



SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS)

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

TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



CURRICULUM & SYLLABI B.E.COMPUTER SCIENCE AND ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

REGULATIONS – 2023

(REVISION I)

(I - VI SEMESTER)

(For the students admitted from the Academic year 2023-2024 and 2024 – 2025 onwards).



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 programme under the same Regulation as may be decided by the Academic Council.





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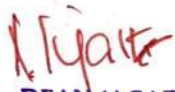
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Chairman - BoS


DEAN (ACADEMICS)
SENGUNTHAR ENGINEERING COLLEGE
TIRUCHENGODE-637 205




PRINCIPAL
SENGUNTHAR ENGINEERING COLLEGE
(AUTONOMOUS)
TIRUCHENGODE - 637 205



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INDEX			
UNDER GRADUATE (B.E. COMPUTER SCIENCE AND ENGINEERING) PROGRAMMES			Page No.
I	SCHEME FOR CURRICULUM		
	Curriculum 1 - 8 Semester	----	8-15
	List of Humanities and Social Sciences	----	16
	List of Basic Sciences	----	16
	List of Engineering Science	----	17
	List of Professional Core	----	17
	List of Professional Elective Courses	----	18-20
	List of Open Elective Courses	----	21-23
	General Electives	----	23
	Elective – Management	----	24
	List of Employability Enhancement Courses	----	25
	List of Mandatory Courses	----	26
	Credit Summary	----	27
II	SCHEME FOR SYLLABI		
	I Semester Syllabi	----	28-55
	II Semester Syllabi	----	56-92
	III Semester Syllabi	----	93-117
	IV Semester Syllabi	----	118-139
	V Semester Syllabi	----	140-167
	VI Semester Syllabi	----	168-177
	Professional Elective - I	----	178-195
	Professional Elective - II	----	196-213
	Professional Elective - III	----	214-231



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	Professional Elective - IV	----	232-248
	Professional Elective - V	----	249-266
	Professional Elective - VI	----	267-284
	Open Elective - I	----	285-319
	General Electives	----	320-326
	Mandatory Course - I	----	327- 337
	Mandatory Course - II	----	338- 348
III	MINOR / HONOURS DEGREE		
	a. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	----	349- 364
	Credit Summary	----	365
	b. CYBER SECURITY	----	366-378
	Credit Summary	----	379





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REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

B.E. COMPUTER SCIENCE AND ENGINEERING

VISION

- To be a pioneer in Computer Science and Engineering education by shaping students into knowledgeable professionals with skills in software development, research, and strong ethical values.

MISSION

- To provide a comprehensive education that shapes the students into professionals in software development, research, ethical conduct, and entrepreneurship.
- To foster industry-collaborative learning, by establishing a research centre of excellence to address local and global challenges.
- To engage the students in outreach programs to create easy, technology-driven solutions.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

- ✓ Apply their technical competence in various fields of Computer Science and Engineering for identifying, formulating and solving real world problems.
- ✓ Engage careers in cutting edge research techniques, develop solutions on problems of social relevance by applying new ideas and technologies and able to adapt the emerging technological changes.
- ✓ Work productively in multidisciplinary environment, nurture the leadership qualities and entrepreneurial skills for their career enhancement.





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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.





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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	Formulate, solve and analyze Computer Science and Engineering problems, design, develop and implement solutions using programming languages, development tools to meet the specific needs.
PSO2	Apply software engineering principles and practices, design software solutions in the areas related to algorithms, networking, cloud computing, web designing to create a successful career.



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	-	-
		23HST102 - தமிழர்மரபு/ Heritage of Tamils	-	-	-	-	-	-	2	1	2	-	1	-	-
		23PHE102 - Applied Physics for Computer Engineering	3	3	1	1	-	-	-	-	-	-	-	-	-
		23CYE101 - Engineering Chemistry	2.2	2.0	2.6	1.8	1.8	1.8	1.5	1.7	1.3	1.3	1.3	-	-
		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
		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	-	-
		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
		23CSE201 -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
		23GEL201 - Engineering Practices Laboratory	3	2	-	-	1	1	1	-	-	-	-	2	1
		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
		23CST301-Operating Systems	3	2.6	2.6	2.3	2.8	1	-	-	-	-	-	2.8	2.8
		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



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III	IV	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	-	-	-	-	-	-	-	-	-	-	-	-	-
		23CST401-Distributed Computing	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
		23CST402-Automata Theory	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
		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
		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
		23EEC401-Online Certification Courses	-	-	-	-	-	-	-	-	-	-	-	-	-
	V	23CST501- Cryptography and Network Security	3.0	3.0	2.8	2.6	3.0	1.6	1.8	1.2	1.2	1.3	2.8	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
		23CSE502-Object Oriented Software Engineering	3.0	2.7	2.8	2.2	2.8	1.5	1.0	1.8	1.5	1.8	3.0	3.0	3.0
		23EEC501-Industrial Training	-	-	-	-	-	-	-	-	-	-	-	-	-
		Professional Elective I													
		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	0.4	1.2	1	2.4	2.8	2.4
		23CSP503-Recommender Systems	2.8	2.6	2	2	2.4	1.2	0.4	0.8	1.4	1.2	2.4	2.8	2.8
		23CSP504-Text and Speech Analysis	3	2.6	2	2	2.8	1	0	0.6	1.2	1	2.8	3	2.8
		23CSP505-Business Analytics	2.6	2.8	2.4	2	2.6	1	0	0.6	2	2	2.4	2.6	2.6
		23CSP506-Big Data Analytics	2.4	2.8	2.8	2.2	2.6	1	0	0	1.4	1	2.4	2.8	2.4
		Professional Elective II													
		23CSP507-Adhoc and Sensor Networks	2.6	2.4	2.8	2.4	2.2	1	0.8	-	1	1	2.2	3	2.8
		23CSP508-Cloud Services Management	2.2	2.4	2.6	2.6	2.6	1.8	1.2	0.4	1.6	1.2	2	2.6	2.4
		23ADT501-UI and UX Design	3	3	3	3	3	-	-	-	1	2	-	2	2
		23CSP510-Software Testing 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	0.6	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
		23CSP513-Virtualization	3	2.4	2.6	2.6	2.6	1.4	1	0.4	1.6	1	1	3	2.6
		23ITP505-Storage Technologies	1.8	1.8	1.8	2.2	2.4	-	-	-	1.8	1.4	2.2	2.2	2.4
		23CSP514-Software Defined Networks	3	2.4	2.4	2.2	2.2	1.4	1.4	0.6	1.6	1.6	1.6	3	2.6
		23CSP515-Stream Processing	3	2.6	2.4	2.8	2.2	0.8	1	-	1.8	1.6	1.8	2.8	2.6
		23CSP516-Security and	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



VI

Privacy in Cloud														
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	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	2.7
23EEJ601 Project Work – Phase I	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Professional Elective IV														
23CSP601-Hacking Techniques	2.6	2.8	2.2	2.6	3.0	1.8	-	2.2	2	1.4	-	2.8	2.2	2.2
23ITP601-Digital Forensics	2.6	2.8	2.4	2.4	2.0	2.2	-	-	-	-	-	3.0	2.6	2.6
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	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	2.4
23CCP602-Cyber Physical Systems Security	2.6	2.8	2.25	2.0	2.75	2.5	3.0	-	2.0	2.0	2.2	2.4	2.2	2.2
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	2.8
Professional Elective V														
23CSP604 – Augmented Reality / Virtual Reality	3	3	2.6	2.4	2.4	1.8	1.3	3	2	1.4	-	2.4	2	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	2.6
23CSP606 – Cyber Security	2.6	2.8	2.2	2.4	2.6	2	1.8	2	1.8	1.2	2	2.8	2.2	2.2
23ADP602 –Neural Networks And Deep Learning	2.6	2.0	2.8	2.2	3.0	1.0	-	-	2.0	1.0	2.0	1.8	1.6	1.6
23CSP607 – Quantum Computing	3	3	-	2	2	2	2	-	-	-	2	2	2	2
23ITP603 – Game Development	2.2	2.2	1.6	1.6	2.2	-	-	-	-	-	-	2	2.2	2.2
Professional Elective VI														
23ADP502 – Knowledge Engineering	2.0	2.0	2.4	2.0	-	-	-	-	2.6	2.2	2.2	1.8	1.4	1.4
23CSP608 – Soft Computing	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	2.2
23CSP609 – Cognitive Science	2.6	2.4	1.8	1.5	1.8	3	3	2.4	1.8	1.6	2	1.8	1.6	1.6
23CSP610 – Optimization Techniques	3.0	3.0	2.4	2.2	2.4	1.3	1.0	2.0	2.0	1.2	2.0	2.8	2.2	2.2
23ITP502 - Computer Vision	3	2.2	2.8	2.8	2.6	-	-	-	2.0	2	1.6	3	2.6	2.6
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	1.6
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	2.8	2.2
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	-	-
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	-	-
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	-	-	-	-	-	-	-	-	-	-	-	-	-



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CURRICULUM

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

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

B.E. – COMPUTER SCIENCE AND ENGINEERING – FIRST SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
THEORY									
23HST101	Professional English	HS	3	0	0	3	40	60	100
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23HST102	தமிழர்மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100
EMBEDDED COURSE									
23PHE102	Applied Physics for Computer Engineering	BS	3	0	2	4	50	50	100
23CYE101	Engineering Chemistry	BS	3	0	2	4	50	50	100
23GEE101	Programming in C	ES	3	0	2	4	50	50	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				

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





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B.E. – COMPUTER SCIENCE AND ENGINEERING – SECOND SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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
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
23CSE201	PC Hardware Services and Networking	PC	3	0	2	4	50	50	100
PRACTICALS									
23GEL201	Engineering Practices Laboratory	ES	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						25			

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EEC	:	Employability Enhancement Courses
MC	:	Mandatory Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
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TOT	:	Total





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B.E. - COMPUTER SCIENCE AND ENGINEERING - THIRD SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
THEORY									
23MAT303	Discrete Mathematics	BS	3	1	0	4	40	60	100
23CST301	Operating Systems	PC	3	0	0	3	40	60	100
23ECT302	Digital Principles and Computer Architecture	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				

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



CURRICULUM

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

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

B.E. - COMPUTER SCIENCE AND ENGINEERING - FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
THEORY									
23CST401	Distributed Computing	PC	3	0	0	3	40	60	100
23CST402	Automata Theory	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
23ITE501	Full Stack Web Development	PC	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						

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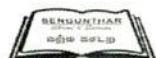
FOR B.E. / B.Tech. DEGREE PROGRAMMES

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B.E. - COMPUTER SCIENCE AND ENGINEERING - FIFTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
THEORY									
23CST501	Cryptography and Network Security	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									
23CSE501	Computer Networks	PC	3	0	2	4	50	50	100
23CSE502	Object Oriented Software Engineering	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
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MC	:	Mandatory Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
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B.E. - COMPUTER SCIENCE AND ENGINEERING -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									
23CSE601	Cloud Computing	PC	3	0	2	4	50	50	100
23ITE601	Mobile 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				

HS	:	Humanities and Social Sciences
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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
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B.E. - COMPUTER SCIENCE AND ENGINEERING - SEVENTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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
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CURRICULUM

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

B.E. - COMPUTER SCIENCE AND ENGINEERING - EIGHTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
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		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		CIA	ESE	TOT
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23PHE102	Applied Physics for Computer Engineering	BS	3	0	2	4	50	50	100
23CYE101	Engineering Chemistry	BS	3	0	2	4	50	50	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



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LIST OF ENGINEERING SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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	PC	3	1	0	4	40	60	100

LIST OF PROFESSIONAL CORE

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		CIA	ESE	TOT
23CSE201	PC Hardware Services and Networking	PC	3	0	2	4	50	50	100
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
23CST301	Operating Systems	PC	3	0	0	3	40	60	100
23CST401	Distributed Computing	PC	3	0	0	3	40	60	100
23CST402	Automata Theory	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
23ITE501	Full Stack Web Development	PC	3	0	2	4	50	50	100
23CST501	Cryptography and Network Security	PC	3	1	0	4	40	60	100
23CSE501	Computer Networks	PC	3	0	2	4	50	50	100
23CSE502	Object Oriented Software Engineering	PC	3	0	2	4	50	50	100
23CSE601	Cloud Computing	PC	3	0	2	4	50	50	100
23ITE601	Mobile Computing	PC	3	0	2	4	50	50	100





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LIST OF PROFESSIONAL ELECTIVE COURSES

Professional Elective – I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		CIA	ESE	TOT
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
23CSP505	Business Analytics	PE	3	0	0	3	40	60	100
23CSP506	Big Data Analytics	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		CIA	ESE	TOT
23CSP507	Adhoc and Sensor Networks	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		CIA	ESE	TOT
23ITP504	Human Computer Interaction	PE	3	0	0	3	40	60	100
23CSP513	Virtualization	PE	3	0	0	3	40	60	100





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23ITP505	Storage Technologies	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
23CSP601	Hacking Techniques	PE	3	0	0	3		40	60	100
23ITP601	Digital Forensics	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
23CCP602	Cyber Physical Systems Security	PE	3	0	0	3		40	60	100
23ITP602	Information Security	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
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
23CSP606	Cyber Security	PE	3	0	0	3		40	60	100
23CSP607	Quantum Computing	PE	3	0	0	3		40	60	100
23ITP603	Game Development	PE	3	0	0	3		40	60	100





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Professional Elective – VI

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		CIA	ESE	TOT
23ADP503	Knowledge Engineering	PE	3	0	0	3	40	60	100
23CSP608	Soft Computing	PE	3	0	0	3	40	60	100
23CSP609	Cognitive Science	PE	3	0	0	3	40	60	100
23CSP610	Optimization Techniques	PE	3	0	0	3	40	60	100
23ITP502	Computer Vision	PE	3	0	0	3	40	60	100
23CSP612	Ethics and AI	PE	3	0	0	3	40	60	100





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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		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





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OPEN ELECTIVE - II

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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





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OPEN ELECTIVES- III

Offered by the Departments	Course Code / Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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		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





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ELECTIVE – MANAGEMENT

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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





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LIST OF EMPLOYABILITY ENHANCEMENT COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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





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LIST OF MANDATORY COURSES

MANDATORY COURSES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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		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	Industrial Safety	MC	3	0	0	0	-	-	-





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CURRICULUM AND SYLLABI

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

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

CREDIT SUMMARY

B.E. COMPUTER SCIENCE AND ENGINEERING

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	6	7	—	—	—	—	—	17
GE	—	—	—	—	—	—	3	—	3
PC	—	4	11	19	12	8	—	—	54
PE	—	—	—	—	9	9	—	—	18
OE	—	—	—	—	—	3	6	—	9
EEC	1	2	1	3	2	4	4	8	25
MC	—	—	—	—	—	—	—	—	—
Total	21	27	23	22	23	24	16	8	164





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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





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Mandatory activity: Record Submission for English Speaking Hour with Faculty Members

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

REFERENCES

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





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23MAT101

MATRICES AND CALCULUS

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

L T P C

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.





