

MOUNT ZION

COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, Affiliated to Anna University & Accredited by NAAC with A+ Grade)

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Curriculum and Syllabus Handbook

B.Tech – Artificial Intelligence and Data Science [Regulation 2025]

[CHOICE BASED CREDIT SYSTEM]

Approved by Academic Council on 24.06.2026

INSTITUTE VISION AND MISSION	
VISION	To be the preferred choice of students who aspire to become Engineers of the highest calibre.
MISSION	<ul style="list-style-type: none"> • Provide world-class physical and digital infrastructure and learning environment. • Develop the competencies of students to make them job-ready and entrepreneurs. • Facilitate mental, physical, emotional and spiritual development of students and ensure their holistic development. • Preserve the environment through the implementation of eco-friendly and sustainable practices. • Serve the community through skill development and other need-based services. • Establish sustainable partnerships with industries and R&D laboratories for mutual benefit.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE	
VISION	To be a leading competency center in Artificial Intelligence and Data Science, empowering students with ground breaking knowledge, skills, and ethical values to drive innovation and solve real-world problems for the prosperity of society.
MISSION	<ul style="list-style-type: none"> • Encouraging innovation and critical thinking to solve complex, real-world problems by delivering cutting-edge curriculum. • Building strong industry and academic partnerships to enhance learning and career opportunities.

	<ul style="list-style-type: none"> Promoting ethical practices and social responsibility, ensuring that our graduates contribute positively to society.
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	<p>The graduates of Artificial Intelligence and Data Science will be</p> <p>PEO 1: Leverage their expertise in foundational sciences, mathematics, artificial intelligence, data science, and statistics to develop systems for managing and analyzing large-scale data.</p> <p>PEO 2: Think critically, continuously learn, and collaborate effectively within a multidisciplinary team while upholding strong ethical standards.</p> <p>PEO 3: Demonstrate innovative thinking and creativity to impact economic development.</p>
PROGRAMME SPECIFIC OUTCOMES (PSO)	<p>Students will be able to</p> <p>PSO1: Develop AI-driven, domain-specific processes to enhance decision-making across various fields, including business and governance.</p> <p>PSO2: Apply theoretical knowledge of AI, data analytics, and practical industry tools and techniques to address and solve complex societal challenges.</p> <p>PSO3: Cultivate data analytics, visualisation skills, and knowledge acquisition, representation, and engineering expertise to coordinate complex projects effectively.</p>

PROGRAM OUTCOMES

At the end of this programme the students will be able to

PO NO.	GRADUATE ATTRIBUTES	PROGRAMME OUTCOMES
PO1	Engineering Knowledge	Apply math, science, and engineering fundamentals to complex problems.
PO2	Problem Analysis	Identify and analyze complex problems using research and sustainability principles.
PO3	Design Solutions	Design systems and processes considering health, safety, cost, culture, and environment.
PO4	Investigations	Use experiments, modelling, and data analysis to reach valid conclusions.
PO5	Engineering Tools	Apply modern tools for modelling and problem-solving, recognizing their limits.
PO6	Society & Environment	Assess societal, legal, and environmental impacts of engineering solutions.
PO7	Ethics	Commit to ethics, human values, diversity, and legal compliance.
PO8	Teamwork	Work effectively as an individual and in multidisciplinary teams.
PO9	Communication	Communicate clearly in reports, presentations, and documentation across diverse groups.
PO10	Management & Finance	Apply management and economic principles in projects and teamwork.
PO11	Lifelong Learning	Engage in continuous learning, adapt to new technologies, and think critically.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

PEO	PROGRAMME OUTCOMES										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	3	2	3	1	-	-	-	-	2
2	-	2	-	-	1	2	3	3	3	2	3
3	1	2	3	2	2	2	1	2	2	3	2

MAPPING OF PROGRAMME SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

PSO	PROGRAMME OUTCOMES										
	1	2	3	4	5	6	7	8	9	10	11
1	3	3	3	2	3	2	1	2	2	1	2
2	3	3	2	3	3	3	2	1	1	1	2
3	2	3	2	3	3	1	1	3	3	3	2

3: High Correlation 2: Average Correlation 1: Low Correlation

MOUNT ZION COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
REGULATIONS 2025
CHOICE BASED CREDIT SYSTEM
B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
CURRICULUM

SEMESTER – I									
S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1.	MA25C01	Applied Calculus	T	BSC	3	1	0	4	4
2.	EN25C01	English Essentials – I	T	HSMC	2	0	0	2	2
3.	UC25H01	தமிழர் மரபு / Heritage of Tamils	T	HSMC	1	0	0	1	1
4.	PH25C01	Applied Physics – I	LIT	BSC	2	0	2	4	3
5.	CY25C01	Applied Chemistry – I	LIT	BSC	2	0	2	4	3
6.	CS25C01	Computer Programming: C	LIT	ESC	2	0	2	4	3
7.	CS25C03	Essentials of Computing	LIT	ESC	2	0	2	4	3
8.	UC25A01	Life Skills for Engineers – I*	---	HSMC	1	0	2	3	1
9.	UC25A02	Physical Education – I*	---	HSMC	0	0	4	4	1
PRACTICALS									
10.	ME25C04	Makerspace	L	ESC	0	0	4	4	2
NON-CREDIT COURSES									
11.	---	NCC / NSS / NSO	---	---	---	---	---	---	---
TOTAL					15	1	18	34	23

