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

ESTD 2001

ISO 9001 REGISTERED

CURRICULUM & SYLLABI

B.E. COMPUTER SCIENCE AND ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

REGULATIONS – 2023

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

Estd : 2001

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

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DEPARTMENT

OF

COMPUTER SCIENCE AND ENGINEERING

REGULATIONS 2023

CURRICULUM AND SYLLABI

FOR B.E.–COMPUTER SCIENCE AND ENGINEERING

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

FIRST SEMESTER

TO

EIGHTH SEMESTER

INDEX

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SCHEME FOR CURRICULUM

B.E.-Computer Science and Engineering

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

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

B.E-COMPUTER SCIENCE AND ENGINEERING

VISION

- To become a prominent in furistic technologies of Computer Science and Engineering and producing competent professionals with research and innovation skills, inculcating moral values and societal concerns.

MISSION

- To impart high quality technical education and knowledge for uplift our students to become sound professional engineers with and moral values.
- To produce best quality computer science professionals and researchers by providing state-of-the-art training, hands on experience and healthy research environment.
- To provide learning ambience to generate innovative and problem solving skills with Professionalism
- To empower the students with the required skills to solve the complex technological problems of modern society and also provide them with a framework for promoting collaborative and multidisciplinary activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can be

- ✓ Proficient in applying their technical competence in computer science for identifying, formulating, and solving real world problems, with technical and people leadership.
- ✓ Expertise in cutting edge research techniques and develop solutions on problems of social relevance by applying new ideas and technologies as the field evolves.
- ✓ Employed in industries/research organizations, exhibiting team skills, managerial roles, work ethics, adaptability and lifelong learning.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9	**Individual and team work**:	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**:	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOME (PSOs)

Students can have the:

PSO1	Ability to understand the fundamental concepts, analyze, design, develop, implement using mathematical foundations and domain knowledge for providing computational solutions to new ideas and innovations.
PSO2	Ability to work and communicate effectively in a team environment and foster the algorithmic skills towards industrial and societal needs.
PSO3	Ability to grasp the advancements in computing and creating a career path to become an entrepreneur, lifelong learner with moral values and ethics.

MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course Name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	23HST101 - Professional English - I	-	-	-	-	-	1.4	2.2	1.3	1.8	3	-	3	-	-	-
		23MAT101 - Matrices and calculus	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
		23HST102 - தமிழர்மரபு/ Heritage of Tamils															
		23PHE102 - Applied Physics for Computer Engineering	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
		23CYE101 - Engineering Chemistry	1.6	1.6	2.4	1.3	1.8	1	2	-	-	-	-	1.5	-	-	-
		23GEE101 - Programming in C	2	2	2	1	2	1	1	1	2	-	3	2	2	2	-
		23EEC101 - Soft Skills															
		23MDC101 - Induction Program (2 Weeks)															
	II	23HST201 - Professional English - II	-	-	-	-	-	1.4	2.2	1.3	1.8	3	-	3	-	-	-
		23MAT202 - Statistics and Numerical Methods with MAT Lab	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
		23PHT202 - Advanced Physics for Computer Engineering	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
		23CYT201 - Environmental Sciences and Sustainability	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-
		23HST202- தமிழரும்தொழில்நுட்பமும் / Tamils and Technology															
		23GEE201 - Engineering Graphics	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
		23EEE202 - Basic Electrical And Electronics Engineering	3	3	3	2.8	3	-	-	-	3	2	-	3	3	1	2
		23GEL201 - Engineering Practices Laboratory	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
		23EEC201 - Communication Skills/Foreign Language	-	-	-	-	-	1.2	1.5	1.5	1.8	3	-	3	-	-	-

		23MDC201 - Life skills & Leadership Enhancement Programme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course Name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
II	III	23MAT303 - Discrete Mathematics	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
		23CST301 - Data Structures and Algorithms	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
		23CST302-Operating Systems	2	2	2	1	-		-	-	-	2	2	2	2	1	2
		23CSE301-Object Oriented Programming	2	1	2	2	2	-	-	-	2	2	1	2	3	2	2
		23GEE301-Problem Solving and Python Programming	2	3	3	3	2	-	-	-	-	-	2	2	3	3	-
		23ECE301- Digital Priniciples and Computer Architecture	3	2	2	3	2	2	-	-	-	-	2	2	3	3	2
		23EEC301 - Professional Development															
	IV	23CST401-Distributed Computing	1.8	2.4	1.8	2.4	2	-	-	-	2.6	2.2	2.2	1.6	2	1.8	1.6
		23CST402-Automata Theory	1.8	1.6	2.4	0.6	0.4	-	-	-	0.8	0.8	0.8	0.8	2.8	2.2	3
		23CST403-Foundations of Data Science	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
		23CSE401-Artificial Intelligence and Machine Learning	2	1	2	2	1				2	2	2	3	2	2	2
		23CSE402-Database Management Systems	2	2	3	2	1	-	-	-	2	2	2	2	2	2	3
		23ITE501-Full Stack Web Development	1.8	2.4	1.8	-	-	-	-	-	-	-	-	-	2	1.8	1.6
		23EEC401 - Value Added Course - I															

CURRICULUM AND SYLLABI

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	TOT
THEORY									
23HST101	Professional English - I	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	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
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

B.E - COMPUTER SCIENCE AND ENGINEERING - SECOND SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
THEORY									
23HST201	Professional English II	HS	3	0	0	3	40	60	100
23MAT201	Statistics and Numerical Methods with MAT Lab	BS	3	1	0	4	40	60	100
23PHT202	Advanced Physics for Computer Engineering	BS	3	0	0	3	40	60	100
23CYT201	Environmental Sciences 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									
23GEE201	Engineering Graphics	ES	3	0	2	4	50	50	100
23EEE202	Basic Electrical and Electronics Engineering	ES	3	0	2	4	50	50	100
PRACTICALS									
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC201	Communication Skills/Foreign Language	EEC	0	0	4	2	100	-	100
MANDATORY COURSE									
23MDC201	Life Skill &Leadership Enhancement Programme	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER - II			26						

HS : Humanities and Social Sciences
BS : Basic Sciences
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PE : Professional Elective
OE : Open Elective
GE : General Elective
EEC : Employability Enhancement Courses
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P : Practical
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CIA : Continuous Internal Assessment
ESE : End Semester Examination
TOT : Total

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	TOT
THEORY									
23MAT303	Discrete Mathematics	BS	3	1	0	4	40	60	100
23CST301	Data Structures and Algorithms	PC	3	0	0	3	40	60	100
23CST302	Operating Systems	PC	3	0	0	3	40	60	100
EMBEDDED COURSE									
23CSE301	Object Oriented Programming	PC	3	0	2	4	50	50	100
23GEE301	Problem Solving and Python Programming	ES	3	0	2	4	50	50	100
23ECE303	Digital Priniciples and Computer Architecture	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
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GE : General Elective
EEC : Employability Enhancement Courses
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C : Credit Point
CIA : Continuous Internal Assessment
ESE : End Semester Examination
TOT : Total

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	TOT
THEORY									
23CST401	Distributed Computing	PC	3	0	0	3	40	60	100
23CST402	Automata Theory	PC	3	1	0	4	40	60	100
23CST403	Foundations of Data Science	PC	3	0	0	3	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	Value Added Course-I	EEC	0	0	4	2	100	-	100
TOTAL CREDITS IN SEMESTER - IV			24						

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

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	TOT
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	Value Added Course-II	EEC	0	0	4	2	100	-	100
MANDATORY COURSE									
23MDC501	Mandatory Course-I	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER - V			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

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 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									
23CSJ601	Project Work	EEC	0	0	10	5	40	60	100
MANDATORY COURSE									
23MDC601	Mandatory Course-II	MC	3	0	0	0	-	-	-
TOTAL CREDITS IN SEMESTER- VI			25						

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

B.E - COMPUTER SCIENCE AND ENGINEERING - SEVENTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100
	Elective-Management	GE	3	0	0	3	40	60	100
	Open Elective – II / NCC L2 / L4	OE	3	0	0	3	40	60	100
	Open Elective - III	OE	3	0	0	3	40	60	100
EMPLOYABILITY ENHANCEMENT COURSE									
23EEC701	Research Paper Writing and Publication	EEC	0	0	4	2	100	-	100
TOTAL CREDITS IN SEMESTER - VII			14						

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

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	TOT
EMPLOYABILITY ENHANCEMENT COURSE									
23CSJ801	Innovative Product Development	EEC	0	0	14	7	40	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100
TOTAL CREDITS IN SEMESTER - VIII			9						

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 (HS) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HST101	Professional English - I	HS	3	0	0	3	40	60	100
23HST102	தமிழர்மரபு/Heritage of Tamils	HS	1	0	0	1	40	60	100
23HST201	Professional English II	HS	3	0	0	3	40	60	100
23CYT201	Environmental Sciences and Sustainability	HS	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும் / 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 (BS) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MAT101	Matrices and Calculus	BS	3	1	0	4	40	60	100
23PHE102	Applied Physics for Computer Engineering	BS	3	0	2	4	50	50	100
23CYE101	Enginnering Chemistry	BS	3	0	2	4	50	50	100
23MAT201	Statistics and Numerical Methods with MAT Lab	BS	3	1	0	4	40	60	100
23PHT202	Advanced Physics for Computer Engineering	BS	3	0	0	3	40	60	100
23PHT201	Solid State Physics and Nano Electronic Devices	BS	3	0	0	3	40	60	100
23MAT301	Discrete Mathematics	BS	3	1	0	4	40	60	100

LIST OF ENGINEERING SCIENCES (ES) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
23GEE201	Engineering Graphics	ES	3	0	2	4	50	50	100
23EEE202	Basic Electrical and Electronics Engineering	ES	3	0	2	4	50	50	100
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100
23GEE301	Problem Solving and Python Programming	ES	3	0	2	4	50	50	100
23ECE303	Digital Priniciples and Computer Organization	ES	3	0	2	4	50	50	100