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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 PERIODS

TEXT BOOKS

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





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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





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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





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OUTCOMES

Upon the completion of the course, the 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 Thinaï concepts, trade and victory of Chozha dynasty.
- Interpret the contribution of Tamils in Indian freedom struggle, Self-esteem movement and siddha medicine.

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை – 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.





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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





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23HST102

தமிழர்மரபு
(அனைத்து துறைகளுக்கும் பொதுவானது)

L T P C

1 0 0 1

நோக்கங்கள்

மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன

- செம்மொழியான தமிழ்மொழியின் விரிவான இலக்கியத்தைப்பற்றி அறிதல்.
- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை உள்ள கலைகளை பகுப்பாய்வு செய்தல்.
- நாட்டுப்புறக்கலைகள் மற்றும் வீர விளையாட்டுகளைப்புரிந்துகொள்ளுதல்.
- தமிழர்களின் திணைக்கோட்பாடுகளைச்செயல்படுத்துதல்.
- இந்திய விடுதலைப்போராட்டத்திற்கும் 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, ஓயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி ,புலியட்டம், தமிழர்களின் விளையாட்டுகள்.





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அலகு IV தமிழர்களின் திணைக்கோட்பாடுகள்

3

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

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாற்றிக்குத் தமிழர்களின் பங்களிப்பு

3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையழுத்துப்படிக்கள் – தமிழ்ப்புத்தகங்களின் அச்ச வரலாறு.

TOTAL: 15 PERIODS

முடிவுகள்

பாடத்தின்முடிவில், மாணவர்கள் அறிந்து கொள்வன:

- தமிழ்மொழியின்செம்மொழிதன்மையையும்சங்கஇலக்கியத்தின்முக்கியத்துவத்தையும்உணர்வார்கள்.
- தமிழர்களின்சிற்ப, ஓவிய, இசை மரபுகளை புரிந்து கொள்வார்கள்.
- நாட்டுப்புறக் கலைகளையும் வீர விளையாட்டுகளையும் வகைப்படுத்துவார்கள்.
- தமிழர்களின்திணைக்கோட்பாடுகளும்சங்ககாலவர்த்தகமும்புரிந்துகொள்வார்கள்.
- இந்திய விடுதலைப் போராட்டம், சுயமரியாதை இயக்கம், சித்த மருத்துவம் ஆகியவற்றில் தமிழர்களின் பங்களிப்பை விளக்குவார்கள்.

உரைமற்றும்குறிப்புத்தகங்கள்

1. தமிழக வரலாறு –மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் –முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை-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.)





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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

[Signature]
Chairman - BoS





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23PHE102

APPLIED PHYSICS FOR COMPUTER ENGINEERING

L T P C

(Common to CSE, CSE-SC, IT, AI&DS and AI&ML)

3 0 2 4

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

UNIT I PHOTONICS

9

Spontaneous and Stimulated Emission- Population Inversion - Derivation of Einstein's A and B coefficients – Principle and working of 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 equations: Time Independent and Time Dependent Equation - 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 - Combinational Logic Circuits - Flip-Flops and Sequential Circuits.





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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 DVD & Blu-ray Disc - **OFF-LINE STORAGE :** USB Flash drive – Memory card – **FUTURE STORAGE DEVICES (Concept only) :** 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.

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: 45 + 15 =60 PERIODS





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OUTCOMES

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

TEXT BOOKS

1. K.G.Aswani, "A Text book 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, 2019

REFERENCES

1. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2016
2. Hanson G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2019
3. C.N.R. Rao, P.J. Thomas and G.U. Kulkarni, "Nanocrystals: Synthesis, Properties and Applications", Springer (2017)

E-RESOURCES

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





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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	-	-	-	-	-	-	-	-	-
6	3	3	1	1	-	-	-	-	-	-	-	-	-
AVG	3	3	1	1	-	-	-	-	-	-	-	-	-

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


Chairman - BoS





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23CYE101

ENGINEERING CHEMISTRY

L T P C

(Common to CSE, EEE, ECE, CSE (CS), MDE, AIDS, IT, PT& CSE(AIML))

3 0 2 4

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

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 (phosphate, calgon and carbonate conditioning methods) – External conditioning – Zeolite process, Demineralization process – Desalination of brackish water by reverse osmosis.

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, Property of polymer: Glass transition temperature, Preparation, properties and uses of PVC, Nylon 6,6, Polyethylene - Rubbers – Types – Vulcanization of rubber – Plastics – Moulding constituents of plastics – Moulding of plastics – Compression and injection - 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- 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 alloy – Brass.





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UNIT IV CHEMISTRY OF NANO MATERIALS

9

Nano chemistry – Basics (Surface area to volume ratio - 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 - 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, 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.

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.

TOTAL: 45 + 15 = 60 PERIODS





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OUTCOMES

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

- Explain the quality parameters of water and identify appropriate methods for removing impurities for both domestic and industrial applications.
- Describe various types of polymers, their polymerization processes, and discuss their special properties and engineering applications.
- Apply the phase rule to understand alloy formation and its relevance in engineering applications.
- Discuss the fundamentals of nanomaterials and apply the core concepts of nanochemistry to engineering problems.
- Analyze the causes of corrosion and propose effective prevention and control strategies.
- Determine the water quality parameters and perform quantitative chemical analysis by pH meter, flame photometry, conductometry and potentiometry.

TEXT BOOKS

1. Jain P.C and Monika Jain, "Engineering Chemistry", Seventeenth Edition, Dhanpat Rai Publishing Company (P) Ltd. New Delhi, 2015.
2. Viswanathan B, "Nanomaterials" First Edition, Alpha Science International Ltd, 2009.

REFERENCES

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", Tenth Edition, S. Chand & Company Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Second Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.

E-RESOURCES

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





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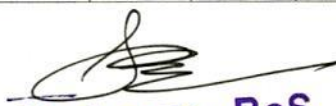
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Mapping of COs-POs & PSOs

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	-	-
6	3	3	2	1	1	2	1	1	2	-	-	-	-
AVG	2.3	2.2	2.5	1.6	1.7	1.8	1.4	1.5	1.4	1.3	1.3	-	-

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


Chairman - BoS





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23GEE101

PROGRAMMING IN C

L T P C

(Lab Embedded Theory Course)

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.





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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.





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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





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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)





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2	3	3	2	1	3	-	-	-	-	-	2	3	3
3	3	3	3	2	3	-	-	-	-	-	2	3	3
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AVG	2.8	2.8	2.5	1.8	3.0	-	1.0	1.0	1.3	1.0	2.0	3.0	2.7

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

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23EEEC101

SOFTSKILLS & LIFE SKILLS

L T P C
1 0 0 1

(Common to all First year / First Semester B.E., B.Tech., Branches)

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.

UNIT I 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





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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 Engineers, 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-RESOURCES

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
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2	1	3	1	1	-	1	-	2	3	3	1	-	-
3	-	1	-	-	-	1	-	3	3	3	1	-	-
4	2	2	1	1	3	1	-	2	3	3	3	-	-
5	1	1	1	-	-	2	-	3	3	3	3	-	-
AVG	1.25	1.60	1.0	1.0	3.0	1.4	2.0	2.6	2.8	2.6	2.0	-	-

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

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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.





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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


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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' 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.





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OUTCOMES

Upon completion of the course, the 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.





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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

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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

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23PHT202

ADVANCED PHYSICS FOR COMPUTER ENGINEERING

(Common to CSE, CSE-SC, IT and AI&DS)

L T P C

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 (Qualitative)

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





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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. Sze S. M., Lee M. K., "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/>





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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





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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.





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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.





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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

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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	2	2.7	3	3	2	2.6	2.4	2.2	-	-

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


Chairman - BoS





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23HST202

TAMILS AND TECHNOLOGY

**LT 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)-ThirumalaiNayakar 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 beads - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

3

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu 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 Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

TOTAL: 15 PERIODS





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OUTCOMES

Upon the completion of the course, the 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 - மக்களும்பண்பாடும் - கே. கே. பிள்ளை-
(வெளியீடு:தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம்
(தொல்லியல்துறைவெளியீடு)
4. பொருறை -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.





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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





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23HST202

தமிழரும் தொழில்நுட்பமும்

LTPC

(அனைத்து துறைகளுக்கும் பொதுவானது)

1001

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.
- அறிவியல்மற்றும்அறிவியல்தமிழ்மற்றும்தமிழ்கணிப்பொறிதொடர்பானஅறிவைநினைவில்கொள்ளுதல்.

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.





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அலகு IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில் துட்பம்:

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.

உரைமற்றும்குறிப்புபுத்தகங்கள்

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை- (வெளியீடு:தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4. பொருறை -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).





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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





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23HSE201

ENGLISH FOR ENGINEERS: THEORY AND PRACTICE

L T P C

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

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, "Technical English II", Maven Learning Private Limited, 2012.
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", Oxford University Press. UK, 2013.

E-RESOURCES

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



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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	1	-	-	-	1	-	-	2	3	-	2	-	-
2	1	2	-	2	-	-	-	-	3	-	1	-	-
3	1	-	-	-	-	-	1	-	3	2	2	-	-
4	-	-	-	-	1	-	2	-	3	2	2	-	-
5	-	-	-	-	-	-	1	3	3	2	1	-	-
6	-	-	-	-	-	2	2	2	3	-	2	-	-
AVG	1	2	-	2	1	2	1.5	2.3	3	2	1.6	-	-

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

[Signature]
Chairman - BoS





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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.





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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", Second Edition, McGraw Hill Education, 2020.
2. S. K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2019.

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.





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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	1
2	3	3	3	3	3	-	1	-	-	-	3	1	1
3	3	3	3	3	3	-	1	-	-	-	3	2	1
4	3	3	3	3	3	-	1	-	-	-	3	2	2
5	3	3	3	3	3	-	1	-	-	-	3	2	1
6	3	3	3	3	3	-	1	3	3	-	3	2	1
AVG	3	3	3	3	3	-	1	3	3	-	3	1.8	1.2

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

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Chairman - BoS





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23CSE201

PC HARDWARE SERVICES AND NETWORKING

L T P C

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

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.





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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 softwares

Problem - Solving Assignments:

1. A system shows unwanted pop-ups and slow performance. Suggest antivirus and firewall 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 Charging. Check 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.





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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.

TOTAL : 45+15 = 60 PERIODS

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





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TEXT BOOKS

1. Scott Mueller, "Upgrading and Repairing PCs", Que Publishing (Pearson), Second Edition, 2011.
2. Behrouz A. Forouzan, "Data Communications and Networking", McGraw-Hill Education, Sixth Edition, 2022.

REFERENCES

1. T Stephen Rood, "Computer Hardware Maintenance", Elsevier, First Edition, 1996.
2. Christian Huitema, "Internet Routing Architectures", Prentice Hall, Second Edition, 2000.

E – RESOURCES

1. <https://archive.nptel.ac.in/courses/106/106/106106144/> (PC Hardware fundamentals)
2. [https://onlinecourses.nptel.ac.in/noc22_cs19/\(Computer Networks and Internet Protocol\)](https://onlinecourses.nptel.ac.in/noc22_cs19/(Computer Networks and Internet Protocol))

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	3	3	3	2	3	1	1	2	2	1	2	3	3
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





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23GEL201

ENGINEERING PRACTICES LABORATORY

L T P C

(Lab Embedded Theory Course)

0 0 4 2

OBJECTIVES

The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES

15

PLUMBING WORK:

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

WOOD WORK:

- a) Sawing,
- b) Planning and
- c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.





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Wood Work Study:

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

PART II ELECTRICAL ENGINEERING PRACTICES

15

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

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES

15

WELDING WORK:

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

BASIC MACHINING WORK:

- a) (simple)Turning.
- b) (simple)Drilling.
- c) (simple)Tapping.

ASSEMBLY WORK:

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

SHEET METAL WORK:

- a) Making of a square tray





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FOUNDRY WORK:

- a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES

15

SOLDERING WORK:

- a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

- a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

- a) Study an elements of smart phone..
- b) Assembly and dismantle of LED TV.
- c) Assembly and dismantle of computer/ laptop.

TOTAL: 60 PERIODS

OUTCOMES

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

- CO1: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
- CO2: Wire various electrical joints in common household electrical wire work.
- CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
- CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.





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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	1
2	3	2	-	-	1	1	1	-	-	-	-	2	1
3	3	2	-	-	1	1	1	-	-	-	-	2	1
4	3	2	-	-	1	1	1	-	-	-	-	2	1
AVG	3	2	-	-	1	1	1	-	-	-	-	2	1

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


Chairman - BoS





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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 वर्णमाला एवं मूलभूत व्याकरण (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 शब्दभंडार एवं व्याकरण (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 पठन एवं लेखन कौशल (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 दैनिक जीवन में हिंदी (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 साहित्य एवं पुनरावृत्ति (LITERATURE AND REVISION)

4

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

TOTAL: 30 PERIODS





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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
CO1	-	-	-	-	-	-	-	-	3	-	1	-	-
CO2	-	-	-	-	-	-	1	1	3	-	1	-	-
CO3	-	-	-	-	-	-	1	2	3	-	2	-	-
CO4	-	-	-	-	-	1	2	2	3	-	1	-	-
CO5	-	-	-	-	-	-	-	-	2	-	3	-	-
AVG	-	-	-	-	-	1.0	1.3	1.6	2.8	-	1.6	-	-

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

P. Sathy
Chairman - BoS





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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 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





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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	2	3	-	2	-	-
4	-	-	-	-	-	-	1	2	3	-	2	-	-
5	-	-	-	-	-	1	2	2	3	-	2	-	-
AVG	-	-	-	-	-	1	1.5	1.7	3	-	1.6	-	-

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

P. Sankar
Chairman - BoS





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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 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





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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
CO1	-	-	-	-	1	1	-	1	2	-	-	-	-
CO2	-	-	-	-	1	2	-	2	2	-	-	-	-
CO3	-	-	-	-	2	2	1	2	3	-	1	-	-
CO4	-	-	-	-	2	2	1	3	3	-	1	-	-
CO5	-	-	-	-	1	1	1	2	3	-	1	-	-
AVG	-	-	-	-	1.4	1.6	1.0	0.2	2.6	-	1.0	-	-

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

P. Sangeetha
Chairman - BoS





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23MDC201

APTITUDE SKILLS
(Common to all Branches)

LT PC
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 CLOC 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





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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 PERIODS





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OUTCOMES

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

- Analyze the concept of logic and proofs.
- Apply the concepts of generating functions, induction and counting techniques.
- Use the applications of graph theory.
- Identify the concepts and properties of algebraic structures.
- Compute the real-time applications using lattices.

