents (Amend ment) Act, 2005, Rationale of Patent & License, Application for Patents, Rights of Patentee, Compulsory Licenses, Surrender and Revocation of Patents, Infringement of Patents, Amendments, Registration of Lapsed Patents, Patent Agent , Overview of global patents and US,Indian Copyright Law and digital technologies-Beme convention, WIPO copyright treaty (WCT), WIPO performance and Phonogram Treaty (WPPT).

UNIT III PATENT FILING **9**

Precautions before patenting-disclosures / non-disclosures, publication-article / thesis , Prior art search-published patents, internet search patent sites, specialized services-search requests, costs, Patent application-forms and guidelines, fee structure, time frames, jurisdiction aspects, Types of patent applications- provisional, non-provisional, PCT and convention patent applications, International patenting-requirement procedures and costs.

UNIT IV FINANCIAL ASSISTANCE FOR PATENTING 9

Introduction to schemes by NRDC and TIFAC ,Publication of patents-gazette of India, status in Europe and US , Patent annuity; Patent attorneys-technical aspects, criteria for selection, addresses, fee, rights and responsibilities of a patentee, Patent infringement- meaning, scope, litigation, case studies and examples.

UNIT V RESEARCH, PATENTS, COPYRIGHT, AND TECHNOLOGY TRANSFER 9

Patenting by research students, lecturers and scientists University / organisational rules in India and abroad, Thesis research paper publication, credit sharing by workers, financial incentives, Useful information sources for patents related information-internet sites and periodicals Significance of copyright protection for researchers, Protection for computer data bases, multimedia works.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, Students will be able to

- Apply the principles of IPR to identify appropriate protection mechanisms based on the nature of pharmaceutical innovations and factors influencing IP protection.
- Analyze the patent systems of India and the United States, and evaluate the impact of amendments on patent protection and innovation.
- Describe the methods for conducting prior art searches using patent databases and online search resources.
- Explain the objectives of NRDC and TIFAC schemes and the patent publication process in India, Europe, and the United States.
- Implement patenting procedures and institutional policies in academic and research environments.

TEXT BOOKS

1. Bayya subba rao. V. Appaji, "Intellectual Property Rights in Pharmaceutical Industry" PharmaMed Press, Second Edition, 2025.
2. Prof. Rupinder Tewari Ms. Mamta Bhardwaj," Intellectual Property", Publication Bureau Panjab University , Forth Edition ,2019.

REFERENCES

1. Harshal Ashok Pawar," Intellectual Property Rights and Patents in Pharmacy" Everest Publishing House , First Edition , 2025
2. Anasuya Patil," textbook on Pharmaceutical Intellectual Property Rights", shashwat publication , First Edition, 2016.

E-RESOURCES

1. https://www.lexology.com/library/detail.aspx?g=0588408f-f7e2-4c00-aa50-76fcb455b12c
2. https://www.lingayasvidyapeeth.edu.in/the-vital-role-of-intellectual-property-rights-ipr-in-pharmacy/

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	1	3	1	1	-	-	1	1	-	-
2	2	2	2	1	3	2	2	-	1	-	-	-	-
3	3	1	2	1	2	1	1	-	-	-	2	-	-
4	2	3	3	2	2	2	1	2	-	1	2	-	-
5	2	3	2	1	1	3	3	2	-	-	2	-	-
AVG	2.4	2.2	2.2	1.2	2.2	1.8	1.6	2	1	1	1.8	-	-

1- **Low 2-Medium 3-High '-' – No Correlation**

Chairman - BoS

23MAO710 OPERATIONS RESEARCH L T P C

3 0 0 3

OBJECTIVES

- To introduce the basic concepts of linear programming.
- To provide knowledge of duality and network models.
- To explain the concepts of integer programming.
- To explore the techniques of classical optimization theory.
- To develop an understanding of the Critical path method and the Program evaluation and review technique.

UNIT I LINEAR PROGRAMMING 9

Principal components of decision problem – Modeling phases – Linear Programming Formulation and graphic solution – Simplex method.

UNIT II DUALITY AND NETWORKS 9

Definition of dual problem – Primal – Dual relationships – Dual simplex methods – Post optimality analysis – Transportation and assignment model – Shortest route problem

UNIT III INTEGER PROGRAMMING 9

Cutting plan algorithm– Branch and bound methods, Multistage (Dynamic) programming.

UNIT IV CLASSICAL OPTIMISATION THEORY 9

Unconstrained external problems, Newton – Raphson method– Equality constraints– Jacobean methods – Lagrangian method–Kuhn–Tucker conditions–Simple problems.

UNIT V OBJECT SCHEDULING 9

Network diagram representation – Critical path method – Time charts and resource leveling– Programme evaluation review technique.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of this course, Students will be able to

- Solve Linear Programming Problems using graphical and simplex methods.
- Apply duality concepts and network optimization techniques to solve transportation, assignment, and shortest path problems.

- Solve Integer Programming and Dynamic Programming problems using appropriate optimization techniques.
- Analyze unconstrained and constrained optimization problems using classical optimization methods.
- Apply project scheduling techniques such as CPM and PERT for planning, scheduling, and resource optimization.

TEXT BOOKS

1. H.A. Taha, "Operation Research", Prentice Hall of India, Eighth Edition, 2002
2. Paneer Selvam, „Operations Research", Prentice Hall of India, Second Edition, 2002

REFERENCES

1. Vohra, "Quantitative Techniques in Management", Tata Mc Graw Hill, Second Edition, 2002
2. Winston "Operation Research", Thomson Learning, Fourth Edition, 2003

E-RESOURCES

1. https://nptel.ac.in/courses/111/102/111102012/ (Operation Research)
2. https://freevideolectures.com/course/4737/nptel-project-management/21(Operation Research)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1	2	1	-	-	-	-	2	-	-
2	3	3	2	2	2	1	-	-	-	-	2	-	-
3	3	3	3	2	2	1	-	-	-	-	2	-	-
4	3	3	2	2	2	1	-	-	-	-	2	-	-
5	2	3	3	2	2	1	-	-	-	-	2	-	-
AVG	2.8	3	2.4	1.8	2	1	-	-	-	-	2	-	-

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

Chairman - BoS

OPEN ELECTIVE - III

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
CIVIL	23CEO717 / Geographical Information System	OE	3	0	0	3	40	60	100
CSE	23CSO715 / Fundamentals of Blockchain Technology	OE	3	0	0	3	40	60	100
ECE	23ECO718 / VLSI Design	OE	3	0	0	3	40	60	100
EEE	23EEO716 / Electrical,Electronic and Magnetic Materials	OE	3	0	0	3	40	60	100
MECHANICAL	23MEO720 / Marine Vehicles	OE	3	0	0	3	40	60	100
MEDICAL ELECTRONICS	23MDO719 / Wearable Technology 23MDO723 / Medical Waste Management 23MDO724 / Lifestyle Diseases	OE	3	0	0	3	40	60	100
ROBOTICS AND AUTOMATION	23RAO721 / Robotics Process Automation	OE	3	0	0	3	40	60	100
MATHEMATICS	23MAO714 / Advanced Numerical Methods	OE	3	0	0	3	40	60	100
MANAGEMENT	23MGO722 / Cost management of Engineering Projects	OE	3	0	0	3	40	60	100

23CEO717 GEOGRAPHICAL INFORMATION SYSTEM L T P C
3 0 0 3

OBJECTIVES

- To introduce the fundamental concepts and components of GIS.
- To impart knowledge on spatial data models and database structures.
- To familiarize students with data acquisition, input, and management techniques.
- To instruct GIS analysis and modeling techniques.
- To enhance skills in spatial data interpretation and real-world applications.

UNIT I INTRODUCTION TO GIS 9

Definition and components of GIS – History and evolution of GIS – Basic concepts of spatial information – Elements of GIS – Hardware, software, data, people and methods – GIS vs conventional mapping – Coordinate systems and map projections – Types of maps – Overview of GIS applications in engineering and resource management.

UNIT II – SPATIAL DATA MODELS AND DATA STRUCTURES 9

Spatial data types – Raster and Vector data models – Comparison between raster and vector models – Spatial data structures – Topology concepts – Attribute data and database management systems – Relational database model – Data storage and retrieval – Metadata concepts – Data quality and accuracy.

UNIT III – DATA ACQUISITION AND INPUT TECHNIQUES 9

Sources of spatial data – Maps, aerial photographs and satellite imagery – GPS data collection – Surveying data integration – Digitization and scanning – Georeferencing – Data editing and transformation – Error sources and correction – Data integration techniques – Spatial data standards.

UNIT IV – GIS ANALYSIS AND MODELING 9

Spatial analysis concepts – Query operations – Buffering and overlay analysis – Network analysis – Terrain analysis and Digital Elevation Model (DEM) – Interpolation techniques – Spatial modeling – Multi-criteria decision analysis – GIS-based modeling applications in urban planning and environmental management.

UNIT V – GIS OUTPUT, VISUALIZATION AND APPLICATIONS 9

Cartographic visualization – Map layout and design – Thematic mapping – Data visualization

techniques – Web GIS concepts – Open-source GIS platforms – GIS applications in water resources, transportation, disaster management, urban planning and environmental monitoring – Introduction to GIS project workflow.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Construct the fundamental concepts and components of GIS.
- Analyze spatial data models and database structures.
- Apply data acquisition and preprocessing techniques in GIS.
- Examine the spatial analysis and GIS modeling.
- Analyze GIS outputs, effective spatial visualizations and GIS techniques.

TEXT BOOKS

1. Kang-tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Education, Ninth Edition, 2022.
2. Ian Heywood, Sarah Cornelius and Steve Carver, "An Introduction to Geographical Information Systems", Pearson Education, Fifth Edition, 2019.
3. Tor Bernhardsen, "Geographic Information Systems: An Introduction", Wiley India, Third Edition, 2018.

REFERENCES

1. Paul A. Longley, Michael F. Goodchild, David J. Maguire and David W. Rhind, "Geographical Information Systems and Science", Wiley, Fourth Edition, 2021.
2. Burrough, P.A. and McDonnell, R.A., "Principles of Geographical Information Systems", Oxford University Press, 2015.
3. Lo, C.P. and Yeung, A.K.W., "Concepts and Techniques of Geographic Information Systems", Prentice Hall, 2018.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_ce84/preview (GIS and Remote Sensing)
2. https://onlinecourses.nptel.ac.in/noc20_ce29/preview (GIS Applications)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	-	3	2	-	-	2	2	1	-	-
2	3	2	2	-	3	2	-	-	2	2	1	-	-
3	3	2	2	-	3	2	-	-	2	2	1	-	-
4	3	2	2	-	3	2	-	-	2	2	1	-	-
5	3	2	2	-	3	2	-	-	2	2	1	-	-
AVG	3	2	2	-	3	2	-	-	2	2	1	-	-

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

Chairman - BoS

23CSO715 FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY LT P C
3 0 0 3

OBJECTIVES

- To impart fundamental knowledge of blockchain technology, distributed ledger concepts, and decentralized systems.
- To develop students' understanding of cryptographic techniques, consensus mechanisms, and blockchain architecture.
- To train students in designing and implementing smart contracts using Ethereum and Solidity.
- To familiarize students with blockchain platforms, decentralized applications (DApps), and enterprise blockchain frameworks.
- To expose students to blockchain applications, security challenges, emerging trends, and real-world case studies through practical implementation.

UNIT I INTRODUCTION TO BLOCKCHAIN TECHNOLOGY 9

Introduction to Blockchain – Evolution of Blockchain – Distributed Ledger Technology (DLT) – Characteristics of Blockchain – Blockchain Architecture – Types of Blockchain (Public, Private, Consortium, Hybrid) – Blockchain Components – Blocks, Transactions and Hashes – Merkle Tree – Blockchain Lifecycle – Benefits and Limitations – Blockchain Applications in Various Industries.

Problem Solving Assignments:

1. Compare Blockchain with traditional centralized databases.
2. Analyze Blockchain adoption in healthcare, banking, or supply chain.

UNIT II CRYPTOGRAPHY AND CONSENSUS MECHANISMS 9

Cryptographic Hash Functions – Digital Signatures – Public Key Infrastructure – Elliptic Curve Cryptography – Wallets – Consensus Algorithms – Proof of Work (PoW) – Proof of Stake (PoS) – Delegated Proof of Stake (DPoS) – Proof of Authority (PoA) – Byzantine Fault Tolerance (PBFT) – Mining Process – Blockchain Security.

Problem Solving Assignments:

1. Compare various consensus mechanisms.
2. Analyze Blockchain security attacks and mitigation techniques.

UNIT III ETHEREUM AND SMART CONTRACTS 9

Ethereum Architecture – Ethereum Virtual Machine (EVM) – Accounts – Gas – Ether – Smart Contracts – Solidity Programming – Variables – Functions – Modifiers – Events – Error Handling – Smart Contract Deployment – Remix IDE – MetaMask – Web3 Basics.

Problem Solving Assignments:

1. Design a blockchain-based voting system.
2. Evaluate gas optimization techniques.

UNIT IV DECENTRALIZED APPLICATIONS AND ENTERPRISE BLOCKCHAIN 9

Decentralized Applications (DApps) – DApp Architecture – IPFS – Hyperledger Fabric – Hyperledger Composer – Corda – Quorum – Blockchain APIs – Blockchain as a Service (BaaS) – Identity Management – Supply Chain Management – Healthcare Applications.

Problem Solving Assignments:

1. Compare Ethereum and Hyperledger Fabric.
2. Design a blockchain-based supply chain management system.

UNIT V BLOCKCHAIN APPLICATIONS AND EMERGING TRENDS 9

Cryptocurrency – Bitcoin Architecture – NFTs – Decentralized Finance (DeFi) – Central Bank Digital Currency (CBDC) – Blockchain in IoT – Blockchain in Artificial Intelligence – Web3 – DAO – Blockchain Scalability – Layer-2 Solutions – Security Challenges – Regulatory Issues – Future Trends – Industry Case Studies.

Problem Solving Assignments:

1. Study blockchain adoption in government and finance.
2. Evaluate scalability solutions for enterprise blockchain.

TOTAL : 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Explain blockchain fundamentals, distributed ledger concepts, blockchain architecture, and applications.
- Analyze cryptographic techniques, digital signatures, wallets, and consensus mechanisms used in blockchain systems.
- Develop smart contracts using Solidity and deploy decentralized applications on Ethereum.
- Analyze enterprise blockchain platforms, decentralized applications, and blockchain integration for real-world business solutions.
- Apply blockchain technologies to develop secure, scalable, and decentralized solutions for modern computing applications

TEXT BOOKS

1. Imran Bashir, "Mastering Blockchain", Packt Publishing, Fourth Edition, 2023.
2. Arshdeep Bahga and Vijay Madisetti, "Blockchain Applications: A Hands-on Approach", VPT Publications, Second Edition, 2017.

REFERENCES

1. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly Media, First Edition, 2015.
2. Andreas M. Antonopoulos and Gavin Wood, "Mastering Ethereum: Building Smart Contracts and DApps", O'Reilly Media, First Edition, 2018.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	–	2	–	–	–	1	–	2	-	-
2	3	3	2	2	3	–	–	–	1	–	2	-	-
3	3	3	3	2	3	–	–	–	1	–	2	-	-
4	3	2	3	2	3	–	–	–	1	–	2	-	-
5	2	2	2	2	3	–	–	–	1	–	2	-	-
AVG	2.8	2.5	2.3	1.7	2.8	1	1	2	1.3	2	2.2	-	-

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

Chairman - BoS

23ECO718 VLSI Design L T P C

3 0 0 3

OBJECTIVES

- To explain the fundamentals of CMOS circuits and their characteristics.
- To realize MOS based circuits using different design styles
- To impart knowledge on adder, multiplier, and shifter circuits for realizing data path design.
- To understand memory architectures, peripheral circuits and SRAM/DRAM design concepts for high-speed VLSI memory systems.
- To gain knowledge of the testing processes of CMOS circuits.

UNIT I MOS TRANSISTOR 9

MOS operating modes, Pass transistors, Characteristics of CMOS inverter, Scaling principles and fundamental limits. Propagation Delays, CMOS inverter scaling, Elmore's constant.

UNIT II MOS CIRCUIT DESIGN STYLES 9

Static: Static CMOS, Pass transistor, Transmission gate, Pseudo NMOS design Styles, Dynamic: C2MOS, Dynamic, Domino, NORA, and Zipper design styles.

UNIT III DATA PATH DESIGN 9

Adder: CLA adder, MODL, Manchester carry chain, High-speed adders: carry skip, carry select and carry save, Multipliers and shifter: Array multiplier and barrel shifter.

UNIT IV MEMORY DESIGN AND PERIPHERAL CIRCUITS 9

Memory architectures- ROM, 6T SRAM, 1Tand 3T DRAM. Memory Peripheral Circuits Address Decoder, Sense Amplifier, Voltage References, Timing and Control, Drivers, Case Study – 4Mbit SRAM.

UNIT V CMOS TESTING 9

CMOS Testing, Need for Testing, Test Principles, Design Strategies for Test, Chip Level and Board Level Test Techniques.

OUTCOMES

Upon completion of the course, Students will be able to

- Explain pass transistor operation, propagation delay and Elmore's constant.
- Analyze different MOS circuit design styles.
- Design adder, multiplier and shifter circuits using MOS logic.
- Examine the memory peripheral circuits in SRAM and DRAM design.
- Analyze the design strategies and concepts of testing.

TEXT BOOK

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI DESIGN", A system PerspectiveAddision Wesley , Second Edition, 2004.
2. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated circuits: A Design Perspective", Prentice Hall of India, Second Edition, 2003.

REFERENCES

1. A.Pucknell, Kamran Eshraghian, "BASIC VLSI DESIGN", Prentice Hall of India, Third Edition, 2007.
2. John P. Uyemura, "Introduction to VLSI Circuits and Systems", Wiley India Pvt. Ltd.

E - RESOURCES

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ee09 - (CMOS digital VLSI design)
2. https://nptel.ac.in/courses/117101004?utm_source=chatgpt.com – (ADVANSED VLSI DESIGN)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	2	2	1	1	-	1	1	1	-	-
2	3	3	3	2	2	1	1	-	1	1	1	-	-
3	3	3	3	2	2	2	1	-	1	1	1	-	-
4	3	3	3	2	2	2	1	-	1	1	1	-	-
5	3	3	3	2	2	2	1	-	1	1	1	-	-
AVG	3	3	3	2	2	1.6	1	-	1	1	1		-

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

Chairman - BoS

23EEO716 ELECTRICAL, ELECTRONIC AND MAGNETIC MATERIALS L T P C

3 0 0 3

OBJECTIVES

- To impart knowledge on dielectric materials and their electrical properties.
- To familiarize with magnetic materials and their characteristics for electrical applications.
- To acquire knowledge on semiconductor materials and superconductivity concepts.
- To enhance understanding of materials used in electrical engineering applications.
- To foster awareness of optical and optoelectronic materials and their applications.