SEMESTER – II

S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1.	MA25C02	Linear Algebra	T	BSC	3	1	0	4	4
2.	EE25C01	Basic Electrical and Electronics Engineering	T	ESC	3	0	0	3	3
3.	CS25C06	Digital Principles and Computer Organization	T	ESC	3	1	0	4	4
4.	UC25H02	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	HSMC	1	0	0	1	1
5.	PH25C03	Applied Physics (CSIE) – II	T	BSC	2	1	0	3	3
6.	AD25201	Python for Data Science	LIT	ESC	3	0	2	5	4
7.	EN25C02	English Essentials – II	LIT	HSMC	1	0	2	3	2
8.	UC25A03	Life Skills for Engineers – II*	---	HSMC	1	0	2	3	1
9.	UC25A04	Physical Education – II*	---	HSMC	0	0	4	4	1
10.		Foreign Language^	LIT	HSMC	1	0	2	3	1
PRACTICALS									
11.	ME25C05	Re-Engineering for Innovation	L	ESC	0	0	4	4	2
TOTAL					18	3	16	37	26

^Deutsch / Japanese / Korean

SEMESTER – III

S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1	MA25302	Discrete Mathematics	T	BSC	3	1	0	4	4
2	CS25301	Data Structures	T	PCC	3	0	0	3	3
3	AI25301	Object Oriented Programming	LIT	PCC	2	0	2	4	3
4	CS25303	Operating Systems	LIT	PCC	2	0	2	4	3
5	AI25302	Artificial Intelligence	T	PCC	3	0	0	3	3
6	AI25303	Data Analytics	T	PCC	3	0	0	3	3
PRACTICALS									
7	AI25304	Artificial Intelligence and Data Analytics Laboratory	L	PCC	0	0	4	4	2
8	CS25306	Data Structures Laboratory	L	PCC	0	0	4	4	2
TOTAL					16	1	12	29	23

SEMESTER – IV									
S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1	MA25401	Probability and Statistics	T	BSC	3	1	0	4	4
2	CS25401	Database Management Systems	T	PCC	3	0	0	3	3
3	CS25402	Design and Analysis of Algorithms	LIT	PCC	2	0	2	4	3
4	AI25401	Machine Learning	T	PCC	3	0	0	3	3
5	AI25402	Big Data Analytics	T	PCC	3	0	0	3	3
6	CY25401	Environmental Science and Sustainability	T	BSC	3	0	0	3	3
PRACTICALS									
7	AI25403	Machine Learning Laboratory	L	PCC	0	0	4	4	2
8	CS25405	Database Management Systems Laboratory	L	PCC	0	0	4	4	2
TOTAL					17	1	10	28	23

SEMESTER – V									
S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1	CS25501	Computer Networks	T	PCC	3	0	0	3	3
2	AI25501	Deep Learning	LIT	PCC	2	0	2	4	3
3	AI25502	Generative AI	T	PCC	3	0	0	3	3
4	***	Professional Elective I	T	PEC	3	0	0	3	3
5	***	Professional Elective II	T	PEC	3	0	0	3	3
6	***	Open Elective I	T	OEC	3	0	0	3	3
7	MX255**	Mandatory Course I ^{&}	T	MC	3	0	0	3	Non-Credit Course
PRACTICALS									
8	CS25503	Computer Networks Laboratory	L	PCC	0	0	4	4	2
9	AI25503	Generative AI Laboratory	L	PCC	0	0	4	4	2
10	EN25501	Technical Seminar	L	EEC	0	0	2	2	1
TOTAL					20	0	12	32	23

SEMESTER – VI

S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1	AI25601	Computer Vision	T	PCC	3	0	0	3	3
2	AI25602	Large Language Models	T	PCC	3	0	0	3	3
3	AI25603	Agentic AI	LIT	PCC	2	0	2	4	3
4	***	Professional Elective III	T	PEC	3	0	0	3	3
5	***	Professional Elective IV	T	PEC	3	0	0	3	3
6	***	Open Elective II	T	OEC	3	0	0	3	3
7	MX256**	Mandatory Course II ^{&}	T	MC	3	0	0	3	Non-Credit Course
PRACTICALS									
8	AI25604	Computer Vision Laboratory	L	PCC	0	0	4	4	2
9	AI25605	Large Language Models Laboratory	L	PCC	0	0	4	4	2
10	EN25601	Professional Communication	L	EEC	0	0	2	2	1
TOTAL					20	0	12	32	23