TEXTBOOKS

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, Thirty Reprints, 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

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23CST301

OPERATING SYSTEMS

L T P C

3 0 0 3

OBJECTIVES

- To familiarize students with the basic concepts and functions of operating systems.
- To enhance knowledge on CPU scheduling algorithms and process synchronization mechanisms.
- To impart understanding of memory management concepts including segmentation.
- To inculcate knowledge of storage management systems and file organization.
- To foster awareness on the fundamentals of virtual machines and mobile operating systems.

UNIT I INTRODUCTION

9

Computer System – Elements and organization; Operating System Overview – Objectives and Functions – Evolution of Operating System; Operating System Structures – Operating System Services – User Operating System Interface – System Calls – System Programs – Design and Implementation – Structuring methods

Problem-solving Assignments:

1. Design and implement an OS bootstrap loader that initializes system services and user interface.
2. Develop a program comparing different OS evolution stages (batch, multiprogramming, time-sharing).

UNIT II PROCESS MANAGEMENT

9

Processes – Process Concept – Process Scheduling – Operations on Processes – Inter-process Communication; CPU Scheduling – Scheduling criteria – Scheduling algorithms: Threads – Multithread Models – Threading issues; Process Synchronization – The Critical-Section problem – Synchronization hardware – Semaphores – Mutex – Classical problems of synchronization – Monitors; Deadlock – Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Problem-solving Assignments:

1. Design a deadlock detection and recovery system using Banker's algorithm for resource allocation.
2. Implement process synchronization for readers-writers problem with multiple readers allowed.

UNIT III MEMORY MANAGEMENT

9

Main Memory – Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Segmentation, Segmentation with paging; Virtual Memory – Demand Paging – Copy on Write – Page Replacement – Allocation of Frames – Thrashing.





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Problem-solving Assignments:

1. Design a virtual memory manager handling demand paging, copy-on-write, and thrashing detection.
2. Implement segmentation with paging and demonstrate memory protection mechanisms.

UNIT IV STORAGE MANAGEMENT

9

Mass Storage system – Disk Structure – Disk Scheduling and Management; File-System Interface – File concept – Access methods – Directory Structure – Directory organization – File system mounting – File Sharing and Protection; File System Implementation – File System Structure – Directory implementation – Allocation Methods – Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem

Problem-solving Assignments:

1. Design a complete file system implementation with mounting, sharing, and protection mechanisms.
2. Implement I/O subsystem with buffering, caching, and disk I/O optimization strategies.

UNIT V VIRTUAL MACHINES AND MOBILE OS

9

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS – iOS and Android

Problem-solving Assignments:

1. Design a mobile OS power management system optimizing battery life with app scheduling.
2. Develop a containerization system using namespaces and cgroups for process isolation.

TOTAL: 45 PERIODS

OUTCOMES

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

- Understand the fundamental structure, objectives and evolution of operating systems.
- Analyze process management concepts including scheduling, synchronization and deadlock handling mechanisms.
- Apply memory management techniques to optimize system performance.
- Examine storage management concepts including file systems, disk scheduling and I/O systems.
- Describe the principles of virtualization and features of iOS and Android operating systems.





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TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley and Sons Inc., Tenth Edition, 2018.
2. S Tanenbaum, "Modern Operating Systems", Pearson, Fifth Edition, 2022

REFERENCES

1. RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, First Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall, Seventh Edition, 2018.

E-RESOURCES

1. <https://nptel.ac.in/courses/106105214>(Operating system fundamentals)
2. <https://nptel.ac.in/courses/106106144>(Introduction to operating systems)

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
2	3	3	3	3	3	-	-	-	-	-	-	3	3
3	3	3	3	3	3	-	-	-	-	-	-	3	3
4	3	3	3	3	3	-	-	-	-	-	-	3	3
5	3	2	2	2	3	1	-	-	-	-	-	3	3
Avg	3	2.6	2.6	2.6	2.8	1	-	-	-	-	-	2.8	2.8

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


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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





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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 R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the VerilogHDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2017.
2. David Harris, "Digital Design and Computer Architecture", Morgan Kaufmann, 2012.

REFERENCES

1. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.
2. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.

E-RESOURCES

1. <https://nptel.ac.in/courses/117/106/117106086/> (Digital Design)
2. <https://nptel.ac.in/courses/108/105/108105132/> (Integrated Circuits)
3. https://onlinecourses.nptel.ac.in/noc24_cs83/ (Computer Architecture)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO3
1	3	3	2	2	2	2	-	-	-	2	2	3	1
2	3	3	3	2	2	2	-	-	-	2	1	3	1
3	3	3	3	2	2	2	-	-	-	2	2	3	1
4	3	2	3	2	2	2	-	-	-	2	2	3	2
5	3	3	3	3	2	2	-	-	-	2	2	3	2
AVG	3	2.8	2.8	2.2	2	2	-	-	-	2	1.8	3	1.4

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

Chairman - BoS





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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.





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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.





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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 JAVA FX 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–HBox and VBox–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.





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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





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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

CO	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





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23CSE302

DATA STRUCTURES AND ALGORITHMS

**L T P C
3 0 2 4**

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





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- 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.





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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.





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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





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OUTCOMES

Upon completion of the course, the 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/>(Introduction to data structure)





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Mapping of COs-POs & PSOs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	3	1	–	1	1	–	2	3	3
CO2	3	3	3	2	3	1	–	1	1	–	2	3	3
CO3	3	3	3	2	3	1	–	1	1	1	2	3	3
CO4	3	3	3	3	3	2	–	2	1	1	2	3	3
CO5	3	3	3	3	3	1	–	1	1	–	3	3	3
CO6	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


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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 blocks of algorithms(statements, state, control flow, 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.





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UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS

9

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

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:





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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

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 &





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Dictionaries)

6. Implementing programs using Functions.(Factorial, largest number In a list, area of shape)
7. Implementing programs using Strings.(reverse,palindrome,charactercount,replacingcharacters)
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", Notion Press, First Edition, 2021.





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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





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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

Create and format a document

Working with tables

Working with Bullets and Lists

Working with styles, shapes, smart art, charts

Inserting objects, charts and importing objects from other office tools

Creating and Using document templates

Inserting equations, symbols and special characters

Working with Table of contents and References, citations

Insert and review comments

Create bookmarks, hyperlinks, endnotes footnote

Viewing document in different modes

Working with document protection and security

Inspect document for accessibility

MS EXCEL:

10 Hours

Create worksheets, insert and format data

Work with different types of data: text, currency, date, numeric etc.

Split, validate, consolidate and Convert data





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Sort and filter data

Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc,)

Work with Lookup and reference formulae

Create and Work with different types of charts

Use pivot tables to summarize and analyze data

Perform data analysis using own formulae and functions

Combine data from multiple worksheets using own formulae and built-in functions to generate results

Export data and sheets to other file formats

Working with macros

Protecting data and Securing the workbook

MS POWERPOINT:

10 Hours

Select slide templates, layout and themes

Formatting slide content and using bullets and numbering

Insert and format images, smart art, tables, charts

Using Slide master, notes and handout master

Working with animation and transitions

Organize and Group slides

Import or create and use media objects: audio, video, animation

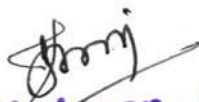
Perform slideshow recording and Record narration and create presentable videos

TOTAL: 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.


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SEMESTER IV

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.

Problem Solving Assignments :

1. Compare message-passing systems and shared memory systems.
2. Identify any two design issues or challenges in distributed systems and explain their impact.

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.

Problem Solving Assignments :

1. Discuss the need for clock synchronization and explain Physical Clock Synchronization using NTP.
2. Describe Message Ordering Paradigms and explain Asynchronous Execution with Synchronous Communication.





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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.

Problem Solving Assignments :

1. Explain Lamport's Mutual Exclusion Algorithm with message types, working steps, and correctness properties.
2. Define deadlock and explain the system model and preliminaries used for deadlock detection in distributed environments.

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.

Problem Solving Assignments :

1. Explain Agreement in a Failure-Free System under:
 - i) Synchronous systems
 - ii) Asynchronous systems
2. Discuss the issues in failure recovery, including the domino effect, orphan messages, and consistency.

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.

Problem Solving Assignments :

1. Explain the Cloud Service Models with suitable examples.
2. Explain the role of Virtualization in cloud computing.

TOTAL: 45 PERIODS





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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, Niranjana 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)





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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
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5	3	3	3	2	3	3	1	1	1	2	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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


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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.





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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.





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REFERENCES

3. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition ,PHI, 2003.
4. 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

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23CSE401

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

L T P C
3 0 0 3

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-Dempster - Shafer theory.





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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 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.





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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 – Generative 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.





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List of Experiments

1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple NN models
12. Build deep learning NN models

TOTAL : 45+15 = 60 PERIODS

OUTCOMES

Upon completion of the course, the 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", Fourth Edition, 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.





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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
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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.





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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

9

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.





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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.





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- 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

- Abraham Silberschatz, Henry F. Korth, S. Sudharshan, -Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
- Ramez Elmasri, Shamkant B. Navathe, —Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.

REFERENCES

- C.J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.
- Raghu Ramakrishnan, "Database Management Systems", 4th Edition, McGraw-Hill College Publications, 2015.

E-RESOURCES

- <https://nptel.ac.in/courses/106/105/106105175/> (Introduction to DBMS)
- <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

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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 implement 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-Appling 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





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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-Appling 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

9

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.





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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 MongoDB 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 Task to 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





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OUTCOMES

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

- Apply 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.
- Develop modern web development frameworks like REACT JS and backend technologies 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 Development)





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Chairman - BoS





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23EEC401

ONLINE CERTIFICATION COURSES

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


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SEMESTER V

23CST501

CRYPTOGRAPHY AND NETWORK SECURITY

LT PC
3 0 0 3

OBJECTIVES

- To introduce the fundamental concepts of cryptography and encryption techniques for securing information.
- To familiarize students with public key cryptography, finite fields, and number theory concepts used in modern security systems.
- To impart knowledge of message authentication mechanisms and hash functions for ensuring data integrity and authenticity.
- To discuss the basic concepts of network security and web security and enhance understanding of security protocols.
- To acquire knowledge and skills for implementing security measures to protect computer systems.

UNIT I INTRODUCTION

9

Security attacks, services and mechanisms – OSI Security Architecture – Classical Encryption Techniques–transposition techniques, Cipher Principles–Data Encryption Standard – Cipher Design Principles and Modes of Operation – Double DES – Triple DES – AES – Blowfish – RC5 algorithm.

Problem-Solving Assignments:

1. Analyze a given security attack scenario and recommend suitable security services and mechanisms to mitigate the threat.
2. Compare DES, Triple DES, AES, Blowfish, and RC5 for a secure communication system and justify the selection of the most appropriate algorithm.

UNIT II NUMBER THEORY AND PUBLIC KEY CRYPTOGRAPHY

9

Finite Fields and Number Theory – Groups, Rings, Fields – Modular arithmetic – Euclid's algorithm – Finite fields – Polynomial Arithmetic – Prime numbers – Fermat's and Euler's theorem–Testing for primality – The Chinese remainder theorem – Discrete logarithms– Key management – Diffie-hellman key exchange – Elliptic Curve Arithmetic and Cryptography–Key distribution – Public Key Cryptography and RSA.





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Problem-Solving Assignments:

1. Solve modular arithmetic and Euclidean algorithm problems to determine multiplicative inverses used in cryptographic applications.
2. Compute the shared secret key using the Diffie-Hellman key exchange algorithm and analyze its security.

UNIT III AUTHENTICATION AND HASH FUNCTION

9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – MD5 – SHA – HMAC – CMAC – Authentication applications–Kerberos,X.509 – Digital signature and authentication protocols –DSS– El-Gamal–Schnorr.

Problem-Solving Assignments:

1. Evaluate the integrity and authenticity of a message using hash functions and message authentication codes.
2. Design and verify a digital signature scheme for secure message authentication and non-repudiation.

UNIT IV NETWORK SECURITY

9

E-mail Security – Pretty Good Privacy – S/MIME – IP Security –Web Security.

Problem-Solving Assignments:

1. Design a secure e-mail communication system using PGP or S/MIME and justify the security features provided.
2. Analyze a network communication scenario and propose an IPsec-based solution for secure data transmission.

UNIT V SYSTEM LEVEL SECURITY

9

Intrusion Detection System – Virus and related threats – Counter measures – Firewalls and types – design principles – Practical implementation of cryptography and security.

Problem-Solving Assignments:

1. Investigate a network intrusion incident and recommend appropriate IDS techniques and countermeasures.





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2. Design a firewall-based security architecture to protect an organization from malware and unauthorized access.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the concepts of security attacks, services, and cryptographic techniques used in information security.
- Apply the principles of number theory and public key cryptography for secure communication and key management.
- Analyze authentication techniques, hash functions, and digital signatures for protecting data and communications.
- Analyze network and web security protocols for securing electronic communications.
- Apply system-level security mechanisms such as intrusion detection systems and firewalls to protect computing resources.

TEXT BOOKS

1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson, Seventh Edition, 2016.
2. Bruce Schneier, "Applied Cryptography" John Wiley & Sons Inc., Second Edition, 1996.

REFERENCES

1. Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw Hill, 2007.
2. Niels Ferguson, "Cryptography Engineering : Design Principles and Practical Applications", Wiley, First Edition, 2010.

E- RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105162/> (Introduction to Cryptography)
2. <https://nptel.ac.in/courses/106/105/106105031/> (Overview on Modern Cryptography)





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Mapping of COs - POs & PSOs

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1	3	3	2	2	3	1	1	1	1	-	2	3	3
2	3	3	3	2	3	1	1	1	1	-	3	3	3
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23CSE501

COMPUTER NETWORKS

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 – IEEE 802.11, 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

9

Network Layer Services – Packet switched networks – Performance – IPV4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols –





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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. Capturing 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.