UNIT I DIELECTRIC MATERIALS 9

Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT II MAGNETIC MATERIALS 9

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and Hysteresis

UNIT III SEMICONDUCTOR MATERIALS 9

Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale Integration techniques. Concept of superconductivity; theories and examples for high temperature superconductivity; discussion on specific superconducting materials; comments on fabrication and engineering applications.

UNIT IV MATERIALS FOR ELECTRICAL APPLICATIONS 9

Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNIT V OPTICAL AND OPTOELECTRONIC MATERIALS 9

Principles of photoconductivity - effect of impurities - principles of luminescence-laser principles - He-Ne, injection lasers, LED materials - binary, ternary photoelectronic materials - LCD materials - photo detectors - applications of optoelectronic materials - optical fibres and materials - electro optic modulators - Kerr effect - Pockels effect.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Explain the properties and behavior of dielectric materials.
- Apply the characteristics of magnetic materials in electrical applications.
- Analyze semiconductor materials and superconducting phenomena.
- Examine the selection of materials for electrical engineering applications.
- Analyze the principles and applications of optical and optoelectronic materials.

TEXT BOOKS

1. Pradeep Fulay, "Electronic, Magnetic and Optical materials", CRC Press, taylor and Francis, Second Edition, 2017.
2. R K Rajput, "A course in Electrical Engineering Materials", Laxmi Publications, 2009.

REFERENCES

1. T K Basak, "A course in Electrical Engineering Materials", New Age Science Publications, 2009.
2. S. P. Seth, P. V. Gupta, "A course in Electrical Engineering Materials", Dhanpat Rai & amp; Sons, 2011.

E-RESOURCES

1. https://archive.nptel.ac.in/courses/108/104/108104087/ - (Electromagnetic Theory).
2. https://onlinecourses.nptel.ac.in/noc24_ee125/preview - (A Basic Course on Electric and Magnetic Circuits).

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	3	-	-	-	-	-	2	-	-
2	3	3	3	3	3	-	-	-	-	-	2	-	-
3	3	3	3	3	3	-	-	-	-	-	2	-	-
4	3	3	3	3	3	-	-	-	-	-	2	-	-
5	3	3	3	3	3	-	-	-	-	-	2	-	-
AVG	3	3	3	3	3	-	-	-	-	-	2	-	-

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23MEO720	MARINE VEHICLES	L T P C
		3 0 0 3

OBJECTIVES

- To introduce the classification, functions, and applications of various marine vehicles, including commercial vessels and submersibles.
- To provide knowledge on the design, construction, operational principles, and applications of manned and unmanned submersible systems.
- To explain the design concepts, components, control systems, stability, and industrial applications of Remotely Operated Vehicles (ROVs).
- To familiarize students with the design, navigation, sensing technologies, control strategies, and applications of Autonomous Underwater Vehicles (AUVs).
- To develop an understanding of the design considerations, pressure hulls, maneuvering, life-support systems, safety requirements, and certification procedures of manned submersibles.

UNIT I MARINE VEHICLES 9

Types – general – by function – commercial marine vehicles- submersibles types – applications

UNIT II SUBMERSIBLES 9

Manned and unmanned submersibles – towed vehicles – gliders – crawler – Design and construction

UNIT III REMOTELY OPERABLE VEHICLE (ROV) 9

Remotely Operable Vehicles (ROV) – The ROV business – Design theory and standards – control and simulation – design and stability – components of ROV - applications

UNIT IV AUTONOMOUS UNDERWATER VEHICLE (AUV) 9

AUV – Design and construction – components – sensors – Navigation -control strategies – applications

UNIT V MANNED SUBMERSIBLE 9

Introduction – Design and operational consideration – pressure hulls and exostructures – ballasting and trim – maneuvering and control – Life support and habitability – emergency devices and equipment's – certification and classification

OUTCOMES

Upon completion of the course, Students will be able to

- Analyze the classification, functions, and operational characteristics of different marine vehicles and submersibles for various underwater applications.
- Examine the design features, construction methods, and operational capabilities of manned and unmanned submersible systems.
- Compare the design principles, stability, control mechanisms, and functional components of Remotely Operated Vehicles (ROVs) for underwater operations.
- Classify Autonomous Underwater Vehicles (AUVs) based on their design, navigation systems, sensing technologies, control strategies, and marine applications.
- Differentiate the design considerations, life-support systems, maneuvering mechanisms, safety features, and certification requirements of manned submersibles for reliable underwater operations.

TEXT BOOKS

1. Jonathan M. Ross, "Human Factors for Naval Marine Vehicle Design and Operation", CRC Press, First Edition, 2020.
2. Tien Anh Tran, Kolla Bhanu Prakash, Subrata Chowdhury, and Ivan C.K. Tam, "Underwater Vehicle Control and Communication Systems Based on Machine Learning Techniques", CRC Press, First Edition, 2024.
3. Paul A. Russell, Reeds, "General Engineering Knowledge for Marine Engineers" , Bloomsbury Publishing (Reeds Marine Engineering and Technology Series), Seventh Edition, 2024.

REFERENCES

1. Ferial L. Hawry (Ed.), "The Ocean Engineering Handbook", CRC Press, First Edition, 2020.
2. Richard A. Geyer (Ed.), Submersibles and Their Use in Oceanography and Ocean Engineering, Elsevier, Revised Edition, 2019
3. Sabiha A. Wadoo and Pushkin Kachroo, "Autonomous Underwater Vehicles: Modeling, Control Design and Simulation", CRC Press, First Edition, 2019.

E-RESOURCES

1. https://nptel.ac.in/courses/114105030 - (Components of Resistance - I)
2. hhttp://www.digimat.in/nptel/courses/video/114105030/L22.html - (Regular Sea Waves - II)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	3	-	-	-	-	-	-	-	-
2	3	2	2	2	3	-	-	-	-	-	-	-	-
3	3	2	2	2	3	-	-	-	-	-	-	-	-
4	3	2	2	2	3	-	-	-	-	-	-	-	-
5	3	2	2	2	3	-	-	-	-	-	-	-	-
AVG.	3	2	2	2	3	-	-	-	-	-	-	-	-

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

Chairman - BoS

23MDO719 WEARABLE TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES

- To introduce the concepts and applications of wearable healthcare systems.
- To familiarize students with wearable devices and physiological parameter monitoring.
- To impart knowledge on communication technologies used in wearable systems.
- To explore wireless body area networks and healthcare monitoring applications.
- To inculcate understanding of data processing, validation, and analytics in wearable technologies.

UNIT I INTRODUCTION TO WEARABLES 9

Wearable Systems- Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Types of Wearable Systems, Components of Wearable Systems, Physiological Parameters Commonly Monitored in Wearable Applications, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles, Sport Application, Smart Fabrics: Intelligent Textiles.

UNIT II WEARABLE DEVICES FOR HEALTHCARE AND VITAL PARAMETERS 9

Vital Parameters Monitored and their Significances, Bio-potential Signal Recordings (ECG, EEG, EMG), Dry Electrodes Design and Fabrication methods, Cuff-less Blood Pressure Measurement, PPG, Galvanic Skin Response (GSR), Body Temperature Measurements, Activity Monitoring for Energy Expenditure, Respiratory parameters, Wearable sensors for Body Temperature: Intermittent and Continuous temperature monitoring, Detection principles – thermistor, infrared radiation, thermopile.

UNIT III COMMUNICATION TECHNOLOGIES 9

Principles of different sensors, Micro-Motors and Communication Channels - Accelerometers, Optical sensor, GPS- Various Input Methods, Power Requirements, Wearable Systems Packaging, Batteries and Charging, Wireless Communication Technologies and Protocols, Receiver Systems.

UNIT IV WIRELESS BODY AREA NETWORKS 9

Wireless Body Area Networks – Introduction, Personal Area Networks (PAN), Application in Vital Physiological Parameter monitoring, Design of Sensor & Sink Nodes, Architecture, Communication & Routing Protocols, Security, Power and Energy Harvesting, Mobile

Applications Based Devices.

UNIT V DATA PROCESSING AND VALIDATION 9

Classification Algorithms, Data Mining and Data Fusion, Signal Processing Algorithms in Wearable Applications, Issues of Wearable Physiological Monitoring Systems, Statistical Validation of Parameters, Certifications of Medical Devices and Patenting.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Examine the fundamentals and applications of wearable healthcare systems.
- Select suitable wearable sensors and devices for monitoring physiological signals.
- Apply communication technologies and protocols employed in wearable healthcare systems.
- Discuss wireless body area network solutions for healthcare monitoring applications.
- Analyze the quality of wearable technology data using suitable processing and validation methods.

TEXT BOOKS

1. Haider Raad, "Fundamentals of IoT and Wearable Technology Design", Wiley, First Edition, 2020.
2. Christine Farion, "The Ultimate Guide to Informed Wearable Technology: A Hands-on Approach for Creating Wearables from Prototype to Purpose Using Arduino Systems", Packt Publishing, First Edition, 2022.

REFERENCES

1. Subhas Chandra Mukhopadhyay, Wearable Electronics and Embedded Computing Systems, Springer, First Edition, 2021.
2. Miodrag Bolic, David Simons, and Insook Choi, Wearable Sensors: Theory, Design, and Applications, Academic Press, First Edition, 2023.

E-RESOURCES

1. https://www.youtube.com/watch?v=gp_X_DwoyC4 - (Introduction to Wireless systems).
2. https://www.youtube.com/watch?v=dm9W5WQUq2A - (Introduction Wearable device).

Mapping Of COs, POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	-	-	1	-	-	-	-	1	-	-
2	2	2	3	1	2	-	-	-	-	-	1	-	-
3	2	3	2	1	3	-	-	-	-	-	1	-	-
4	2	2	2	2	2	2	1	-	-	-	1	-	-
5	2	3	1	3	2	-	-	-	-	-	3	-	-
AVG.	2.2	2.4	1.8	1.75	2.25	1.5	1.0	-	-	-	1.4	-	-

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

Chairman - BoS

23MDO723 MEDICAL WASTE MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To familiarize students with biomedical waste management practices in healthcare facilities.
- To introduce biomedical waste handling, segregation, and transportation procedures.
- To impart knowledge on biomedical waste treatment and disposal technologies.
- To explore biomedical waste regulations, standards, and compliance requirements.
- To inculcate awareness of patient safety and environmental protection measures.

UNIT I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS 9

Waste disposal management, Hospital waste management, Biosafety- regulatory framework for GMOs, bioethics and its socio economic impact, hazards associated with poor health care waste management..

UNIT II BIOMEDICAL WASTE HANDLING TECHNIQUES 9

Characterization of medical waste(management and handling) rules, 1998, amendments and guidelines, segregation, packaging, storage, transport of infectious waste. Techniques of biomedical waste management. Health and safety rules. Protocols, issues, and challenges in transportation of biomedical waste.

UNIT III DISPOSAL TECHNIQUES 9

Treatment method- Autoclave, Hydroclave, Microwave, Chemical Disinfection, Solidification and stabilization, Bioremediation, Thermal Conversion Technologies, accumulation and storage of hazardous waste, land disposal of hazardous waste, other treatment and disposalmethod. Common Hazardous Waste Treatment Facilities (TSDF).

UNIT IV RULES AND CATEGORIES OF WASTE 9

Biomedical waste management rule: Biomedical wastes categories and their segregation, collection, treatment, processing, and disposal options, Standards For Treatment and Disposal Of Bio-Medical wastes, Standards for autoclaving of bio-medical waste, standards of microwaving, standards for deep burial, standards for the efficacy of chemical disinfection, standards for dry heat sterilization, standards ,or liquid waste.

UNIT V PREVENTION AND PATIENT SAFETY 9

Healthcare Immunizations, Centers for Disease Control and Prevention, Disinfectants, Sterilants, and Antiseptics, OSHA Bloodborne Pathogens Standard, Tuberculosis, Healthcare Opportunistic Infections, Medical Waste. Patient Safety: An Organizational Function, Errors and Adverse Events, Safety Cultures.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Examine biomedical waste management practices in healthcare facilities.
- Apply biomedical waste handling and transportation procedures.
- Analyze biomedical waste treatment and disposal techniques.
- Utilize biomedical waste management regulations and standards in healthcare settings.
- Develop safety measures for patient protection and environmental sustainability.

TEXT BOOKS

1. NehaSuyal , Prasenjit Debbarma , Manali Singh , Anita Mishra, Roop S Bora ,"Biomedical Waste Management: Bioremediation and Recycling", September 2024.
2. Dr. Shivakumar M.A,"Law Relating to Bio-medical Waste Management With Special Reference to Bangalore Urban City", BlueRose Publishers Pvt.Ltd, First Edition,January 2023.

REFERENCES

1. Himadri Panda, "Biomedical Waste: Management, Recycling And Applications", Discovery Publishing House PVT LTD, First Edition, April 2019.
2. NIIR Board of Consultants & Engineers, "Handbook on Recycling and Disposal of Hospital Waste Municipal Solid Waste, Biomedical Waste Plastic Waste", NIIR Project Consultancy Services, January 2018.

E-RESOURCES

1. https://www.youtube.com/watch?v=32KyVb-Ggn8 – (Biomedical Waste Management System)
2. https://www.youtube.com/watch?v=hYRp7SDWJXE - (Mnemonic for Biomedical waste management)

Mapping of COs, POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	1	-	1	3	2	-	-	1	1	-	-
2	2	2	2	1	2	3	2	-	-	1	1	-	-
3	2	3	2	2	2	2	1	-	-	1	1	-	-
4	2	2	2	2	2	3	2	-	-	1	1	-	-
5	2	3	2	2	2	3	3	1	1	2	2	-	-
AVG.	2	2.4	1.8	1.75	1.8	2.8	2	1	1	1.2	1.2	-	-

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

Chairman - BoS

23MDO724	LIFESTYLE DISEASES	L T P C
		3 0 0 3

OBJECTIVES

- To introduce the concepts of lifestyle diseases and their associated risk factors.
- To inculcate awareness on cancer, its types and treatment. .
- To impart knowledge on cardiovascular diseases and their causes..
- To familiarize students with types of diabetes,obesity and their preventive measures.
- To explore respiratory diseases, their causes, prevention, and management strategies.

UNIT I INTRODUCTION 9

Lifestyle diseases – Definition ; Risk factors – Eating, smoking, drinking, stress, physical activity, illicit drug use ; Obesity, diabetes, cardiovascular diseases, respiratory diseases, cancer; Prevention – Diet and exercise.

UNIT II CANCER 9

Types – Lung cancer, Mouth cancer, Skin cancer, Cervical cancer, Carcinoma esophagus; Causes Tobacco usage, Diagnosis – Biomarkers, Treatment.

UNIT III CARDIOVASCULAR DISEASES 9

Coronary atherosclerosis – Coronary artery disease; Causes -Fat and lipids, Alcohol abuse — Diagnosis - Electrocardiograph, echocardiograph, Treatment, Exercise and Cardiac rehabilitation.

UNIT IV DIABETES AND OBESITY 9

Types of Diabetes mellitus; Blood glucose regulation; Complications of diabetes – Pediatrics and adolescent obesity – Weight control and BMI.

UNIT V RESPIRATORY DISEASES 9

Chronic lung disease, Asthma, COPD; Causes - Breathing pattern (Nasal vs mouth), Smoking – Diagnosis - Pulmonary function testing.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Analyze lifestyle diseases and their associated risk factors.
- Examine diagnostic and treatment approaches for cancer management.
- Utilize diagnostic tools used in cardiovascular disease assessment.
- Apply weight management and diabetes prevention strategies.
- Develop preventive measures and management plans for respiratory diseases.

TEXT BOOKS

1. MingfuLu, "Solving Lifestyle Disease with Lifestyle", Thorpe Bowker Australia, February 2018.
2. Labros S. Sidossis, Labros S. Sidossis, "Textbook of Lifestyle Medicine", February 2022.

REFERENCES

1. K V Ramani , Hemlatha Ramani , Gunjan Y Trivedi Vishwanathan P Lakshmi M and Anita Verma ,"Preventing Insidious Lifestyle Diseases", January 2022.
2. Jeff Lumiri , Cliff Nyambichu, "Lifestyle Diseases: Lifestyle Disease Management" February 2018.

E-RESOURCES

1. https://youtu.be/6I6gTPIZeOk?si=3GYHWv5itK1unItc – (Diagnosis Prognosis)
2. https://youtu.be/fhL5IAyjz0o?si=GFUtO-FSyShP9gXN - (Prescribing Asthma and COPD)

Mapping of COs, POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	3	1	-	1	2	1	-	-	1	1	-	-
2	2	2	2	1	2	2	1	-	-	1	1	-	-
3	2	2	2	2	3	2	1	-	-	1	1	-	-
4	2	2	2	1	2	2	1	-	-	1	2	-	-
5	2	3	2	2	2	3	2	1	1	2	2	-	-
AVG.	2	2.4	1.8	1.5	2	2.2	1.2	1	1	1.2	1.4	-	-

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

Chairman - BoS

23RA0721 **ROBOTIC PROCESS AUTOMATION** L T P C
3 0 0 3

OBJECTIVES

- To introduce the fundamentals and evolution of Robotic Process Automation.
- To develop skills in workflow sequencing, data manipulation, and control flow for automated decision-making.
- To familiarize students with application integration, web scraping methods, and the use of recorders to automate UI actions.
- To develop expertise in exception handling, debugging techniques, and the organization of reusable automation projects.
- To inculcate knowledge of bot deployment using Orchestration Servers, license management, and the current landscape of RPA vendors.

UNIT I INTRODUCTION TO RPA 9

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation – Benefits of RPA – Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools – Templates, User Interface, Domains in Activities, Workflow Files.