SEMESTER – VII									
S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
THEORY AND LAB INTEGRATED THEORY									
1	MG25701	Principles of Management	T	HSMC	3	0	0	3	3
2	MG25702	Human Values and Ethics	T	HSMC	2	0	0	2	2
3	***	Professional Elective V	T	PEC	3	0	0	3	3
4	***	Professional Elective VI	T	PEC	3	0	0	3	3
5	***	Open Elective III	T	OEC	3	0	0	3	3
6	***	Open Elective IV	T	OEC	3	0	0	3	3
PRACTICALS									
7	AI25R01	Summer Internship	L	EEC	0	0	0	0	2
8	AI25701	Mini Project	PW	EEC	0	0	4	4	2
TOTAL					17	0	4	21	21

SEMESTER – VIII									
S. NO	COURSE CODE	COURSE TITLE	COURSE TYPE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	C
					L	T	P		
PRACTICALS									
1	AI25801	Project Work	L	EEC	0	0	16	16	8
TOTAL					0	0	16	16	8

TOTAL CREDITS: 170

SUMMARY

	Name of the Programme: B.Tech. Artificial Intelligence and Data Science											
S. No.	Subject Area	Credits per Semester										
		I	II	III	IV	V	VI	VII	VIII	AICTE	AU	Credit Gained
1	HSMC	5	6	0	0			5		15	12	16
2	BSC	10	7	4	7					23	29	28
3	ESC	8	13	0	0					22	14	21
4	PCC			19	16	13	13			54	62	61
5	PEC					6	6	6		18	18	18
6	OEC					3	3	6		15	12	12
7	EEC					1	1	4	8	16	16	14
Total		23	26	23	23	23	23	21	8	163	163	170

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

- A student may optionally register for additional courses totaling 18 credits and become eligible for the award of a B.E. / B.Tech. (Honours) or a Minor Degree.
- For B.E. / B.Tech. (Honours), a student shall register for the additional courses (18 credits) from Semester V onwards. These courses shall be selected from the same domain or from a combination of different domains within the same programme of study.
- For a Minor Degree, a student shall register for the additional courses (18 credits) from Semester V onwards. All these courses shall be from a specific domain of any one of the other programmes of study.

MANDATORY COURSES - I

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX25501	Introduction to Women and Gender Studies	MC	3	0	0	3	0
2.	MX25502	Elements of Literature	MC	3	0	0	3	0
3.	MX25503	Film Appreciation	MC	3	0	0	3	0
4.	MX25504	Disaster Risk Reduction and Management	MC	3	0	0	3	0

***Mandatory Courses are offered as Non-Credit Courses**

MANDATORY COURSES - II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX25601	Well Being with Traditional Practices Yoga, Ayurveda and Siddha	MC	3	0	0	3	0
2.	MX25602	History of Science and Technology in India	MC	3	0	0	3	0
3.	MX25603	Political and Economic Thought for a Humane Society	MC	3	0	0	3	0
4.	MX25604	State, Nation Building and Politics in India	MC	3	0	0	3	0
5.	MX25605	Industrial Safety	MC	3	0	0	3	0

***Mandatory Courses are offered as Non-Credit Courses**

PROFESSIONAL ELECTIVE COURSES

	Domain Name	Professional Elective I	Professional Elective II	Professional Elective III	Professional Elective IV	Professional Elective V	Professional Elective VI
1	Data Science	Knowledge Engineering	Exploratory Data Analysis	Business Analytics	Image and Video Analytics	Text and Speech Analysis	Recommender Systems
2	Full Stack Development	UI and UX Design	Progressive web applications	App Development	Software Testing and Automation	Web Application Security	Human Computer Interaction
3	Cyber Security and Data Privacy	Ethical Hacking	Security and Privacy in Cloud	Social Network Security	Engineering Secure Software Systems	Cryptocurrency and Blockchain Technologies	Digital and Mobile Forensics
4	Emerging Technologies	Robotic Process Automation	GPU Programming	Augmented Reality / Virtual Reality	Quantum Computing	Game Development	3D Printing and Design
5	Cognitive and Intelligent Systems	Natural Language Processing	Soft Computing	Neural Networks	Optimization Techniques	Stream Data Analytics	Ethics And AI
6	Computational Intelligence	Fuzzy Logic and Expert Systems	Genetic Algorithms	Web Intelligence	Computational Neuroscience	Reinforcement Learning	Explainable AI

PROFESSIONAL ELECTIVE COURSES:

SEMESTER V

PROFESSIONAL ELECTIVE I

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25P01	Knowledge Engineering	PEC	3	0	0	3	3
2.	IT25P02	UI and UX Design	PEC	3	0	0	3	3
3.	CS25P01	Ethical Hacking	PEC	3	0	0	3	3
4.	CS25P02	Robotic Process Automation	PEC	3	0	0	3	3
5.	AI25P02	Natural Language Processing	PEC	3	0	0	3	3
6.	AI25P03	Fuzzy Logic and Expert Systems	PEC	3	0	0	3	3