LIST OF PROFESSIONAL CORE (PC) COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23CST301	Data Structures and Algorithms	PC	3	0	0	3	40	60	100
23CST302	Operating Systems	PC	3	0	0	3	40	60	100
23CSE301	Object Oriented Programming	PC	3	0	2	4	50	50	100
23CST401	Distributed Computing	PC	3	0	0	3	40	60	100
23CST402	Automata Theory	PC	3	1	0	4	40	60	100
23CST403	Foundations of Data Science	PC	3	0	0	3	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

LIST OF PROFESSIONAL ELECTIVE (PE) COURSES

Professional Elective – I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	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	C	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
23CSP509	UI and UX Design	PE	3	0	0	3	40	60	100
23CSP510	Software Testing and Automation	PE	3	0	0	3	40	60	100
23CSP511	Web Application Security	PE	3	0	0	3	40	60	100
23CSP512	DevOps	PE	3	0	0	3	40	60	100

Professional Elective – III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23ITP504	Internet of Things	PE	3	0	0	3	40	60	100
23CSP513	Virtualization	PE	3	0	0	3	40	60	100
23ITP505	StorageTechnologies	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 and Mobile 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	Cryptocurrency and BlockchainTechnologies	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

Professional Elective – VI

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	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	OptimizationTechniques	PE	3	0	0	3	40	60	100
23CSP611	Game Theory	PE	3	0	0	3	40	60	100
23CSP612	Ethics and AI	PE	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVE COURSES

OPEN ELECTIVES - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23MEO601	Introduction to Industrial Engineering	OE	3	0	0	3	40	60	100
23ECO602	Fundamentals of Electronic Devices and Circuits	OE	3	0	0	3	40	60	100
23EEO603	Electric Vehicle Technology	OE	3	0	0	3	40	60	100
23EEO604	Renewable Energy System	OE	3	0	0	3	40	60	100
23MEO605	Resource Management Technique	OE	3	0	0	3	40	60	100
23MAO606	Graph Theory	OE	3	0	0	3	40	60	100
23CEO607	Environmental and Social Impact Assessment	OE	3	0	0	3	40	60	100
23PMO608	Pharamaceutical Nanotechnology	OE	3	0	0	3	40	60	100
23RAO609	Foundation of Robotics	OE	3	0	0	3	40	60	100
23CSO610	Introduction to Drone Technologies	OE	3	0	0	3	40	60	100
23MDO611	Biomolecules	OE	3	0	0	3	40	60	100
23CSO612	Cyber Forensics and Ethical Hacking	OE	3	0	0	3	40	60	100

OPEN ELECTIVES- II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HSO701	English for Competitive Examinations	OE	3	0	0	3	40	60	100
23MGO702	Democracy and Good Governance	OE	3	0	0	3	40	60	100
23MEO703	Fundamentals of Mechatronics	OE	3	0	0	3	40	60	100
23CEO704	Remote Sensing Concepts	OE	3	0	0	3	40	60	100
23MEO704	Nano Technology	OE	3	0	0	3	40	60	100
23MDO705	Ultrasound Principles and its Medical Applications	OE	3	0	0	3	40	60	100
23PMO706	IPR For Pharma Industry	OE	3	0	0	3	40	60	100
23RAO707	Concepts in Mobile Robots	OE	3	0	0	3	40	60	100
23ECO708	Energy Technology	OE	3	0	0	3	40	60	100
23EEO709	Sensors and Actuators	OE	3	0	0	3	40	60	100
23MAO710	Probability and Queuing Theory	OE	3	0	0	3	40	60	100
23CSO711	Introduction to Cyber Security	OE	3	0	0	3	40	60	100
23MEO712	3D Printing and Design	OE	3	0	0	3	40	60	100

OPEN ELECTIVES - III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23HSO713	Project Report Writing	OE	3	0	0	3	40	60	100
23MAO714	Advanced Numerical Methods	OE	3	0	0	3	40	60	100
23CSO715	Fundamentals of Blockchain Technology	OE	3	0	0	3	40	60	100
23EEO716	Electrical,Electronic and Magnetic Materials	OE	3	0	0	3	40	60	100
23CEO717	Geographical Information System	OE	3	0	0	3	40	60	100
23ECO718	VLSI Design	OE	3	0	0	3	40	60	100
23MDO719	Wearable Technology	OE	3	0	0	3	40	60	100

23MEO720	Additive Manufacturing	OE	3	0	0	3	40	60	100
23RAO721	Nanomaterials and Application	OE	3	0	0	3	40	60	100
23MGO722	Cost Management of Engineering Projects	OE	3	0	0	3	40	60	100
23HSO723	Food Safety and Quality Regulations	OE	3	0	0	3	40	60	100
23MDO724	Lifestyle Diseases	OE	3	0	0	3	40	60	100

GENERAL ELECTIVES

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

ELECTIVE - MANAGEMENT

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

LIST OF EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23EEC201	Communication Skills/Foreign Language	EEC	0	0	4	2	100	-	100
23EEC201	Communication Skills/Foreign Language	EEC	0	0	4	2	100	-	100
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
23EEC401	Value Added Course-I	EEC	0	0	4	2	100	-	100
23EEC501	Value Added Course-II	EEC	0	0	4	2	100	-	100
23CSJ601	Project Work	EEC	0	0	10	5	40	60	100
23EEC701	Research Paper Writing and Publication	EEC	0	0	4	2	100	-	100
23CSJ801	Innovative Product Development	EEC	0	0	14	7	40	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100

LIST OF MANDATORY COURSES

MANDATORY COURSES - I

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

MANDATORY COURSES - II

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

CURRICULUM AND SYLLABI

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

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

CREDIT SUMMARY

B.E. COMPUTER SCIENCE AND ENGINEERING

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	4	7	–	–	-	–	3	–	14
BS	12	7	4	-	-	–	–	–	23
ES	4	10	8	-	–	–	-	–	22
GE	-	-	-	-	-	-	3	-	3
PC	–	-	10	22	12	8	-	–	52
PE	–	–	–	–	9	9	-	-	18
OE	–	–	–	–	–	3	6	-	9
EEC	1	2	1	2	2	5	2	9	24
MC	–	–	–	–	–	–	–	–	–
Total	21	26	23	24	23	25	14	9	165

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

SCHEME FOR SYLLABI

B.E.-Computer Science and Engineering

DSEMESTER I

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

OBJECTIVES

- To develop learning English language through grammar.
- To use grammar efficiently for demonstrating all the four language skills (LSRW).
- To write business letters, dialogue writing, paragraph and essay writing.
- To speak effectively about self introduction and real time situation.
- To build the reading skills through reading comprehension and note taking.

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

Mandatory activity: Self Introduction

OUTCOMES

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

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

TEXT BOOKS

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

REFERENCES

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

E-RESOURCES

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	3	1	2	3	-	3	-	-	-
2	-	-	-	-	-	1	2	-	1	3	-	3	-	-	-
3	-	-	-	-	-	3	3	2	3	3	-	3	-	-	-
4	-	-	-	-	-	1	2	1	2	3	-	3	-	-	-
5	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.40	2.20	1.25	1.80	3.00	-	3.00	-	-	-

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

23MAT101 **MATRICES AND CALCULUS** **LT P C**

(Common to all B.E./ B.Tech. Branches) **3 1 0 4**

OBJECTIVES

- To develop the use of matrix algebra techniques those are needed by engineers for practical applications.
- To familiarize the students with differential and integral calculus.
- To describe the student with functions of several variables.
- To acquire the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines.

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, Students will be able to:

- Classify the matrix algebra methods for solving practical problems.
- Discover differential calculus tools in solving various application problems and compare different methods of integration in solving practical problems.
- Develop differential calculus ideas on several variable functions.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.
- Solve engineering problems using the concept of vector calculus.

LIST OF TUTORIALS

1. Computation of Eigen values and Eigen vectors.
2. Calculate differentiation and integration of simple functions.
3. Determining Maxima and minima of functions for two variables.
4. Evaluating double and triple integrals.
5. Computing Gradient, divergence and curl of point functions.

TOTAL: 45+15=60 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, 2013.

E-RESOURCES

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
2	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
3	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
4	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
5	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-

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

23HST102 HERITAGE OF TAMILS LT P C
1 0 0 1

UNIT I LANGUAGE AND LITERATURE 3

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

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

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

UNIT III FOLK AND MARTIAL ARTS 3

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

UNIT IV THINAI CONCEPT OF TAMILS 3

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

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

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

TOTAL: 15 PERIODS

TEXT BOOKS

1.Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2.Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3.Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4.The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

5.Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6.Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
7.Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

REFERENCE BOOKS

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

23HST102 **தமிழர் மரபு** **LT PC**
1 0 0 1

அலகு I மொழி மற்றும் இலக்கியம் **3**

இந்திய மொழி குடும்பங்கள்- திராவிட மொழிகள் -தமிழ் ஒரு செம்மொழி -தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தில் சமய சார்பற்ற தன்மை- சங்க இலக்கியத்தில் பகிர்தல் அறம்- திருக்குறளில் மேலாண்மை கருத்துக்கள் -தமிழ் காப்பியங்கள்- தமிழகத்தில் பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள் -தமிழில் நவீன இலக்கியம் வளர்ச்சி -தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

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

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

அலகு III நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள் **3**

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

அலகு IV தமிழர்களின் திணைகோட்பாடுகள் **3**

தமிழகத்தின் தாவரங்களும் , விலங்குகளும் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறகோட்பாடுகள்-தமிழர்கள் போற்றிய அறக்கோட்பாடு -சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவு,கல்வியும்- சங்க கால நகரங்களும் துறை முகங்களும் -சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி -கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு

3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு- இந்தியாவின் பிறபகுதிகளில் தமிழ்பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்தமருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிகள் -தமிழ் புத்தகங்களின் வரலாறு

TOTAL: 15 PERIODS

TEXT BOOKS

1.தமிழக வரலாறு -மக்களும் பண்பாடும் -கே கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2.கணினி தமிழ் -முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்)

3.கீழடி -வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4.பொருநை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCES

1.தமிழர் மரபு -முனைவர் ஆ பூபாலன் (வி ஆர்பி பி பப்ளிஷர்ஸ்)

23PHE102 APPLIED PHYSICS FOR COMPUTER ENGINEERING **L T P C**

(Common to CSE, CSE-SC, IT and AI&DS) **3 0 2 4**

OBJECTIVES

- To explore the principles of lasers and the uses for them in general.
- To Utilize Schrödinger's wave equation and the fundamentals of quantum mechanics to investigate the complicated physical phenomena.
- To understand the basic concepts of IC's and digital components.
- To enhance the knowledge on magnetic and optical storage devices.
- To learn the fundamentals of nano material's and synthesis methods.
- To observe the physical concept used in the fields of semiconductors, optics and electronics.