UNIT II AUTOMATION PROCESS ACTIVITIES 9

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

UNIT III APPLICATION INTEGRATION, RECORDING & SCRAPING 9

Application integration strategies, selector usage - key workflow activities ,Recording mouse/keyboard actions -Web scraping from websites and exporting to CSV - Introductory process mining

UNIT IV EXCEPTION HANDLING AND CODE MANAGEMENT 9

Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine

UNIT V DEPLOYMENT AND MAINTENANCE 9

Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors – Open Source RPA, Future of RPA

OUTCOMES

Upon completion of the course, Students will be able to

- Classify RPA platforms and components by differentiating between traditional automation and modern robotic process evolution.
- Build automated workflows using sequences, flowcharts, and data manipulation techniques for effective decision-making.
- Apply recording and web scraping techniques to integrate applications and export data into structured formats.
- Examine exception handling and debugging techniques to ensure robust code management and workflow reusability.
- Analyze deployment strategies using Orchestration Servers to manage bot licensing, publishing, and maintenance updates.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Mary C. Lacity, Leslie P. Willcocks, Robotic Process Automation and Cognitive Automation:The Next Phase, SB Publishing, 2018.
2. NandanMullakara, Robotic Process Automation with UiPath: A Complete Guide, BPB Publications, 2021.

REFERENCES

1. Alok Mani Tripathi), "A practical guide to understanding and implementing RPA with UiPath and other tools."Packt Publishing, Fourth Edition, 2019.
2. Pascal Bornet, Ian Barkin, JochenWirtz, Intelligent Automation: Welcome to the World of Hyperautomation, Apress, 2019

E-RESOURCES

1. https://nptel.ac.in/courses/112101098 -(Robotics)
2. https://docs.uipath.com/-(UiPath Documentation)

Mapping of COs-POs& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	2	2	1	–	–	1	1	1	–	–
2	3	3	3	2	3	1	–	–	1	1	1	–	–
3	3	3	3	2	3	1	–	–	1	1	1	–	–
4	3	3	2	3	3	1	–	–	1	1	1	–	–
5	3	3	3	3	3	2	–	–	2	2	2	–	–
AVG	3	2.8	2.4	2.4	2.8	1.2	–	–	1.2	1.2	1.2	–	–

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

23MAO714 ADVANCED NUMERICAL METHODS L T P C
3 0 0 3

OBJECTIVES

- To explore techniques for solving algebraic and transcendental equations.
- To introduce numerical techniques for solving matrix inversion and eigenvalue problems.
- To explain the concepts of interpolation and difference equations.
- To provide knowledge of numerical differentiation and integration.
- To explain various numerical methods for solving partial differential equations.

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 9

Introduction – Basic properties of equations – Transformation of equations – Bisection method – Method of false position – Iteration method – Newton-Raphson Method – Some Deductions From Newton-Raphson Formula.

UNIT II MATRIX INVERSION AND EIGENVALUE PROBLEMS 9

Matrix inversion – Gauss-Jordan method – Factorization method – Partition method – Power method – Jacobi's method.

UNIT III INTERPOLATION AND DIFFERENCE EQUATIONS 9

Spline interpolation – inverse interpolation by Lagrange's method – Definition and order of difference equations – Formation of difference equations – Linear difference equations – Rules for finding the complementary function.

UNIT IV NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Numerical differentiation: Formulae for derivatives – Maxima and minima of a tabulated function – Numerical Integration: Romberg's method – Gaussian integration – Gaussian quadrature for double integral approximation.

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference approximations to partial derivatives –Solution of Laplace's equation – Solution of Poisson's equation – Solution of one dimensional heat equation – Hyperbolic equations – Solution of wave equation.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Apply numerical methods to solve algebraic and transcendental equations using iterative techniques.
- Understand the concept of matrix inversion and eigenvalue problems using numerical methods.
- Apply interpolation techniques and solve linear difference equations in numerical analysis.
- Apply numerical differentiation and integration methods to approximate derivatives and definite integrals.
- Analyze partial differential equations using finite difference methods for engineering applications.

TEXT BOOKS

1. Dr.Grewal,B.S., "Numerical Methods in Engineering and Science", Khanna Publishers, Eleventh Edition, 2023.
2. Dr.Kandasamy, P., "Numerical Methods", S.Chand & Company PVT.LTD, Seventeenth Edition, 2016.

REFERENCES

1. Burden, R.L and Faires, J.D, "Numerical Analysis", Cengage Learning, Tenth Edition, 2016.
2. Iyengar, S.R.K and Jain, R.K, "Numerical methods", New Age International (P) Ltd., Publishers, Seventh Edition, 2009.

E-RESOURCES

1. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods)
2. https://nptel.ac.in/courses/127106019 (Numerical Methods)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	2	1	2	-	-	-	-	-	2	-	-
2	3	3	2	1	2	-	-	-	-	-	2	-	-
3	3	3	2	1	2	-	-	-	-	-	2	-	-
4	3	3	3	2	2	-	-	-	-	-	2	-	-
5	3	3	3	2	2	-	-	-	-	-	2	-	-
AVG	3	3	2.4	1.4	2	-	-	-	-	-	2	-	-

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

Chairman - BOS

23PGO202 COST MANAGEMENT OF ENGINEERING PROJECTS L T P C
3 0 0 3

OBJECTIVES

- To familiarize students with the fundamental concepts and processes of strategic cost management.
- To inculcate knowledge of the different stages of project execution and management.
- To enhance knowledge of cost behavior and profit planning in mechanical and process industries.
- To familiarize students with various pricing strategies followed in engineering projects.
- To impart knowledge of various quantitative techniques used in cost management.

UNIT I INTRODUCTION 9

Introduction and overview of the strategic cost management process – Cost concepts in decision making – Relevant cost, Differential cost, Incremental cost and Opportunity cost – Objectives of a Costing System – Inventory valuation – Creation of a database for operational control – Provision of data for decision making.

UNIT II PROJECT 9

Meaning, different types, why to manage, cost overruns centres, various stages of project execution – Conception to commissioning – Project execution as conglomeration of technical and nontechnical activities – Detailed Engineering activities – Pre project execution main clearances and documents – Project team: Role of each member – Importance of project site – Data required with significance – Project contracts – Types and contents – Project execution – Project cost control – Bar charts and network diagram.

UNIT III PROJECT COMMISSIONING 9

Mechanical and process – Cost Behavior and Profit Planning – Marginal Costing – Distinction between marginal costing and absorption costing – Break-even Analysis – Cost volume-Profit Analysis – Various decision-making problems – Standard Costing and Variance Analysis.

UNIT IV PRICING STRATEGIES 9

Pareto Analysis – Target costing – Life cycle costing – Costing of service sector – Just-in-time approach – Material requirement planning – Enterprise resource planning – Total quality management and theory of constraints – Activity-based cost management – Bench marking –

Balanced score card and value-chain analysis – Budgetary control – Flexible budgets – Performance budgets – Zero-based budgets – Measurement of divisional profitability pricing decisions including transfer pricing.

UNIT V QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT 9

Quantitative techniques for cost management – Linear programming – PERT/CPM – Transportation problems – Assignment problems – Simulation – Learning curve theory.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Analyze the basics of the cost management process.
- Examine the stages of project execution from conception to commissioning.
- Construct suitable analytical techniques for project commissioning.
- Examine various pricing strategies followed in project implementation.
- Analyze different quantitative techniques used for cost management.

TEXT BOOKS

1. Charles T. Horngren, Srikant M. Datar and Madhav V. Rajan, "Cost Accounting A Managerial Emphasis", Pearson Education, Fourteenth Edition, 2023.
2. Charles T. Horngren and George Foster, "Advanced Management Accounting", Pearson Education, Thirteenth Edition, 2020.
3. QiuGuo Lin, "Cost management of engineering project", China Electric Power Press, Seventh Edition, 2021.

REFERENCES

1. Robert S Kaplan, Anthony A. Alkinson, "Management Accounting", Pearson Education, Fourth Edition, 2022.
2. Ashish K. Bhattacharya, "Principles & Practices of Cost Accounting", PHI Learning Private Limited, Sixth Edition, 2020.
3. Kenneth K Humpheys, "Project and cost engineers" handbook (cost management), CRC Press, Fourth Edition, 2023.

E–RESOURCES

1. https://nptel.ac.in/courses/105/106/105106149/ (Types of Projects)

2. https://nptel.ac.in/courses/110/104/110104073/ (Cost Management for Projects)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	-	1	-	-	-	1	1	1	3	3
2	3	3	3	-	1	-	1	-	1	1	2	3	3
3	3	3	3	-	1	-	1	-	1	1	-	2	3
4	3	3	3	-	1	-	1	1	1	1	1	2	3
5	3	3	3	-	1	-	1	1	1	1	2	3	3
AVG	3	3	3	-	1	-	1	1	1	1	1.5	2.6	3

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

Chairman - BoS

GENERAL ELECTIVES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23NCCL01	NCC AIRFORCE LEVEL-1	GE	3	0	0	3	40	60	100
23NCCL02	NCC AIRFORCE LEVEL - 2	GE	3	0	0	3	40	60	100
23NCCL03	NCC ARMY LEVEL - 3	GE	3	0	0	3	40	60	100
23NCCL04	NCC ARMY LEVEL - 4	GE	3	0	0	3	40	60	100

23NCCL01	NCC AIRFORCE LEVEL-1	L T P C
	(Common to All UG Programme NCC Students)	3 0 0 3

OBJECTIVES

- To familiarize students with the organizational structure of the National Cadet Corps (NCC), the duties and responsibilities of cadets, the incentives offered, and the significance of various NCC camps.
- To impart knowledge on personality development by enhancing communication skills, self-awareness, creative thinking, critical thinking, and leadership qualities.
- To introduce students to the qualities of effective leadership through the study of eminent leaders, their contributions, and the values required for responsible citizenship.
- To inculcate a sense of social responsibility by encouraging active participation in community service activities and promoting awareness of the role of youth in nation-building.
- To provide an understanding of the importance of health, hygiene, yoga, environmental cleanliness, and obstacle training while motivating students to contribute towards the vision of a Clean India.
- To provide practical training in foot drill, rifle drill, ceremonial drill, and social service activities for developing discipline, teamwork, leadership, and a sense of community responsibility.

UNIT I NCC GENERAL .. 7

Aims, objectives and Organization of NCC - incentives - duties of NCC Cadets - NCC camps - types - conduct.

UNIT II PERSONALITY DEVELOPMENT 7

Personality Development – Factors - Self Awareness - Communication skills –Empathy - Critical and Creative thinking - Decision making.

UNIT III LEADERSHIP 7

Leadership Capsule - Traits - Case studies - Leaders like APJ Abdul Kalam, RatanTata, shivaji, Tipu Sultan, Rabindranath Tagore, N Narayana murthy

UNIT IV SOCIAL SERVICE 7

Social Service Capsule – Basics - Rural development programmes – NGOs -Contribution of Youth - Swatch Bharath Abhiyan, Social evils - Drug Abuse - Digital Awareness - Waste Management - Women Health and Sanitation - Tree Plantation -Traffic Awareness - Pollution.

UNIT V HEALTH AND HYGIENE 7

Hygiene and sanitation – First Aid – Introduction to Yoga – Adventure – Environmental awareness and conservation – Obstacle Training – Adventure.

PRACTICAL COMPONENT 10

S.No.	Name of the Experiment	CO Mapping	RBT
1	Foot Drill	CO1	Apply
2	Rifle Drill	CO1	Apply
3	Ceremonial Drill	CO2	Understand
4	Social Service and Community Development	CO4	Understand

TOTAL: 35+10= 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Explain the organizational structure of the NCC, the roles and responsibilities of cadets, and the significance of various NCC camps.
- Apply communication, self-awareness, and creative and critical thinking skills to demonstrate personality development and confidence.
- Analyze the leadership qualities and contributions of eminent leaders to develop effective leadership skills and responsible citizenship.
- Demonstrate social responsibility by participating in community service activities and promoting awareness of national development initiatives.
- Apply the principles of health, hygiene, yoga, environmental cleanliness, and obstacle training to maintain personal well-being and develop physical fitness.
- Demonstrate proficiency in foot drill, rifle drill, ceremonial drill, and social service activities by applying discipline, teamwork, leadership, and community service skills in practical situations.

TEXT BOOKS

1. Cadet Hand Book(Common Subjects),published by DG NCC.
2. Cadet Hand Book(Specialized Subjects),published by DG NCC.
3. ANO Handbook

REFERENCE BOOKS

1. Grooming tomorrow's Leaders, published by DG NCC.
2. Youth in Action, published by DGNCC.
3. The Cadet, Annual Journal of the NCC.
4. Précis Issued by respective Service Head quarters on specialized subject available to PI Staff as reference material.

E-RESOURCES

1. https://www.indiancc.nic.in
2. https://www.indiancc.mygov.in
3. https://www.play.google.com/MY_IAF
4. https://www.play.google.com/DGNCC_Training

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	–	3	3	2	2	–	2	–	–
CO2	2	3	2	–	–	3	2	3	3	3	2	–	–
CO3	2	3	2	2	–	3	3	2	2	2	2	–	–
CO4	3	2	2	2	–	3	3	2	3	2	2	–	–
CO5	3	2	2	2	2	3	3	2	–	–	2	–	–
CO6	2	2	3	–	–	3	3	3	3	2	2		
AVG.	2.5	2.3	2.2	2.0	2.0	3.0	2.8	2.3	2.6	2.25	2.0	–	–

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

Chairman - BoS

23NCCL02	NCC AIRFORCE LEVEL- 2	L T P C
	(Common to All UG Programme NCC Students)	3 0 0 3

OBJECTIVES

- To familiarize students with the concepts of national security, national integration, and threats to the nation.
- To impart knowledge on leadership development, problem-solving techniques, emotional management, and time management skills.
- To introduce the principles of disaster management and encourage active participation in disaster response and relief activities.
- To inculcate an understanding of the significance of airmanship, air campaigns, and the role of the Indian Air Force in national service.
- To provide an insight into aeromodelling and its applications in aviation, while motivating students to explore the Armed Forces as a career.
- To impart practical knowledge of weapon assembling and reassembling while emphasizing safe handling procedures and operational efficiency.

UNIT I NATIONAL INTEGRATION AND AWARENESS 7

National Integration and Awareness - importance and necessity-factors affecting National integration-Unity in Diversity-Threats to National Security

UNIT II PERSONALITY DEVELOPMENT 7

Problem solving - Group discussions-Coping with stress and emotions-Change your mindset- Time management-Social skills-Team work-public speaking

UNIT III DISASTER MANAGEMENT 7

Disaster Management Capsule – Organization - Types -Essential services – Assistance - Civil Defence Organization - Initiative training-organizing skills - Dos and Don't's Fire Services and Fire Fighting.

UNIT IV GENERAL SERVICE KNOWLEDGE ON AIRCRAFT AND AIRMANSHIP 7

Armed forces and IAF Capsule-Modes of Entry in IAF-Aircraft types, capabilities and role-Air Campaigns-Principle of Flight-Forces acting on Aircraft-Airmanship – Navigation:

UNIT V AEROMODELLING 7

Introduction and Types of Aero Engine–Aircraft Controls–Introduction to Radars–Aero modelling capsule – Flying/Building of Aero models – Micro Light Flying – Simulator Flying.

PRACTICAL COMPONENT 10

S.No.	Name of the Experiment	CO Mapping	RBT
1	Foot Drill	CO1	Apply
2	Rifle Drill	CO1	Apply
3	Weapon Assembling and Reassembling	CO2	Apply
4	Basics of Aero modelling	CO5	Understand

TOTAL: 35+10= 45 PERIODS

OUTCOMES

Upon Completion of the course, Students will be able to

- Apply the principles of national integration to explain the threats and factors affecting national security.
- Analyze the role of public speaking skills and problem-solving techniques in effective leadership and decision-making.
- Explain the types of disasters and the appropriate emergency response measures.
- Analyze the role of the Indian Air Force, aircraft, and airmanship in ensuring national security and defence.
- Apply the concepts of aeromodelling and radar handling to demonstrate an understanding of aircraft operations and flying principles.
- Analyze the importance of drill, weapon training, and aero modelling in developing leadership, teamwork, and military skills.

TEXT BOOKS

- Cadet Hand Book(Common Subjects),published by DG NCC.
- Cadet Hand Book(Specialized Subjects),published by DG NCC.
- ANO Hand Book

REFERENCES

- Grooming tomorrow's Leaders, published by DG NCC.
- Youth in Action, published by DG NCC.
- The Cadet, Annual Journal of the NCC.
- Précis Issued by respective Service Head quarters on specialized subject available to PI Staff as reference material.

E-RESOURCES

1. https://www.indiancc.nic.inhttps://www.indiancc.mygov.in
2. https://www.play.google.com/MY_IAFs
3. https://www.play.google.com/DGNCC_Training

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	–	3	3	2	2	–	2	–	–
CO2	2	3	2	–	–	3	2	3	3	3	2	–	–
CO3	2	3	2	2	–	3	3	2	2	2	2	–	–
CO4	3	3	2	2	2	3	2	2	–	–	2	–	–
CO5	3	2	2	3	3	2	2	2	–	–	2	–	–
CO6	2	2	3	–	–	3	3	3	3	2	2	-	-
AVG.	2.5	2.5	2.2	2.3	2.5	2.8	2.5	2.3	2.5	2.3	2.0	–	–

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

Chairman - BoS

23NCCL03	NCC ARMY WING LEVEL-3	L TP C
	(Common to All UG Programme NCC Students)	3 0 0 3

COURSE PREREQUISITES: 75% Attendance in First Year of NCC Course

OBJECTIVES

- To learn the basic structure of NCC and its organization,Incentives,duties of Cadets; imbibe the knowledge of various types of Camp.
- To motivate the cadets as confidence leaders by refining theirpersonality andself-awareness, with the help of Communication skills andaware of creative, critical thinking abilities.
- To create an awareness on MilitaryHistoryand great heroes of India and to know about the important military operations
- To inspire the cadets to take part in the Social Service Activities and also to learn about the infantry battalion
- To acquire knowledge about the basics of health and hygiene, yoga, environment cleanliness and motivate young Indians towards the path of clean India and acquaint about obstacle training.
- To develop discipline, confidence, alertness, and coordination through the practice of basic foot drill movements and commands.

UNIT I NCC GENERAL 7

Aims, objectives and Organization of NCC-incentives-duties of NCC Cadets-NCC camps- types - conduct.

UNIT II PERSONALITY DEVELOPMENT 7

Personality Development -Factors-Self Awareness-Communication skills-Empathy-Critical and Creative thinking-Decision making.

UNIT III MILITARY HISTORY 7

Military History - Biographies, Heroes Study of Battles of Indo- PakWar 1965,1971 - Operation MeghdootandKargil.