PROFESSIONAL ELECTIVE II

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25P04	Exploratory Data Analysis	PEC	3	0	0	3	3
2.	IT25P05	Progressive web applications	PEC	3	0	0	3	3
3.	CS25P04	Security and Privacy in Cloud	PEC	3	0	0	3	3
4.	CS25P05	GPU Programming	PEC	3	0	0	3	3
5.	AI25P05	Soft Computing	PEC	3	0	0	3	3
6.	AI25P06	Genetic Algorithms	PEC	3	0	0	3	3

SEMESTER VI
PROFESSIONAL ELECTIVE III

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25P07	Business Analytics	PEC	3	0	0	3	3
2.	IT25P08	App Development	PEC	3	0	0	3	3
3.	CS25P07	Social Network Security	PEC	3	0	0	3	3
4.	CS25P08	Augmented Reality / Virtual Reality	PEC	3	0	0	3	3
5.	AI25P08	Neural Networks	PEC	3	0	0	3	3
6.	AI25P09	Web Intelligence	PEC	3	0	0	3	3

PROFESSIONAL ELECTIVE IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25P10	Image and Video Analytics	PEC	3	0	0	3	3
2.	IT25P11	Software Testing and Automation	PEC	3	0	0	3	3
3.	CS25P10	Engineering Secure Software Systems	PEC	3	0	0	3	3
4.	CS25P11	Quantum Computing	PEC	3	0	0	3	3
5.	AI25P11	Optimization Techniques	PEC	3	0	0	3	3
6.	AI25P12	Computational Neuroscience	PEC	3	0	0	3	3

SEMESTER VII**PROFESSIONAL ELECTIVE V**

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25P13	Text and Speech Analysis	PEC	3	0	0	3	3
2.	IT25P14	Web Application Security	PEC	3	0	0	3	3
3.	CS25P13	Cryptocurrency and Blockchain Technologies	PEC	3	0	0	3	3
4.	CS25P14	Game Development	PEC	3	0	0	3	3
5.	AI25P14	Stream Data Analytics	PEC	3	0	0	3	3
6.	AI25P15	Reinforcement Learning	PEC	3	0	0	3	3

PROFESSIONAL ELECTIVE VI

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25P16	Recommender Systems	PEC	3	0	0	3	3
2.	IT25P17	Human Computer Interaction	PEC	3	0	0	3	3
3.	CS25P16	Digital and Mobile Forensics	PEC	3	0	0	3	3
4.	CS25P17	3D Printing and Design	PEC	3	0	0	3	3
5.	AI25P17	Ethics And AI	PEC	3	0	0	3	3
6.	AI25P18	Explainable AI	PEC	3	0	0	3	3

OPEN ELECTIVES OFFERED BY AI&DS

OPEN ELECTIVE I

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25X01	Generative AI	OEC	3	0	0	3	3
2.	AI25X02	Fuzzy Logic and Expert Systems	OEC	3	0	0	3	3

OPEN ELECTIVE II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25X03	Reinforcement Learning	OEC	3	0	0	3	3
2.	AI25X04	Genetic Algorithms	OEC	3	0	0	3	3

OPEN ELECTIVE III

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25X05	Explainable AI	OEC	3	0	0	3	3
2.	AI25X06	Web Intelligence	OEC	3	0	0	3	3

OPEN ELECTIVE IV

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	AI25X07	Stream Data Analytics	OEC	3	0	0	3	3
2.	AI25X08	Computational Neuroscience	OEC	3	0	0	3	3

OPEN ELECTIVES

OPEN ELECTIVES - I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				T	L	P		
1	CE25X01	Air and Noise Pollution Control Engineering	OEC	3	0	0	3	3
2	CE25X02	Prefabricated Structures	OEC	3	0	0	3	3
3	CS25X01	Information Retrieval	OEC	3	0	0	3	3
4	CS25X02	Business Intelligence and its Applications	OEC	3	0	0	3	3
5	EC25X01	IoT Processors	OEC	3	0	0	3	3
6	EC25X02	MEMS Design	OEC	3	0	0	3	3
7	EE25X01	Measurements and Instrumentation	OEC	3	0	0	3	3
8	EE25X02	Smart System Automation	OEC	3	0	0	3	3
9	ME25X01	Hydraulics and Pneumatics	OEC	3	0	0	3	3
10	ME25X02	Sustainable Manufacturing	OEC	3	0	0	3	3
11	IT25X01	Human Computer Interaction	OEC	3	0	0	3	3
12	IT25X02	Video Creation and Editing	OEC	3	0	0	3	3
13	MG25X01	Project Management	OEC	3	0	0	3	3
14	MG25X02	Retail Marketing	OEC	3	0	0	3	3