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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/UDP 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)





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23CSE502

OBJECT ORIENTED SOFTWARE ENGINEERING

LT P C

3 0 2 4

OBJECTIVES

- To familiarize students on Software Engineering principle and software process models.
- To impart knowledge on the software requirements analysis process and specification.
- To teach the students on System Analysis and Design concepts using UML.
- To foster the students on software testing and maintenance approaches
- To inculcate the knowledge on project management scheduling using DevOps.
- To design the requirements specification and to implement for an intended software system.

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT

9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming-XP Process.

Coding Exercises:

1. Develop a simple Software Development Life Cycle (SDLC) tracker that accepts project phases and displays their sequence, duration, and status.
2. Write a program to simulate the Waterfall model, where the user enters completion status for Requirements, Design, Coding, Testing, and Deployment.

Problem-Solving Assignments:

1. Develop an Online Examination System.
2. company develops a banking application using the Waterfall model.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION

9

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

Coding Exercises:

1. Implement a Finite State Machine for a vending machine.
2. Develop a program to store actors and their associated use cases for a software system.

Problem-Solving Assignments:

1. Classify each requirement as functional/non-functional.
2. Explain how concurrency can be represented using Petri Nets.

UNIT III SOFTWARE DESIGN

9





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Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design

Coding Exercises:

1. Build a simple Student/Employee Management application using Model-View-Controller architecture.
2. Implement a three-layer application: Presentation, Business Logic, and Data Access.

Problem solving Assignments:

1. Design an Online Examination System using MVC.
2. Implement an Online Shopping System using multiple design patterns.

UNIT IV SOFTWARE TESTING AND MAINTENANCE

9

Testing – Unit testing – Black box testing– White box testing – Integration and System testing–Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking.

Coding Exercises:

1. Analyze effective testing strategies, debugging methods, and program analysis techniques to ensure software quality.
2. Write a program and calculate its statement, branch, and path coverage.

Problem solving Assignments:

1. Design test cases for statement coverage.
2. Explain whether the defect is syntax, runtime, or logical.

UNIT V PROJECT MANAGEMENT

9

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

Coding Exercises:

1. Apply project management practices, including scheduling, configuration management, and DevOps pipelines for deployment and maintenance.
2. Build a simple version-control system that stores file versions and change descriptions.

Problem solving Assignments:

1. Explain the importance of configuration management.
2. Identify how the application moves from development to production.





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LIST OF EXPERIMENTS

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the use case diagram
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios.

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

- Explain the foundational concepts of software engineering, software process models
- Analyze software requirements using formal methods, UML models
- Apply software design principles, patterns, and architectural styles for building efficient software systems.
- Analyze effective testing strategies, debugging methods, and program analysis techniques to ensure software quality.
- Apply project management practices, including scheduling, configuration management, and DevOps pipelines for deployment and maintenance.
- Implement the concepts of OO analysis and design for a given software system.

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. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill Education Pvt Ltd., First Edition, 2008.





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REFERENCES

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, First Edition, 2008.
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/content/storage2/courses/106105087/> (Design Patterns)
2. <https://nptel.ac.in/courses/106/105/106105224/> (UML Diagrams)

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	1	2	3	3	3
2	3	3	3	2	3	1	1	2	2	1	3	3	3
3	3	3	3	2	3	2	1	2	1	2	3	3	3
4	3	3	3	3	3	1	1	1	1	1	3	3	3
5	3	2	3	2	3	2	1	2	2	3	3	3	3
6	3	3	3	3	3	2	1	3	2	2	3	3	3
AVG	3.0	2.7	2.8	2.2	2.8	1.5	1.0	1.8	1.5	1.8	3.0	3.0	3.0

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


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23EEC501

INDUSTRIAL TRAINING

LTPC
0042

The students shall undergo Industrial Training during summer / winter vacation. The industry/organization shall be selected with the approval of the Head of the Department. A faculty member nominated by the Head of the Department shall act as the faculty coordinator and shall be responsible for monitoring and evaluation of the student's progress.

OUTCOMES

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

- CO1: Participate in the projects in industries during his or her industrial training.
- CO2: Describe the use of advanced tools and techniques encountered during the industrial training and visit.
- CO3: Interact with industrial personnel and follow engineering practices and discipline prescribed in the industry.
- CO4: Develop awareness about general workplace behaviour and build interpersonal and team skills.
- CO5: Prepare professional work reports and presentations.


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SEMESTER VI

23CSE602

CLOUD COMPUTING

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





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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.





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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 Edition, 2011.
2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2015.





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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
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1-Low 2-Medium,3-High “-” – No Correlation


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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





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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
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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


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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.





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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	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	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


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PROFESSIONAL ELECTIVE – I

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 –Data Warehouse 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





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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.





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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)

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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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


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23CSP502

EXPLORATORY DATA ANALYSIS

L T P C

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 ANALYSIS

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 - Handling Several Batches - Scatterplots and Resistant Lines.





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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)





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Mapping of COs-POs & PSOs

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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2.6	2	1.8	2.4	1.4	-	1	1.2	1.3	2.4	2.8	2.4

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


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23CSP503

RECOMMENDER SYSTEMS

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.





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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>





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Mapping of COs-POs & PSOs

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AVG	2.8	2.6	2.0	2.0	2.4	1.2	1.0	1.0	1.4	1.5	2.4	2.8	2.8

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23CSP504

TEXT AND SPEECH ANALYSIS

LT P C

3 0 0 3

OBJECTIVES

- 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 – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models.

UNIT III QUESTION ANSWERING AND DIALOGUE SYSTEMS

9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems – evaluating dialogue systems.

UNIT IV TEXT-TO-SPEECH SYNTHESIS

9

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing – Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems.





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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, the 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)





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4	3	3	3	3	3	1	-	1	2	2	3	3	3
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6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.6	2.0	2.0	2.8	1.0	-	1.0	1.2	1.3	2.8	3.0	2.8

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


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23CSP505

BUSINESS ANALYTICS

LT P C

3 0 0 3

OBJECTIVES

- To Impart the fundamental concepts of Business Analytics and data-driven decision-making processes for solving business problems
- To Develop students' understanding of Business Intelligence, Decision Support Systems, data warehousing, and analytical tools for organizational decision-making.
- To Enable students to apply predictive analytics, data mining, and machine learning techniques for business forecasting and strategic planning.
- To Provide comprehensive knowledge of analytics applications in Human Resource Management and Supply Chain Management to improve operational efficiency
- To Train students to apply analytics techniques in marketing and sales for customer behavior analysis, and decision support.

UNIT I INTRODUCTION TO BUSINESS ANALYTICS

9

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT II BUSINESS INTELLIGENCE

9

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNIT III BUSINESS FORECASTING

9

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.

UNIT IV HR & SUPPLY CHAIN ANALYTICS

9

Human Resources – Planning and Recruitment – Training and Development - Supply chain network Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain Applying HR Analytics to make a prediction of the demand for hourly employees for a year.





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UNIT V MARKETING & SALES ANALYTICS

9

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning

Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.

TOTAL :45 PERIODS

OUTCOMES

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

- Explain the Business Analytics life cycle, analytics methodologies, and data-driven approaches for solving business problems.
- Analyze Business Intelligence systems, Decision Support Systems, and OLAP techniques to support organizational decision-making.
- Apply predictive analytics, data mining, and machine learning techniques for business forecasting and strategic business planning.
- Apply analytics techniques to Human Resource Management and Supply Chain Management for improving organizational operational efficiency.
- Analyze customer behavior and apply marketing and sales analytics techniques to support business growth and informed decision-making.

TEXT BOOKS

1. R. Evans James, "Business Analytics", Pearson, Second Edition, 2017.
2. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley, Second Edition, 2016.

REFERENCES

1. Philip Kotler and Kevin Keller, "Marketing Management", PHI, Fifteenth Edition , 2016.
2. Mahadevan B, "Operations Management -Theory and Practice", Pearson Education, Third Edition , 2018.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc24_mg70/preview (Business Analytics)
2. https://onlinecourses.swayam2.ac.in/ntr24_ed68/preview (Business Analytics)



Mapping of COs-POs & PSOs

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AVG	2.6	2.8	2.4	2.0	2.6	1.0	-	1.0	2.0	2.0	2.4	2.6	2.6

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23CSP506

BIG DATA ANALYTICS

L T P C

3 0 0 3

OBJECTIVES

- To provide students with a comprehensive understanding of Big Data concepts, architectures, and emerging technologies used for large-scale data processing.
- To enable students to understand and apply NoSQL database models, distributed data management techniques, and scalable storage solutions for diverse datasets.
- To impart knowledge of Hadoop ecosystem, MapReduce programming paradigm, and YARN framework for distributed computing and analytics.
- To familiarize students with the architecture of Hadoop Distributed File System (HDFS), including data storage, retrieval, and processing mechanisms.
- To equip students with the skills to use Hadoop ecosystem tools such as HBase, Pig, and Hive for storing, querying, processing, and analyzing Big Data applications.

UNIT I UNDERSTANDING BIG DATA

9

Introduction to big data – convergence of key trends – unstructured data – industry examples of bigdata – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNIT II NOSQL DATA MANAGEMENT

9

Introduction to NoSQL – aggregate data models – key-value and document data models-relationships – graph databases – schemaless databases – materialized views – distribution models – master-slave replication – consistency.

UNIT III MAP REDUCE APPLICATIONS

9

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.





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UNIT IV BASICS OF HADOOP

9

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization.

UNIT V HADOOP RELATED TOOLS

9

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the concepts, technologies, and applications of Big Data and analyze its significance in solving real-world business problems.
- Apply NoSQL data management models and distributed database concepts to manage large-scale structured and unstructured data efficiently.
- Analyze the Hadoop ecosystem, MapReduce programming model, YARN architecture for distributed data analytics.
- Apply Hadoop Distributed File System (HDFS), Hadoop I/O mechanisms, and data processing techniques to store, retrieve, and manage Big Data efficiently.
- Develop Big Data analytical solutions using Hadoop ecosystem tools such as HBase, Pig, and Hive for data storage, querying, and analytics.

TEXT BOOKS

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCES

1. Sadalage, Pramod J. "NoSQL distilled", 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.





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E – RESOURCES

1. https://onlinecourses.swayam2.ac.in/ntr24_ed70/preview (Data Analytics)
2. https://onlinecourses.nptel.ac.in/noc24_cs130/preview (Big Data Computing)

Mapping of COs-POs & PSOs

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PROFESSIONAL ELECTIVE – II

23CSP507

AD HOC AND SENSOR NETWORKS

LT PC

3 0 0 3

OBJECTIVES

- To impart the students with fundamentals of wireless communication principles, mobile ad hoc networks (MANETs), wireless sensor networks (WSNs), and their real-world applications.
- To enable students to understand the design issues, classification, and operation of Medium Access Control (MAC) protocols used in wireless ad hoc and sensor networks.
- To equip students with knowledge of routing and transport layer protocols for MANETs and to analyze protocol performance under dynamic network conditions.
- To provide comprehensive knowledge of wireless sensor network architecture, MAC protocols, IEEE 802.15.4, and efficient data communication mechanisms.
- To develop students' analytical skills in evaluating routing, localization, Quality of Service (QoS), and security mechanisms in ad hoc and sensor networks.

UNIT I INTRODUCTION

9

Fundamentals of wireless communication technology – Electromagnetic spectrum – Radio propagation mechanisms – characteristics of the wireless channel -Mobile Ad Hoc Networks (MANETS): Concepts and architectures. Applications of ad hoc and sensor networks. Design challenges in ad hoc and sensor networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

9

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS

9

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.





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UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS

9

Single node architecture: Components of a sensor node - WSN Network architecture—types-Low duty cycle protocols and wakeup concepts -data relaying and aggregation strategies -MAC layer protocols for WSN- Data-Centric and Contention-Based Networking -IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS

9

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization- absolute and relative localization, triangulation-QOS in WSN- Security Attacks

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the principles of wireless communication, MANET architecture, wireless sensor networks, and their applications.
- Apply the concepts of MAC protocol design, classify various MAC protocols, and interpret the operation of wireless ad hoc networks.
- Analyze routing and transport layer protocols in MANETs and evaluate their suitability for different networking scenarios.
- Explain the architecture of wireless sensor networks, MAC protocols, data aggregation techniques, and IEEE 802.15.4 standards
- Analyze localization techniques, QoS requirements, and security challenges in wireless sensor networks to recommend suitable networking solutions.

TEXT BOOKS

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures Protocols ", Pearson India Pvt Ltd., 2021.
2. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2007.

REFERENCES

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publications - 2002.



E – RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105160/> (Mobile Adhoc Networks)
2. <https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/> (Adhoc and Sensor Networks)

Mapping of COs-POs & FSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3	2	2	2	2	1	1	-	1	1	2	3	2
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5	2	3	3	3	2	1	1	-	1	1	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.6	2.4	2.8	2.4	2.2	1.0	1.0	-	1.0	1.0	2.2	3.0	2.8

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


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23CSP508

CLOUD SERVICES MANAGEMENT

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





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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", Enel Publications, 2018.
2. Thomas Erl, Ricardo Puttini, Zaigham Mohammad, "Cloud Computing: Concepts, Technology & Architecture", 2013.

REFERENCES

1. Praveen Ayyappa "Economics of Cloud Computing", LAP Lambert Academic Publishing, 2017.
2. Rajkumar Buyya, Christian Vechhiola, S.Thamarai Selvi, "Mastering Cloud Computing Foundations and Applications Programming", 2015.

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)





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Mapping of COs-POs & PSOs

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AVG	2.2	2.4	2.6	2.6	2.6	1.8	1.2	2.0	1.6	1.2	2.0	2.6	2.4

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


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23ADT501

UI AND UX DESIGN

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 Behaviors and Principles — Branding - Style Guides.

UNIT III FOUNDATIONS OF UX DESIGN

9

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know 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





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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

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5	3	3	3	3	2	-	-	1	2	3	2	3	3
6	3	3	3	2.8	2.6	0.8	0.2	0.4	1.2	2.6	1	2.2	2.6
AVG	3	3	3	3	3	-	-	-	1	2	-	2	2

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23CSP510

SOFTWARE TESTING AND AUTOMATION

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.