UNIT IV SOCIAL SERVICE& INFANTRYBATALLION 7

Social Service Capsule-Basics-Rural development programmes-NGOs-Contribution of Youth - Swatch BharathAbhiyan, Social evils-Drug Abuse-Digital Awareness-Waste Management-Women

Health and Sanitation-Organisation of Infantry,characteristics

UNITV HEALTH AND HYGIENE 7

Hygiene and sanitation – First Aid – Introduction to Yoga – Adventure – Environmental awareness and conservation – Obstacle Training -Adventure

TOTAL: 35 PERIODS

OUTCOMES

Upon completion of this course, Students will be able to

- Understand the basic organization of NCC and roles, responsibilities of cadets for the smooth functioning of all camps
- Develop the cadets personality and to think divergently to break functional fixedness
- Identify the Leadership traits of military heroes and learn about their organization
- Understand the concept and important of Social service and evolution of infantry battalion
- Practice healthy practices to improve the personal sanitation and hygiene and get into the adventurous activities
- Execute drill procedures effectively while maintaining military etiquette, discipline, and coordination during parades.

TEXT BOOKS

1. Cadet Hand Book (Common Subjects), published by DGNCC.
2. Cadet Hand Book (Specialized Subjects), published by DGNCC.
3. ANO Handbook

REFERENCE BOOKS

1. Grooming tomorrow's Leaders, published by DG, NCC.
2. Youth in Action, published by DG, NCC.
3. The Cadet, Annual Journal of the NCC.
4. Précis Issued by respective Service Headquarters on specialized subject available to PI Staff as reference material.

E - RESOURCES

1. https://www.indiancc.nic.in
2. https://www.indiancc.mygov.in
3. https://www.play.google.com/MY_IAF
4. https://www.play.google.com/DGNCC_Training

LIST OF DRILLS

(Common to All UG Programme NCC Students)

1. Foot Drill
2. Rifle Drill
3. Ceremonial Drill
4. Social Service and Community Development

TOTAL = 10 PERIODS

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	-	-	-	2	-	3	2	2	1	-	-
2	-	2	-	-	-	2	-	2	3	3	2	-	-
3	2	2	-	-	-	3	-	3	3	2	3	-	-
4	-	2	2	-	-	3	3	3	2	2	2	-	-
5	2	2	-	-	-	3	3	2	2	1	2	-	-
6	2	2	3	-	-	2	-	2	3	2	2	-	-
AVG.	2	2	2.5	-	-	2.5	3	2.5	2.5	2	2	-	-

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

Chairman - BoS

23NCCL04	NCC ARMY WING LEVEL-4	L TP C
	(Common to All UG Programme NCC Students)	3 0 0 3

COURSE PREREQUISITES: 75% Attendance in Second Year of NCC Course

OBJECTIVES

- To realize the importance of national security and threats for the nation and aware of National Integration.
- To create interest in cadet to develop into great leaders by teaching them about problem solving techniques, handling emotions and time management skills.
- Toaware of disaster management and motivate the young minds to help during the time of disasters.
- To create a pool of organized, trained and motivated youth with authoritative qualities to serve in CAPF and to know the Modes of CAPF
- To learn about the use of Maps in army, usage of conventional signs, scale and grid systems.
- To develop discipline, confidence, alertness, and coordination through the practice of basic foot drill movements and commands.

UNIT I NATIONAL INTEGRATION AND AWARENESS 7

National Integration and Awareness - importance and necessity-factors affecting National integration-Unity in Diversity-Threats to National Security.

UNIT II PERSONALITY DEVELOPMENT 7

Problem solving - Group discussions-Coping with stress and emotions-Change your mindset-Time management-Social skills-Team work-public speaking.

UNIT III DISASTER MANAGEMENT 7

Disaster Management Capsule – Organization - Types -Essential services – Assistance - Civil Defence Organization - Initiative training-organizing skills - Dos and Don'tsFire Services and Fire Fighting

UNIT IV INTRODUCTION TO ARMED FORCES 7

Army-Police and Central Armed Police Forces – Badges – Role – Tasks –Modes of Entry into Army, Police and CAPF

UNITV MAPS, CONVENTIONAL SIGNS, SCALE AND GRID SYSTEMS 7

CONVENTIONAL SIGNS – Scales And Grid Systems – Topographical Forms and Technical Terms, Cardinal Points And Types of North – Types of Bearing And Use of Service Protractor Google Maps & Applications

TOTAL: 35PERIODS

OUTCOMES

Upon completion of this course, Students will be able to

- Realize the importance of National integration, threats and factors affecting the National Security.
- Demonstrate their public speaking skills and problem solving techniques.
- Identify and analyzethe problems during Disaster type and to give solutions during the emergency periods with their presence of mind
- Grasp the concept of CAPF andits importanceto the nation and detailed Knowledge onmodes of entry into CAPF.
- Obtain knowledge on maps, usage of conventional signs, learn about the features of land
- Execute drill procedures effectively while maintaining military etiquette, discipline, and coordination during parades.

TEXT BOOKS

1. Cadet Hand Book (Common Subjects), published by DGNCC.
2. Cadet Hand Book (Specialized Subjects), published by DGNCC.
3. ANO Hand Book

REFERENCE BOOKS

1. Grooming tomorrow's Leaders, published by DG, NCC.
2. Youth in Action, published by DG, NCC.
3. The Cadet, Annual Journal of the NCC.
4. Précis Issued by respective Service Headquarters on specialized subject available to PI Staff as reference material.

E - RESOURCES

1. https://www.indiancc.nic.in
2. https://www.indiancc.mygov.in
3. https://www.play.google.com/MY_IAFs
4. https://www.play.google.com/DGNCC_Training

LIST OF DRILLS

(Common to All UG Programme NCC Students)

1. Foot Drill
2. Rifle Drill
3. Weapon Assembling and Reassembling
4. Basics of Maps

TOTAL: 10 PERIODS

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	-	-	-	3	2	3	2	2	1	-	-
2	2	2	-	-	-	2	-	3	3	2	2	-	-
3	2	2	2	-	-	3	2	3	3	2	2	-	-
4	2	2	2	-	-	3	-	3	2	2	3	-	-
5	2	2	3	-	2	2	-	3	2	2	2	-	-
6	2	2	3	-	-	2	-	3	3	2	2	-	-
AVG.	2	2	2.5	-	2	3	2	3	2	2	1	-	-

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

Chairman - BoS

ELECTIVE – MANAGEMENT

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MGT701	Principles of Management	GE	3	0	0	3	40	60	100
23MGT702	Total Quality Management	GE	3	0	0	3	40	60	100
23MGT703	Engineering Economics and Financial Accounting	GE	3	0	0	3	40	60	100
23MGT704	Human Resource Management	GE	3	0	0	3	40	60	100
23MGT705	Knowledge Management	GE	3	0	0	3	40	60	100
23MGT706	Industrial Management	GE	3	0	0	3	40	60	100
23MGT707	Supply Chain Management	GE	3	0	0	3	40	60	100
23MGT708	e-Waste Management	GE	3	0	0	3	40	60	100

23MGT701 PRINCIPLES OF MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To familiarize the basic concepts of management, managerial roles, business organizations and management approaches.
- To inculcate the planning process, strategic management concepts and decision-making techniques.
- To provide knowledge of organizational structure, authority relationships and human resource management functions.
- To impart knowledge of motivation, leadership, communication and individual and group behavior in organizations.
- To enhance the concepts of controlling, performance measurement and management control techniques.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management - Science or Art - Manager Vs Entrepreneur - types of managers - managerial roles and skills - Evolution of Management - Scientific, human relations, system and contingency approaches - Types of Business organization - Sole proprietorship, partnership, company - public and private sector enterprises - Organization culture and Environment - Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning - Planning process - Types of planning - Objectives - Setting objectives - Policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose - Formal and informal organization - Organization chart - Organization - structure - Types - Line and staff authority - Departmentalization - delegation of authority - Centralization and decentralization - Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour - Motivation - Motivation theories -Motivational techniques - Job satisfaction - Job enrichment - Leadership - types and theories of leadership - Communication - Process of communication - Barrier in communication -Effective communication - Communication and IT.

UNIT V CONTROLLING 9

System and process of controlling - Budgetary and non-Budgetary control techniques - Use of computers and IT in Management control - Productivity problems and management - Control and performance - Direct and preventive control - Reporting.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Explain the principles of management, organizational forms and management theories.
- Analyze the planning tools and decision-making techniques in organizational situations.
- Apply the organizational structures and human resource management practices.
- Explain the leadership, motivation and communication approaches for organizational effectiveness.
- Examine the assess control systems and performance management techniques used in organizations.

TEXT BOOKS

1. Stephen P. Robbins and Mary Coulter, "Management", Fourteen Edition Prentice Hall (India) Pvt. Ltd., 2017.
2. Harold Koontz and Heinz Weihrich, "Essentials of management", Eleventh Edition, Tata McGraw Hill, 2020.

REFERENCES

1. Robert Kreitner and Mamata Mohapatra, "Management", Biztantra, 2008.
2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, "Fundamentals of Management , Seventh Edition, Pearson Education", 2011.

E-RESOURCES

1. https://nptel.ac.in/courses/110107150 - (Principles of Management)
2. https://nptel.ac.in/courses/110105146 - (Principles of Management)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	-	-	-	-	1	-	-	-	-	-	-	-
2	-	1	1	-	-	-	-	-	-	-	-	-	-
3	1		-	2	-	1	-	2	-	1	1	-	-
4	-	1	1	1	2	-	1	2	-	-	-	-	-
5	1	-	-	-	1	1	-	-	3	-	1	-	-
AVG	1.6	1	1	1.5	1.5	1	1	2	3	1	1	-	-

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

Chairman - BOS

23MGT702 TOTAL QUALITY MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To guide students in understanding the philosophies and practices of total quality management.
- To familiarize students with the principles of TQM, including leadership, customer satisfaction, employee involvement, and continuous improvement.
- To introduce students to quality management tools and techniques for process analysis and improvement.
- To explain advanced quality improvement methods and performance measurement techniques used in organizations.
- To guide students in understanding Quality management systems, environmental management Systems and ISO standards for quality and environmental management.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Costs of quality.

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs – Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction - Benefits of ISO Registration - ISO 9000 Series of Standards – Sector - Specific Standards - AS 9100, TS16949 and TL 9000 - ISO 9001 Requirements – Implementation – Documentation - Internal Audits – Registration - ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction - ISO 14000 Series Standards - Concepts of ISO 14001 - Requirements of ISO 14001- Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, Students will be able to

- Examine the concepts, philosophies, frameworks, and customer-focused practices of Total Quality Management.
- Analyze the roles of leadership, employee involvement, continuous improvement, and supplier partnership in achieving organizational excellence.
- Analyze quality management tools and techniques, including Six Sigma, benchmarking, and FMEA, for process improvement and problem-solving.
- Differentiate the applications of Control Charts, Process Capability Analysis, QFD, Taguchi Methods and TPM in quality improvement.
- Compare the requirements and implementation procedures of quality management systems and environmental management systems based on ISO standards.

TEXT BOOKS

1. Dale H. Besterfiled,, "Total quality Management", Fifth Edition, Pearson Education India, 2019.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2022.
3. John S. Oakland, "Total Quality Management and Operational Excellence: Text with Cases", Fifth Edition, Routledge, 2024.

REFERENCES

1. James R. Evans and William M. Lindsay, "Managing for Quality and Performance Excellence" Twelfth Edition, Cengage Learning, 2023.
2. Poornima M. Charantimath, "Total Quality Management", Fourth Edition, Pearson Education India, 2020.

3. David L. Goetsch and Stanley B. Davis, "Quality Management for Organizational Excellence", Nineth Edition, Pearson, 2022.

E-RESOURCES

1. https://nptel.ac.in/courses/110104080 - (Total Quality Management)
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_mg72 -(Total Quality Management II)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	-	1	-	-	-	-	-	2	2	1
2	3	2	2	-	1	-	-	-	-	-	2	2	1
3	3	2	2	-	1	-	-	-	-	-	2	2	1
4	3	2	2	-	1	-	-	-	-	-	2	2	1
5	3	2	2	-	1	-	-	-	-	-	2	2	1
Avg.	3	2	2	-	1	-	-	-	-	-	2	2	1

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

Chairman - BoS

23MGT703 ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING L T P C
3 0 0 3

OBJECTIVES

- To introduce managerial economics for effective decision-making.
- To Familiarize students with production and cost concepts to analyse production optimization for business decisions
- To explore pricing decisions under different market structures and pricing objectives.
- To enhance the ability to interpret financial statements.
- To gain knowledge of capital budgeting techniques for investment decisions.

UNIT I DEMAND AND SUPPLY ANALYSIS 9

Managerial Economics – Relationship with other disciplines – Firms: Types, objectives and goals – Managerial decisions – Decision analysis. Demand – Types of demand – Determinants of demand – Demand function – Demand elasticity – Demand forecasting – Supply – Determinants of supply – Supply function -Supply elasticity.

UNIT II PRODUCTION AND COST ANALYSIS 9

Production function – Returns to scale – Production optimization – Least cost input Isoquants – Managerial uses of production function. Cost Concepts – Cost function – Determinants of cost – Short run and Long run cost curves – Cost Output Decision – Estimation of Cost.

UNIT III PRICING 9

Determinants of Price – Pricing under different objectives and different market structures – Price discrimination – Pricing methods in practice.

UNIT IV FINANCIAL ACCOUNTING 9

Balance sheet and related concepts – Profit & Loss Statement and related concepts – Financial Ratio Analysis – Cash flow analysis – Funds flow analysis – Comparative financial statements – Analysis & Interpretation of financial statements.

UNIT V CAPITAL BUDGETING 9

Investments – Risks and return evaluation of investment decision – Average rate of return – Payback Period – Net Present Value – Internal rate of return.

TOTAL: 45 PERIODS

OUTCOMES

Upon Completion of this course, Student will be able to

- Apply the principles of managerial economics for effective business decision-making.
- Analyse production and cost concepts to support production optimization and business decisions.
- Examine pricing decisions under different market structures and pricing objectives.
- Analyse financial statements to evaluate the financial performance of an organization.
- Compare capital budgeting techniques to evaluate investment opportunities and support investment decisions.

TEXT BOOKS

1. P. L. Mehta, "Managerial Economics: Analysis, Problems and Cases", Seventeenth Edition, Sultan Chand & Sons, 2022.
2. S. N. Maheshwari and S. K. Maheshwari, "Financial Accounting", seventh Edition, Vikas Publishing House Pvt. Ltd., 2023.

REFERENCES

1. Dominick Salvatore and Siddhartha K. Rastogi, "Managerial Economics: Principles and Worldwide Applications", Tenth Edition, Oxford University Press, 2024.
2. M. Pandey, Financial Management, Twelfth Edition, Pearson India, 2023.

E-RESOURCES

1. http://www.digimat.in/nptel/courses/video/110101005/110101005.html
2. https://nptel.ac.in/courses/110101131

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	-	-	-	1	-	1	1	3	1	-	-
2	2	3	2	1	2	1	-	-	1	3	1	-	-
3	2	3	1	-	-	2	1	1	1	3	1	-	-
4	2	3	-	1	2	1	-	-	2	3	1	-	-
5	2	3	2	1	2	2	1	1	1	3	2	-	-
AVG	2	2.8	1.7	1	2.0	1.4	1	1	1.2	3	1.2	-	-

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

Chairman - BoS

23MGT704 HUMAN RESOURCE MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To introduce the evolution and significance of Human Resource Management in organizations.
- To familiarize students with matching HR demand and supply with internal and external sources.
- To gain knowledge about executive development programs, common practices and benefits.
- To explore career management and mentor–protégé relationships.
- To enable an understanding of performance evaluation methods and feedback.

UNIT I PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT 9

Evolution of human resource management - The importance of the human factor - Challenges - Role of human resource manager Challenges for Human Resource Managers - Trends in Human Resource Policies – Computer Applications in Human Resource Management - Case analysis.

UNIT II HUMAN RESOURCE PLANNING AND RECRUITMENT 9

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

UNIT III TRAINING AND EXECUTIVE DEVELOPMENT 9

Training need Analysis – Purpose – Training Evaluation methods – Benefits - Executive development – Self Development – Knowledge Management – Case analysis.

UNIT IV EMPLOYEE ENGAGEMENT 9

Compensation plan - Reward - Motivation – X, Y, Z Theories - Career management - Mentoring- Developmnet of Mentor - Protege relationships.

UNIT V PERFORMANCE EVALUATION AND CONTROL PROCESS 9

Performance Evaluation Methods - types – Feedback - Industry practices. Promotion, Demotion, Transfer and Separation - The control process - Importance -Methods - grievances – Causes - Implications - Redressal Methods – Artificial Intelligence and an Era of Human Resource – Benefits – Challenges - Case analysis

OUTCOMES

Upon completion of the course, Students will be able to

- Develop the skills needed to understand the significance of Human Resource Management.
- Differentiate internal and external sources of recruitment for effective Human Resource Planning.
- Analyze the effectiveness of HRM practices in supporting the strategic and operational needs of the organizations in a global economy.
- Examine career management and mentoring practices in organizations.
- Analyze performance evaluation methods practice and control processes.

TEXT BOOKS

1. Biswajeet Pattanayak, "Human Resource Management", Seventh Edition, PHI Learning Private Limited, 2025.
2. Dessler, G., & Varkkey, B,"Human Resource Management ", Pearson Education India, Seventeenth Edition, 2024.

REFERENCES

1. Aswathappa, K," Human Resource Management", Tenth Edition, Tata McGraw-Hill Education. 2023.
2. Ivancevich, J. M., "Human Resource Management", McGraw Hill Education, Fourteenth Edition, 2021.

E-RESOURCES

1. https://open.umn.edu/opentextbooks/textbooks/71?utm_source=.com
2. https://positivepsychology.com/theory-x-and-theory-y/

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	1	-	-	-	1	1	2	2	1	-	2	-	-
2	1	2	-	-	1	1	1	2	1	1	2	-	-
3	1	2	2	2	2	2	2	2	2	2	2	-	-
4	-	2	-	-	-	1	2	3	2	1	2	-	-
5	1	2	1	2	2	1	2	2	2	2	2	-	-
AVG	1	2	1.5	2	1.5	1.2	1.8	2.2	1.6	1.5	2	-	-

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

Chairman - BoS

23MGT705 KNOWLEDGE MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To introduce the concepts, evolution, challenges, and ethical aspects of Knowledge Management.
- To understand knowledge sharing and tacit knowledge management.
- To explore technologies and tools supporting Knowledge Management.
- To impart knowledge of Knowledge Management strategies and organizational applications.
- To enhance understanding of future trends and case studies in Knowledge Management.