Open Electives - Shall be chosen from the list of open electives offered by other Programmes

OPEN ELECTIVES - II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				T	L	P		
1	CE25X03	Airports and Harbours	OEC	3	0	0	3	3
2	CE25X04	Industrial Wastewater Management	OEC	3	0	0	3	3
3	CS25X03	Information Security	OEC	3	0	0	3	3
4	CS25X04	Digital Marketing Analytics	OEC	3	0	0	3	3
5	EC25X03	Image Processing	OEC	3	0	0	3	3
6	EC25X04	DSP Architecture and Programming	OEC	3	0	0	3	3
7	EE25X03	Electric Vehicle Architecture	OEC	3	0	0	3	3
8	EE25X04	Intelligent Control of Electric Vehicles	OEC	3	0	0	3	3
9	ME25X03	Manufacturing Process	OEC	3	0	0	3	3
10	ME25X04	Power Plant Engineering	OEC	3	0	0	3	3
11	IT25X03	Multimedia and Animation	OEC	3	0	0	3	3
12	IT25X04	Multimedia Data Compression and Storage	OEC	3	0	0	3	3
13	MG25X03	International Human Resource Management	OEC	3	0	0	3	3
14	MG25X04	Product and Brand Management	OEC	3	0	0	3	3

Open Electives - Shall be chosen from the list of open electives offered by other Programmes

OPEN ELECTIVES – III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				T	L	P		
1	CE25X05	Geographical Information System	OEC	3	0	0	3	3
2	CE25X06	Construction Equipment and Machinery	OEC	3	0	0	3	3
3	CS25X05	Intelligent Systems	OEC	3	0	0	3	3
4	CS25X06	Predictive Data Analytics	OEC	3	0	0	3	3
5	EC25X05	Wearable Devices	OEC	3	0	0	3	3
6	EC25X06	Medical Imaging Systems	OEC	3	0	0	3	3
7	EE25X05	Energy Management and Auditing	OEC	3	0	0	3	3
8	EE25X06	Substation Engineering and Automation	OEC	3	0	0	3	3
9	ME25X05	Non-traditional Machining Processes	OEC	3	0	0	3	3
10	ME25X06	Non-Destructive Testing	OEC	3	0	0	3	3
11	IT25X05	Green Computing	OEC	3	0	0	3	3
12	IT25X06	Serverless Computing	OEC	3	0	0	3	3
13	MG25X05	Management Concepts and Organizational Behaviour	OEC	3	0	0	3	3
14	MG25X06	Quality Management	OEC	3	0	0	3	3

Open Electives - Shall be chosen from the list of open electives offered by other Programmes

OPEN ELECTIVES – IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				T	L	P		
1	CE25X07	Advanced Construction Techniques	OEC	3	0	0	3	3
2	CE25X08	Solid and Hazardous waste Management	OEC	3	0	0	3	3
3	CS25X07	Distributed Computing	OEC	3	0	0	3	3
4	CS25X08	Decision Support Systems	OEC	3	0	0	3	3
5	EC25X07	Satellite Communication	OEC	3	0	0	3	3
6	EC25X08	Underwater Communication	OEC	3	0	0	3	3
7	EE25X07	Protection and Switchgear	OEC	3	0	0	3	3
8	EE25X08	Underground Cable Engineering	OEC	3	0	0	3	3
9	ME25X07	Additive Manufacturing	OEC	3	0	0	3	3
10	ME25X08	Lean Manufacturing	OEC	3	0	0	3	3
11	IT25X07	E- Learning Techniques	OEC	3	0	0	3	3
12	IT25X08	Edge and Fog Computing	OEC	3	0	0	3	3
13	MG25X07	Marketing Management	OEC	3	0	0	3	3
14	MG25X08	Supply Chain and Logistics Management	OEC	3	0	0	3	3

Open Electives - Shall be chosen from the list of open electives offered by other Programmes

SEMESTER I

MA25C01	APPLIED CALCULUS	L	T	P	C
		3	1	0	4
Course Objectives:	<ul style="list-style-type: none"> To provide technical competence of modelling engineering problems using calculus. To apply the calculus concepts in solving engineering problems using analytical methods and computational tools. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Understand the fundamental concepts of limits, continuity, and differentiation and apply them to solve basic problems in calculus.				K2
CO2	Apply techniques of differentiation to analyse maxima, minima, and optimization problems in practical applications.				K3
CO3	Apply definite and indefinite integrals to evaluate areas, volumes, and other engineering-related problems.				K3
CO4	Analyse functions of several variables and compute partial derivatives for solving multivariable problems.				K4
CO5	Apply multiple integrals to evaluate double and triple integrals in engineering and real-life applications.				K3