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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 various 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, 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, Third Edition, 2012.
2. Elfriede Dustin, Thom Garrett, Bernie Gauff, "Implementing Automated Software Testing", Pearson Education, 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

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5	2	2	3	3	3	1	-	-	2	2	2	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.4	2	2.8	2.4	2.4	1	-	-	1.4	2.0	1.8	2.8	2.2

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23CSP511

WEB APPLICATION SECURITY

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





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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 , 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)
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23CSP512

DEVOPS

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 .





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UNIT V BUILDING DEVOPS PIPELINES USING AZURE

9

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file.

TOTAL:45 PERIODS

OUTCOMES

Upon completion of the course, the 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", Kindle Edition, 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:" English Edition, 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>





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23ITP504

PROFESSIONAL ELECTIVE – III HUMAN COMPUTER INTERACTION

L T P C

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





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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, interactive 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", O'Reilly, First Edition, 2009.

REFERENCES

1. Yvonne Rogers, Helen Sharp, Jenny Preece, "Interaction Design: Beyond Human-Computer Interaction", Wiley, Third Edition, 2011.
2. Ben Shneiderman, Catherine Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", Addison-Wesley, Fifth Edition, 2009.

E-RESOURCES

1. <https://nptel.ac.in/courses/106103115/> (Human-Computer Interaction)
2. <https://archive.nptel.ac.in/courses/106/106/106106177/> (Introduction to Human-Computer Interaction)





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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	2.2	2.2	2.0	1.8	-	-	-	2.2	2.2	1.0	1.6	1.8

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


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23CSP513

VIRTUALIZATION

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 – Para virtualization-Types of Hypervisors.

UNIT II SERVER AND DESKTOP VIRTUALIZATION

9

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization — Uses of Virtual Server Consolidation — Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization.

UNIT III NETWORK VIRTUALIZATION

9

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization-VLAN-WAN Architecture-WAN Virtualization.

UNIT IV STORAGE VIRTUALIZATION

9

Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping Risks of Storage Virtualization-SAN-NAS-RAID.





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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, the students 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. Anthony T.Velte , Toby J. Velte Robert Elsenpeter, "Cloud computing a practical approach" - TATA McGraw- Hill ,New Delhi, 2010.
2. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", 2017.

REFERENCES

1. Nick Marshall , "Mastering VMware vSphere 7", 2019.
2. Matthew Portnoy , "Virtualization Essentials", 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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.4	2.6	2.6	2.6	1.4	1.0	1.0	1.6	1.0	1.0	3.0	2.6

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


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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.





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UNIT IV BACKUP, ARCHIVE AND REPLICATION

9

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT V SECURING STORAGE INFRASTRUCTURE

9

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts of Information storage and third platform technologies.
- Analyze the intelligent storage systems, RAID configurations, and storage architectures
- Apply storage networking and virtualization technologies.
- Explain various backup and recovery strategies.
- Analyze security requirements and security controls for securing storage environments.

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.





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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
CO1	1	2	1	3	3	-	-	-	1	1	1	3	3
CO2	3	1	2	3	3	-	-	-	3	2	3	3	2
CO3	1	1	3	2	2	-	-	-	3	1	1	3	3
CO4	3	2	1	2	2	-	-	-	1	1	3	2	3
CO5	1	3	2	1	2	-	-	-	1	2	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.8	1.8	1.8	2.2	2.4	-	-	-	1.8	1.4	2.2	2.8	2.8

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


Chairman - BoS





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23CSP514

SOFTWARE DEFINED NETWORKS

L T P C

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 - OpenFlow Protocol - Flow Table - Control Plane Functions- Southbound Interface, Northbound Interface — SDN Controllers - Ryu, OpenDaylight, 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





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Re

quirements – 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 students 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", 2018.

REFERENCES

1. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan Kauffman, 2016.
2. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", O'Reilly Media, Second Edition, 2017.





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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
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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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

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23CSP515

STREAM PROCESSING

L T P C
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 Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL





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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", O'Reilly publications, 2016.
2. Flink, Storm and Kafka, "Practical Real-time Data Processing and Analytics: Distributed Computing and Event Processing" using Apache Spark, Packet Publishing, 2018.





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REFERENCES

1. Martin Kleppmann, "Designing Data-Intensive Applications", O'Reilly Media, 2013.
2. Chris Poelker and R. James MacDonald, "Resources for Learning Stream Data Processing", 2018.

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

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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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

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23CSP516

SECURITY AND PRIVACY IN CLOUD

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 CONCEPT

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





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NIT 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, the 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, and rzejGoscinski, "Cloud Computing ", Wiley , 2013.
2. Dave shackleford, "Virtualization Security", SYBEX a wiley Brand, 2013.

REFERENCES

1. Mark C. Chu-Carroll , "Code in the Cloud ",CRC Press, 2011
2. Rajkumar Buyya,Christian Vechhiola, 3. ThamaraiSelvi, "Mastering Cloud Computing", 2018.





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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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





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PROFESSIONAL ELECTIVE - IV

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.





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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, deauthentication - 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 HOURS

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 tools 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.





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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 inculcate 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.





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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 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.ac.in/courses/106/105/106105217/> (Digital Forensics)
2. <https://nptel.as.in/courses/167/108/165265456> (Digital Forensics)





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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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


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23CSP602

SOCIAL NETWORK SECURITY

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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





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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.





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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
6	–	–	–	–	–	–	–	–	–	–	–	–	–
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


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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





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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 HOURS

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)





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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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


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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





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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, the 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-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc23_cs62/preview (Foundation of cyber physical system)
2. <https://nptel.ac.in/courses/106106199> (Secure system engineering)





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Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PSO1	PSO?
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
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AVG	2.6	2.8	2.3	2.0	2.8	2.5	3.0	—	2.0	2.0	2.2	2.4	2.2

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


Chairman - BoS



23ITP602

INFORMATION SECURITY

L T 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.

OUTCOMES

Upon 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.
- Analyze 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. [https://nptel.ac.in/courses/106/105/106105031/Cryptography and Network Security](https://nptel.ac.in/courses/106/105/106105031/Cryptography%20and%20Network%20Security)
2. [https://nptel.ac.in/courses/106/106/106106141/Introduction to Information Security](https://nptel.ac.in/courses/106/106/106106141/Introduction%20to%20Information%20Security)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO11	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 '-'-Nocorrelation


Chairman - BoS



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PROFESSIONAL ELECTIVE - V

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 HOURS

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.

TEXTBOOKS

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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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 HOURS

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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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

23CSP606

CYBER SECURITY

L T P C

3 0 0 3

OBJECTIVES

- To familiarize the students with fundamentals, history, and legal aspects of cyber security and cyber crimes.
- To foster various types of cyber-attacks, malware, and appropriate countermeasures.
- To train students in reconnaissance and scanning techniques for information gathering and vulnerability assessment.
- To impart intrusion detection methods, architectures, and tools including IDS and Snort.
- To acquire the knowledge on intrusion prevention techniques, firewalls, IPS, and unified threat management strategies.

UNIT I INTRODUCTION

9

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime– Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT II ATTACKS AND COUNTERMEASURES

9

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT III RECONNAISSANCE

9

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweep Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT IV INTRUSION DETECTION

9

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT V INTRUSION PREVENTION

9

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the basics of cyber security, cybercrime and cyber law.
- Classify various types of attacks and the tools for countermeasures.
- Apply various tools to perform information gathering.
- Apply intrusion techniques to detect intrusion.
- Analyze the intrusion prevention techniques and its effectiveness.

TEXTBOOKS

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, Second Edition, 2021.
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, First Edition, 2011.

REFERENCES

1. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, First Edition, 2007.
2. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, First Edition, 2014.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc25_ee54/ (Network Security)
2. <https://nptel.ac.in/courses/106/105/1060606210/> (Intrusion Prevention)

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	3	3	3	1	1	-	2	1
2	3	3	2	2	2	2	2	-	1	1	-	3	2
3	2	3	2	2	3	1	1	-	2	1	-	3	2
4	2	3	2	3	3	2	1	-	2	1	-	3	3
5	3	3	3	3	3	2	2	1	3	2	2	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.6	2.8	2.2	2.4	2.6	2	1.8	2	1.8	1.2	2	2.8	2.2

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-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT III THIRD-GENERATION NEURAL NETWORKS

9

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT IV DEEP FEEDFORWARD NETWORKS

9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT V RECURRENT NEURAL NETWORKS

9

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

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 autoencoders and generative models for suitable applications.

TEXT BOOKS

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.

E-RESOURCES

1. <https://nptel.ac.in/courses/108108148> (Introduction to neural networks)
2. <https://nptel.ac.in/courses/106106184> (Neural networks and Deep learning)

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	2.0	2.8	2.2	3.0	1.0	-	-	2.0	1.0	2.0	1.8	1.6

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


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23CSP607

QUANTUM COMPUTING

L T P C

3 0 0 3

OBJECTIVES

- To introduce the fundamental principles and mathematical foundations of quantum mechanics and their role in quantum computation and information.
- To provide an understanding of quantum circuit models, universal gate sets, quantum parallelism, and the role of entanglement and non-locality in quantum algorithms.
- To introduce the principles of the quantum Fourier transform, phase estimation, and their applications, along with fundamentals of quantum-based machine learning.
- To provide an understanding of major quantum algorithms and their extensions for solving search and computational problems.
- To introduce the principles, protocols, and security foundations of quantum cryptography, quantum communication, and related applications.

UNIT I INTRODUCTION TO QUANTUM MECHANICS

9

History of quantum Computation and quantum information - Linear algebra: Dirac notation, Hilbert spaces, Unitary, Hermitian Operator, and Normal matrices, Inner product, Outer product, Tensor product, Postulates of Quantum Mechanics.

UNIT II CIRCUIT MODEL OF QUANTUM COMPUTING

9

Quantum Computation: Classical Circuits, Quantum Circuits, Universality of various sets of elementary gates. Quantum parallelism: Deutsch-Jozsa algorithm, Bernstein-Vazirani algorithm. Entanglement and Non-Local: Quantum non-locality, CHSH-Clauser-Horne-Shimony-Holt, Magic square game, A non-local version of distributed Deutsch-Jozsa.

UNIT III QUANTUM FOURIER TRANSFORM

9

The quantum Fourier transform, Quantum Phase Estimation, Applications: order-finding and factoring, General applications of the quantum Fourier transform. Quantum Machine Learning: Supervised learning from quantum data – Unsupervised learning from quantum data.



UNIT IV QUANTUM ALGORITHMS

9

Simple algorithms: Deutsch's algorithm, Simon's algorithm, Shor's algorithm, Grover's search algorithm, G-BBHT algorithm, Minimum- finding algorithm, Generalizations and modifications of Search problems.

UNIT V QUANTUM CRYPTOGRAPHY

9

Quantum Key Generation: Basic ideas of two parties quantum key generation, Security issues of QKG protocols, Quantum key generation protocols BB84 and B92, Multiparty key generation. Quantum Cryptographic Protocols: Quantum coin-flipping and bit commitment protocols, Quantum oblivious transfer protocols, Security of the quantum protocols, Security limitations of the quantum cryptographic protocols. Quantum Teleportation and Superdense Coding: Basic principles, Teleportation circuit, Quantum secret sharing, Superdense coding.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply core quantum mechanical concepts such as Dirac notation, operators, tensor products, and postulates to basic quantum computation frameworks.
- Explain the structure of quantum circuits, basic quantum algorithms, and the significance of entanglement and non-locality in computation.
- Apply the quantum Fourier transform, its applications, and basic approaches to quantum machine learning.
- Analyze the structure and working principles of quantum algorithms and their generalizations for various computational tasks.
- Explain quantum key generation, cryptographic protocols, teleportation, and superdense coding.

TEXT BOOKS

1. Michael A. Nielsen & Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2010.
2. J.Gruska, "Quantum Computing", McGraw-Hill, 1999.

REFERENCES

1. Ronald de Wolf, "Quantum Computing", CWI and University of Amsterdam, 2023.
2. Thomas G.Wong, "Introduction to Classical and Quantum Computing", Rooted Grove, 2022.

E-RESOURCES

1. <https://nptel.ac.in/courses/106106232> (Quantum Algorithm)
2. https://onlinecourses.nptel.ac.in/noc23_cs04 (Quantum Cryptography)

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	3	-	2	2	-	-	-	-	-	2	2	2
3	3	3	-	2	2	-	-	-	-	-	2	2	2
4	3	3	-	2	2	-	-	-	-	-	2	2	2
5	3	3	-	2	2	2	2	-	-	-	-	2	2
AVG	3	3	-	2	2	2	2	-	-	-	2	2	2

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


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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 & rendering 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 – Path finding.

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





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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 rendering techniques using game environment.
- Apply recent gaming environments using development frameworks.
- Analyze a simple game application using Pygame

REFERENCES

1. Sanjay dhav, "Game Programming Algorithms and Techniques: A Platform 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", Chapman and Hall/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)





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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	-	-	-	-	-	-	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 '-'-NoCorrelation


Chairman - BoS





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PROFESSIONAL ELECTIVE - VI

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.





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UNIT IV REASONING 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.
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



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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 ALGORITHM

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





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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. Mizutani E., "Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence", Prentice Hall, First Edition, 2015.
2. Himanshu Singh, Yunis Ahmad Lone, "Deep Neuro-Fuzzy Systems with Python", Apress, First Edition, 2020.

REFERENCES

1. Roj Kaushik and Sunita Tiwari, "Soft Computing-Fundamentals Techniques and Applications", McGraw Hill, Second Edition, 2018.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI learning, First Edition, 2003.

E-RESOURCES

1. <https://archive.nptel.ac.in/courses/106/105/106105173/> (Introduction to Soft Computing)
2. <https://nptel.ac.in/courses/108108148> (Neural networks)





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Mapping of COs-POs& PSO

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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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


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23CSP609

COGNITIVE SCIENCE

L T P C

3 0 0 3

OBJECTIVES

- To familiarize the students with theoretical background of cognition.
- To foster the knowledge on cognition and computational intelligence.
- To enhance the students to explore probabilistic programming language.
- To develop the students' understanding on computational inference models of cognition.
- To foster the computational learning models of cognition .

UNIT I PHILOSOPHY, PSYCHOLOGY AND NEURO SCIENCE

9

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing –Cognitive Neuroscience – Perception – Decision – Learning and Memory- Language understanding and Processing

UNIT II COMPUTATIONAL INTELLIGENCE

9

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making – Learning – Language-Vision.

UNIT III PROBABILISTIC PROGRAMMING LANGUAGE

9

Web PPL Language – Syntax – Using Java script Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Co routines: Functions that receive continuations – Enumeration

UNIT IV INFERENCE MODELS OF COGNITION

9

Generative Models – Conditioning – Causal and statistical dependence – Conditional Dependence-Data Analysis – Algorithms for Inference.