UNIT I INTRODUCTION 9

Introduction – The foundation of Knowledge Management – Cultural issues - technology applications - organizational concepts and processes - management aspects - and decision support systems. The Evolution of Knowledge management - Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.

UNIT II CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING 9

Organization and Knowledge Management - Building the Learning Organization. Knowledge Markets - Cooperation among Distributed Technical Specialists – Tacit Knowledge and Quality Assurance.

UNIT III TECHNOLOGIES AND TOOLS FOR KNOWLEDGE MANAGEMENT 9

Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information.

UNIT IV KNOWLEDGE MANAGEMENT STRATEGIES AND APPLICATIONS 9

Knowledge Management Strategy – Components of Knowledge Strategy – Knowledge Acquisition, Storage, Sharing and Application – Knowledge Management Frameworks and Models – Organizational Applications of Knowledge Management – Case Studies on Knowledge Management Practices – Challenges in Implementing Knowledge Management.

UNIT V FUTURE TRENDS AND CASE STUDIES 9

Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.

TOTAL: 45 PERIODS

OUTCOMES

Upon Completion of this course, Student will be able to

- Examine Knowledge Management concepts, challenges and ethical aspects.
- Analyze knowledge sharing and tacit knowledge management practices.
- Apply technologies and tools for effective Knowledge Management.
- Compare Knowledge Management strategies, frameworks, and applications.
- Analyze future trends and case studies in Knowledge Management.

TEXT BOOKS

1. Dalkir, K. "Knowledge Management in Theory and Practice", Fourth Edition, MIT Press, 2023.
2. Becerra-Fernandez, I., & Sabherwal, R, "Knowledge Management: Systems and Processes" Third Edition. Routledge, 2023.

REFERENCES

1. Nonaka, I., & Takeuchi, H. "The Wise Company: How Companies Create Continuous Innovation", Oxford University Press, 2021.
2. Girard, J. P., & Girard, J. L., "Knowledge Management: Concepts, Methodologies, Tools, and Applications. IGI Global", 2022.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_mg96
2. https://www.britannica.com/technology/search-engine

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	-	-	1	-	3	-	-	-	2	-	-
2	2	3	-	-	1	1	-	2	2	-	2	-	-
3	2	2	1	1	2	-	-	1	1	1	2	-	-
4	2	2	2	1	2	1	-	1	1	2	2	-	-
5	2	3	2	2	2	2	1	1	2	2	3	-	-
AVG	2	2.4	1.7	1.3	1.6	1.3	2.0	1.3	1.5	1.7	2.2	-	-

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

Chairman - BoS

23MGT706 INDUSTRIAL MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To introduce the fundamentals of management and organizations.
- To enhance planning, organizing, and staffing functions.
- To impart knowledge of leadership, communication, controlling, and decision-making.
- To familiarize students with organizational behavior and change management.
- To provide knowledge of productivity improvement and modern management practices.

UNIT I INTRODUCTION TO MANAGEMENT 9

Management: Introduction; Definition and Functions - Approaches to the study of Management - Mintzberg's Ten Managerial Roles - Principles of Taylor, Weber, Parker - Forms of Organization: Sole Proprietorship; Partnership Cooperative - Public Sector Vs Private Sector Organization - Business Environment: Economic, Social, Political, Legal - Trade Union.

UNIT II FUNDAMENTALS OF MANAGERIAL FUNCTIONS 9

Planning - Strategic Planning - Vision & Mission statement in Planning – Organizing - Departmentalization - Centralization and Decentralization - Authority & Responsibility – Staffing: Systems Approach; Recruiting and Selection Process.

UNIT III MANAGERIAL FUNCTIONS IN ENGINEERING AND TECHNOLOGY 9

Directing - Leadership Traits; Style; Morale; Managerial Grids (Blake-Mounton, Reddin) – Communication - Barriers – Controlling - Audit - Preventive Control – Decision Making.

UNIT IV ORGANIZATION THEORY 9

Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management – Motivation Theories - Change Management - Sources of Resistance - Overcoming Resistance - Guidelines to managing Conflict.

UNIT V PRODUCTIVITY AND MODERN TOPICS 9

Productivity – Concept - Measurements - Affecting Factors; Methods to Improve – Business Process Reengineering (BPR) – Benchmarking - SWOT/SWOC Analysis - Total Productive Maintenance - Management of Information Systems (MIS), Industry

TOTAL: 45 PERIODS

OUTCOMES

Upon Completion of this course, Student will be able to

- Examine the fundamentals of management and organizations.
- Apply planning, organizing and staffing functions.
- Apply leadership, communication, controlling, and decision-making techniques.
- Analyse organizational behavior and change management practices.
- Compare productivity improvement techniques and modern management practices.

TEXT BOOKS

1. Koontz, H., Weihrich, H. and Cannice, M. V., "Essentials of Management: An International, Innovation and Leadership Perspective", Eleventh Edition, McGraw-Hill Education, 2021.
2. Govindarajan, M. and Natarajan, S., "Principles of Management, Prentice Hall of India / Pearson Education", New Delhi, 2009.

REFERENCES

1. Daft, Richard L., "Organization Theory and Design", Thirteenth Edition, Cengage Learning, 2020.
2. Certo, Samuel C. and Certo, S, "Trevis, Modern Management: Concepts and Skills", Fifteenth Edition, Pearson Education, 2020.

E-RESOURCES

1. https://www.jkkmct.edu.in/software/uploads/syllabus/8d168a38585feb8e45346543f7aeaaff.pdf?utm_source=chatgpt.com
2. https://sitams.ac.in/wp-content/uploads/2026/03/UNIT-II-MOB.pdf

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	1	-	-	-	-	1	1	-	-	2	1	-	-
2	1	2	-	-	1	-	-	1	1	3	-	-	-
3	1	2	-	-	-	1	1	2	2	2	-	-	-
4	1	2	-	-	-	2	2	2	2	1	1	-	-
5	1	2	1	-	2	1	-	1	1	3	2	-	-
AVG	1	2	1	-	1.5	1.3	1.3	1.5	1.5	3.7	1.3	-	-

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

Chairman - BoS

23MGT707 **SUPPLY CHAIN MANAGEMENT** L T P C

3 0 0 3

OBJECTIVES

- To introduce the major decisions in supply chain management.
- To familiarize students with the concepts of supplier selection and contract negotiation.
- To explore the impact of uncertainty on network design.
- To enhance knowledge of multiple-location inventory management concepts.
- To gain knowledge of supply chain integration concepts and their advancements in current trends.

UNIT I INTRODUCTION 9

Supply Chain - Fundamentals – Evolution - Role in Economy - Importance - Decision Phases Supplier – Manufacturer - Customer chain. - Enablers/ Drivers of Supply Chain Performance. Supply chain strategy Supply Chain Performance Measures.

UNIT II STRATEGIC SOURCING 9

Outsourcing - Make Vs buy - Identifying core processes - Market Vs Hierarchy - Make Vs buy continuum - Sourcing strategy Supplier Selection and Contract Negotiation. Creating a world class supply base - Supplier Development - World Wide Sourcing.

UNIT III SUPPLY CHAIN NETWORK 9

Distribution Network Design - Role - Factors Influencing Options, Value Addition - Distribution Strategies - Models for Facility Location and Capacity allocation. Distribution Center Location Models. Supply Chain Network optimization models. Impact of uncertainty on Network Design - Network Design decisions using Decision trees.

UNIT IV PLANNING DEMAND, INVENTORY AND SUPPLY 9

Managing supply chain cycle inventory. Uncertainty in the supply chain - Analyzing impact of supply chain redesign on the inventory - Risk Pooling - Managing inventory for short life cycle products - multiple item - multiple location inventory management. Pricing and Revenue Management.

UNIT V CURRENT TRENDS 9

Supply Chain Integration - Building partnership and trust in SC Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain. SC Restructuring - SC Mapping SC process

restructuring, Postpone the point of differentiation - IT in Supply Chain - Agile Supply Chains Reverse Supply chain. Agra Supply Chains

TOTAL: 45 PERIODS

OUTCOMES

Upon Completion of this course, Student will be able to

- Apply supply chain management principles in major supply chain decision areas.
- Examine supplier selection processes and contract negotiation strategies in supply chain operations.
- Analyze the impact of uncertainty on supply chain network design decisions.
- Apply appropriate approaches for managing multiple-location inventory systems.
- Explain the concepts of supply chain integration and their evolution in current industry trends.

TEXT BOOKS

1. Sunil Chopra, "Supply Chain Management: Strategy, Planning & Operation", PHI Learning, Eigth Edition, 2025.
2. David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, and Ravi Shankar "Designing and Managing the Supply Chain: Concepts, Strategies, and Cases", Tata McGraw-Hill, Fourth Edition, 2022.

REFERENCES

1. Ballou Ronald H, "Business Logistics and Supply Chain Management", Fifth Edition, Pearson, 2021.
2. Shapiro Jeremy F, "Modeling the Supply Chain", Second Reprint, Pearson, 2022.

E-RESOURCES

1. https://www.tutorialspoint.com/supply_chain_management(SCM tutorial).
2. https://www.mixmove.io/post/supply-chain-integration(supply-chain-integration)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	2	1	1	1	1	-	-	-	2	1	1
2	2	2	1	1	-	2	1	1	2	2	2	-	-
3	2	3	2	2	2	1	1	-	-	-	2	1	1
4	2	2	3	2	2	1	1	-	-	-	3	1	1
5	1	1	1	-	1	2	1	-	1	2	2	-	1
AVG	1.8	2	1.8	1.5	1.5	1.4	1	1	1.5	2	2.2	1	1

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

Chairman - BoS

23MGT708 E – WASTE MANAGEMENT L T P C

3 0 0 3

OBJECTIVES

- To understand e-waste generation, composition, hazards, and impacts.
- To gain knowledge of global e-waste trade and recycling practices.
- To enhance understanding of e-waste control measures and regulatory frameworks.
- To impart knowledge of e-waste handling and management practices.
- To familiarize students with international e-waste legislations and policies.

UNIT I INTRODUCTION 9

E- waste composition and generation - Global context in e- waste - E-waste pollutants - E waste hazardous properties - Effects of pollutant (E- waste) on human health and surrounding environment - domestic e-waste disposal - Basic principles of E waste management - Technologies for recovery of resources from electronic waste - resource recovery potential of e-waste - steps in recycling and recovery of materials - technologies for recovery of materials - occupational and environmental health perspectives of recycling e-waste in India.

UNIT II E-WASTE HAZARDOUS ON GLOBAL TRADE 9

Essential factors in global waste trade economy - Free trade agreements as a means of waste trading - Import of hazardous e-waste in India - India's stand on liberalizing import rules - E-waste economy in the organized and unorganized sector - Estimation and recycling of e-waste in metro cities of India.

UNIT III E- WASTE CONTROL MEASURES 9

Need for stringent health safeguards and environmental protection laws in India - Extended Producers Responsibility (EPR) - Import of e-waste permissions - Producer- Public-Government cooperation - Administrative Controls & Engineering controls - monitoring of compliance of Rules - Effective regulatory mechanism strengthened by manpower and technical expertise - Reduction of waste at source.

UNIT IV E- WASTE MANAGEMENT HANDLING 9

E-waste (Management and Handling) Rules, 2022 - and E-Waste (Management) Rules - Salient Features and its likely implication - Government assistance for TSDFs.

UNITV THE INTERNATIONAL LEGISLATION 9

The Basel Convention - The Bamako Convention - The Rotterdam Convention - Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union - Restrictions of Hazardous Substances (RoHS) Directive.

TOTAL: 45 PERIODS

OUTCOMES

Upon Completion of this course, Students will be able to

- Explain e-waste generation, composition, hazards, and environmental impacts.
- Analyze global e-waste trade and recycling practices.
- Apply e-waste control measures and regulatory frameworks.
- Describe e-waste handling, management, and recycling processes.
- Analyze international e-waste legislations and policies.

TEXTBOOKS

1. Priya, A. (Ed.), "Management of Electronic Waste: Resource Recovery, Technology and Regulation", First Edition, John Wiley & Sons, 2024.
2. Kumar.S, & Kumar, V., "Electronic Waste Management: Policies, Processes, Technologies, and Impact", John Wiley & Sons, 2024.

REFERENCES

1. Johri, R, "E-Waste: Implications, Regulations, and Management in India and Current Global Best Practices", First Edition, TERI Press, New Delhi, 2008.
2. Kumar, A., Rathore, P. S., Dubey, A. K., Srivastav, A. L., Dutt, V., & Ananth Kumar.T, "Sustainable Management of Electronic Waste", Second Edition, John Wiley & Sons, 2024.

E-RESOURCES

1. https://news.mit.edu/2013/ewaste-mit.
2. https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2	2	2	1	1	2	1	-	2	-	1	-	-
2	1	3	2	2	1	2	1	1	2	2	2	-	-
3	2	2	3	2	2	2	2	1	2	2	2	-	-
4	2	2	3	2	2	2	1	2	1	2	2	-	-
5	2	3	2	2	1	2	1	1	2	2	2	-	-
AVG	1.8	2.4	2.4	1.8	1.4	2	1.2	1.3	1.8	2	1.8	-	-

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

Chairman - BoS

MANDATORY COURSES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDC501	Introduction to Women and Gender Studies	MC	3	0	0	0	-	-	-
23MDC502	Elements of Literature	MC	3	0	0	0	-	-	-
23MDC503	Film Appreciation	MC	3	0	0	0	-	-	-
23MDC504	Disaster Risk Reduction and Management	MC	3	0	0	0	-	-	-
23MDC505	Constitution of India	MC	3	0	0	0	-	-	-

23MDC501 INTRODUCTION TO WOMEN AND GENDER STUDIES L T P C

3 0 0 0

OBJECTIVES

- To introduce foundational concepts of sex, gender, masculinity, femininity, and socialization.
- To examine structural systems including patriarchy, essentialism, binaryism, power, and hierarchy.
- To study major theoretical frameworks of feminism (e.g., Liberal, Marxist, Radical, Eco feminist).
- To trace the history and evolution of global, national, and local women's movements.
- To analyze how gender is constructed and represented across language, popular visual media, and social media.

UNIT I CONCEPTS

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

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.

UNIT III WOMEN'S MOVEMENTS:

GLOBAL, NATIONAL AND LOCAL Rise of Feminism in Europe and America. Women's Movement in India.

UNIT IV GENDER AND LANGUAGE

Linguistic Forms and Gender. Gender and narratives.

UNIT V GENDER AND REPRESENTATION

Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.

OUTCOMES

- Identify and articulate concepts of socialization, binaryism, essentialism, and hegemony in social structures.
- Differentiate among various feminist theories and explain their core ideological foundations.
- Illustrate the milestones of women's rights movements in Europe, America, and India.

- Deconstruct linguistic forms and literary narratives to expose implicit gender biases.
- Assess media representations of gender roles in advertising and alternative media critically

Chairman - BoS

23MDC502 ELEMENTS OF LITERATURE L T P C

3 0 0 0

OBJECTIVES

- To make students aware of the finer sensibilities of human existence through art.
- To develop students' appreciation of different literature forms as modes of human expression.
- To enhance reading, critical thinking, discussion, and writing skills through literary studies.
- To familiarize students with the essential elements, modes, and patterns of fiction and narrative perspective.
- To explore the representational, theatrical, and rhetorical elements of drama and poetry

.

UNIT I 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

Fiction, fact and literary truth, Fictional modes and patterns. Plot character and perspective.

UNIT III ELEMENTS OF POETRY

Emotions and imaginations. Figurative language. (Simile, metaphor, conceit, symbol, pun and irony).Personification and animation. Rhetoric and trend

UNIT IV ELEMENTS OF DRAMA

Drama as representational art,Content mode and elements, Theatrical performance, Drama as narration, mediation and persuasion, Features of tragedy, comedy and satire.

READINGS

1. An Introduction to the Study of English Literature, W.H. Hudson, Atlantic, 2007.
3. An Introduction to Literary Studies, Mario Klarer, Routledge, 2013.
4. The Experience of Poetry, Graham Mode, Open college of Arts with Open Unv Press,1991.
5. The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2114.
6. The Elen ents of Drama, J.L.Styan, Literary Licensing, 2011.

OUTCOMES

- Demonstrate enhanced reading, thinking, and writing skills by engaging with literary texts.
- Develop finer interpersonal sensibilities and an unbiased understanding of human issues.
- Experience catharsis and emotional reconciliation through literary analysis.
- Identify key figurative devices (metaphor, simile, irony, conceit) and emotional dimensions in poetry.
- Analyze dramatic performance, features of tragedy, comedy, satire, and narrative structures

Chairman - BoS

23MDC503 FILM APPRECIATION L T P C

3 0 0 0

OBJECTIVES

- To introduce the development of film as an art and entertainment form.
- To explore the century-long evolution of film language, movement, and form.
- To instruct students on how to read a film text and appreciate its structural nuances.
- To examine technical components including equipment, screenplays, roles, and the filmmaking process.
- To guide students in studying film theory, criticism, and visual storytelling joyfully

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

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.

OUTCOMES

- Explain the roles of materials, crew members, screenplays, and directors in film production.
- Trace the historical transition from silent cinema and early French films to talkies and feature films.
- Apply visual and auditory cinematic language to "read" films as complex texts.
- Evaluate film theories and engage in critical film appreciation.
- Demonstrate an understanding of storytelling structure and narrative techniques in modern cinema.

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23MDC504 DISASTER RISK REDUCTION AND MANAGEMENT L T P C

3 0 0 0

OBJECTIVES

- To impart knowledge on core concepts of hazards, vulnerability, resilience, and disaster risks.
- To familiarize students with international frameworks (Sendai Framework) and community-based risk reduction strategies.
- To explain the legislative, policy, and institutional frameworks governing disaster management in India.
- To introduce tools, technology, and early warning systems used in preparedness and damage assessment.
- To build practical response skills using case studies, field work, and mock drills.