Unit I - Differential Calculus	9+3
Functions, Graph of functions, New functions from old functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem, Effect of derivatives on the shape of a graph.	
Unit II - Functions of Several Variables	9+3
Partial derivatives, Chain rule, Total derivative, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers, Application problems in engineering.	
Unit III - Integral Calculus	9+3
Fundamental theorem of calculus, Indefinite integrals and the net change theorem, Improper integrals, Arc length, Area of region, Area of surface of revolution.	
Unit IV - Double Integrals and Coordinate Transformations	9+3
Iterated integrals and Fubini's theorem, Evaluation of double integrals, change of order of integration, Change of variables between Cartesian and Polar coordinates.	
Unit V- Triple Integrals and 3D Coordinate Systems	9+3
Evaluation of triple integrals, Change of variables between Cartesian and cylindrical and spherical co-ordinates.	
TOTAL (L:45, T:15): 60 PERIODS	

Textbooks:

1. Anton, H., Bivens, I. C., and Davis, S., "Calculus: Early transcendentals", John Wiley and Sons, 2021.
2. Ron Larson and David C. Falvo, "Calculus: an Applied Approach", Cengage Learning, 2013.

References:

1. Stewart, J., Clegg, D., and Watson, S., "Calculus: Early transcendentals", 2019.
Thomas, G. B., Jr., Weir, M. D., Hass, J., and Heil, C. "Thomas' calculus: Early transcendentals", Pearson, 2018.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	-	-	-	-	-	-	1	-	-	-
2	3	3	1	-	-	-	-	-	-	-	1	-	-	-
3	3	2	1	-	-	-	-	-	-	-	1	-	-	-
4	3	3	1	-	-	-	-	-	-	-	1	-	-	-
5	3	2	1	-	-	-	-	-	-	-	1	-	-	-
Avg.	3	2.4	1	-	-	-	-	-	-	-	1	-	-	-

EN25C01	ENGLISH ESSENTIALS-I	L	T	P	C
		2	0	0	2
Course Objectives:	<ul style="list-style-type: none"> Enhance learners' listening and speaking skills to understand and deliver speeches effectively Equip students with the skills to write clear, coherent, and grammatically correct texts for various purposes. Strengthen the ability to comprehend, interpret, and analyse written English across diverse contexts. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Apply vocabulary and grammar appropriately to communicate in written and spoken forms.				K3
CO2	Listen and comprehend spoken English, take and draft notes.				K2
CO3	Analyze texts in different contexts using appropriate reading strategies.				K4
CO4	Communicate thoughts and ideas in real life situations				K3
CO5	Develop communication skills relevant to engineering and technology				K3

Unit I - Basic Grammar for Effective Communication	6
Tenses, Adjectives, Subject- Verb Agreement	
Unit II - Speaking Skills	6
Self-Introduction, Expressing opinions, Participating in conversations (Speech Acts - agreeing andamp; disagreeing – synonyms and antonyms).	
Unit III - Listening Skills	6
Listening to simple conversations (understanding tone and intent), Short speeches / stories, Extracting information, Pronunciation, Listening to various accents, Note-taking.	
Unit IV - Reading Skills	6
Reading strategies – (Skimming, scanning, predicting) intensive reading - short passages and long passages on suggested themes (Sentence patterns, Prefixes and suffixes, Idioms and phrases), Cloze, Reading comprehension, note making and summarizing.	
Unit V- Writing Skills	6
Word substitution, Sentence formation, Hints development (Guided Writing), Writing different types of paragraphs - (Sentence structure) – Letter writing / Emails (informal), Picture and poster description.	
TOTAL: 30 PERIODS	
Textbooks:	
1. Miller, K. Q., and Wahl, S. T. "Business and Professional Communication: KEYS for Workplace Excellence", 5 th Edition, SAGE Publications, 2023.	
References:	
1. Kumar, Sanjay and Pushpalatha, "English Language and Communication Skills for Engineers", India: Oxford University Press, 2018.	

Engineers", India: Oxford University Press, 2018.

2. Sharma, S., and Mishra, B. "Communication Skills for Engineers and Scientists" (2nd Edition, PHI Learning, 2024.

E-resources:

1. Cambridge English – <https://www.cambridgeenglish.org/learning-english/grammar-and-vocabulary/>
 2. Perfect English Grammar – <https://www.perfect-english-grammar.com/>
 3. British Council – Learn English – <https://learnenglish.britishcouncil.org/grammar>
 4. Speechling – <https://speechling.com/>
 5. mePro by Pearson – <https://mepro.pearson.com/>
- TED Talks – <https://www.ted.com/>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	-	-	-	-	-	-	1	-	-	-
2	3	3	1	-	-	-	-	-	-	-	1	-	-	-
3	3	2	1	-	-	-	-	-	-	-	1	-	-	-
4	3	3	1	-	-	-	-	-	-	-	1	-	-	-
5	3	2	1	-	-	-	-	-	-	-	1	-	-	-
Avg.	3	2.4	1	-	-	-	-	-	-	-	1	-	-	-