UNIT I PHOTONICS **9**

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

UNIT II QUANTUM PHYSICS **9**

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

UNIT III FUNDAMENTALS OF DIGITAL ELECTRONICS AND LOGIC DESIGN **9**

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

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

UNIT IV DATA STORAGE MATERIALS **9**

PRIMARY STORAGE: Random Access Memory (RAM)– Static RAM – Dynamic RAM – Read only Memory (ROM) - **SECONDARY STORAGE** : Magnetic Disc Memories –Hard Disk Drive and Solid State Drive - **TERTIARY STORAGE** : Optical Data Storage Devices: Principle-Disc data storage-Structure and Operating Principle of CD-ROM – DVD - Blu-ray Disc - **OFF-LINE STORAGE** : Floppy Disk – Zip diskette – USB Flash drive – Memory card – **FUTURE STORAGE DEVICES (QUALITATIVE)** : Holographic data storage - DNA digital data storage - Helium Drives - Shingled Magnetic Recording (SMR) - non-volatile, random access memories (NVRAM) **-** Rack scale design - 5D Optical storage.

UNIT V INTRODUCTION TO NANO SCIENCE & NANOELECTRONICS 9

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) - Ball Milling- **NANO-ELECTRONIC TECHNOLOGIES** : Nano capacitors, Single electron transistors, Coulomb blockade, Nano lithography - Data storage – Nano Photonics - Nano Electronic and Magnetic Devices – Spintronics - Nanotechnology in Computer Science.

TOTAL: 45 PERIODS

OUTCOMES

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

- Learn the basics of lasers and their use in some applications.
- Apply the basic principles of quantum mechanics and Schrödinger's wave equation to study the complex physical phenomenon.
- Acquire knowledge and apply it to various electronic devices.
- Learn about storage mediums and devices.
- Understand the fundamentals of nano materials and various synthesize methods.
- Compose principles of elasticity, optics and semiconductor properties in engineering applications through experiments.

TEXT BOOKS

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

REFERENCES

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

E-RESOURCES

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

LIST OF EXPERIMENTS

(Common to CSE, CSE-SC, IT and AIDS)

(Eight Experiments are to be conducted in Lab)

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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

23CYE101 ENGINEERING CHEMISTRY L T P C

(Common to CSE, EEE, ECE, CSE (CS), MDE, AIDS, IT & PT) **3 0 2 4**

OBJECTIVES

- To classify the impurities of water and know the treatment and the conditioning methods for domestic and industrial uses.
- To develop an understanding the fundamentals of polymers.
- To gain knowledge the phase rule and its applications in engineering field.
- To explain the basics of Nano chemistry, synthesis, properties and applications of nano materials.
- To be familiar with the types of corrosion and control measures and working of batteries.
- 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 (colloidal, phosphate, calgon and carbonate conditioning methods) – External conditioning – Zeolite process, Demineralization process – Desalination of brackish water by reverse osmosis-Nano filtration - Municipality water treatment - Break point chlorination.

UNIT II POLYMER CHEMISTRY 9

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

UNIT III PHASE RULE AND ALLOYS 9

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

UNIT IV CHEMISTRY OF NANO MATERIALS 9

Nano chemistry – Basics (Surface area to volume ratio - Quantum confinement – 0D, 1D, 2D& 3D) - Distinction between molecules, nanoparticles and bulk materials- Characterization of nanomaterials using EDX and HR-TEM. Synthesis of nano materials: Top down approach - Ball milling - Bottom up approach - Sol-gel method, Chemical vapour deposition - Properties of nanomaterials and Applications of nanomaterials (Nano products of today).

UNIT V ELECTROCHEMISTRY, CORROSION AND ITS CONTROL 9

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

OUTCOMES

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

- Infer the quality of water and Identify the method of removal of impurities from water for domestic and industrial purpose.
- Identify the different types of polymers, polymerization processes and some special properties and applications of polymers.
- Apply the knowledge of phase rule to alloy making for various engineering applications.
- Discuss the fundamentals of the nano materials and apply the basic concepts of nano chemistry in engineering applications.
- Analyze the causes of corrosion, suggest the control measures and discuss the functions of batteries.
- Determine the water quality parameters and perform quantitative chemical analysis by pH metery, flame photometry, conductometry and potentiometry.

TOTAL:45 + 15 = 60 PERIODS

TEXT BOOKS

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

REFERENCES

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

E-RESOURCES

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

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.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	-	1	-	3	-	-	-	-	2	-	-	-
2	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
3	2	2	3	1	1	1	-	-	-	-	-	1	-	-	-
4	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-
5	2	1	2	1	3	-	1	-	-	-	-	-	-	-	-
6	2	3	-	2	3	-	-	-	-	-	-	-	-	-	-
AVG	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	-	1.5	-	-	-

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

23GEE101 **PROGRAMMING IN C** **L T P C**

(Lab Embedded Theory Course) **3 0 2 4**

OBJECTIVES

- To understand the constructs of C language.
- To study arrays and strings for developing C programs.
- To know the functions and pointers application in C programs.
- To understand the concepts of structures and Union.
- To understand input/output and file handling in C.
- To develop programs and applications using C.

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.

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.

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.

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.

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.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

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

TOTAL: 45 +15 = 60 PERIODS

OUTCOMES

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

- Build C programs for simple applications using basic constructs.
- Develop C programs using arrays and strings.
- Construct C programs involving functions, recursion and pointers
- Implement applications in C programs using structures.
- Develop applications in C using file processing.
- Develop applications using C programming constructs.

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., 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/ (Stack Operations)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	2	1	1	1	2	-	3	2	1	2	-
2	2	2	2	1	2	1	1	1	2	-	3	3	2	2	-
3	2	3	2	1	2	1	1	1	2	-	3	2	2	2	-
4	3	2	2	1	3	1	1	1	2	-	3	3	2	2	-
5	2	3	3	1	2	1	2	1	2	-	3	2	2	3	-
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	-
AVG	2.00	2.33	2.33	1.16	2.00	1.66	1.00	0.83	2.00	0.16	2.83	2.33	1.83	2.16	-

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

SEMESTER II

23HST201	**PROFESSIONAL ENGLISH - II**	**L T P C**
	(Common to all B.E. & B.Tech. Branches)	**3 0 0 3**

OBJECTIVES

- To use grammatical components effectively in written communication.
- To read and understand on comprehend technical writing.
- To develop skills for writing email, business letters, Job Application Letter and Resume.
- To write checklist, recommendation, transcoding graphics and letter.
- To speak fluently in real contexts.

UNIT I GRAMMER **9**

Articles - Prepositions - Compound words - Conditionals - Subject verb agreement - Active and Passive voice - Impersonal Passive Voice.

UNIT II LISTENING & READING **9**

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

UNIT III BUSINESS WRITING **9**

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

UNIT IV WRITING **9**

Checklist - Writing Recommendations - Transcoding Graphics - Bar Chart, Flow Chart, Pie Chart and Tables - Formal Letter Writing - inviting dignitaries and declining invitations.

UNIT V SPEAKING **9**

Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging - Suggesting - Comparing and Contrasting – Expressing - Finding out facts, attitudes and opinions - Situational Role-play.

TOTAL: 45 PERIODS

Mandatory activity: PowerPoint Presentation

OUTCOMES

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

- Use grammar to frame sentences and write sentences in passive forms
- Read vocabulary, newspaper and improve listening skills
- Draft emails, write business letters, construct resume with job application letter.
- Frame checklist, write recommendation and Transcoding graphical representation.
- Develop speaking skill for taking part in Collaborative task and Situational Role-play.

TEXT BOOKS

1. S. Sumant Maven Learning. Technical English II.
2. KN Shoba, Lourdes Joavani Rayen. Communicative English. Published by Cambridge university, 2017.

REFERENCES

1. Dr K Elango, Dr. Veena Selvam, Dr. Sujatha Priyadarshini, "Resonance English for Engineers and Technologists", Cambridge University Press, First Edition, Foundation Books, New Delhi, 2013.
2. Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.
3. Norman Whitby, Business Benchmark- Pre-Intermediate to Intermediate, Students book, Cambridge University Press, 2006.

E-RESOURCES

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	-	2	3	-	3	-	-	-
2	-	-	-	-	2	1	1	1	2	3	-	3	-	-	-
3	-	-	-	-	2	1	2	1	2	3	-	3	-	-	-
4	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
5	-	-	-	-	-	2	1	1	3	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	2.00	1.20	1.20	1.00	2.00	3.00	-	3.00	-	-	-

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

23MAT201 STATISTICS AND NUMERICAL METHODS WITH MATLAB L T P C
(Common to all B.E./ B.Tech. Branches) **3 1 0 4**

OBJECTIVES

- To provide the necessary basic concepts in testing of hypothesis for small and large samples which plays an important role in real life problems.
- To acquaint the knowledge of classifications of design of experiments.
- To extend the basic concepts of solving algebraic and transcendental equations.
- To apply the numerical techniques of interpolation and integration.
- To produce the knowledge of various techniques in solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distribution – Testing of significance for single proportion, single mean and difference of means – Test of significance for small samples by 't' test – Snedecor's F- test of significance – Chi-square test : Chi-square test of goodness of fit – Independent of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+3

Basic principles of experimental design – Completely randomised design – Analysis of vaiance for one way classification – Randomised block design – Analysis of variation for two factor experiments variations – Latin square design.