UNIT I HAZRADS, VULNERABILITY AND DISASTER RISKS

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

UNIT II DISASTER RISK REDUCTION (DRR)

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

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

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

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

OUTCOMES

- Categorize natural, human-induced, and climate-related disasters and assess India's vulnerability profile.
- Formulate disaster risk reduction measures using structural, non-structural, and indigenous methods.
- Understand institutional roles (NDMA, SDMA, DDMA) and legal provisions under the Disaster Management Act (2005).
- Apply GIS, information technology, and standard operating procedures for risk assessment and relief planning.
- Perform damage assessments and participate in mock drills, practical response plans, and field interventions.

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23MDC505	CONSTITUTION OF INDIA	L T P C
		3 0 0 0

OBJECTIVES

- To understand the meaning of the Constitution law and Constitutionalism.
- To realize the fundamental rights.
- To understand the execution powers of union and states bout.
- To be aware of the Constitutional powers.
- To acquaint with other Constitutional functionaries.

UNIT I INTRODUCTION

Meaning of the Constitution law and constitutionalism - Historical perspective of the Constitution of India - Preamble - Salient features and characteristics of the Constitution of India - Citizenship.

UNIT II FUNDAMENTAL RIGHTS

Scheme of the fundamental rights - The scheme of the fundamental duties and its legal status - The directive principles of state policy - Its importance and implementation.

UNIT III UNION AND STATE EXECUTIVE

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary form of Government in India - The Constitution powers and status of the President of India - Governor - Appointment, powers and functions.

UNIT IV CONSTITUTIONAL POWERS

Amendment of the Constitutional powers and procedure - The historical perspectives of the Constitutional amendments in India - Emergency provisions: National emergency, President rule, financial emergency.

UNIT V OTHER CONSTITUIONAL FUNCTIONARIES

Election Commission of India: Organization, powers and functions, Union Public Service Commission, State Public Service Commission - Local Self Government.

OUTCOMES

Upon Completion of this course, the students will be able to:

- Understand the salient features and characteristics of the Constitution of India.
- Analyze the scheme of the fundamental rights and duties.
- Evaluate in detail the powers between the Union and the States.
- Know the concept of Constitutional powers.
- Recognize other Constitutional functionaries.

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MANDATORY COURSES - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MDC601	Well Being with Traditional Practices- Yoga, Ayurveda andSiddha	MC	3	0	0	0	-	-	-
23MDC602	History of Science and Technology in India	MC	3	0	0	0	-	-	-
23MDC603	Political and Economical Thought for a Human Society	MC	3	0	0	0	-	-	-
23MDC604	State, Nation Building and Politics in India	MC	3	0	0	0	-	-	-
23MDC605	Industrial Safety	MC	3	0	0	0	-	-	-

23MDC601	WELL-BEING WITH TRADITIONAL PRACTICES- YOGA, AYURVEDA AND SIDDH	L T P C 3 0 0 0

OBJECTIVES

- To enjoy life happily with fun filled new style activities that help to maintain health also
- To adapt a few lifestyle changes that will prevent many health disorders
- To be cool and handbill every emotion very smoothly in every walk of life
- To learn to eat cost effective but healthy foods that are rich in essential nutrients
- To develop immunity naturally that will improve resistance against many health disorders

UNIT I HEALTH AND ITS IMPORTANCE

Definition - Importance of maintaining health - More importance on prevention than treatment Ten types of health one has to maintain - Physical health - Mental health - Social health - Financial health - Emotional health - Spiritual health - Intellectual health - Relationship health - Environmental health - Occupational/Professional heath

UNIT II DIET

Role of diet in maintaining health - energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-related illness, such as some cancers - keeps active and - helps one to maintain a healthy weight - helps to reduce risk of developing lifestyle disorders like diabetes – arthritis – hypertension – PCOD – infertility – ADHD – sleeplessness -helps to reduce the risk of heart diseases - keeps the teeth and bones strong Balanced Diet and its 7 Components - Carbohydrates – Proteins – Fats – Vitamins – Minerals - Fibre and Water.

Food additives and their merits & demerits - Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions

Definition of BMI and maintaining it with diet Importance - Consequences of not maintaining BMI - different steps to maintain optimal BM

Common cooking mistakes Different cooking methods, merits and demerits of each method

UNIT III ROLE OF AYURVEDA & SIDDHA SYSTEMS IN MAINTAINING HEALTH

AYUSH systems and their role in maintaining health - preventive aspect of AYUSH - AYUSH as a soft therapy.Secrets of traditional healthy living - Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life.

Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - Pancheekarana Theory / (Five Element Theory) 96 fundamental Principles - Uyir Thathukkal (Tri-Dosha Theory) - Udal Thathukkal

Prevention of illness with our traditional system of medicine Primary Prevention - To decrease the number of new cases of a disorder or illness - Health promotion/education, and - Specific protective measures - Secondary Prevention - To lower the rate of established cases of a disorder or illness in the population (prevalence) - Tertiary Prevention - To decrease the amount of disability associated with an existing disorder.

UNIT IV MENTAL WELLNESS

Emotional health - Definition and types - Three key elements: the subjective experience - the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life -Short term and long term effects of emotional disturbances - Leading a healthy life with emotions - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self-compassion - Expressing a full range of emotions.

Stress management - Stress definition - Stress in daily life - How stress affects one's life - Identifying the cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help) - Complications of stress mismanagement. Sleep - Sleep and its importance for mental wellness - Sleep and digestion. Immunity - Types and importance - Ways to develop immunity

UNIT V YOGA

Definition and importance of yoga - Types of yoga - How to Choose the Right Kind for individuals according to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life.

OUTCOMES

- Identify and explain the ten types of health, including physical, mental, emotional, spiritual, and environmental health.
- Analyze the role of a balanced diet and its 7 components in preventing lifestyle disorders like diabetes, hypertension, and arthritis.
- Understand the principles of Siddha and Ayurveda systems, including the Five Element Theory, Tri-Dosha Theory, and daily/seasonal regimens (Dinacharya/Ritucharya).
- Apply stress management techniques, sleep hygiene practices, and emotion-regulation strategies to enhance mental wellness.
- Demonstrate basic yogasanas and understand the Eight Limbs of Yoga for health disorder prevention and cure

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23MDC602 HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA L T P C
3 0 0 0

OBJECTIVES

- To enjoy life happily with fun filled new style activities that help to maintain health also.
- To adapt a few lifestyle changes that will prevent many health disorders.
- To be cool and handle every emotion very smoothly in every walk of life.
- To learn to eat cost effective but healthy foods that are rich in essential nutrients.
- To develop immunity naturally that will improve resistance against many health disorders.

UNIT I CONCEPTS AND PERSPECTIVES

Meaning of History Objectivity, Determinism, Relativism, Causation, Generalization in History; Moral judgment in history Extent of subjectivity, contrast with physical sciences, interpretation and speculation, causation verses evidence, concept of historical inevitability, Historical Positivism. Science and Technology-Meaning, Scope and Importance, Interaction of science, technology & society, Sources of history on science and technology in India.

UNIT II HISTORIOGRAPHY OF SCIENCE AND TECHNOLOGY IN INDIA

Introduction to the works of D.D. Kosambi, Dharmpal, Debiprasad Chattopadhyay, Rehman, S. Irfan Habib, Deepak Kumar, Dhruv Raina, and others.

UNIT III SCIENCE AND TECHNOLOGY IN ANCIENT INDIA

Technology in pre-historic period Beginning of agriculture and its impact on technology Science and Technology during Vedic and Later Vedic times Science and technology from 1st century AD to C-1200.

UNIT IV SCIENCE AND TECHNOLOGY IN MEDIEVAL INDIA

Legacy of technology in Medieval India, Interactions with Arabs Development in medical knowledge, interaction between Unani and Ayurveda and alchemy Astronomy and Mathematics: interaction with Arabic Sciences Science and Technology on the eve of British conquest

UNIT V SCIENCE AND TECHNOLOGY IN COLONIAL INDIA

Science and the Empire Indian response to Western Science Growth of techno-scientific institutions

UNIT VI SCIENCE AND TECHNOLOGY IN A POST-INDEPENDENT INDIA

Science, Technology and Development discourse Shaping of the Science and Technology Policy

Developments in the field of Science and Technology Science and technology in globalizing India Social implications of new technologies like the Information Technology and Biotechnology

23MDC603 POLITICAL AND ECONOMIC THOUGHT FOR A HUMANE SOCIETY L T P C

3 0 0 0

OBJECTIVES

- Define key historical concepts like determinism, relativism, causation, and historical positivism as applied to science and technology.
- Recognize the historiographical contributions of scholars such as D.D. Kosambi, Dharampal, and Debiprasad Chattopadhyay.
- Explain the technological advancements made during ancient and medieval Indian history, including interactions with Arabic sciences.
- Evaluate the growth of techno-scientific institutions and the Indian response to Western science during the colonial period.
- Assess the social implications of emerging technologies and science policy decisions in post-independent and globalizing India

COURSE TOPICS:

Considerations for humane society, holistic thought, human being's desires, harmony in self, harmony in relationships, society, and nature, societal systems. **(9 lectures, 1 hour each)**

(Refs: A Nagaraj, M K Gandhi, JC Kumarappa)

Capitalism – Free markets, demand-supply, perfect competition, laissez-faire, monopolies, imperialism. Liberal democracy. **(5 lectures)**

(Refs: Adam smith, J S Mill)

Fascism and totalitarianism. World war I and II. Cold war. (**2 lectures)**

Communism – Mode of production, theory of labour, surplus value, class struggle, dialectical materialism, historical materialism, Russian and Chinese models.

(Refs: Marx, Lenin, Mao, M N Roy) (**5 lectures)**

Welfare state. Relation with human desires. Empowered human beings, satisfaction. (3 lectures)

Gandhian thought. Swaraj, Decentralized economy & polity, Community. Control over one's lives. Relationship with nature. (6 lectures)

(Refs: M K Gandhi, Schumacher, Kumarappa)

Essential elements of Indian civilization. **(3 lectures)**

(Refs: Pt Sundarlal, R C Mazumdar, Dharampal)

Technology as driver of society, Role of education in shaping of society.

Future directions. **(4 lectures)**

(Refs: Nandkishore Acharya, David Dixon, Levis Mumford)

Conclusion **(2 lectures)**

OUTCOMES

- Understand the core considerations required for a humane society and achieving harmony across self, society, and nature.
- Compare the theoretical foundations and historical implementations of free-market capitalism, imperialism, and communism.
- Analyze the relation between human desires, empowerment, satisfaction, and the mechanisms of a welfare state.
- Apply Gandhian economic and political thought (Swaraj, decentralized polity) to contemporary societal and environmental challenges.
- Evaluate future directions for society by considering technology as a driver and education as a shaping too

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23MDC604 STATE, NATION BUILDING AND POLITICS IN INDIA L T P C

3 0 0 0

OBJECTIVES

- To provide an understanding of the state, its main organs (Executive, Legislature, Judiciary), separation of powers, and the concept of sovereignty.
- To acquaint students with the legacies of the national movement and constitutional development in India.
- To explain the reasons for adopting a Parliamentary-federal system and the broad philosophy of the Constitution of India.
- To examine the changing nature of the Indian political system, new social movements, and challenges to nation-building.
- To discuss issues concerning national integration and nation-building with the aim of developing a future vision for better governance.

TOPICS:

Understanding the need and role of State and politics. Development of Nation-State, sovereignty, sovereignty in a globalized world. 183 Organs of State – Executive, Legislature, Judiciary. Separation of powers forms of government unitary-federal, Presidential-Parliamentary, and The idea of India.

1857 and the national awakening.

1885 Indian National Congress and development of national movement – its legacies.

Constitution making and the Constitution of India.

Goals, objective and philosophy. Why a federal system? 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. What can we do?

OUTCOMES

- Understand the theoretical aspects of the state, its organs, operationalization, and sovereignty in a globalized world.
- Explain the historical background, philosophy, goals, and objectives behind the founding of the Indian Constitution.
- Analyze the rationale behind adopting a federal-parliamentary system and the broad streams of national integration.
- Identify major challenges to nation-building, social movements, and institutional difficulties within the democratic setup.
- Devise perspectives for active participation in the system to improve governance and delivery for the common citizen.

23MDC605 INDUSTRIAL SAFETY L T P C
3 0 0 0

OBJECTIVES

- To understand the introduction and basic terminologies of safety.
- To enable the students to learn about the important statutory regulations and standards.
- To enable students to conduct and participate in various safety activities in the industry.
- To have knowledge about workplace exposures and hazards.
- To assess various hazards and consequences through various risk assessment techniques

UNIT I SAFETY TERMINOLOGIES

Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold LimitValue (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

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

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 Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety- Toxic gas Release

UNIT V HAZARD IDENTIFICATION TECHNIQUES 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- 217 Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment

OUTCOMES

- Understand the basic concept of safety.
- Obtain knowledge of Statutory Regulations and standards
- . Know about the safety Activities of the Working Place.
- Analyze on the impact of Occupational Exposures and their Remedies
- Obtain knowledge of Risk Assessment Techniques.

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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR/HONOURS DEGREE – MULTIMEDIA)

B.Tech. – INFORMATION TECHNOLOGY

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23ITMT01	Digital Design and Visual Communication	PC	3	0	0	3	40	60	100
23ITMT02	Mixed Reality	PC	3	0	0	3	40	60	100
23ITMT03	Digital Media and Storytelling	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23ITME04	Multimedia Production	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23ITMP01	Project Work	EEC	0	0	12	6	60	40	100
Total Credits			**19**						

HS	:	Humanities and Social Sciences
BS	:	Basic Sciences
ES	:	Engineering Sciences
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
GE	:	General Elective
EEC	:	Employability Enhancement Courses
MC	:	Mandatory Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
TOT	:	Total

SEMESTER - III

23ITMT01	DIGITAL DESIGN AND VISUAL COMMUNICATION	L T P C
		3 0 0 3

OBJECTIVES

- To gain knowledge about the principles and techniques of visually appealing digital design.
- To explore hands-on experience with digital design software such as Adobe Creative Suite.
- To develop the ability to adapt visual content for diverse digital platforms by considering their unique requirements and user experiences.
- To enhance understanding creative thinking and problem-solving skills to address design challenges and develop innovative digital visual solutions.
- To develop engaging multimedia presentations for social media platforms.

UNIT I FUNDAMENTALS OF GRAPHIC DESIGN 9

Introduction to visual elements (line, shape, color, etc.), Principles of design (balance, contrast, hierarchy, etc.), Typography and font usage, Creating digital illustrations and graphics

Problem Solving Assignments :

1. Analyze the visual elements and principles of design used in a given digital poster and suggest improvements in balance, contrast, hierarchy, and color.
2. Design a simple digital illustration by applying appropriate typography, visual elements, and principles of graphic design.

UNIT II DIGITAL IMAGING AND PHOTO EDITING 9

Image resolution and file formats, Photo editing techniques using Adobe Photoshop Color correction and enhancement, Image manipulation and compositing

Problem Solving Assignments :

1. Analyze the suitability of different image resolutions and file formats for print and digital media, and justify the appropriate format for a given application.
2. Apply photo editing, color correction, enhancement, and image manipulation techniques to improve a given digital image.

UNIT III VECTOR GRAPHICS AND ILLUSTRATION 9

Introduction to vector graphics and Adobe Illustrator, Creating scalable vector illustrations and logos, Working with bezier curves and paths, Using layers and effects for design elements

Problem Solving Assignments :

1. Design a scalable logo or vector illustration using Adobe Illustrator by applying Bezier curves, paths, layers, and effects.
2. Compare raster and vector graphics and determine the suitable graphics format for different

design requirements.

UNIT IV LAYOUT AND PUBLICATION DESIGN 9

Designing layouts for print and digital publications, Grid systems and page composition, Designing brochures, flyers, and posters, Interactive digital publishing platforms

Problem Solving Assignments :

1. Design a brochure, flyer, or poster by applying grid systems, page composition, typography, and layout principles.
2. Analyze a given publication layout and recommend suitable improvements in alignment, spacing, hierarchy, and visual organization.

UNIT V VISUAL COMMUNICATION FOR MULTIMEDIA 9

Applying design principles to multimedia projects, Creating multimedia presentations and infographics, designing for social media and mobile platforms, User engagement through visual storytelling

Problem Solving Assignments :

1. Develop a multimedia presentation by applying visual design principles, infographics, and visual storytelling techniques.
2. Design a social media or mobile visual campaign by adapting multimedia content to improve user engagement.

TOTAL: 45 PERIODS

OUTCOMES

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

- Describe the visually appealing and captivating designs that effectively communicate messages and ideas.
- Design software like Adobe Creative Suite, developing the skills needed to work proficiently in the digital design industry.
- Describe the vector graphics.
- Design brochures, flyers and posters.
- Develop multimedia presentations for social media.

TEXT BOOKS

1. Paul Martin Lester, "Visual Communication: Images with Messages", Routledge Publications, Seventh Edition,2018
2. Ellen Lupton, "Thinking with Type: A Critical Guide for Designers, Writers, Editors, & Students", Princeton Architectural Press Publications, Second Revised and Expanded Edition,2016

REFERENCES

1. Robin Williams, "The Non-Designer's Design Book" , Peach pit Publications, Fourth Edition.2016
2. Elizabeth Resnick ,"Design for Communication: Conceptual Graphic Design Basics" , Wiley Publications, Third Edition,2014

E- RESOURCES

1. https://onlinecourses.nptel.ac.in/noc21_ar17/preview (Visual Communication & Design)
2. https://www.classcentral.com/tag/visual-communication (Visual Communication for Design media)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	3	2	3	-	-	-	3	2	1	3	2
2	3	3	3	3	3	-	-	-	3	3	2	3	2
3	3	3	3	3	3	-	-	-	3	3	2	3	2
4	3	3	3	3	3	2	-	-	3	3	3	3	3
5	3	3	3	3	3	2	-	-	3	3	3	3	3
AVG	3	2.8	3	2.8	3	2.	-	-	3	2.8	2.2	3	2.4

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

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SEMESTER IV

23ITMT02	MIXED REALITY	L T P C
		3 0 0 3

OBJECTIVES

- To gain knowledge about the fundamental concepts and principles of AR/VR technologies.
- To explore the concepts of 3D modelling and viewing the 3D world.
- To develop knowledge about VR toolkits and their applications.
- To examine the various applications of Virtual Reality.
- To understand the methodology and terminology of Augmented Reality.

UNIT I INTRODUCTION TO VIRTUAL REALITY AND AUGMENTED REALITY 9

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies- Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.

Problem Solving Assignments :

1. Analyze the components of a VR system and determine suitable input, tracking, display, and interaction devices for a given VR application.
2. Compare Virtual Reality, Augmented Reality, and 3D Computer Graphics based on interaction, display, tracking, and application requirements.