UC25H01	தமிழர் மரபு	L	T	P	C
		1	0	0	1
Course Objectives:	<ul style="list-style-type: none"> To enable students to understand the heritage of the Tamil civilization. 				
Course Outcomes					Knowledge Level
The students will be able to					
CO1	Understand the language families of India.				K2
CO2	Understand the artistic and cultural heritage of Tamils				K2
CO3	Describe traditional folk arts, performing arts, martial arts, and cultural practices of Tamils.				K2
CO4	Explain the Thinaï concept, Aham-Puram concepts, and Aram philosophy.				K2
CO5	Understand the contribution of Tamils to the Indian freedom struggle, cultural influence across India.				K2

அலகு I - மொழி மற்றும் இலக்கியம்	3
இந்திய மொழிக் குடும்பங்கள், திராவிட மொழிகள், தமிழ் ஒரு செம்மொழி, தமிழ் செவ்விலக்கியங்கள், சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை, சங்க இலக்கியத்தில் பகிர்தல் அறம், திருக்குறளில் மேலாண்மைக் கருத்துக்கள், தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம், பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள், சிற்றிலக்கியங்கள், தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி, தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	
அலகு II - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை, ஐம்பொன் சிலைகள், பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள், தேர் செய்யும் கலை, சுடுமண் சிற்பங்கள், நாட்டுப்புறத் தெய்வங்கள், குமரிமுனையில் திருவள்ளுவர் சிலை, இசைக் கருவிகள், மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம், தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	
அலகு III - நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	
அலகு IV - தமிழர்களின் திணைக் கோட்பாடுகள்	3
தமிழகத்தின் தாவரங்களும், விலங்குகளும், தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள், தமிழர்கள் போற்றிய அறக்கோட்பாடு, சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும், சங்ககால நகரங்களும் துறை முகங்களும், சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி,	

கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.	
அலகு V - இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு, இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம், சுயமரியாதை இயக்கம், இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள், தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	
TOTAL: 15 PERIODS	
Textbooks: <ol style="list-style-type: none"> 1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2. கணினித் தமிழ், முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). 	
References: <ol style="list-style-type: none"> 1. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு). 2. பொருறை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	1	-	-	-	-	1	-	-	2	-	1	-	-	-
2	-	-	-	-	-	2	-	-	1	-	1	-	-	-
3	-	-	-	-	-	2	-	1	2	-	1	-	-	-
4	-	-		-	-	2	2	-	1	-	1	-	-	-
5	-	-		-	2	3	2	-	1	-	1	-	-	-
Avg.	1	-	-	-	2	2	2	1	1.4	-	1	-	-	-

UC25H01	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1
Course Objectives:	<ul style="list-style-type: none"> To enable students to understand the heritage of the Tamil civilization. 				
Course Outcomes					Knowledge Level
The students will be able to					
CO1	Understand the language families of India.				K2
CO2	Understand the artistic and cultural heritage of Tamils				K2
CO3	Describe traditional folk arts, performing arts, martial arts, and cultural practices of Tamils.				K2
CO4	Explain the Thinaï concept, Aham-Puram concepts, and Aram philosophy.				K2
CO5	Understand the contribution of Tamils to the Indian freedom struggle, cultural influence across India.				K2

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 and 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, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and games of tamils.	
Unit IV - Thinaï Concept of Tamils:	3
Flora and fauna of tamils and 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 and manuscripts, Print history of tamil books.	
Textbooks: <ol style="list-style-type: none"> 1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB and ESC and RMRL – (in print) 2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies. 	
References: <ol style="list-style-type: none"> 1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by:International Institute of Tamil Studies). 2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 3. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology and Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) 	

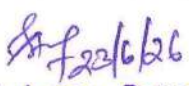
Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	1	-	-	-	-	1	-	-	2	-	1	-	-	-
2	-	-	-	-	-	2	-	-	1	-	1	-	-	-
3	-	-	-	-	-	2	-	1	2	-	1	-	-	-
4	-	-	-	-	-	2	2	-	1	-	1	-	-	-
5	-	-	-	-	2	3	2	-	1	-	1	-	-	-
Avg.	1	-	-	-	2	2	2	1	1.4	-	1	-	-	-


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PH25C01	APPLIED PHYSICS – I	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> To impart knowledge and expose the essentials of physics in various engineering applications. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Explain the mechanical properties of matter and relate them to practical applications like bridges and buildings.				K2
CO2	Apply the principles of simple harmonic motion and torsional pendulum to analyze oscillatory systems				K3
CO3	Describe the concepts of electromagnetic wave propagation using Maxwell's equations and their applications in communication systems.				K2
CO4	Apply the fundamental principles of quantum mechanics, and quantum tunnelling to microscopic systems.				K3
CO5	Apply the principles of interference, fiber optics and laser technology in optical communication systems, and modern optical devices.				K3