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: Newton's forward and backward interpolation formulae – Lagrange's interpolation formula – Newton's divided difference formula – Numerical integration by Trapezoidal and Simpson's 1/3 rule –Numerical double integration by Trapezoidal rule.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Euler's method – Modified Euler's method – Fourth order Runge - Kutta method for solving first order equations – Taylor's series method – Predictor-corrector methods: Milne's method – Adams-Bash forth method.

OUTCOMES

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

- Analyze the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Summarize the numerical techniques of interpolation in various intervals and apply the numerical techniques of integration for engineering problems.
- Produce various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial conditions by using certain techniques with engineering applications.

LIST OF TUTORIALS

1. Solving one sample and paired sample't' test.
2. Determination of roots of a polynomial.
3. Solution of linear system of equations by Gauss Seidel methods.
4. Evaluation of line integrals by Trapezoidal rule.
5. Solution of ordinary differential equations by Euler's method.

TOTAL: 45+15=60 PERIODS

TEXT BOOKS

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Dr.Kandasamy. P, Dr.Thilagavathy . K and Dr. Gunavathy .K., "Statistics and Numerical Methods", S. Chand and Company Ltd., NewDelhi, 2010.

REFERENCES

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 12th Edition, New Delhi, 2020.

E-RESOURCES

1. https://nptel.ac.in/courses/111/105/111105041/ (Statistics 2).
2. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods).

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
2	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
3	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
4	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
5	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-

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

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

OBJECTIVES

- To acquire knowledge on semiconductor and apply it to various electronic devices
- To develop the knowledge in Superconducting and Dielectric materials.
- To make use of the light phenomenon in optical device fabrications.
- To enlarge knowledge about fiber optics and data transmission systems.
- To apply the knowledge Quantum Electronics

UNIT I PHYSICS OF SEMICONDUCTORS 9

Elemental and Compound Semiconductors – Intrinsic Semiconductor – Carrier Concentration Derivation – Fermi level – Extrinsic Semiconductor - Carrier Concentration in N-type and P-type semiconductor(Qualitative) – Hall Effect and applications - PN junction Diode – Schottky Diode- Ohmic contacts- Tunnel Diode.

UNIT II MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Electron Theory of Magnetism; Dia, Para, Ferromagnetism and their Properties- Domain Theory of Ferromagnetism – Hard and Soft magnetic Materials - Ferrites - Superconductivity: Properties – Type I and Type II superconductors – BCS theory of superconductivity – General applications of Superconductors –Cryotron and Magnetic Levitation.

UNIT III OPTICAL AND DISPLAY DEVICES 9

Introduction-Electroluminescence Process - LED materials - Fabrication of LED - Liquid Crystal Display - Principle and Fabrication of Twisted Nematic LCD systems - Thin Film Transistor-LCD (TFT-LCD) Organic LED – Fabrication Various types of OLEDs - PDPs (Plasma display panels) – Laser powered phosphor display - Attributes of a good display device.

UNIT IV FIBER OPTICS AND DATA TRANSMISSION SYSTEMS 9

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

UNIT V EMERGING TECHNOLOGIES 9

Quantum Computing - 3D Printing - 5G & 6G Cellular Communications - Explainable Artificial Intelligence(AI) - Biometrics - Cloud Computing - Computer-assisted Translation(CAT) - Holographic Imaging - Quantum Cryptography - Robotics - Quick Response Codes (QR codes) - Wearable Computing - Ultra-High Definition(UHD) - Vision Enhancement - Virtual Reality(VR) – Augmented Reality (AR) – Mixed Reality (MR).

TOTAL: 45 PERIODS

OUTCOMES

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

- Acquire knowledge on basics of semiconductor physics and its applications in various devices
- Describe and analyze the characteristics of dielectric and superconducting materials.
- Understand the function of optical materials and display devices.
- Apply the fundamentals of optical fibers and their applications in communication systems.
- Evaluate and analyze the principles of quantum computing in electronic systems

TEXT BOOKS

1. R Murugesan "Optics and Spectroscopy" S. Chand Publishing, 5 th Edition (2013)
2. Raghavan V, "Materials Science and Engineering: A First Course", PHI Publications, 2015
3. V. Gupta, P. Mandayam and V. S. Sunder. "The Functional Analysis of Quantum Information Theory", In Springer Lecture Notes in Physics, Vol 902 (2015).

REFERENCES

1. Rajendran V. "Engineering Physics". Tata McGraw Hill Publications, 2012.
2. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2006.
3. R Murugesan "Modern Physics", S Chand Publishing; Eighteenth edition 2016

E – RESOURCES

1. https://archive.nptel.ac.in/courses/115/101/115101092/
2. https://nptel.ac.in/courses/108104113

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
2	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
3	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
4	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
5	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-

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

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

OBJECTIVES

- To understand the importance of the environment and interrelationship between living organism and environment.
- To impart knowledge on kinds of pollutions,solid waste management and precautionary measures for disasters.
- To be familiar with the social issues and identify the possible way to improve the quality of environment.
- To analyze the problems of overpopulation and understand the value education..
- To familiarize the concept of sustainability and implement sustainable practices in various fields..

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 (c) desert ecosystem (d) aquatic ecosystems (ponds, rivers, oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – Biogeographically classification of India – Value of biodiversity – India as a mega-diversity nation – Hot-spots 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 (f) Thermal pollution (g) Nuclear hazards – 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

From unsustainable to sustainable development – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies - Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Green Chemistry and principles - Environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Public awareness.

Activity: Creating environmental awareness.

UNIT IV HUMAN POPULATION AD 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-Millennium development goals, and protocols-Sustainable Development Goals-Targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-Case studies. Zero waste and R concept, Material Life cycle assessment, Environmental Impact 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, Students will be able to:

- Acquire knowledge on public awareness & about environment and ecosystem and biodiversity.
- Find solutions for pollutions and waste management to improve the quality of environment.
- Identify the causes of social issues and apply the concept of green chemistry to maintaining a clean environment..
- Analyze the effects of human population and issues related to the environment and human health.
- Understand the different goals of sustainable development and apply them for suitable technological advancement and societal development.

TEXT BOOKS

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Allen, D. T. and Shonnard, D. R., 'Sustainability Engineering: Concepts, Design and Case Studies', Prentice Hall.

REFERENCES

1. Erach Bharucha, 'Textbook of Environmental Studies', Universities Press(I) Pvt Ltd, Hydrabad, 2015.
2. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
3. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

E-RESOURCES

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

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	3	2	-	1	3	-	1	-	-	1	-	-	-
2	2	2	2	2	2	2	1	-	-	-	-	-	-	-	-
3	-	2	2	2	1	1	3	-	-	-	-	-	-	-	-
4	1	2	2	1	1	2	3	3	-	-	-	-	-	-	-
5	-	2	2	2	2	1	1	1	-	2	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-

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

23HST202 TAMIL AND TECHNOLOGY LT P C

1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT III MANUFACTURING TECHNOLOGY 3

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

TOTAL: 15 PERIODS

TEXT - CUM - REFERENCE BOOKS

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

6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

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

அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

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

அலகு III உற்பத்தித் தொழில்நுட்பம் 3

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

அலகு IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம் 3

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

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் 3

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

TOTAL: 15 PERIODS

TEXT - CUM - REFERENCE BOOKS

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

REFERENCE BOOKS

1. தமிழர் மரபு -முனைவர் ஆ பூபாலன் (வி ஆர்பி பி பப்ளிஷர்ஸ்)

23GEE201 **ENGINEERING GRAPHICS** **L T P C**

(Common to All B.E /B.Tech Branches) **3 0 2 4**

OBJECTIVES

- To acquire the knowledge of various curves.
- To learn projections of points, lines, planes viewed in different positions.
- To impart the graphic skills for converting pictorial views of solids in to orthographic views an perspective projections.
- To learn the principles of projection of simple solids.
- To gain the knowledge about the section of solids and development of surfaces of the given solids.

UNIT I PLANE CURVES (Manual drafting) **9+3**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per BIS conventions. **(Not for Examination)**

Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the curves.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES (Manual drafting) **9+3**

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III ORTHOGRAPHIC AND PERSPECTIVE PROJECTIONS (Manual drafting) **9+3**

Conversion of isometric projection into orthographic projection. Perspective projection of prisms, pyramids, cones and cylinders by visual ray method.

UNIT IV PROJECTION OF SOLIDS (CAD software) **9+3**

Projections of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT V SECTION OF SIMPLE SOLIDS AND DEVELOPMENT OF SURFACES (CAD software) **9+3**

Sectioning of simple solids like prisms – pyramids, cylinder and cone - Inclined to one reference plane. Development of lateral surfaces of simple and truncated solids: Prisms, Pyramids, Cylinders and Cones.

TOTAL : 45+15=60 PERIODS

OUTCOMES

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

- Predict the construction of various curves..
- Analyze the principles of projection of various planes by different angle to projection points, lines and plane surfaces.
- Draw the projection of three dimensional into two dimensional objects and perspective projections.
- Draw the section of solids drawings and development of surfaces of given objects.
- Apply free hand sketching and concept of isometric in engineering practice.

TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., - "Engineering Graphics", 15th Edition, New Age International (P) Limited, New Delhi, 2018.
2. Natarajan K.V., "Engineering Graphics", 32nd Edition, Dhanalakshmi Publishers, Chennai, 2019.

REFERENCES

1. K.R. Gopalakrishna, "Engineering Drawing Volume 1 & 2", 55th Edition, Subhas Publications, Bangalore, 2017.
2. T.Jeyapoovan., "Engineering Graphics using Auto CAD" 3rd Edition, vikas publishing house Pvt Ltd, New Delhi, 2017.

E- RESOURCES

1. https://nptel.ac.in/courses/112/103/112103019/ - (Geometric Constructions)
2. https://nptel.ac.in/courses/105/104/105104148/ - (Projections)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
2	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
3	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
4	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
5	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	-	2	-	-	-	-	3	-	2	2	2	2

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

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 understand electric circuit laws, single and three phase circuits, wiring and measuring instruments.
- To know working principles of electrical machines.
- To realize the working principle of various electronic devices and applications.
- To apply the principles of digital electronics in digital world.
- To familiarize the use of various measuring instruments.
- To provide practical knowledge on electrical and electronics engineering.