UNIT V LEARNING MODELS OF COGNITION

9

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models–Learning (Deep) Continuous Functions – Mixture Models.

TOTAL:45 PERIODS





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OUTCOMES

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

- Explain the foundational concepts of cognition with insights from philosophy, psychology and neuroscience.
- Analyze the relationship between cognition and computational intelligence through AI architectures, reasoning and knowledge systems.
- Apply probabilistic programming languages in modeling cognitive processes.
- Analyze the computational inference models such as generative models, conditioning and causal inference to perform cognitive tasks.
- Examine the learning models of cognition including hierarchical models, mixture models, and continuous deep function learning.

TEXTBOOKS

1. Jose Luis Bermudez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, Second Edition, 2019.
2. Neil Stillings, "Cognitive Science: An Introduction", MIT Press, Second Edition, 1995.

REFERENCES

1. Michael Gazzaniga, Richard Ivry, George Mangun, "Cognitive Neuroscience: The Biology of the Mind", W.W. Norton & Co., Fifth Edition, 2014.
2. Daniel Dennett, "Consciousness Explained", Penguin Books, First Edition, 2015.

E-RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc25_hs40/preview\(computational intelligence\)](https://onlinecourses.nptel.ac.in/noc25_hs40/preview(computational%20intelligence))
2. [https://onlinecourses.nptel.ac.in/noc22_hs97/preview\(learning models\)](https://onlinecourses.nptel.ac.in/noc22_hs97/preview(learning%20models))



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	3	1	1	-	1	1
2	3	2	1	1	2	3	3	2	2	2	-	2	2
3	3	3	3	2	2	3	3	2	2	2	2	3	2
4	2	2	1	-	-	3	3	3	1	1	-	1	1
5	2	2	2	1	1	3	3	2	3	2	2	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.6	2.4	1.8	1.5	1.8	3	3	2.4	1.8	1.6	2	1.8	1.6

1-Low 2-Medium 3-High “-” – No Correlation


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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





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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
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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	2.4	2.2	2.4	1.3	1.0	2.0	2.0	1.2	2.0	2.8	2.2

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


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23ITP502

COMPUTER VISION

L P T 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.

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.

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.

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 maps.





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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.

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.
- Analyze 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 Zisserman, "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/\(computer-vision\)](https://nptel.ac.in/courses/106/105/106105216/(computer-vision))
2. [https://www.nptelvideos.com/topics/\(computer-vision\)](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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
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


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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.





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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)





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Mapping of COs-POs & PSOs

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1	2	2	-	-	-	3	3	3	1	1	-	1	1
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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
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.8	2.6	2	1.3	1.5	3	3	2.4	1.8	1.6	2	1.8	1.6

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		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



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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

OPEN ELECTIVE – I



23CEO607

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

**LT 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

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.
3. 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



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23CSO610

INTRODUCTION TO DRONE TECHNOLOGIES

LT P C

3 0 0 3

OBJECTIVES

- To impart fundamental knowledge of drone technology, including its concepts, terminology, historical evolution, and emerging applications.
- To develop students understanding of UAV architecture, drone components, fabrication techniques, and programming methodologies.
- To train students in drone flight operations, navigation systems, sensors, data acquisition, and UAV management tools.
- To enable students to explore commercial applications of drones in sectors such as agriculture, logistics, inspection, surveillance, and aerial imaging.
- To familiarize students with drone safety regulations, licensing requirements, and emerging technologies including autonomous and swarm-based UAV systems.

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 lines and power distribution -Drones in filming and panoramic picturing.





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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, the student will be able to,

- Explain the fundamental concepts, terminology, classifications, history, and applications of drone technology.
- Design a multirotor drone by selecting appropriate hardware appropriate components and tools.
- Apply flight control principles, navigation methods, onboard sensors, and UAV management tools for drone flight operations.
- Analyze the drone technologies for commercial applications such as aerial imaging, agriculture, logistics, infrastructure inspection, and surveillance
- Analyze drone safety regulations, licensing requirements, and emerging technologies including autonomous drones and swarm intelligence for future 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. Završnik, "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	PO 1	PO 2	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	-	-
AV G	2.6	2.8	2.4	1.8	3	-	-	1.5	-	-	2.6	-	-

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


Chairman - BoS

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 impart 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.

REFERENCES

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	PO 1	PO 2	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	-	-
AV G	3	3	3	3	2.8	2.4	-	-	-	-	2.4	-	-

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

23EE0603

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 in battery 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 Edition, 2011.
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



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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.


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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)



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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, Eighth 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



SENGUNTHAR ENGINEERING COLLEGE

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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



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=dXHJemWm1xl&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



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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	1
2	3	2	-	3	3	-	-	-	2	-	2	3	2
3	3	2	-	3	3	-	-	2	2	2	2	3	2
4	3	2	-	3	3	2	-	2	2	2	2	3	3
5	3	2	-	2	3	2	-	2	2	3	3	3	3
AVG	3.0	2	-	2.8	3.0	2.0	1.0	2.0	2.0	2.3	2.0	2.8	2.2

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 .



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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


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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. Deje, 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.

23PMO608

PHARMACEUTICAL NANOTECHNOLOGY

LT 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 pharmaceuticals 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, erythroosomes, 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


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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



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





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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)





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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



GENERAL ELECTIVES

CourseCode	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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

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


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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 their personality and self-awareness, with the help of Communication skills and aware of creative, critical thinking abilities.
- To create an awareness on Military History and 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- Pak War 1965, 1971 - Operation Meghdoot and Kargil.





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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


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MANDATORY COURSES – I

CourseCode	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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	-	-	-



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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.





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OUTCOMES

Upon Completion of this course, the students will be able to:

- 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.


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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.
2. An Introduction to Literary Studies, Mario Klarer, Routledge, 2013.
3. The Experience of Poetry, Graham Mode, Open college of Arts with Open Univ Press, 1991.
4. The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2114.
5. The Elements of Drama, J.L. Styan, Literary Licensing, 2011.



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OUTCOMES

Upon Completion of this course, the students will be able to:

- 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





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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

Upon Completion of this course, the students will be able to:

- 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.


Chairman - BoS



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 HAZARDS, 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

Upon Completion of this course, the students will be able to:

- 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

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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.
- 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 CONSTITUTIONAL FUNCTIONARIES

Election Commission of India: Organization, powers and functions, Union Public Service Commission, State Public Service Commission - Local Self Government.





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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

CourseCode	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		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	Industrial Safety	MC	3	0	0	0	-	-	-

23MDC601

**WELL-BEING WITH TRADITIONAL PRACTICES-
YOGA, AYURVEDA AND SIDDH**

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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 health

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





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sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life.

Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - Panchcheekarana 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.





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OUTCOMES

Upon Completion of this course, the students will be able to:

- 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

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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, Dharmapal, 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





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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

OUTCOMES

Upon Completion of this course, the students will be able to:

- Explain the concepts, perspectives, and significance of history, science, and technology in India.
- Examine the contributions of major historians to the historiography of science and technology in India.
- Analyze the development of science and technology in Ancient and Medieval India and their societal contributions.
- Analyze the influence of colonial rule on scientific progress and institutional development in India.
- Evaluate the advancements in science and technology in post-independent India and their impact on development and globalization.

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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:

1. 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)
2. Capitalism – Free markets, demand-supply, perfect competition, laissez-faire, monopolies, imperialism. Liberal democracy. **(5 lectures)**
(Refs: Adam smith, J S Mill)
3. 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)**
4. 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)
5. Essential elements of Indian civilization. **(3 lectures)**
(Refs: Pt Sundarlal, R C Mazumdar, Dharampal)
6. Technology as driver of society, Role of education in shaping of society. Future directions. **(4 lectures)**
(Refs: Nandkishore Acharya, David Dixon, Levis Mumford)
8. Conclusion **(2 lectures)**



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OUTCOMES

Upon Completion of this course, the students will be able to:

- 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

Upon Completion of this course, the students will be able to:

- 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.





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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 Limit Value (TLV) - Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS

UNIT II STANDARDS AND REGULATIONS

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 posture 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





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OUTCOMES

Upon Completion of this course, the students will be able to:

- 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- ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

B.E. – COMPUTER SCIENCE AND ENGINEERING

Course Code	Name of the Subject	Category	Periods / Week			Credit C	Maximum Marks		
			L	T	P		CIA	ESE	TOT
THEORY									
23CSAT01	Intelligent Systems	PC	3	0	0	3	40	60	100
23CSAT02	Machine Learning Applications	PC	3	0	0	3	40	60	100
23CSAT03	AI and Robotics	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23CSAE01	Deep Learning	PC	3	0	2	4	50	50	100
23CSAP01	Project Work	EEC	0	0	10	6	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE									
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





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SEMESTER III

23CSAT01

INTELLIGENT SYSTEMS

L T P C

3 0 0 3

OBJECTIVES

- To Introduce the fundamental concepts, problem-solving techniques, and search strategies, used in Artificial Intelligence.
- To Provide knowledge of logical and structured knowledge representation techniques for modeling intelligent systems
- To Develop understanding of knowledge inference mechanisms, and reasoning methods for intelligent decision-making.
- To Impart the principles, architectures, learning algorithms, and applications of Artificial Neural Networks.
- To Familiarize the students with the fundamentals of Machine Learning and commonly used machine learning algorithms for solving real-world problems.

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

9

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

UNIT II KNOWLEDGE REPRESENTATION

9

Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT III 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-Dempster - Shafer theory.

UNIT IV NEURAL NETWORKS

9

Introduction, Artificial Neural Network, Appropriate problems for neural network learning, Characteristics of the problems, Basic understanding of neural networks, A single neuron, Activation Functions, Architectures of neural networks, Feed forward neural network, Single-Layer feed forward architecture, Multiple-Layer feed forward architecture, Types of feed forward networks, Multi-layer perception, Training MLP: The back-propagation algorithm.





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UNIT V MACHINE LEARNING BASICS AND METHODS

9

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization. Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Featurization

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the artificial intelligence problem-solving techniques, search strategies, and heuristic methods to solve computational problems.
- Apply logical and structured knowledge representation techniques to model intelligent systems effectively.
- Apply knowledge inference and reasoning techniques, including rule-based systems, and Bayesian reasoning, fuzzy logic to support intelligent decision-making.
- Analyze the Artificial Neural Network models, including feed-forward networks and backpropagation learning algorithms, for solving pattern recognition and classification problems.
- Analyze machine learning paradigms, and classification, regression, and clustering techniques for developing intelligent applications

TEXT BOOKS

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, Fourth Edition, 2020.
2. Ameet V Joshi, "Machine Learning and Artificial Intelligence", Springer Publications, 2020.

REFERENCES

1. John Paul Muller, Luca Massaron, "Machine Learning Dummies", Wiley Publications, 2021.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill, Third Edition, 2010.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview (Introduction to Machine Learning Techniques)
2. https://onlinecourses.nptel.ac.in/noc20_cs29/preview. (Introduction to Artificial intelligences)





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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
2	3	3	3	2	2	-	1	-	-	-	2	3	3
3	3	3	3	2	2	1	1	-	-	-	2	3	3
4	3	3	3	3	3	-	-	-	-	-	3	3	3
5	3	3	3	3	3	1	-	-	-	-	3	3	3
AVG	3	3	2.8	2.5	2.4	1	1	-	-	-	2.4	3	2.8

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


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SEMESTER IV

23CSAT02

MACHINE LEARNING APPLICATIONS

L T P C

3 0 0 3

OBJECTIVES

- To enable students to understand the role of machine learning in the banking sector and financial services..
- To train students to apply machine learning techniques in communication, media, and entertainment applications.
- To Develop students' ability in analyzing machine learning applications in the education sector using learning analytics and educational data mining.
- To impart knowledge on the use of machine learning models in insurance industries for risk prediction and claim analysis.
- To foster students' skills in applying machine learning techniques in transportation systems and intelligent mobility solutions.

UNIT I MACHINES LEARNING IN BANKING

9

Why machine learning in banking sector, Use of AI in banking and finance, Fraud detection, Tough competition in banking industry, Risk modeling and investment banks, Customer data management, Decreased customer experience and loyalty, Personalized marketing, Role of machine learning: Challenges of banking sector and securities, Widely used machine learning algorithms in banking and security.

Problem-Solving Assignments:

1. Design a simple fraud detection model using classification techniques.
2. Analyze a bank customer dataset using ML algorithms.

UNIT II MACHINE LEARNING IN COMMUNICATION AND MEDIA

9

Machine learning in communication, media and entertainment, Usage of machine learning in media and entertainment industry, Machine learning techniques for customer sentiment analysis, Word embedding's, Sentiment analysis with long short term memory networks, Real-time analytics in communication, media and entertainment industries, Real time analytics and social media, Deep learning for social media analytics, Recommendations engines, Collaborative filtering, Memory based collaborative filtering, Model based collaborative filtering, Content based filtering, Hybrid recommendation systems., Summary of recommendation systems, Deep learning techniques on recommender systems.

Problem-Solving Assignments:

1. Implement sentiment analysis using sample social media data.
2. Build a collaborative filtering recommendation system.





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UNIT III MACHINE LEARNING IN EDUCATION

9

Advantages of machine learning in education, learning analytics, Academic analytics, Action research, Educational data mining, Recommender system, Personalized adaptive learning, Learning analytics process, Data environment: What? Stakeholders: Who? Methods: How? Case study: Sentimental analysis for student's feedback using ML, Recommender systems in education, Domain model, Learner model, Students classification algorithm, Recommendation model, Case study: Application of ML in predicting students' performance, Proposed methodology, Data description, Sample data sets, Visualization, Selection of machine learning technique.

Problem-Solving Assignments:

1. Develop a student performance prediction model.
2. Perform visualization and analysis using educational datasets.

UNIT IV MACHINE LEARNING IN INSURANCE INDUSTRIES

9

Importance of machine learning in insurance, Potential use cases of machine learning in insurance industry, Case study on insurance claim analysis using machine learning algorithms, Case study on using machine learning for insurance pricing optimization, Personalized marketing in insurance industry, Predictive model for insurance underwriting, Case study: Risk prediction in life insurance industry.