UNIT II VR MODELING 9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

Problem Solving Assignments :

1. Develop a simple 3D virtual object by applying geometric modeling, transformation matrices, object positioning, and viewing techniques.
2. Analyze a virtual environment and determine suitable techniques for collision detection, surface deformation, force computation, and behavior modeling.

UNIT III VR PROGRAMMING 9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World

Problem Solving Assignments :

1. Compare World Toolkit and Java 3D based on their features, scene graph structure, programming support, and suitability for VR applications.
2. Develop a simple VR scene using a suitable VR toolkit and apply scene graph concepts to organize virtual objects. ToolKit and Java 3D.

UNIT IV APPLICATIONS 9

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.

Problem Solving Assignments :

1. Analyze the applications of VR in healthcare, education, manufacturing, robotics, business, and entertainment, and identify suitable applications for a given problem.
2. Evaluate the health, safety, social, and human factors associated with the use of Virtual Reality in a selected application.

UNIT V AUGMENTED REALITY **9**

Introduction to Augmented Reality (AR)- Computer vision for AR - Understanding the technology behind AR applications.- Interaction in Augmented Reality: Exploring methods of user interaction in AR environments.- Modelling and Annotation in AR: Creating virtual objects and annotating the real world in AR.- Navigation in Augmented Reality: Techniques for guiding users within AR experiences- Wearable Devices in AR: Exploring the role of wearable devices in enhancing AR applications.

Problem Solving Assignments :

1. Design a simple AR application by applying computer vision, user interaction, modelling, annotation, and navigation techniques.
2. Analyze the role of wearable devices in AR and propose a suitable wearable-based AR solution for a real-world application.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts and principles of AR and VR.
- Describe 3D models and techniques for viewing the 3D world.
- Illustrate the features and applications of VR toolkits.

- Analyze the various applications of Virtual Reality.
- Compare AR/VR methodologies and terminology

TEXTBOOKS

1. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, Third Edition, 2018.

2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016.

REFERENCES

1. Steven M. LaValle, "Virtual Reality", Cambridge University Press, Fourth Edition, 2017.

2. Ramesh Raskar, Greg Welch, "Augmented Reality: Principles and Practice", A K Peters/CRC Press,Third Edition , 2017.

E- RESOURCES

1. https://learn.unity.com/course/virtual-and-augmented-reality (Virtual and Augmented Reality Development)

2. http://kcl.digimat.in/nptel/courses/video/106106138/L64.html

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	-	3	-	-	-	2	2	1	2	1
2	3	2	2	1	3	-	-	-	3	2	2	3	1
3	3	3	2	2	3	-	-	-	3	2	1	3	2
4	3	3	3	2	3	-	-	-	3	2	2	3	2
5	3	3	3	3	3	-	-	-	3	3	3	3	3
AVG	3.0	2.6	2.4	2.0	3.0	-	-	-	2.8	2.2	1.8	2.8	1.8

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

Chairman - BOS

SEMESTER V

23ITMT03	DIGITAL MEDIA AND STORYTELLING	L T P C 3 0 0 3

OBJECTIVES

- To gain knowledge about the fundamental principles of digital media production and storytelling.
- To explore various digital media platforms and tools used for digital storytelling.
- To develop narratives using animation, motion graphics, images, audio, and video.
- To design interactive and immersive digital stories for different audiences and contexts.
- To explore user-generated content and community engagement in digital storytelling.

UNIT I INTRODUCTION TO DIGITAL MEDIA AND STORYTELLING 9

Overview of Digital Media and its Evolution- Understanding the Art of Storytelling in Various Media Forms- Role of Digital Media in Storytelling and Communication- Exploring Different Digital Media Platforms and Tools- Ethical and Legal Considerations in Digital Storytelling

Problem-Solving Assignments:

1.Analyze the evolution of digital media and explain how it has changed storytelling and communication.

2.Evaluate a digital storytelling platform and identify the ethical and legal issues involved in creating and sharing digital content

UNIT II CREATING NARRATIVES WITH ANIMATION AND MOTION GRAPHICS 9

Introduction to Animation and Motion Graphics- Principles of Visual Storytelling in Animation - Techniques for Creating Engaging Animated Narratives- Using Motion Graphics to Enhance Storytelling- Animation and Motion Graphics Software Tools and Applications

Problem-Solving Assignments:

1. Analyze an animated story and identify how visual storytelling principles, animation, and motion graphics are used to communicate the narrative.

2. Design a suitable animation and motion graphics workflow for developing an engaging digital story using appropriate software tools.

UNIT III DIGITAL STORYTELLING TOOLS AND TECHNIQUES 9

Exploring Digital Storytelling Platforms and Software- Incorporating Images, Audio, and Video in Digital Stories- Interactive Elements and Hypermedia in Digital Narratives- Crafting Engaging Narratives with Multimedia Elements- Enhancing Emotional Impact in Digital Storytelling

Problem-Solving Assignments:

1. Analyze an existing digital story and identify how images, audio, video, interactive elements, and hypermedia contribute to its effectiveness.

2. Redesign a given digital story by incorporating suitable multimedia elements and techniques to improve its emotional and narrative impact.

UNIT IV CREATING USER-GENERATED CONTENT AND COMMUNITY 9

Understanding User-Generated Content (UGC) in Digital Storytelling - Fostering Community Engagement through Digital Narratives - Social Media and its Role in Sharing Digital Stories - Collaborative Storytelling and Co-Creation in Digital Media - Strategies for Building and Sustaining an Online Storytelling Community

Problem-Solving Assignments:

1. Analyze a social media storytelling campaign and evaluate how user-generated content contributes to community engagement.
2. Develop strategies to encourage collaboration, co-creation, and sustained participation within an online storytelling community

UNIT V DIGITAL STORYTELLING ACROSS PLATFORMS AND CONTEXTS 9

Digital Storytelling for Web and Mobile Platforms - Storytelling through Social Media and Micro content - Interactive and Immersive Storytelling in Virtual Reality (VR) and Augmented Reality (AR)- Adapting Stories for Different Audiences and Cultures- Future Trends in Digital Media and Storytelling

Problem-Solving Assignments:

1. Analyze a digital story designed for one platform and propose suitable modifications for web, mobile, and social media platforms.
2. Evaluate the use of VR and AR in digital storytelling and recommend suitable applications for creating interactive and immersive experiences.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts and theories of digital media and storytelling, gaining insights into the evolution of storytelling in the digital age.
- Develop the compelling narratives in digital media.
- Describe the storytelling techniques to different digital media platforms, such as websites, social media, and virtual reality.
- Develop their stories for specific audiences and cultural contexts.
- Design collaborative and interactive digital storytelling, fostering a sense of community and participation among their audiences.

TEXT BOOKS

1. Liz Blazer, "Animated Storytelling: Simple Steps For Creating Animation & Motion Graphics",

Peachpit Press, Second Edition , 2015.

2. Joe Lambert, "Digital Storytelling: Capturing Lives, Creating Community", Fifth Edition,Routledge, 2021.

REFERENCES

1. Jason Ohler, "Digital Storytelling in the Classroom: New Media Pathways to Literacy, Learning, and Creativity", Corwin, Second Edition, 2018.

2. Carolyn Handler Miller, "Digital Storytelling: Capturing Lives, Creating Community", Routledge, Fourth Edition 2019.

E- RESOURCES

1. https://elearningindustry.com/18-free-digital-storytelling-tools-for-teachers-and- students (Digital Storytelling in the Classroom)

2. https://tlp-lpa.ca/digital-skills/digital-storytelling (Animated Storytelling)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	1	2	1	1	-	-	-	1	2	3	3	1
2	2	3	3	3	1	-	-	-	1	2	2	1	1
3	2	2	3	3	1	-	-	-	3	1	1	2	1
4	2	2	2	2	1	-	-	-	3	1	1	2	2
5	2	1	3	3	1	-	-	-	3	2	1	2	2
AVG	2.2	1.8	2.6	2.4	1	-	-	-	2.2	1.6	1.6	2	1.4

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

Chairman - BoS

SEMESTER VI

23ITME04	MULTIMEDIA PRODUCTION	L T P C
		3 0 2 4

OBJECTIVES

- To gain knowledge about the fundamental concepts and elements of multimedia.
- To explore the principles of visual design in multimedia.
- To develop skills in audio production, including recording and editing audio.
- To foster the students with video production techniques, including shooting, capturing, and editing video footage.
- To explore the principles of animation and develop 2D and 3D animations.
- To implement interactive multimedia presentations using presentation software.

UNIT I INTRODUCTION 9

Overview of Multimedia Production- Understanding Multimedia Elements (text, graphics, audio, video, animation) - Introduction to Multimedia Software and Tools- Fundamentals of Communication and Multimedia Messaging- OSI Security Architecture in Multimedia

Coding Exercises:

1. Create a multimedia presentation incorporating text, graphics, audio, video, and animation elements.
2. Develop multimedia project using appropriate multimedia software and tools.
3. Design a multimedia message combining text, images, audio, and video elements.

Problem-Solving Assignments:

1. Analyze a given multimedia project and identify the different multimedia elements used, explaining their purpose and effectiveness.
2. Examine a multimedia communication scenario and recommend suitable security measures based on the OSI Security Architecture.

UNIT II GRAPHICS AND VISUAL DESIGN 9

Principles of Visual Design in Multimedia- Image Editing and Manipulation- Creating Vector Graphics and Illustrations- Typography and Text Design in Multimedia- Color Theory and its Application in Multimedia

Coding Exercises:

1. Create and edit digital images using image editing software with cropping, resizing, layering, and enhancement techniques.
2. Design a multimedia poster or illustration using vector graphics and appropriate typography.
3. Develop a multimedia design applying color theory, contrast, alignment, balance, and visual

hierarchy.

Problem-Solving Assignments:

1. Analyze a poorly designed multimedia poster and identify issues related to typography, color, alignment, and visual hierarchy. Propose suitable improvements.
2. Redesign a given multimedia graphic by applying appropriate principles of visual design, typography, and color theory.

UNIT III AUDIO PRODUCTION AND EDITING 9

Introduction to Audio Production in Multimedia - Recording and Editing Audio - Audio Effects and Sound Enhancement Techniques - Working with Music and Voiceovers- Audio Compression and Formats

Coding Exercises:

1. Record and edit an audio clip using suitable audio production software by applying trimming, cutting, and noise-reduction techniques.
2. Create a multimedia audio track by combining background music, sound effects, and voiceover.
3. Develop an audio project using suitable audio effects such as fade-in, fade-out, equalization, and volume adjustment.

Problem-Solving Assignments:

1. Analyze a recorded audio file containing background noise and distortion and apply suitable sound enhancement techniques to improve its quality.
2. Compare different audio compression techniques and formats and select an appropriate format for web, mobile, and multimedia applications.

UNIT IV VIDEO PRODUCTION AND EDITING 9

Basics of Video Production in Multimedia- Shooting and Capturing Video Footage- Video Editing Techniques and Software- Adding Visual Effects and Transitions- Video Compression and Formats for Different Platforms

Coding Exercises:

1. Capture video footage using suitable recording equipment and organize the clips for editing.
2. Create a short video by applying cutting, trimming, sequencing, transitions, and audio synchronization techniques.
3. Develop a multimedia video incorporating visual effects, titles, transitions, and background music.

Problem-Solving Assignments:

1. Analyze a poorly edited video and identify issues related to sequencing, transitions, audio synchronization, and visual quality. Suggest suitable corrections.
2. Select appropriate video compression techniques and formats for publishing a given video on web, mobile, and social media platforms.

UNIT V ANIMATION AND INTERACTIVITY 9

Understanding Animation Principles- Creating 2D and 3D Animations- Interactive Multimedia Elements (Buttons, Menus, Navigation)- Incorporating Animation and Interactivity into Multimedia Projects- Multimedia Authoring and Interactive Development Tools

Coding Exercises:

1. Create a 2D animation using keyframes, motion, timing, and basic animation principles.
2. Develop a simple 3D animation incorporating objects, movement, lighting, and camera effects.
3. Design an interactive multimedia presentation containing buttons, menus, navigation controls, animation, and multimedia elements.

Problem-Solving Assignments:

1. Analyze an interactive multimedia application and identify how animation, buttons, menus, and navigation improve user interaction.
2. Design and develop an interactive multimedia project using suitable multimedia authoring and interactive development tools.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Create composite images and apply various artistic effects Image Editing and Manipulation, Use image editing software to enhance and manipulate photographs.
2. Record and edit audio using digital audio workstations (DAWs). Remove background noise, add effects, and mix audio tracks. Create a short audio composition or podcast.
3. Video Editing and Post-Production, Edit video footage using video editing software.
4. Create a 2D animation or motion graphics sequence using animation software.
5. Develop an interactive multimedia presentation using presentation software.
6. Design a website using HTML, CSS, and JavaScript. Create responsive layouts for various screen sizes.
7. Create a 3D model using 3D modeling software.
8. Design and develop a simple virtual reality experience using VR development tools.
9. Create an AR application using AR development platforms.
10. Design a multimedia project from concept to completion.

TOTAL: 45 + 15 =60 PERIODS

OUTCOMES

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

- Describe the multimedia elements.
- Explain the Principles of Visual Design in Multimedia.
- Describe the Audio Production in Multimedia - Recording and Editing Audio.

- Explain the Video Production in Multimedia- Shooting and Capturing Video Footage- Video Editing Techniques.
- Develop the 2D and 3D Animations.
- Design interactive multimedia presentation using presentation software.

TEXT BOOKS

1. Tay Vaughan, "Multimedia: Making It Work", McGraw-Hill Education, Second Edition, 2021.

2. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, "Fundamentals of Multimedia", Pearson, Second Edition, 2014.

REFERENCES

1. Jennifer Burg, "Audio/Video Protocol Handbook: For Multimedia Communications", CRC Press, 2017.

2. Ralf Steinmetz, Klara Nahrstedt, "Multimedia Systems", Springer, Second Edition, 2014.

E – RESOURCES

1. https://www.lemonlight.com/blog/7-resources-to-learn-the-basics-of-video-production-online/(Basics of video production)
2. http://ecoursesonline.iasri.res.in/course/resources.php?id=688(Multimedia Principles)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	3	2	3	-	-	-	3	2	1	3	2
2	3	3	3	3	3	-	-	-	3	3	2	3	2
3	3	3	3	3	3	-	-	-	3	3	2	3	2
4	3	3	3	3	3	2	-	-	3	3	3	3	3
5	3	3	3	3	3	2	-	-	3	3	3	3	3
6	3	3	3	3	3	2	-	-	3	3	3	3	3
AVG	3	2.8	3	2.8	3	1	-	-	3	2.8	2.3	3	2.5

1-Low **2-Medium 3-High '-' – No Correlation**

Chairman - BoS

SEMESTER VII

23ITMP01	PROJECT WORK	L T P C 0 0 12 6

GUIDELINES

The student can select any topic which is relevant to his/her specialization of the programme. 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: 180 PERIODS

OUTCOMES

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

- Describe the sound technical knowledge of their selected project topic.
- Develop problem-solving skills as they analyze issues, design solutions, and implement them in their projects.
- Develop their communication and presentation abilities.
- Identify the successful collaboration and teamwork will be evident in the project's executionand outcomes
- Explain new knowledge or insights to the relevant field, making it a valuable addition to the academic community.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	-	-	-	-	-	-	-	3	3
2	-	-	-	-	3	3	-	-	-	-	-	3	-
3	-	-	-	-	-	-	3	-	3	-	-	-	-
4	-	-	-	-	-	-	-	3	3	3	3	-	-
5	-	-	-	-	-	-	-	-	-	-	-	3	3
AVG	3	3	3	3	3	3	3	3	3	3	3	3	3

1-Low 2-Medium 3-High '-' – No Correlation.

Chairman - BoS

CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR DEGREE / HONOURS - MULTIMEDIA)

CREDIT SUMMARY

B.Tech. INFORMATION TECHNOLOGY

Category	Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
PC	-	-	3	3	3	4	-	-	13
EEC	-	-	-	-	-	-	6	-	6
Total	-	-	3	3	3	4	6	-	19

CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR / HONOURS DEGREE – CLOUD COMPUTING)

B.Tech. – INFORMATION TECHNOLOGY

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23ITCT01	Cloud Based Services	PC	3	0	0	3	40	60	100
23ITCT02	Cloud Security and Compliance	PC	3	0	0	3	40	60	100
23ITCT03	Cloud Infrastructure and Management	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23ITCE04	Cloud Application Development	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23ITCP01	Project Work	EEC	0	0	12	6	60	40	100
Total Credits			**19**						

PC : Professional Core
EEC : Employability Enhancement Courses
L : Lecture
T : Tutorial
P : Practical
C : Credit Point
CIA : Continuous Internal Assessment
ESE : End Semester Examination
TOT : Total

SEMESTER III

23ITCT01	CLOUD BASED SERVICES	L T P C
		3 0 0 3

OBJECTIVES

1.To introduce the fundamental concepts, principles, and technologies of cloud computing.

2. To focus on various cloud architectures and their components.

3. To provide an understanding of different cloud platforms and their services.

4. To inculcate the integration of databases with cloud storage services.

5.To develop an understanding of cloud security and compliance considerations

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Overview of cloud computing and its characteristics- Evolution and adoption of cloud computing in the industry- Cloud service models: IaaS, PaaS, and SaaS- Cloud deployment models: public, private, hybrid, and community clouds.

Problem-Solving Assignments:

1. Analyze a given business scenario and select a suitable cloud service model (IaaS, PaaS, or SaaS) with justification.

2. Evaluate different cloud deployment models and recommend the most appropriate model for an organization based on scalability, cost, security, and accessibility requirements.

UNIT II CLOUD INFRASTRUCTURE AND VIRTUALIZATION 9

Cloud architecture and components.- Virtualization technology and its role in cloud computing

- Managing virtual machines and containers.- Scalability and elasticity in the cloud.

Problem-Solving Assignments:

1. Analyze a cloud infrastructure scenario and identify the appropriate virtualization technology, virtual machines, or containers required to meet the application requirements.

2. Evaluate a given workload and propose suitable scalability and elasticity strategies to maintain application performance during varying demand.

UNITIII CLOUD SERVICE PROVIDERS AND PLATFORMS 9

Major cloud service providers (e.g., Amazon Web Services, Microsoft Azure, Google Cloud)

- exploring cloud platforms and their services – Introduction to serverless computing and micro services.