UNIT I ELECTRICAL CIRCUITS 9

DC circuits: Circuit components: Conductor, Resistor, Inductor, Capacitor - Ohm's Law - Kirchhoff's Laws - Independent and Dependent sources - Nodal analysis, Mesh analysis with Independent sources only (Steady state) – Thevenin's theorem – Maximum Power Transfer theorem.

Introduction to AC circuits and parameters: Waveforms, Average value, RMS value, Instantaneous power, real power, reactive power and apparent power, power factor - Steady state analysis of RL, RC & RLC circuits.

UNIT II ELECTRICAL MACHINES 9

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

UNIT III ANALOG ELECTRONICS 9

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

UNIT IV DIGITAL ELECTRONICS 9

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

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

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

LIST OF EXPERIMENTS

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

TOTAL : 45+15=60 PERIODS

OUTCOMES

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

- To understand electric circuits and choose appropriate instruments for electrical measurement for a specific application.
- To understand the concept of different types of DC and AC machines.
- To identify the diode's usage as a rectifier, and Zener diode's usage as an voltage regulator and discuss the basic characteristics of BJT.
- To employ Boolean algebra to implement the combinational logic circuits.
- To understand the operating principles of measuring instruments and choose suitable instrument for measuring the parameters.
- To understand and analyze practical electrical and electronics engineering.

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, 2017.

REFERENCES

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

E-RESOURCES

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	-	1	-	3	-	-	-	-	2	-	-	-
2	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
3	2	2	3	1	1	1	-	-	-	-	-	1	-	-	-
4	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-
5	2	1	2	1	3	-	1	-	-	-	-	-	-	-	-
6	2	3	-	2	3	-	-	-	-	-	-	-	-	-	-
AVG	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	-	1.5	-	-	-

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

23GEL201 ENGINEERING PRACTICES LABORATORY L T P C
0 0 4 2

OBJECTIVES:

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

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wire work.
- 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.
- 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) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

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 boardwiring 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 usingDiac/Triac/61oolean)
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:

1. **Making of a square tray**

FOUNDRY WORK:

2. **Demonstrating basic foundry operations.**

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:

3. Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

4. 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, Students will be able to:

- 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.
- Wire various electrical joints in common household electrical wire work.
- 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.
- Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
5	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
6	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
AVG	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

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

23EEC201 **COMMUNICATION SKILLS** **L T P C**

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

OBJECTIVES

- To use vocabularies appropriately in a sentence and various situations.
- To improve communicative competence through listening.
- To make effective presentations and group discussions.
- To read and recognize different context.
- To write paragraph, essay and special addresses.

UNIT I VOCABULARY **6**

Vocabulary building – Articulate ideas and thoughts; usage of palindromes, greetings, wishes, festival related words - Vocabulary Words with Sentences. - Idiomatic Expressions.

UNIT II LISTENING **6**

Listening Skill- Its importance – Purpose - Process - Types- Barriers - Effective Listening strategies- Listening to telephonic conversations – Watching Inspiring Speech videos on Youtube - Listening native speaker's videos for pronunciation - Listening to broadcast, messages, announcements - Listening to Instagram Videos.

UNIT III SPEAKING **6**

JAM Talk - Role play - Debate - Conversational skills (formal and informal) - Conversation practice - Group Discussion and Interview Skills – Introducing oneself and others – Goal Settings - Immediate, Long term and short term.

UNIT IV READING **6**

Reading for the Main idea- Finding Specific Information - Reading for Detail - Read and recognize different text types ranging from newspaper, articles, magazines, books and Reading autobiographies.

UNIT V WRITING **6**

Paragraph Writing - Essay writing - Creative writing - Special Address on Specific topic - Welcome Address, vote of Thanks.

TOTAL: 30 PERIODS

Mandatory activities: Presentation, Group Discussion, Mock Interview

OUTCOMES

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

- Improve vocabulary and express the same contextually.
- Listen and comprehend the general and technical text.
- Speak effectively in presentation, debate and group discussions.
- Read and understand the concept from newspapers, articles, magazines and books.
- Draft special addresses, welcome address, vote of thanks and write paragraph and essay.

TEXT BOOKS

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011.
2. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford, 2011.

REFERENCES

1. Davis, Jason and Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan, 2014.
3. Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press,1992.
4. Asraf rezvi. Effective Technical Communication. India: McGraw-Hill Education Private Limited, 2005.

EXTENSIVE READING

1. Dr. A. P. J. Abdul Kalam " Wings of Fire "

E-RESOURCES

1. https://youglish.com
2. https://newsinlevels.com
3. https://britishcouncil.org
4. https://writeandimprove.com

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
2	-	-	-	-	-	1	-	-	1	3	-	3	-	-	-
3	-	-	-	-	-	1	2	2	3	3	-	3	-	-	-
4	-	-	-	-	-	2	2	-	3	3	-	3	-	-	-
5	-	-	-	-	-	1	1	-	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.20	1.50	1.50	1.80	3.00	-	3.00	-	-	-

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

SEMESTER III

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

OBJECTIVES

- To acquaint the knowledge of logic and proofs.
- To learn induction and counting techniques in Combinatorics area.
- To understand the knowledge of graph theory.
- To familiarize the applications of algebraic structures.
- To know the concepts and significance of lattices and Boolean algebra.

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

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

UNIT II INDUCTION AND COUNTING **9+3**

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

UNIT III GRAPHS **9+3**

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

UNIT IV ALGEBRAIC STRUCTURES **9+3**

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

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

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

TOTAL: 45+15=60 PERIODS

OUTCOMES

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

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

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, 30th Reprint, 2011.

REFERENCES

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

E-RESOURCES

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
2	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
3	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
4	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
5	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2	1	-	-	-	-	-	1	-	-	-	-	-

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

23CST301 DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES

- To understand the concepts of ADTs.
- To learn linear data structures – stacks, and queues.
- To understand non-linear data structures – trees and graphs.
- To understand and apply the algorithm analysis techniques on searching , sorting algorithms.
- To understand different algorithm design techniques and the concepts behind NP Completeness.

UNIT I LISTS 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.

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.

UNIT III TREES AND GRAPHS 9

Tree ADT – Tree Traversals – Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap- B-Tree – B+ Tree – Graph Definition – Representation of Graphs – Types of Graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm

UNIT IV ALGORITHM ANALYSIS 9

Time and space complexity - Asymptotic Notations and its properties Best case, Worst case and average case analysis – Recurrence relation: substitution method – Lower bounds – **Searching:** linear search and binary search . Sorting: Insertion sort and heap sort

UNIT V ALGORITHM DESIGN TECHNIQUES 9

Divide and Conquer methodology: Finding maximum and minimum - Merge sort - Quick sort **Dynamic programming:** Elements of dynamic programming — Matrix-chain multiplication – Multi stage graph — Optimal Binary Search Trees**. Greedy Technique:** Elements of the greedy strategy - Activity-selection problem –- Optimal Merge pattern — Huffman Trees. NP-algorithms - NP-hardness and NP-completeness.

TOTAL:45 PERIODS

OUTCOMES

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

- Implement the ADT's concepts.
- Describe linear and non–linear data structure operations.
- Apply graph algorithms to solve problems and analyze their efficiency.
- Analyze the efficiency of recursive and non recursive algorithms mathematically.
- Implement and analyze the problems using different algorithmic design techniques.

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
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

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.
3. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

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)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	2	2	1	1	-	1	2	1	3	2	1	3
2	1	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3	2	3	1	2	3	-	-	-	1	1	1	2	2	1	2
4	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
5	1	2	1	2	2	1	1	-	1	2	1	3	2	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.6	2.2	1	1.8	2	1	1	-	1.2	1.4	1	2.4	2	1.8	2.2

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

23CST302 OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES

- To learn the basics and functions of operating systems.
- To study the scheduling algorithms and process synchronization.
- To understand the concept of memory management and segmentation.
- To understand the storage management system.
- To study the basics of virtual machines and Mobile OS.

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.

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.

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.

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.

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.

TOTAL :45 PERIODS

OUTCOMES

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

- Acquire knowledge about basics and functions of operating systems.
- Analyze various scheduling algorithms and process synchronization.
- Compare and contrast various memory management schemes.
- Describe the functionality of file systems, I/O systems, and Virtualization
- Apply Virtualization and compare iOS and Android Operating Systems.

TEXT BOOKS

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

REFERENCES

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

E-RESOURCES

1. https://nptel.ac.in/courses/106105214(Operating system fundamentals)
2. https://nptel.ac.in/courses/106106144(Introduction to process management)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	-	-	-	-	-	3	2	3	1	1	2
2	2	2	3	1	-	-	-	-	-	2	2	2	3	1	2
3	1	3	2	2	-	-	-	-	-	2	2	1	1	1	1
4	1	3	3	3	-	-	-	-	-	3	2	3	2	3	1
5	3	1	2	2	-	-	-	-	-	3	3	2	2	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2	2.4	2	-	-	-	-	-	2.6	2.2	2.2	1.8	1.4	1.8

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

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

OBJECTIVES

- To understand Object Oriented Programming concepts and basics of Java programming language.
- To know the principles of packages, inheritance and interfaces.
- To understand a java application with exceptions and threads.
- To learn I/O streams and string handling function.
- To study and build Graphical User Interface Application using JAVAFX.
- To implement the java applications in OOPs concepts.

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

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.

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.

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 Type Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT V JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 9

JAVAFX Events and Controls: Event Basics–Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – ScrollPane.Layouts–FlowPane–HBoxandVBox–BorderPane–StackPane–GridPane.Menus–Basics – Menu–Menu bars – Menu Item.

LIST OF EXPERIMENTS

(Any Eight Experiments to be Conducted)

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms(selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.
5. Implement exception handling and creation of user defined exceptions.
6. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
7. Write a program to perform file operations.
8. Develop applications to demonstrate the features of generics classes.
9. Develop applications using JavaFX controls, layouts and menus.
10. Develop a mini project for any application using Java concepts.