Problem-Solving Assignments:

1. Build a predictive model for insurance risk analysis.
2. Analyze insurance claim datasets using ML techniques.

UNIT V MACHINE LEARNING IN TRANSPORTATION

9

Introduction, Applications of ML and artificial intelligence in transportation, Applications of machine learning in transport, Incident detection, Predictive models, Application of AI in aviation and public transportation, Aviation, Shared mobility, Buses, Intelligent urban mobility, Autonomous vehicles, Autonomous transportation, Artificial intelligence use cases in logistics, Back office AI, Cognitive customs, Predictive logistics, Predictive risk management, Seeing thinking and speaking logistics operations, ML powered customer experience, Limitations of AI techniques in transportation, Computation complexity of AI algorithms.

Problem-Solving Assignments:

1. Develop a traffic prediction or incident detection model.
2. Analyze transportation datasets using predictive analytics.

TOTAL: 45 PERIODS





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OUTCOMES

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

- Apply machine learning concepts and their applications in the banking sector.
- Analyze the machine learning methods for real time data analytics in communication and media.
- Analyze machine learning applications in the education domain using learning analytics and educational data mining.
- Apply machine learning models for insurance data analysis, claim prediction, and risk assessment.
- Analyze machine learning-based solutions for transportation, logistics, and predictive decision-making applications.

TEXT BOOKS

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson Education, 2018.
2. S. Sridhar, M. Vijayalakshmi, "Machine Learning", Oxford University Press, 2018.

REFERENCES

1. Manaranjan Pradhan, U. Dinesh Kumar, "Machine Learning Using Python", Wiley, Publication, 2019.
2. Dr. R. Kumar, Mr. J. Jegan Amarnath, Dr. P. Visu, "Advanced Machine learning", Notion Press, 2020.

E-RESOURCES

1. <https://nptel.ac.in/courses/106106139>. (Machine Learning)
2. https://onlinecourses.nptel.ac.in/noc20_cs29/preview. (A brief introduction to Machine Learning)





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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	2	1	-	-	-	2	3	3
2	3	3	3	3	3	2	1	-	1	-	3	3	3
3	3	3	3	3	3	2	1	-	1	-	3	3	3
4	3	3	3	3	3	2	2	-	-	-	3	3	3
5	3	3	3	3	3	3	2	-	1	1	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	3	2.8	3	2.2	1.4	-	1	1	2.8	3	3

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


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23CSAT03

SEMESTER V
AI AND ROBOTICS

L T P C
3 0 0 3

OBJECTIVES

- To impart the fundamental concepts of Artificial Intelligence and various robot locomotion mechanisms.
- To Provide knowledge of mobile robot kinematics, motion constraints, and motion control techniques.
- To foster the principles of robot perception using sensors, computer vision, and image processing techniques for environmental understanding.
- To Enable students to understand localization techniques and autonomous map-building approaches for mobile robots.
- To Develop students' ability to analyze robot planning, and navigation strategies for autonomous robotic systems.

UNIT I ROBOT LOCOMOTION

9

Introduction to AI and Robotics – robot locomotion – legged mobile robots – wheeled mobile robots– aerial mobile robots.

UNIT II MOBILE ROBOT KINEMATICS

9

Kinematic models and constraints – mobile robot maneuverability – mobile robot workspace – Advanced kinematics – motion control.

UNIT III ROBOT PERCEPTION

9

Sensors for mobile robots – computer vision for robots – image processing for robotics – place recognition – range data.

UNIT IV MOBILE ROBOT LOCALIZATION

9

Introduction to localization – noise and aliasing – localization-based navigation – belief representation – map representation – probabilistic map-based localization – autonomous map Building.

UNIT V ROBOT PLANNING AND NAVIGATION

9

Planning and navigation – planning and reacting – path planning – obstacle avoidance – navigation architectures.

TOTAL: 45 PERIODS





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OUTCOMES

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

- Explain the fundamentals of Artificial Intelligence, robot locomotion mechanisms, and different types of mobile robots.
- Analyze mobile robot kinematic models, motion constraints, and motion control techniques for robotic systems.
- Apply robot perception techniques using sensors, computer vision, and image processing for environmental sensing and recognition.
- Analyze the localization and mapping techniques for mobile robot navigation.
- Analyze the robot path planning and navigation strategies to enable autonomous operation in dynamic environments.

TEXT BOOKS

1. R. Siegwart, I. R. Nourbaksh, and D. Scaramuzza, "Introduction to Autonomous Mobile Robots", MIT Press, Second Edition, 2011.
2. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, Fourth Edition, 2020.

REFERENCES

1. R.Mittle, I.Nagrath, "Robotics and Control", McGraw Hill Education, 2017.
2. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, "Robotics: Modelling, Planning and Control", Springer, 2010.

E-RESOURCES

1. <https://nptel.ac.in/courses/112105249>. (Introduction to Robotics)
2. https://onlinecourses.nptel.ac.in/noc19_me71/preview (Fundamentals of Artificial Intelligences)





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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	—	—	—	3	3	2
2	3	3	3	2	3	1	—	—	—	—	3	3	3
3	3	3	3	3	3	2	1	—	1	—	3	3	3
4	3	3	3	3	3	2	1	—	—	—	3	3	3
5	3	3	3	3	3	3	2	1	1	1	3	3	3
6	—	—	—	—	—	—	—	—	—	—	—	—	—
AVG	3	2.8	2.8	2.75	2.8	2	1.25	1	1	1	3	3	3

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


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23CSAE01 SEMESTER VI
DEEP LEARNING

LT P C
3 0 2 4

OBJECTIVES

- To familiarize the students with the fundamental concepts of deep neural networks and their mathematical foundations
- To provide knowledge of Convolutional Neural Networks (CNNs), architectures, and optimization methods for image and pattern recognition tasks.
- To teach the students about principles and working of Artificial Neural Networks (ANN).
- To enable students to understand data science fundamentals, data preprocessing, feature engineering, visualization, and their integration with deep learning techniques.
- To develop students' ability to design, implement, and evaluate deep learning models for solving real-world problems in Artificial Intelligence
- To provide Practical exposure in designing, implementing, and evaluating deep learning models and data analytics techniques for solving real-world applications.

UNIT I INTRODUCTION

9

Linear Algebra: Scalars - Vectors -- Matrices and tensors; Probability Distributions – Gradient based Optimization - Machine Learning Basics: Capacity - Overfitting and underfitting -Hyper parameters and validation sets - Estimators - Bias and variance- Stochastic gradient descent - Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization - Optimization.

Coding Practices:

1. Develop a program to model a problem environment and compute a solution using systematic state-space exploration.
2. Design a program to solve constrained or competitive problems and evaluate solution quality.

Problem-Solving Assignments:

1. Analyze alternative search strategies and evaluate efficiency and optimality.
2. Solve a constrained or adversarial decision-making problem and justify correctness.

UNIT II CONVOLUTIONAL NEURAL NETWORKS

9

Convolution Operation - Sparse Interactions - Parameter Sharing - Equivariance - Pooling - Convolution Variants: Strided - Tiled - Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions- Loss Functions- Regularization-Optimizers-Gradient Computation.

Coding Practices:

1. Implement a reasoning mechanism to infer new knowledge and evaluate confidence.
2. Design a system that handles uncertainty using probabilistic or belief-based reasoning.





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Problem-Solving Assignments:

1. Apply logical reasoning to derive conclusions from given facts.
2. Solve decision-making problems under uncertainty using belief measures.

UNIT III DEEP LEARNING ALGORITHMS FOR ANN

9

Artificial Neural Networks- Linear Associative Networks - Perceptrons -The Back propagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Auto encoders – Deep Backprop Networks- Auto encoders.

Coding Practices:

1. Develop an evolutionary algorithm for optimization and evaluate iterative performance.
2. Compare sequential and parallel execution of evolutionary models.

Problem-Solving Assignments:

1. Formulate evolutionary solutions for optimization or pattern recognition problems.
2. Analyze the effect of learning and parallelization on computational efficiency.

UNIT IV DATA SCIENCE AND DEEP LEARNING

9

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks.

Coding Practices:

1. Implement FOIL or similar algorithms to derive general rules.
2. Test and refine learned rule sets on unseen data.

Problem-Solving Assignments:

1. Infer general rules from specific instances and justify reasoning.
2. Evaluate rule accuracy, generalization ability, and limitations.

UNIT V APPLICATIONS

9

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion - NLP tasks - dimensionality estimation - time series forecasting -building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

Coding Practices:

1. Develop a sequential prediction model using HMM.
2. Perform probabilistic inference in graphical models.

Problem-Solving Assignments:

1. Design probabilistic models for uncertain domains.
2. Update beliefs based on observed evidence and analyze inference accuracy.





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LIST OF EXPERIMENTS

1. Solve XOR problem using Multilayer perceptron.
2. Implement character and Digit Recognition using ANN.
3. Implement the analysis of X-ray image using auto encoders
4. Implement Speech Recognition using NLP
5. Develop a code to design object detection and classification for traffic analysis using CNN
6. Implement online fraud detection of share market data using any one of the data analytics tools.
7. Implement image augmentation using deep RBM.
8. Implement Sentiment Analysis using LSTM.

TOTAL:45+15=60 PERIODS

OUTCOMES

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

- Explain the mathematical foundations and deep feed-forward neural network concepts required for developing deep learning models.
- Analyze the Convolutional Neural Network (CNN) architectures, convolution operations, and optimization algorithms for image-based learning applications.
- Design Artificial Neural Network (ANN) models, including backpropagation, Hopfield networks, Boltzmann Machines, and Autoencoders for solving complex learning problems.
- Apply data science methodologies, data preprocessing, feature engineering, visualization techniques to prepare data for deep learning applications.
- Analyze the deep learning models for real-world applications for intelligent decision-making systems.
- Implement and evaluate deep learning models using ANN, CNN, LSTM, NLP, and data analytics techniques for image processing, sentiment analysis and other real-world AI applications

TEXT BOOKS

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Stone, James, "Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning", Sebtel Press, 2019.

REFERENCES

1. Vance, William, "Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science", Joining the dots tv Limited, 2019.
2. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), "Deep Learning Applications", Springer Publications, 2022.





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E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc20_cs11/preview. (Deep Learning)
2. https://onlinecourses.nptel.ac.in/noc21_ge07/preview. (Neural Networks)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	2	2	-	-	-	-	-	3	3	2	3
2	3	3	3	3	3	1	-	-	1	-	3	3	3	3
3	3	3	3	3	3	1	1	-	1	-	3	3	3	3
4	3	3	3	3	3	2	1	-	2	-	3	3	3	3
5	3	3	3	3	3	3	2	1	2	1	3	3	3	3
6	3	3	3	3	3	2	2	2	2	1	3	3	3	3
AVG	3	3	2.8	2.8	2.8	1.8	1.5	1.5	1.6	1.0	3.0	3.0	2.8	3

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


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23CSAP01

SEMESTER VII
PROJECT WORK

L T P C
0 0 12 6

OBJECTIVES

- To train the students for gaining domain knowledge, and technical skills to solve potential business / research problems.
- To gather requirements and Design suitable software solutions and evaluate alternatives.
- To work in small teams and understand the processes and practices in the industry.
- To implement, test and deploy solutions for target platforms.
- To prepare project report and to face reviews and viva voce examination.

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 the project work, the students will be able to:

- Gain Domain knowledge and technical skill set required for solving industry /research problems
- Provide solution architecture, module level designs, algorithms.
- Implement, test and deploy the solution for the target platform Conduct an engineering project.
- Implement, test and deploy the solution for the target platform.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO
Mapping outcome	3	3	3	3	3	3	3	3	3	3	3	3	3

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-ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CREDIT SUMMARY

B.E. COMPUTER SCIENCE AND ENGINEERING

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	-	-	-	-	-	-	-	-	-
BS	-	-	-	-	-	-	-	-	-
ES	-	-	-	-	-	-	-	-	-
PC	-	-	3	3	3	4	-	-	13
PE	-	-	-	-	-	-	-	-	-
OE	-	-	-	-	-	-	-	-	-
EEC	-	-	-	-	-	-	6	-	6
MC	-	-	-	-	-	-	-	-	-
Total	-	-	3	3	3	4	6	-	19


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CURRICULUM

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

(MINOR/HONOURS DEGREE- CYBER SECURITY)

Curriculum and Syllabi

B.E. – COMPUTER SCIENCE AND ENGINEERING

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
THEORY									
23CSCT01	Essentials of Information Security	PC	3	0	0	3	40	60	100
23CSCT02	Modern Crypto Systems	PC	3	0	0	3	40	60	100
23CSCT03	Cryptocurrency and Blockchain Technologies	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23CSCE01	Cyber Crypto Systems	PC	3	0	2	4	50	50	100
EMPLOYABILITY ENHANCEMENT COURSE									
23CSCP01	Project Work	EEC	0	0	10	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





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SEMESTER III		
23CSCT01	ESSENTIALS OF INFORMATION SECURITY	L T P C
		3 0 0 3

OBJECTIVES

- To Introduce the fundamental principles of information security, and the CIA triad.
- To Provide knowledge of modern cryptographic techniques and operational security practices for protecting information in various states.
- To Familiarize the students with physical security controls, network security mechanisms, and security tools used to safeguard information systems.
- To Enable students to understand operating system hardening, application security, and secure software development practices.
- To Develop students' understanding of information security auditing, governance, compliance frameworks for organizational security.

UNIT I THE CIA TRIAD 9

Confidentiality - Integrity & Availability - what is Information Security? Identification and Authentication- Authorization and Access Control -Auditing and Accountability.

UNIT II CRYPTOGRAPHY, OPERATIONS SECURITY 9

Modern Cryptography Tools- Protecting Data at rest-In motion- And In Use- Origins Of Operations Security- The Operations Security Process- Laws Of Operations Security-Operations Security in our Personal Lives.

UNIT III PHYSICAL SECURITY AND NETWORK SECURITY 9

Introduction- Physical Security Controls- Protecting People- Data and Equipment. Protecting Networks- Protecting Network Traffic- Network Security Tools.

UNIT IV OPERATING SYSTEM AND APPLICATION SECURITY 9

Operating System Hardening- Protecting Against Malware-Software Firewalls and Host Intrusion Detection - Operating System Security Tools - Software Development Vulnerabilities- Web Security- Database Security- Application Security Tools.

UNIT V INFORMATION SECURITY AUDIT AND GOVERNANCE 9

Change and Security Implications - System Models- Targets and Methods- Log Management- Data Aggregation and Reduction - Notifications and Reporting- Monitoring and Control Challenges- Auditing Standards- SAS 70 Audits- Sarbanes -Oxley - Addressing Multiple Regulations for Information Security Technical Frameworks for IT Audits - Intelligence and Compliance-Management and Governance.