Problem-Solving Assignments:

1. Compare the services offered by major cloud service providers such as AWS, Microsoft Azure, and Google Cloud for a given application requirement and recommend a suitable platform.

2. Analyze a given application scenario and determine whether serverless computing or microservices architecture would be more appropriate, with justification.

UNIT III CLOUD SERVICE PROVIDERS AND PLATFORMS 9

Major cloud service providers (e.g., Amazon Web Services, Microsoft Azure, Google Cloud)

- Exploring cloud platforms and their services- Introduction to server less computing and micro services.

Problem-Solving Assignments:

1. Design a suitable cloud deployment strategy for a web application by selecting appropriate compute, database, and storage services.
2. Analyze a cloud-native application scenario and recommend suitable database, storage, and application design principles to achieve scalability and reliability.

UNIT IV CLOUD APPLICATION DEVELOPMENT 9

Building and deploying applications on the cloud- Integration of databases and storage services - Cloud-native application design principles.

Problem-Solving Assignments:

1. Analyze a given cloud security scenario and identify potential security vulnerabilities related to identity, access control, and data protection. Recommend suitable security measures.
2. Develop a disaster recovery and backup strategy for a cloud-based application considering data availability, recovery requirements, security, and business continuity.

UNIT V CLOUD SECURITY AND COMPLIANCE 9

Cloud security challenges and best practices- Identity and access management in the cloud

- Data privacy and compliance considerations- Disaster recovery and backup strategies.

TOTAL: 45 PERIODS

OUTCOMES

Upon completing the course, the students will be able to,

- Describe the fundamental concepts, principles, and technologies of cloud computing.
- Explain various cloud architectures and their components.
- Describe different cloud platforms and their services.
- Explain the integration of databases with cloud storage services.
- Describe cloud security and compliance considerations

TEXT BOOKS

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall, Publications, Second Edition, 2019.
2. Mark Johnson and Jonathan Simon, "Google Cloud Platform in Action", Manning Publications,Third,Edition, 2018.

REFERENCES

1. Judith S. Hurwitz, Robin Bloor, Marcia Kaufman, and Fern Halper, "Cloud Computing for

2. Dummies", John Wiley & Sons, Second Edition,2013.
3. Joe Baron, Hisham Baz, Tim Bixler, Biff Gaut, Kevin E. Kelly, and Sean Senior, "AWS Certified Solutions Architect Official Study Guide", Sybex, Fourth Edition,2016.

E-RESOURCES

1. https://nptel.ac.in/courses/106/105/106105178/ (cloud computing services)
2. http://www.digimat.in/nptel/courses/video/106105167/L16.html

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	1	-	-	-	2	3	1	2	1
2	3	1	2	2	1	-	-	-	1	2	1	2	2
3	2	3	2	3	1	-	-	-	3	1	1	1	1
4	1	2	3	3	3	-	-	-	3	3	1	1	3
5	2	3	3	1	3	-	-	-	2	2	1	2	2
AVG	2.2	2.2	2.2	2	1.8	-	-	-	2.2	2.2	1	1.6	1.8

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

Chairman - BoS

SEMESTER IV

23ITCT02	CLOUD SECURITY AND COMPLIANCE	L T P C
		3 0 0 3

OBJECTIVES

- To gain knowledge on cloud security concepts, threats, and challenges.
- To familiarize the data encryption and secure key management.
- To train the students incompliance regulations and frameworks relevant to cloud computing.
- To expose students with Cloud-based backup and disaster recovery solutions.
- To impart the integration of security into the development process

UNIT I INTRODUCTION TO CLOUD SECURITY 9

Cloud security fundamentals and key concepts- Shared responsibility model in cloud computing.- Security risks and threats in the cloud- Security challenges of multi-tenancy and virtualization.

Problem-Solving Assignments:

1. Identify major security threats such as data breaches, insecure APIs, account hijacking, and privilege escalation in a multi-tenant cloud environment.
2. Analyze the shared responsibility model and determine the security responsibilities of the cloud service provider and customer.

UNIT II CLOUD SECURITY MEASURES 9

Identity and access management (IAM) in the cloud- Data encryption and secure key management- Network security in cloud environments- Application security best practices.

Problem-Solving Assignments:

1. Design an IAM strategy using authentication, authorization, role-based access control, and least-privilege principles.
2. Select suitable encryption and key-management mechanisms to protect data at rest and data in transit.

UNIT III CLOUD COMPLIANCE AND REGULATIONS 9

Overview of cloud compliance frameworks (e.g., GDPR, HIPAA, PCI DSS) - Cloud security certifications and audits- Compliance challenges and strategies in the cloud.

Problem-Solving Assignments:

1. Analyze the security and privacy requirements of GDPR, HIPAA, and PCI DSS for a cloud-based organization.
2. Identify potential compliance gaps in areas such as data protection, access control, auditing, and data storage.

UNIT IV INCIDENT RESPONSE AND DISASTER RECOVERY 9

Developing incident response plans for cloud-based systems- Cloud-based backup and disaster recovery solutions- Business continuity in the cloud.

Problem-Solving Assignments:

1. Analyze a hypothetical cloud data breach or ransomware attack and identify the stages of incident response.
2. Design a backup and disaster recovery strategy using appropriate recovery objectives such as RTO and RPO.

UNIT V EMERGING TRENDS IN CLOUD SECURITY 9

Serverless security and challenges - DevSecOps and integrating security into the development process- Cloud-native security tools and technologies.

Problem-Solving Assignments:

1. Identify security challenges in serverless computing, including insecure functions, excessive permissions, and vulnerable dependencies.
2. Integrate security into a DevSecOps pipeline using automated code scanning, dependency checking, vulnerability assessment, and security testing.

TOTAL: 45 PERIODS

OUTCOMES

Upon completing the course, the students will be able to:

- Use the concepts of cloud security, threats, and challenges.
- Discuss the data encryption and secure key management.
- Analyze the compliance regulations and frameworks relevant to cloud computing.
- Apply the Cloud-based backup and disaster recovery solutions.
- Design the integration of security into the development process.

TEXTBOOKS

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Governance: Who's on your cloud?", O'Reilly Media, Third Edition, 2019.
2. Chris Dotson and Bill Patterson, "Cloud Native DevOps with Kubernetes: Building, Deploying, and Scaling Modern Applications in the Cloud," O'Reilly Media, Third Fourth, 2019.

REFERENCES

1. Ronald L. Krutz and Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing," Wiley, Fifth Edition, 2020.
2. Vic (J.R.) Winkler, "Securing the Cloud: Cloud Computer Security Techniques and Tactics," Syngress, , Sixth Edition, 2021.

E- RESOURCES

1. https://archive.nptel.ac.in/courses/106/105/106105167/

2. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

Mapping of COs-POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	1	-	-	-	2	3	1	2	1
2	3	1	2	2	1	-	-	-	1	2	1	2	2
3	2	3	2	3	1	-	-	-	3	1	1	1	1
4	1	2	3	3	3	-	-	-	3	3	1	1	3
5	2	3	3	1	3	-	-	-	2	2	1	2	2
AVG	2.2	2.2	2.2	2	1.8	-	-	-	2.2	2.2	1	1.6	1.8

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

Chairman - BoS

SEMESTER V

23ITCT03	CLOUD INFRASTRUCTURE AND MANAGEMENT	L T P C 3 0 0 3

OBJECTIVES

- To gain knowledge on cloud security concepts, threats, and challenges.
- To familiarize the data encryption and secure key management.
- To train the students i n compliance regulations and frameworks relevant to cloud computing.
- To expose students with Cloud-based backup and disaster recovery solutions.
- To impart the integration of security into the development process.

UNIT I INTRODUCTION TO CLOUD INFRASTRUCTURE 9

Overview of cloud computing and its benefits.- Cloud service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid).- Cloud infrastructure components: compute, storage, and networking.

Problem-Solving Assignments:

1. Identify major security threats such as data breaches, insecure APIs, account hijacking, and privilege escalation in a multi-tenant cloud environment.
2. Analyze the shared responsibility model and determine the security responsibilities of the cloud service provider and customer.

UNIT II CLOUD ARCHITECTURE AND DESIGN 9

Cloud architecture patterns (e.g., multi-tier, micro services).- Scalability and elasticity in cloud environments.- Designing for fault tolerance and high availability.- Security considerations in cloud infrastructure.

Problem-Solving Assignments:

1. Design an IAM strategy using authentication, authorization, role-based access control, and least-privilege principles.
2. Select suitable encryption and key-management mechanisms to protect data at rest and data in transit.

UNIT III CLOUD RESOURCE MANAGEMENT 9

Deploying and configuring virtual machines and containers.- Automating cloud infrastructure with Infrastructure as Code (IaC) tools (e.g., Terraform, Cloud Formation).- Managing cloud- based storage and databases.- Network configuration and security groups in the cloud.

Problem-Solving Assignments:

1. Analyze the security and privacy requirements of GDPR, HIPAA, and PCI DSS for a cloud-based organizatio

2. Identify potential compliance gaps in areas such as data protection, access control, auditing, and data storage

UNIT IV CLOUD PERFORMANCE OPTIMIZATION 9

Monitoring cloud performance and resource utilization.- Load balancing and auto-scaling strategies.- Performance tuning and optimizing cloud-based applications.

Problem-Solving Assignments:

1. Analyze a hypothetical cloud data breach or ransomware attack and identify the stages of incident response.
2. Design a backup and disaster recovery strategy using appropriate recovery objectives such as RTO and RPO.

UNIT V CLOUD AVAILABILITY AND DISASTER RECOVERY 9

Implementing high availability and fault tolerance in the cloud- Backup and disaster recovery strategies for cloud-based systems- Business continuity planning in cloud environments.

Problem-Solving Assignments:

1. Identify security challenges in serverless computing, including insecure functions, excessive permissions, and vulnerable dependencies.
2. Integrate security into a DevSecOps pipeline using automated code scanning, dependency checking, vulnerability assessment, and security testing.

TOTAL: 45 PERIODS

OUTCOMES

Upon completing the course, the students will be able to:

- Use the concepts of cloud security, threats, and challenges.
- Discuss the data encryption and secure key management.
- Analyze the compliance regulations and frameworks relevant to cloud computing.
- Apply the Cloud-based backup and disaster recovery solutions.
- Design the integration of security into the development process.

TEXT BOOKS

1. E. F. Volk, "Cloud Computing Infrastructure and Services," CRC Press, Second Edition, 2019.
2. Rajkumar Buyya, James Broberg, and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms," Wiley, Sixth Edition, 2021.

REFERENCES

1. K. R. Subramanian, "Cloud Computing: Concepts, Technology, and Architecture," Cambridge University Press, Fourth Edition, 2019.
2. Jamsheer K., Nithin V. George, and Binu A., "Cloud Infrastructure and Services: Hands-On with Amazon Web Services (AWS)," Apress, Third Edition ,2020.

E-RESOURCES

1. https://aws.amazon.com/documentation/ (Amazon Web)
2. https://archive.nptel.ac.in/courses/106/105/106105167/

Mapping of COs-POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	1	1	1	-	-	-	2	3	1	2	1
2	3	1	2	2	1	-	-	-	1	2	1	2	2
3	2	3	2	3	1	-	-	-	3	2	2	1	1
4	3	3	3	3	3	-	-	-	3	3	2	1	3
5	3	3	3	3	3	-	-	-	3	3	2	1	3
AVG	2.8	2.4	2.2	2.4	1.8	-	-	-	2.4	2.6	1.6	1.4	2

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

Chairman - BoS

SEMESTER VI

23ITCE04	CLOUD APPLICATION DEVELOPMENT	L T P C 3 0 2 4

OBJECTIVES

- To gain knowledge in cloud computing platforms and services used for application development.
- To acquire knowledge about the cloud-native principles and architectures
- To equip students in Data caching and synchronization in cloud applications
- To impart knowledge of security considerations in cloud application development.
- To expose students in continuous deployment of cloud applications.
- To implement the real-world scenarios and challenges in cloud application development

UNIT I INTRODUCTION TO CLOUD APPLICATION DEVELOPMENT 9

Cloud application development overview-Cloud platforms and services for application development-Setting up development environments for the cloud.

Coding Practices

1. Develop a simple cloud-based web application using a suitable programming language and deploy it on a cloud platform.
2. Create a basic application that uses a cloud service/API to perform data storage or retrieval.

Problem-Solving Assignment

1. Identify a real-world problem that can be solved using a cloud application.
2. Design and implement the application using suitable cloud platforms, services, and programming technologies.

UNIT II CLOUD NATIVE DEVELOPMENT 9

Cloud-native principles and architectures- Micro services and server- less computing.

- Containerization and orchestration with Docker and Kubernetes.

Coding Practices:

1. Develop a simple microservices application with separate services for user management and data processing.
2. Create and run a Docker container for a cloud application using a Dockerfile.

Problem-Solving Assignment:

1. Divide a monolithic application into appropriate microservices based on functional requirements.
2. Containerize the services using Docker and configure communication between the services.

UNIT III CLOUD DATABASES AND STORAGE 9

Relational and NoSQL databases on the cloud- Cloud storage solutions and best practices.

- Data caching and synchronization in cloud applications.

Coding Practices:

1. Develop CRUD operations using a cloud-based relational database.
2. Implement CRUD operations using a NoSQL cloud database such as a document-based database.

Problem-Solving Assignment:

1. Select an appropriate relational or NoSQL database based on the application's data and transaction requirements.
2. Implement cloud storage for large files and configure appropriate data access and storage policies.

UNIT IV CLOUD APPLICATION SECURITY 9

Security considerations in cloud application development - Implementing authentication and authorization in cloud applications- Securing data and communications in the cloud.

Coding Practices:

1. Implement user registration and login using secure authentication techniques.
2. Develop role-based authorization to restrict access to application resources.

Problem-Solving Assignment:

1. Identify potential security vulnerabilities in a cloud application, including unauthorized access, insecure APIs, and data exposure.
2. Implement authentication and role-based authorization to protect application resources.

UNIT V DEVOPS AND CONTINUOUS DEPLOYMENT 9

DevOps principles and practices - Continuous integration and continuous deployment (CI/CD) pipelines - Monitoring and performance optimization in cloud applications.

Coding Practices:

1. Create a Git-based version-control repository and practice branching, merging, and collaborative development.
2. Develop a CI pipeline that automatically builds and tests the application whenever code is committed.

Problem-Solving Assignment:

1. Develop a cloud application and maintain its source code using Git and version control practices.
2. Design a CI/CD pipeline that automatically performs build, testing, security checks, and deployment.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Setting Up Cloud Development Environment
2. Deploying a Static Website on the Cloud
3. Building a Cloud-Native API
4. Data Storage and Retrieval in the Cloud
5. Cloud Authentication and Authorization

6. Containerization and Orchestration
7. Continuous Integration and Continuous Deployment (CI/CD)
8. Implementing Event-Driven Architecture
9. Load Testing and Scaling in the Cloud
10. Implementing Cloud Monitoring and Logging

TOTAL : 45+15 PERIODS

OUTCOMES

Upon completing the course, the students will be able to:

- Explain the cloud computing platforms and services used for application development.
- Describe the cloud-native principles and architectures
- Describe the Data caching and synchronization in cloud applications
- Apply the security considerations in cloud application development
- Describe the continuous deployment of cloud applications.
- Design real-world scenarios and challenges in cloud application development.

TEXTBOOKS

1. John Arundel, Justin Domingus, "Cloud Native Development with Kubernetes", O'Reilly Media, Fourth Edition, 2021.

2. Gene Kim, Jez Humble, Patrick Debois, John Willis, "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", Second Edition,2016.

REFERENCES

1. Lee Atchison, "Architecting for Scale: High Availability for Your Growing Applications", Second Edition,2019.
2. Peter Sbarski, "Serverless Architectures on AWS: With Examples Using AWS Lambda", Fourth Edition, 2017.

E-RESOURCES

1. https://docs.microsoft.com/en-us/azure/ (Microsoft Azure Documentation)
2. http://kcl.digimat.in/nptel/courses/video/106106222/L04.html

Mapping of COs-POs & PSOs

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3	2	3	2	3	1	-	-	-	3	1	1	1	1
4	1	2	3	3	3	-	-	-	3	3	1	1	3
5	2	3	3	1	3	-	-	-	2	2	1	2	2
6	2	3	2	3	1	-	-	-	3	1	1	1	3
AVG	**2.2**	**2.2**	**2.2**	**2**	**1.8**	**-**	**-**	**-**	**2.2**	**2.2**	**1**	**1.6**	**1.8**

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

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SEMESTER VII

23ADBP01	PROJECT WORK	L T P C 0 0 12 6

OBJECTIVES

- To develop the student's learning and skill development in a specific area of interest
- To provide students with an opportunity to apply the theoretical knowledge gained from their minor courses to a practical real-world scenario or problem
- To learn and conduct research and investigate various aspects, fostering critical thinking and problem-solving skills.
- To promote collaboration and teamwork among students, enabling them to work effectively in a team environment
- To prepare project report and to face reviews and viva voce examination.

GUIDELINES FOR REVIEW AND EVALUATION

The student can select any topic which is relevant to his/her specialization of the programme. 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: 180 PERIODS

OUTCOMES

Upon completion of this course, Students will be able to:

- Demonstrate a sound technical knowledge of their selected project topic.
- Develop problem-solving skills as they analyze issues, design solutions, and implement them in their projects.
- Improve their communication and presentation abilities.
- Build successful collaboration and teamwork will be e ident in the project's execution and outcomes
- Explain new knowledge or insights to the relevant field, making it a valuable addition to the academic community.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	3	3	3	-	-	-	-	-	-	-	3	3
2	-	-	-	-	3	3	-	-	-	-	-	3	-
3	-	-	-	-	-	-	3	-	3	-	-	-	-
4	-	-	-	-	-	-	-	3	3	3	3	-	-
5	-	-	-	-	-	-	-	-	-	-	-	3	3
AVG	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.2	0.6	0.6	1.8	1.2

1-Low 2-Medium 3-High '-' – No Correlation.

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CURRICULUM AND SYLLABI

FOR B.E. / B.Tech. DEGREE PROGRAMMES

(MINOR DEGREE / HONOURS – CLOUD COMPUTING)

CREDIT SUMMARY

B.Tech. INFORMATION TECHNOLOGY

Category	Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
PC	-	-	3	3	3	4	-	-	13
EEC	-	-	-	-	-	-	6	-	6
Total	-	-	3	3	3	4	6	-	19