TOTAL: 45 +15=60 PERIODS

OUTCOMES

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

- Apply the concepts of classes and objects to implement java applications.
- Develop programs using inheritance, packages and interfaces.
- Discuss exception handling mechanisms and multithreaded model to solve real world problems.
- Apply the Java applications with I/O packages, string classes, Collections and generics concepts.
- Explain the concepts of event handling and Java FX components and controls for developing GUI based applications.
- Implementation of GUI based java application using OOPs concepts.

TEXTBOOKS

1. Herbert Schildt, "Java: The Complete Reference",Eleventh Edition, McGraw Hill Education, New Delhi,2019
2. Herbert Schildt,"Introducing JavaFX8 Programming",First Edition,McGraw Hill Education,New Delhi,2015

REFERENCES

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

E-RESOURCES

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

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	3	1	3	-	-	-	3	2	2	2	3	1	2
2	2	1	3	2	1	-	-	-	2	1	1	3	3	3	2
3	3	3	1	2	2	-	-	-	3	2	1	2	3	1	3
4	3	1	2	2	2	-	-	-	1	2	1	3	3	1	1
5	1	1	2	3	2	-	-	-	3	2	1	2	3	3	3
6	1	1	2	3	1	-	-	-	1	1	3	2	3	1	2
AVG	1.83	1.33	2.17	2.17	1.83	-	-	-	2.17	1.67	1.5	2.33	3	1.67	2.17

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

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

OBJECTIVES

- To understand the basics of algorithmic problem solving.
- To learn the data types, expressions and the statements in python.
- To study the Python functions and function calls to solve problems.
- To learn Python data structures-lists, tuples, dictionaries to represent complex data.
- To understand the modules and python Packages.
- To practice various computational operations and develop solutions using python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

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

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

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

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

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

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 andmethods; advanced list processing – list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation

UNIT V FILES,MODULES,PACKAGES & DATA VISUALIZATION 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 – density and contour plots-Histograms.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops.(Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries.(Language,components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries)
6. Implementing programs using Functions.(Factorial, largest number In a list,area of shape)
7. .ImplementingprogramsusingStrings.(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, Students will be able to:

- Develop algorithmic solutions to simple computational problems.
- Develop Python programs using expressions to solve the problem.
- Deploy functions and function calls to decompose python programs.
- Implement solutions using compound data in Python lists, tuples, dictionaries.
- Utilize file modules and python packages for developing applications.
- Implement python programs for solving various computational problems.

TEXTBOOKS

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

REFERENCES

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

E – RESOURCES

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

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
AVG	2.33	2.5	1.5	1.83	1.83	-	-	-	-	-	1.5	0.66	2.66	0.5	-

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

23ECE303 DIGITAL PRINCIPLES AND COMPUTER ARCHITECTURE **L T P C**

(Common to CSE, IT and AI&DS) **3 0 2 4**

(Lab Embedded Theory Course)

OBJECTIVES

- To learn the Digital fundamentals, Boolean algebra and its applications in digital systems.
- To study with the design of various combinational digital circuits using logic gates.
- To know the design procedures for synchronous and asynchronous sequential circuits.
- To learn the basic structure and registers of a computer.
- To study the memory hierarchies, cache memories and virtual memories.
- To learn practical experience with designing and implementing concepts of micro processor systems using 8085 micro processor.

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.

LIST OF EXPERIMENTS

DIGITAL CIRCUITS

1. Verification of Boolean theorems using digital logic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3. Design and implementation of 4-bit binary adder / subtractor using basic gates.
4. Design and implementation of parity generator / checker, magnitude comparator using basic gates and MSI devices.
5. Design and implementation of application using multiplexers/ Demultiplexers.
6. Design and implementation of Shift registers, Synchronous and Asynchronous counters.

COMPUTER ARCHITECTURE

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program to arrange an array of data in ascending and descending order.
3. Find the largest and smallest number in an array of data using 8085 instruction set.
4. Write an simple Interrupt service routine to understand interrupt.

TOTAL: 45 + 15 = 60 PERIODS

OUTCOMES

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

- Develop real time applications through digital fundamentals.
- Design various combinational digital circuits using logic gates.
- Analyze and design procedures for synchronous and asynchronous sequential circuits.
- Apply the basics of computers, operations and instructions with design of arithmetic and logic unit.
- Discuss the various memory systems and bus architectures.
- Analyze the Digital circuits and 8085 microprocessors instruction set.

TEXT BOOKS

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

REFERENCES

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

E-RESOURCES

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

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	2	-	-	-	-	3	3	3	3	2
2	3	2	2	3	2	2	-	-	-	-	2	1	2	3	2
3	3	3	3	2	1	2	-	-	-	-	2	2	3	2	2
4	3	3	2	3	2	2	-	-	-	-	3	2	2	3	1
5	3	2	3	2	2	1	-	-	-	-	2	2	3	3	2
6	3	2	1	3	2	2	-	-	-	-	2	3	2	2	2
AVG	3.00	2.33	2.17	2.50	1.83	1.83	-	-	-	-	2.33	2.17	2.5	2.67	1.83

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

SEMESTER IV

23CST401 DISTRIBUTED COMPUTING L T P C
3 0 0 3

OBJECTIVES

- To study the computation and communication models of distributed systems.
- To learn the issues of synchronization and collection of information in distributed systems.
- To understand the distributed mutual exclusion and distributed deadlock detection techniques.
- To know the agreement protocols and fault tolerance mechanisms in distributed systems.
- To learn the cloud computing models and the underlying concepts.

UNIT I INTRODUCTION 9

Introduction: Definition-Relation to Computer System Components – Motivation – Message -Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.

UNIT II LOGICAL TIME AND GLOBAL STATE 9

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Algorithms.

UNIT III DISTRIBUTED MUTEX AND DEADLOCK 9

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart-Agrawala's Algorithm –– Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm.

UNIT IV CONSENSUS AND RECOVERY 9

Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System (Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery.

UNIT V CLOUD COMPUTING 9

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the foundations of distributed systems .
- Solve synchronization and state consistency problems.
- Analyze various Deadlock algorithms.
- Apply working model of consensus and recovery of distributed systems.
- Acquire knowledge on cloud computing and virtualization.

TEXT BOOKS

1. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.
2. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc-Graw Hill Publishers, 2017.

REFERENCES

1. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
2. Coulouris George, Dollimore Jean, "Distributed Operating Systems: Concepts and Design", Pearson Education, 2017.

E-RESOURCES

1. https://nptel.ac.in/courses/106106107/(Distributed coordination)
2. https://archive.nptel.ac.in/courses/106/106/106106168/ (Basic distributed algorithms)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	3	1	-	-	-	2	1	3	3	2	1	1
2	1	3	2	1	2	-	-	-	2	2	2	2	1	3	2
3	2	2	1	3	3	-	-	-	3	2	1	1	1	2	1
4	1	2	2	3	1	-	-	-	3	3	2	1	3	1	1
5	3	3	1	2	3	-	-	-	3	3	3	1	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.8	2.4	1.8	2.4	2	-	-	-	2.6	2.2	2.2	1.6	2	1.8	1.6

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

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

OBJECTIVES

- To understand the fundamentals of automata theory.
- To study the concept of Regular expressions and Regular languages.
- To understand context free grammar and push down automata.
- To learn the various phases of compiler.
- To study the various parsing techniques.

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.

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.

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.

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.

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.

OUTCOMES

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

- Construct finite automata and non-deterministic finite automata.
- Explain the regular expressions using regular languages.
- Design context free grammar and pushdown automata for any language.
- Explain the different phases of compiler.
- Apply different parsing algorithms to design parsing and apply code optimization.

TEXT BOOKS

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

REFERENCES

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2003.
2. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence–based Approach", Morgan Kaufmann Publishers, 2002.

E – RESOURCES

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

Mapping of CO's-PO's & PSO's

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	-	-	-	-	-	-	-	-	-	3	3	3
2	1	1	2	-	-	-	-	-	-	-	-	-	3	3	3
3	1	2	3	-	-	-	-	-	-	-	-	-	3	3	3
4	2	2	3	2	1	-	-	-	2	1	1	1	2	1	2
5	3	1	1	1	1	-	-	-	2	3	3	3	3	1	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.8	1.6	2.4	0.6	0.4	-	-	-	0.8	0.8	0.8	0.8	2.8	2.2	3

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

23CST403 FOUNDATIONS OF DATA SCIENCE L T P C
3 0 0 3

OBJECTIVES

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To study the Python libraries for Data Wrangling.
- To understand the data interpretation using visualization libraries in Python

UNIT I INTRODUCTION 9

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

UNIT II DESCRIBING DATA 9

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

UNIT III DESCRIBING RELATIONSHIPS 9

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

UNIT IV PYTHON LIBRARIES FOR DATA WRANGLING 9

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

UNIT V DATA VISUALIZATION 9

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

TOTAL:45 PERIODS

OUTCOMES

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

- Explain the data science process.
- Describe different types of data description for data science process.
- Analyze the relationship between data.
- Use the python libraries for data wrangling.
- Apply visualization Libraries in Python to interpret and explore data.

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

REFERENCES

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.
2. Aviram blum,John hopcroft,Ravidran kannan "Foundations of data science",2020.

E-RESOURCES

1. https://nptel.ac.in/courses/106106179(Data science for engineers)
2. https://nptel.ac.in/courses/110106072 (Introduction to data analytics)

Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
2	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
3	2	2	1	2	2	1	1	-	1	2	1	3	2	2	3
4	3	2	2	1	2	-	-	-	1	1	2	2	3	3	2
5	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
6	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
AVG	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1

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

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

OBJECTIVES

- To learn different search methods in artificial intelligence.
- To learn techniques for reasoning under uncertainty.
- To understand about various genetic algorithms.
- To know about FOIL.
- To understand the graphical models of machine learning algorithms.
- To implement the various models in AI.

UNIT I INTRODUCTION **9**

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

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.

UNIT III NEURAL NETWORKS AND GENETIC ALGORITHMS **9**

Neural Network Representations – perceptrons – Multilayer and Back propogation Algorithm – An Illustrative Examples: Face Recognition Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning – Parallelizing Genetic Algorithms.

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.