TOTAL : 45 PERIODS





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OUTCOMES

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

- Explain the fundamental principles of information security, including the CIA triad, authentication, authorization, access control, auditing, and accountability.
- Apply cryptographic techniques and operational security principles to protect information during storage, transmission, and processing.
- Analyze physical and network security mechanisms, security controls, and protection tools to secure organizational infrastructure.
- Analyze operating system security, application security, malware protection, web security, and security tools to mitigate cyber threats.
- Analyze information security auditing, governance, compliance standards, monitoring techniques for maintaining secure information systems.

TEXT BOOKS

1. "Information Security Fundamentals" by IBM ICE Publications, 2016.
2. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, "Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives", CRC Press, 2018.

REFERENCES

1. James Graham, Richard Howard and Ryan Otson, "Cyber Security Essentials, CRC Press.
2. Chwan- Hwa(john) Wu, J. David Irwin, "Introduction to Cyber Security", CRC Press T&F Group.

E- RESOURCES

1. <https://www.classcentral.com/course/swayam-introduction-to-cyber-security-14116> (Cyber Security)
2. <https://www.futurelearn.com/courses/introduction-to-cyber-security> (Introduction to Cyber Security)

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	-	3	3	-	-	-	-	-	-	3	3
3	-	-	2	-	3	-	-	-	-	-	-	3	3
4	-	-	2	-	3	2	-	-	-	-	2	3	3
5	-	-	-	-	-	3	2	-	-	2	2	-	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	0.6	0.8	0.8	0.6	1.8	1	0.4	-	-	0.4	0.8	2.4	2.4

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





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SEMESTER IV

23CSCT02

MODERN CRYPTO SYSTEMS

L T P C
3 0 0 3

OBJECTIVES

- To Impart the fundamental concepts and principles of modern cryptography and cryptanalysis techniques
- To Provide knowledge of symmetric-key cryptographic algorithms, block and stream ciphers, and encryption techniques for ensuring data confidentiality.
- To Foster asymmetric cryptographic algorithms and secure key exchange mechanisms for secure communication.
- To Enable students to understand cryptographic hash functions, message authentication codes, and mechanisms for ensuring data integrity and authenticity.
- To Develop students' ability to understand secure hash algorithms, digital signature techniques, authentication protocols, and their applications in modern information security.

UNIT I INTRODUCTION TO CRYPTOGRAPHY

9

Overview Of Cryptography-Historical development-Basic terminology and concepts-Classical cryptosystems- Cryptanalysis techniques.

UNIT II SYMMETRIC-KEY CRYPTOGRAPHY

9

Definition – Substitution ciphers – Transposition ciphers - Stream and block ciphers - A5, RC4 - Characteristics of good ciphers - Data Encryption Standard (DES) – International Data Encryption Algorithm – Advanced Encryption Standard – Block cipher modes of operation – Confidentiality using symmetric encryption.

UNIT III ASYMMETRIC CRYPTOGRAPHY

9

Introduction to Public-Key Cryptography-RSA Cryptosystem-Diffie-Hellman Key Exchange-Elliptic Curve Cryptography (ECC)-Digital Signatures-Public-Key Infrastructure (PKI)-Applications of Asymmetric Cryptography.

UNIT IV HASH FUNCTIONS AND MESSAGE AUTHENTICATION CODES

9

Hash Functions and their Properties-Cryptographic Hash Functions-Applications of Hash Functions-HMAC (Hash-Based Message Authentication Code)-Security Properties of MACs-Applications of MACs in Network Security.





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UNIT V HASH AND DIGITAL SIGNATURES

9

MD5 Message Digest Algorithm – Secure Hash Algorithm (SHA) –RIPMED160 - HMAC - Digital Signatures – Authentication Protocols – Digital Signature Standard (DSS).

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the fundamental concepts, historical development, classical cryptosystems and cryptanalysis techniques in modern cryptography.
- Apply Symmetric-key cryptographic techniques, including DES, IDEA, AES, stream and block ciphers and block cipher modes of operation for ensuring confidentiality.
- Apply Asymmetric cryptographic algorithms such as RSA, Diffie–Hellman and Elliptic Curve Cryptography for secure communication and key management.
- Analyze Cryptographic hash functions and message authentication codes (MACs), including HMAC, for data integrity and authentication in network security.
- Analyze properties of cryptographic hash functions and digital signatures to ensure data security.

TEXT BOOKS

1. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
2. William Stallings, "Cryptography and Network Security", Prentice Hall, New Delhi, 2006.

REFERENCES

1. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, New Delhi, 2020.
2. Jonathan Katz, Yehuda Lindell, "Introduction to Modern Cryptography", Chapman & Hall/CRC, New York, 2017.

E – RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc20_cs21/preview\(Introduction\)](https://onlinecourses.nptel.ac.in/noc20_cs21/preview(Introduction))
2. <http://nptel/cryptography-and-network-security.html>(Cipher Text)





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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	-	-	-	2	1	1	2	1
2	1	3	2	1	2	-	-	-	3	2	2	2	1
3	1	1	2	3	2	-	-	-	1	1	1	1	1
4	3	1	2	1	3	-	-	-	3	1	1	3	2
5	2	3	3	3	3	-	-	-	3	1	1	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2.2	2.4	2.2	2.2	-	-	-	2.4	1.2	1.2	2	1.2

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


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SEMESTER V		
23CSCT03	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L T P C 3 0 0 3

OBJECTIVES

- To Introduce the fundamental concepts, architecture, cryptographic principles, and data structures underlying in Blockchain technology.
- To Provide knowledge of cryptocurrencies, Bitcoin architecture, blockchain protocols, and consensus mechanisms used in decentralized systems.
- To Foster various blockchain models, permissioned and permissionless networks, and distributed ledger technologies.
- To Enable students to understand the architecture, components, and smart contract development of Hyperledger Fabric and Ethereum platforms.
- To Develop students' ability to analyze and apply blockchain technologies for developing secure decentralized applications.

UNIT I INTRODUCTION TO BLOCKCHAIN 9

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree.

UNIT II BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

UNIT III BITCOIN CONSENSUS 9

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW, monopolyproblem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT IV HYPERLEDGER FABRIC & ETHEREUM 9

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.





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UNIT V BLOCKCHAIN APPLICATIONS

9

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, etc- Case Study.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the architecture, cryptographic foundations, and data structures of Blockchain technology.
- Analyze the Bitcoin architecture, cryptocurrency concepts, blockchain protocols, and consensus algorithms for secure decentralized transactions.
- Analyze different blockchain consensus mechanisms, mining techniques, permissioned blockchain models, and their applications in distributed systems.
- Analyze Hyperledger Fabric, Ethereum, and smart contracts to implement blockchain solutions for decentralized application development.
- Design blockchain-based solutions for real-world applications such as supply chain management, finance, banking, insurance, logistics, smart cities, and other decentralized systems.

TEXT BOOKS

1. Bashir and Imran, "Mastering Blockchain", Second Edition, 2017.
2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2019.

REFERENCES

1. Daniel Drescher, "Blockchain Basics", Apress, First Edition, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. "Bitcoin and cryptocurrency technologies: a comprehensive introduction", Princeton University Press, 2016.

E- RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc22_cs44/preview\(Blockchain and its applications\)](https://onlinecourses.nptel.ac.in/noc22_cs44/preview(Blockchain and its applications))
2. [https://archive.nptel.ac.in/courses/106/105/106105184 \(Blockchain architecture and use\)](https://archive.nptel.ac.in/courses/106/105/106105184 (Blockchain architecture and use))





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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	2	-	-	-	2	-	-	-	-	-	3	2
3	-	-	2	2	3	-	-	-	-	-	-	2	3
4	-	-	2	-	3	-	-	-	-	-	2	-	3
5	-	-	3	-	-	2	-	-	-	2	2	-	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.2	0.8	1.4	0.4	1.2	0.8	-	-	-	0.4	0.8	1.6	2.2

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


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23CSCE01

SEMESTER VI CYBER CRYPTO SYSTEMS

L T P C
3 0 2 4

OBJECTIVES

- To Introduce the fundamentals of cyber space, cybercrime, digital forensics for investigating digital incidents.
- To Provide knowledge of digital forensic investigation methodologies, evidence acquisition techniques, file systems, and forensic analysis procedures.
- To Foster the knowledge of digital evidence collection, preservation, forensic standards, chain of custody, and the use of forensic tools for cybercrime investigations.
- To Enable students to understand cyber laws, ethical practices, legal frameworks, and reporting standards applicable to digital investigations.
- To Develop students' skills in using digital forensic tools, forensic imaging techniques to investigate cyber incidents
- To provide practical exposure on digital forensic investigation, evidence acquisition, cybercrime analysis, forensic tools and techniques for investigating and validating real-world cyber incidents.

UNIT I INTRODUCTION TO FORENSICS

9

Classifications of Cyber Crimes against individuals - property and nation - Need for Digital forensics and steps in digital forensics (scientific methods) - Number System: Binary - Decimal- Hexadecimal - ASCII and Unicode representation of data - Arenas for digital forensics: disk-network- wireless - database- mobile - e-mail - GPS and memory - Incident handling and response with forensic triage - Ethical Hacking and future of cyber crime.

UNIT II INVESTIGATION

9

Locard's exchange principle and digital forensic investigation models - types: artifacts - identifying raw and proprietary forensic storage formats - identification of potential evidence: slack space - swap space - steganography - recovery of hidden - deleted and corrupt data - standard file formats with their headers and forensic file carving - planning your investigation - order of volatility and forensic triage - overview of file systems.

UNIT III EVIDENCE COLLECTION AND FORENSIC TOOLS

9

Rules of collecting Digital Evidence - Standard collection procedures: seizure - write blockers - bit-stream imaging - hashing - Chain of Custody (COC) - evidence bags and SOP for collecting evidences - Source and Location of Digital Evidences - Duplicating and Preserving Digital Evidences - Importance of MAC timings -Types of System logs and Windows Registry





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UNIT IV CYBER LAWS

9

Forensic laboratory requirements: setting up of lab - evaluating lab staff - selection of appropriate forensic workstations - backup and recovery plans - generating forensically sound reports. - IPR and Cyber Laws in India - IT Act 2000 and 2008 Amendment and like - minded IPC sections, Code of Ethics - Expert Witness and analyzing sample forensic reports.

UNIT V ANALYSIS AND VALIDATION

9

Validating and gathering evidence using DOS Commands and Unix/Linux Commands - Forensic imaging using DD commands - Software tools - Open Source and proprietary digital forensic frameworks - Hardware tools - write blockers - images and evidence protection containers/bags - NIST tools - CFReDS - CTFF and NSRL and analyzing e-mail headers and network packets.

LIST OF EXPERIMENTS

1. Recovering Graphics Files
2. Digital Forensics Analysis and Validation
3. Virtual Machine Forensics
4. Live Acquisitions, and Network Forensics
5. Email/Social Media Investigations
6. Mobile Device Forensics
7. Disk Forensics and Data Recovery
8. Steganography
9. Key loggers
10. Network monitors

TOTAL : 45+15=60 PERIODS

OUTCOMES

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

- Implementation of various computer forensic tools in real time applications.
- Explain the concepts of cybercrime, digital forensics, cyber forensics and forensic investigation techniques.
- Analyze and perform digital forensic investigations, and examining digital evidence using standard forensic methodologies.
- Apply forensic tools, evidence collection procedures, chain of custody practices, and forensic analysis techniques to investigate cybercrime incidents.
- Analyze cyber laws, ethical guidelines, legal procedures, and reporting standards related to digital forensic investigations.
- Examine the digital forensic tools and frameworks to perform disk, memory, mobile, email, network, and malware investigations for real-world cyber security applications.





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- Implement cyber forensics techniques to analyze, validate digital evidences for investigating computer, network, mobile, email, and cybercrime incidents in real-world environments.

TEXT BOOKS

1. E. Casey, "Handbook of Digital Forensics and Investigation", Academic Press, 2010.
2. David Cowen, "Computer Forensics: A Beginners Guide", McGraw Hill Education, 2013.

REFERENCES

1. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Fourth Edition, 2014.
2. Brian Carrier, "File System Forensic Analysis", Pearson, 2016.
3. Marjie T. Britz, "Computer Forensics and Cyber Crime", Pearson, 2018.

E- RESOURCES

1. https://onlinecourses.swayam2.ac.in/cec21_ge10/preview (Digital Forensics)
2. https://onlinecourses.swayam2.ac.in/cec22_lw07/preview/ (Cyber Crime Administration)

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	-	-	2		2	2	-	-	-	-	-	3
3	-	-	2	-	3	2	-	-	-	-	-	2	3
4	-	-	-	-	-	3	3	-	-	2	-	-	3
5	-	-	2	-	3	-	-	-	-	-	2	-	3
6	-	-	-	3	3	-	-	-	-	-	2	3	3
AVG	1	0	1	1	2	1	1	-	-	-	1	1	3

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


Chairman - BoS





SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS)

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23CSCP01

SEMESTER VII
PROJECT WORK

LT PC
0 0 12 6

OBJECTIVES

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To utilize new tools, algorithms and mechanisms that contribute to obtain the solution.
- To test and validate the results obtained through conformance.
- To prepare project report and to face reviews and viva voce examination.
- To develop the ability to take up the challenging practical problems.

GUIDELINES

The students in a group of 3 to 4 works on a topic approved by the Head of the Department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOMES

On Completion of the project work, the students will be able to:

- Develop the ability to solve a specific problem till the successful solution of the same.
- Utilize new tools, algorithms and mechanisms that contribute to obtain the solution.
- Test and validate the results obtained through conformance.
- Prepare project report and to face reviews and viva voce examination.
- Take up any challenging practical problems and find the solution by formulating proper methodology.

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

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CURRICULUM AND SYLLABI FOR B.E. / B.Tech. DEGREE PROGRAMMES MINOR DEGREE/HONOURS-CYBER SECURITY CREDIT SUMMARY

B.E. COMPUTER SCIENCE AND ENGINEERING

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	-	-	-	-	-	-	-	-	-
BS	-	-	-	-	-	-	-	-	-
ES	-	-	-	-	-	-	-	-	-
PC	-	-	3	3	3	4	-	-	13
PE	-	-	-	-	-	-	-	-	-
OE	-	-	-	-	-	-	-	-	-
EEC	-	-	-	-	-	-	6	-	6
MC	-	-	-	-	-	-	-	-	-
Total	-	-	3	3	3	4	6	-	19


Chairman - BoS