UNIT V GRAPHICAL MODELS **9**

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

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

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, Students will be able to,

- Use appropriate search algorithms for problem solving
- Apply appropriate algorithm for inference.
- Discuss neural networks and genetic algorithms for various problems.
- Apply set of rules for machine learning.
- Design systems that use appropriate graph models of machine learning.
- Design and develop various models in AI.

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.

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	PO12	PSO1	PSO2	PSO3
1	3	2	3	3	-	-	-	-	1	3	3	3	1	2	2
2	1	1	1	3	1	-	-	-	1	2	1	3	2	3	2
3	2	1	2	1	1	-	-	-	2	1	1	3	1	1	1
4	3	1	3	1	-	-	-	-	2	1	2	1	2	2	2
5	3	1	1	2	2	-	-	-	3	1	2	3	2	1	2
6	3	1	1	2	2	-	-	-	2	1	2	1	2	2	2
AVG	2.5	1.2	1.8	2.0	1.5	-	-	-	1.8	1.5	1.8	2.3	1.7	1.8	1.8

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

23CSE402 **DATABASE MANAGEMENT SYSTEMS** **L T P C**
(Lab Embedded Theory Course) **3 0 2 4**

OBJECTIVES

- To study the fundamentals of data models,relational algebra and SQL.
- To understand the database system using ER diagrams and to learn normalization techniques.
- To know the fundamental concepts of transaction processing– concurrency control techniques and recovery procedures.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DBdesign.
- To learn different advanced database techniques.
- To provide a practical knowledge about various commands and procedures in a RDBMS.

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.

UNIT II DATABASE DESIGN **9**

Entity-Relationship model – E-R Diagrams – Enhanced E-R 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.

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.

UNIT IV IMPLEMENTATION 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.

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.

LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

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, Students will be able to:

- Construct SQL queries using relational algebra.
- Design database using ER model and normalize the database.
- Construct queries to handle transaction processing and maintain consistency of the database.
- Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database.
- Analyze different advanced database techniques.
- Apply various commands and procedures to design RDBMS application.

TEXT BOOKS

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

REFERENCES

1. C.J.Date,A.Kannan,S.Swamynathan,"An Introduction to Database Systems",Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth edition, McGraw–Hill College Publications, 2015.

E – RESOURCES

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

Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	2	1	-	-	-	2	1	1	1	2	1	3
2	3	1	1	2	1	-	-	-	2	3	3	3	1	1	2
3	3	2	3	2	1	-	-	-	2	1	1	2	3	3	3
4	1	2	3	2	-	-	-	-	3	2	3	3	2	2	3
5	1	1	3	3	2	-	-	-	1	3	3	1	2	2	2
6	2	3	2	2	1	-	-	-	2	1	3	2	2	2	2
AVG	2.00	1.83	2.50	2.17	1.20	-	-	-	2.00	1.83	2.33	2.00	2	1.83	2.50

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

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

OBJECTIVES

- To know basic concepts of HTML..
- To learn scalable web applications by using CSS.
- To understand components of JS with lifecycle.
- To study functionality using Node.js and Type Script.
- To study SQL with MongoDB & applications.
- To develop APIs and other services.

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.

UNIT II CSS **9**

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

UNIT III JAVASCRIPT **9**

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

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

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.

LIST OF EXPERIMENTS

(Any Eight Experiments to be Conducted)

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

TOTAL : 45+15 = 60 PERIODS

OUTCOMES

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

- Design web pages by using HTML tags.
- Apply CSS properties for web application design.
- Design responsiveness of applications by Javascript.
- Develop cross-platform applications using ReactJS and NodeJS.
- Design and develop web services using MongoDB.
- Implementation of web pages and other web services using APIs.

TEXT BOOKS

1. Nader Dabit,"Full Stack Server less:Modern Application Development with React", First Edition ,2020.
2. Chris Northwood ,"The Full Stack Developer:Your essential guide to the everyday skills",First Edition,2018.

REFERENCES

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

E-RESOURCES

1. https://archive.nptel.ac.in/courses/106/106/106106156/
2. https://www.digimat.in/nptel/courses/video/106106156/L01.html

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	-	-	-	-	-	-	-	-	-	2	1	1
2	1	3	2	-	-	-	-	-	-	-	-	-	1	3	2
3	2	2	1	-	-	-	-	-	-	-	-	-	1	2	1
4	1	2	2	-	-	-	-	-	-	-	-	-	3	1	1
5	3	3	1	-	-	-	-	-	-	-	-	-	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.8	2.4	1.8	-	-	-	-	-	-	-	-	-	2	1.8	1.6

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

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

MINOR DEGREE / HONOURS

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	TOT
23CSCT01	Essentials of Information Security	PC	3	0	0	3	40	60	100
23CSCT02	Modern Cryptography	PC	3	0	0	3	40	60	100
23CSCT03	Cyber Physical Systems	PC	3	0	0	3	40	60	100
23CSCE01	Cyber Forensics	PC	3	0	2	4	50	50	100
23CSCP01	Project Work	EEC	0	0	12	6	40	60	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

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

OBJECTIVES

- To understand the four Factors of Security.
- To learn Security tools and operating security.
- To learn about physical security and network security.
- To understand about application Security.
- To learn about audit system in Information 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

OUTCOMES

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

- Explain the four factors of security
- Apply knowledge on cryptography tools and cryptography.
- Describe the tools used in physical security and network security
- Analyze the tools used in Application Security
- Explain the audit and monitoring of information Security

TEXT BOOKS

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

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	PO12	PSO1	PSO2	PSO3
1	1	1	1	1	-	1	-	-	-	-	1	-	2	2	1
2	1	3	1	3	2	1	-	-	-	-	-	-	2	2	3
3	2	1	1	1	-	1	-	-	-	-	1	-	2	2	1
4	3	3	2	2	2	1	-	-	-	-	-	-	2	2	2
5	3	2	1	1	1	1	-	1	-	-	1	-	2	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2	1.2	1.6	1	1	-	0.2	-	-	0.6	-	2	2	1.6

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

23CSCT02 **MODERN CRYPTOGRAPHY** **L T P C**
3 0 0 3

OBJECTIVES

- To learn the principles of modern cryptography.
- To learn symmetric cipher techniques.
- To understand asymmetric cipher techniques.
- To learn about message authentication,function and process.
- To study the hash functions and digital signature for message authentication.

UNIT I INTRODUCTION **9**

Cryptography and modern cryptography – Setting of private-key encryption – Historical ciphers and their cryptanalysis – Basic principles of modern cryptography – Services, Mechanisms and Attacks – OSI security architecture.

UNIT II SYMMETRIC TECHNIQUES **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 TECHNIQUES **9**

Principles of Public Key Cryptosystems – The RSA Algorithm – Key Management – Diffie Hellman Key Exchange – Elliptic Curve Cryptography – Prime fields and binary fields, Applications, Practical considerations.Cryptography in Embedded Hardware.

UNIT IV MESSAGE AUTHENTICATION **9**

Authentication requirements – Authentication functions – Message Authentication Codes (MAC) – Hash functions – Security of hash functions and MACs.

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, Students will be able to:

- Explain the principles of modern cryptography.
- Apply symmetric techniques.
- Analyze asymmetric cipher techniques.
- Apply algorithm for Message Authentication, Hash and Digital Signatures.
- Describe about cryptography in embedded software.

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, 2010.
2. Jonathan Katz, Yehuda Lindell,"Introduction to Modern Cryptography", Chapman & Hall/CRC, New York, 2007.

E – RESOURCES

1. https://onlinecourses.nptel.ac.in/noc20_cs21/preview(Introduction)
2. http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html(Cipher Text)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	1	-	-	-	2	1	1	2	2	1	1
2	1	3	2	1	2	-	-	-	3	2	2	2	2	1	2
3	1	1	2	3	2	-	-	-	1	1	1	3	1	1	1
4	3	1	2	1	3	-	-	-	3	1	1	2	3	2	1
5	2	3	3	3	3	-	-	-	3	1	1	1	2	1	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2.2	2.4	2.2	2.2	-	-	-	2.4	1.4	1.2	2	2	2	1.2

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

23CSCT03 **CYBER PHYSICAL SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the basic concepts of cyber physical system.
- To study the principles of automated control design.
- To understand the CPS implementation.
- To learn different formal methods for safety assurance of CPS.
- To learn the secure deployment of CPS.

UNIT I INTRODUCTION TO CYBER PHYSICAL SYSTEMS (CPS) 9

Cyber-Physical Systems (CPS) in the real world - Basic principles of design and validation of CPS - Industry 4.0,AutoSAR, IIOT implications - Building Automation, Medical CPS -- CPS - Platform components - CPS HW platforms -Processors, Sensors, Actuators - CPS Network – Wireless Hart, CAN, Automotive Ethernet.

UNIT II PRINCIPLES OF AUTOMATED CONTROL DESIGN 9

Principles of Automated Control Design - Dynamical Systems and Stability - Controller Design Techniques – Stability Analysis: CLFs, MLFs, stability under slow switching - Performance under Packet drop and Noise.

UNIT III CPS IMPLEMENTATION 9

CPS implementation - From features to software components, Mapping software components to ECUs - CPS Performance Analysis - effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion.

UNIT IV FORMAL METHODS FOR SAFETY ASSURANCE OF CPS 9

Formal Methods for Safety Assurance of Cyber-Physical Systems - Advanced Automata based modeling and analysis -Basic introduction and examples - Timed and Hybrid Automata - Definition of trajectories, zenoness - Formal Analysis: Flowpipe construction, reachability analysis - Analysis of CPS Software: - Weakest Pre-conditions - Bounded Model checking.

UNIT V SECURE DEPLOYMENT OF CPS 9

Secure Deployment of CPS - Attack models - Secure Task mapping and Partitioning - State estimation for attack detection- Automotive Case study : Vehicle ABS hacking - Power Distribution Case study : Attacks on Smart Grids.

TOTAL: 45 PERIODS

OUTCOMES

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

- Explain the concepts of cyber physical system in real world application.
- Design the own model for cyber physical system.
- Explain the basics of CPS implementation.
- Analyze various formal methods of CPS.
- Explain the basics of CPS implementation.
- Apply CPS security and safety measures in deployment of CPS.

TEXT BOOKS

1. Rajeev Alur ,"Principles of Cyber-Physical Systems ",MIT Press, 2018.
2. E. A. Lee, Sanjit Seshia." Introduction to Embedded Systems – Cyber–Physical Systems Approach", MIT Press 2017.

REFERENCES

1. Moller, Dietmar P.F," Computing Fundamentals in Cyber- Physical Systems Concepts, Design Methods and Applications", Springer, 2016.
2. Platzer, Andre,"Logical Foundations of Cyber-Physical Systems", Springer, 2018.

E- RESOURCES

1. https://nptel.ac.in/courses/108105056/Introduction to system elements (Introduction)
2. https://www.iitk.ac.in/ee/Control of Cyber Physical Systems/ (Cyber Physical System)

Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	2	1	-	-	-	2	1	1	1	2	1	3
2	3	1	1	2	1	-	-	-	2	3	3	3	1	1	2
3	3	2	3	2	1	-	-	-	2	1	1	2	3	3	3
4	1	2	3	2	-	-	-	-	3	2	3	3	2	2	3
5	1	1	3	3	2	-	-	-	1	3	3	1	2	2	2
6	1	1	2	2	1	-	-	-	1	2	2	1	1	1	1
AVG	1.8	1.5	2.5	2.1	1.0	-	-	-	1.8	2.0	2.1	1.8	1.8	1.6	2.3

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

23CSCE01 **CYBER FORENSICS** **L T P C**
3 0 2 4

OBJECTIVES

- To know the fundamentals of digital and cyber forensics.
- To study the principle of cyber crime and investigation models.
- To study about evidence collected and various forensic tools..
- To study the cyber security laws.
- To learn about the various forensic tools for analysis and validation.
- To implement real time applications by using various forensic tools.

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

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 VALIADTION **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.

TOTAL : 45 PERIODS

OUTCOMES

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

- Explain the concept of digital forensics and cyber forensics.
- Analyze cyber forensics for the cybercrime incident.
- Explain the different forensics tools and standard to report the real-world cyber Incidents.
- Analyze the fundamentals of Anti-forensics and Cyber laws.
- Analyze the forensic open source tools and components.
- Implementation of various computer forensic tools in real time applications.

LIST OF EXPERIMENTS

(Any Eight experiments to be conducted)

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

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, 2006.
3. Marjie T. Britz, "Computer Forensics and Cyber Crime", Pearson, 2012.

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	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	-	1	1	-	-	-	2	-	3	-
2	2	1	1	2	2	-	-	-	-	-	-	2	2	1	1
3	2	2	1	1	-	-	-	-	-	-	-	1	3	-	2
4	-	-	-	-2	-	-	1	2	-	-	-	1	2	2	-
5	-	3	-	2	-	-	1	1	-	-	-	2	2	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2	2	1	2	2	-	1	1	-	-	-	2	2	2	2

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

23CSCP01 **PROJECT WORK** **L T P C**
0 0 12 6

OBJECTIVES

- To understand the skills to formulate a technical project.
- To know the ability to solve specific problem.
- To study the new tools, algorithms and techniques required to carry out the projects.
- To learn guidance on the various procedures for validation of the product and and cost effectiveness..
- To study the guidelines to prepare technical report of the project.

GUIDELINES

The students in a group of 3, works on a specific topic approved by the faculty member who is familiar in the area of interest. The student can select any topic which is revelent to his/her specialization of the programme. The topic may be experimental or analytical or case studies.At the end of the semester,after completing the work to the satisfaction of the supervisor and the review committee, a detailed report should be prepared and submitted to the head of the department.The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

TOTAL: 180 PERIODS

OUTCOMES

Upon Completion of the project work ,Students will be able to:

- Discuss the requirement and develop the design solutions.
- Construct the strategies and methodologies..
- Illustrate the prototype and analysis the cost effectiveness.
- Analyze the oral presentations.
- Apply the practical problem in the field of engineering and find better solutions to it.

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	1	3	-	2	-	-	2	1	1	3	3	3	3
2	3	3	1	3	-	2	-	-	2	1	1	3	3	3	3
3	2	2	2	3	-	2	-	-	2	1	1	3	1	1	1
4	3	1	1	3	-	2	-	-	2	1	1	3	3	3	3
5	3	3	1	3	-	2	-	-	2	1	1	1	3	1	1
AVG	2.8	2.0	1.20	3.0	-	2.0	-	-	2.0	1.0	1.0	2.60	2.60	2.20	2.20

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

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

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	Maximum Marks		
			L	T	P	C	CIA	ESE	TOT
23CSAT01	Intelligent Systems	PC	3	0	0	3	40	60	100
23CSAT02	Application of Machine Learning	PC	3	0	0	3	40	60	100
23CSAT03	AI and Robotics	PC	3	0	0	3	40	60	100
23CSAE01	Deep Learning	PC	3	0	2	4	50	50	100
23CSAP01	Project Work	EEC	0	0	12	6	40	60	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

23CSAT01 **INTELLIGENT SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the basic concepts, search strategies and problem solving methods.
- To introduce the logics for knowledge representation.
- To know the various inference knowledge based systems.
- To study the concept of neural network and its applications.
- To understand the basic concepts of machine learning and its methods.

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 INFERRENCE 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.

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 this course, Students will be able to:

- Explain and apply problem solving methods.
- Apply various techniques to represent knowledge.
- Construct the various knowledge inference systems.
- Apply the concept of neural networks to solve problems.
- Illustrate the machine learning concepts and its methods.

TEXT BOOKS

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 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)", Third Edition, McGraw Hill- 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

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
4	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
5	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2.6	2.2	-	-	-	-	-	-	-	-	-	3	1.6	2.2

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

23CSAT02 APPLICATIONS OF MACHINE LEARNING L T P C
3 0 0 3

OBJECTIVES

- To know the concept of Machine Learning in banking sectors.
- To learn Machine Learning Techniques in Communication and Media.
- To know the various applications in Education sectors.
- To study the applications in Insurance industries.
- To learn the applications in Transportation.

UNIT I MACHINE 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

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, World 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.

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.

UNIT IV MACHINE LEARNING IN INSURANCE INDUSTRIES 9

Importance of machine learning in insurance, Potential use cases of machine leaning in insurance industry, Case study on insurance climb 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.

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.

TOTAL: 45 PERIODS

OUTCOMES

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

- Apply the concept of Machine Learning in banking sectors.
- Use Machine Learning Techniques in Communication and Media.
- Develop the various applications in Education sectors.
- Identify the applications in Insurance industries.
- Identify the applications in Transportation.

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)

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
2	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
3	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
4	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
5	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	1	-	-	-	-	-	-	-	-	-	3	1	1

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

23CSAT03 **AI AND ROBOTICS** **LT P C**
3 0 0 3

OBJECTIVES

- To study the Robot Locomotion and types of robots.
- To know the kinematic models and constraints.
- To learn sensors of robots and image processing for robotics.
- To understand the methods for mobile robot localization.
- To understand the knowledge about Path planning and Navigation of Robots.

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

OUTCOMES

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

- Discuss the robot locomotion and its types.
- Describe the kinematics of Robots.
- Apply image processing algorithms for Robot perception.
- Apply Localization algorithms for mobile Robot.
- Analyze Path planning methods for navigation application.

TEXT BOOKS

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

Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
4	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
5	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3

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

23CSAE01 **DEEP LEARNING** **L T P C**
3 0 2 4

OBJECTIVES

- To understand the basics of deep neural networks.
- To study CNN architectures of deep neural networks.
- To learn the concepts of Artificial Neural Networks.
- To know the basics of Data science in Deep learning.
- To learn about applications of deep learning in AI and Data Science.
- To enhance the knowledge of deep learning and apply for simple problems.

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.

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.

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 Autoencoders – DeepBackprop Networks- Auto encoders

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.

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 forcontrollable energy resources - guiding charities in maximizing donations and robotic control inindustrial environments.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

(Any Eight Experiments to be Conducted)

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.

OUTCOMES

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

- Explain the basics in deep neural networks.
- Apply Convolution Neural Network for real time applications.
- Explain the basics of ANN using deep learning.
- Apply deep learning and data science algorithms for data modelling.
- Apply deep learning algorithms for various applications.
- Develop a real world applications using deep learning algorithms.

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

E-RESOURCES

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

Mapping of COs-POs & PSOs

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1	3	2	1	-	-	-	-	-	1	-	-	-	3	1	1
2	3	2	1	-	3	-	2	-		-	2	-	3	1	1
3	3	2	1	-	-	-	-	-	-	-	-	-	-	1	1
4	3	2	1	-	2	-		-	1	-	-	-	3	1	1
5	3	2	1	-	-	-	-	-	-	-	-	-	-	1	1
6	3	2	1	-	-	-	-	-	-	-	-	-	-	1	1
AVG	3	2	1	-	2.5	-	2	-	1	-	-	-	3	1	1

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

23CSAP01 **PROJECT WORK** **L T P C**
0 0 12 6

OBJECTIVES

- To understand the skills to formulate a technical project.
- To know the ability to solve specific problem.
- To study the new tools, algorithms and techniques required to carry out the projects.
- To learn guidance on the various procedures for validation of the product and and cost effectiveness..
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TOTAL: 180 PERIODS

OUTCOMES

Upon Completion of the project work ,Students will be able to:

- Discuss the requirement and develop the design solutions.
- Construct the strategies and methodologies..
- Illustrate the prototype and analysis the cost effectiveness.
- Analyze the oral presentations.
- Apply the practical problem in the field of engineering and find better solutions to it.

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2	3	3	1	3	-	2	-	-	2	1	1	3	3	3	3
3	2	2	2	3	-	2	-	-	2	1	1	3	1	1	1
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CURRICULUM AND SYLLABI

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

MINOR DEGREE/HONOURS-ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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ES	–	–	–	–	–	–	–	–	–
PC	–	–	3	3	3	4	–	–	13
PE	–	–	–	–	–	–	–	–	–
OE	–	–	–	–	–	–	–	–	–
EEC	–	–	–	–	–	–	6	–	6
MC	–	–	–	–	–	–	–	–	–
Total	–	–	3	3	3	4	6	-	19