Unit I - Properties of Matter	6
Elasticity, Cantilever –Young's modulus (non-uniform bending), Girders: Bridges and buildings, Viscosity: Stokes method – Surface tension: drop weight method, Thermal expansion, Thermal stress, Bimetallic strips, Expansion joints.	
Unit II - Oscillations	6
Simple harmonic motion, Torsional pendulum, Couple per unit twist, Damped and Forced oscillation	
Unit III - Electromagnetic Waves	6
Waves on a stretched string, Energy and Power, standing waves, Ultrasonics, piezo-electric method, Acoustic grating, Electromagnetic waves: Maxwell equation, Production of EM waves by dipole antenna, Propagation of EM waves in free space, wave equation, Cell phone reception.	
Unit IV - Quantum Mechanics	6
Black body radiation, Photoelectric effect, de Broglie hypothesis - Schrodinger wave equation, Particle in a box (infinite potential well, three-dimensional box), Barrier penetration and quantum tunnelling.	
Unit V- Applied Optics	6
Interference: Air wedge, Michelson's Interferometer, Fiber optics: Structure of a fiber – Fiber optic communication system – Fiber sensors (Virtual demo) – Displacement, pressure sensor and Temperature sensor - Einstein Co-efficient - Nd:YAG laser, CO ₂ laser (construction, functioning and applications), dye laser.	
TOTAL: 30 PERIODS	
List of Experiments:	
1. Non-Uniform bending - Young's modulus of the material.	


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2. Torsional pendulum - Rigidity modulus of the wire and moment of inertia of the disc.
3. Melde's string experiment – Frequency of an electrically vibrating metal tip
4. Photo-electric effect
5. Determination of Planck's constant
6. Ruling width of Compact disc using Laser.
7. Thickness of a thin sheet/wire using Air Wedge Method.

TOTAL: 30 PERIODS

Textbooks:

1. Young, H. D., and Freedman, R. A. "University physics with modern physics", Pearson, 2020.
2. Gaur, R. K., and Gupta, S. L. "Engineering physics", Dhanpat Rai Publications, 2022.

References:

1. Mathur, D. S. "Elements of properties of matter", S. Chand Publishing, 2010.
2. Griffiths, D. J. "Introduction to quantum mechanics" Cambridge University Press, 2018.
3. Silfvast, W. T. "Laser fundamentals", 2nd Edition, Cambridge University Press, 2008.

E-resources:

1. Barrier penetration problem and Quantum tunnelling:
<https://archive.nptel.ac.in/courses/115/104/11510409/>
2. EM waves and wireless channelling:
https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. CO2 Laser : https://onlinecourses.nptel.ac.in/noc25_ph03/preview
4. Bimetallic Strips _ <https://www.youtube.com/watch?v=WZQ8lvxdzDk>
5. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOwA
6. Dipole Antenna_ <https://www.youtube.com/watch?v=4xF1Fq2wBII>
7. Optical Sensors _
<https://auece.digimat.in/nptel/courses/video/108106173/L02.html>
8. Scanning Tunnelling Electron Microscope_
<https://www.youtube.com/watch?v=XNYZYbXNWQA>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	1	-	1	-	-	-	-	1	-	-	-
2	3	2	-	1	-	-	-	-	-	-	1	-	-	-
3	3	2	-	1	1	-	-	-	-	-	1	-	-	-
4	3	2	-	1	-	-	-	-	-	-	1	-	-	-
5	3	2	-	1	2	-	-	-	-	-	1	-	-	-
Avg.	3	2	-	1	1.5	1	-	-	-	-	1	-	-	-

CY25C01	APPLIED CHEMISTRY – I	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> To provide students with a solid understanding of the chemical principles for engineering applications. To introduce the chemical properties of materials and how these properties influence the selection and use of materials in engineering systems. To impart practical applications of chemistry in commonly used engineering devices. 				
Course Outcomes				Knowledge Level	
The students will be able to					
C01	Understand the quality of water from quality parameter and international standard.			K2	
C02	Classify nanomaterials based on their structure and determination, analyses their size dependent properties.			K2	
C03	Explain the working principles of electrochemical cells, determine electrode potentials.			K2	
C04	Identify the types and mechanism of chemical and electrochemical corrosion, interpret the galvanic series.			K2	
C05	Compare conventional, contemporary and emerging battery technologies.			K2	

Unit I - Water Technology	6
Water quality parameters and standards. Industrial feed water – Remediation. Municipal water treatment. Desalination.	
Unit II - Nano-chemistry	6
Classification, Size-dependent properties. Preparation of nanomaterials – Top-down and Bottom-Up approaches, Applications.	
Unit III - Electrochemistry	6
Electrochemical cell - Electrode potential- Redox reaction. Conductivity of electrolytes – Factors.	
Unit IV - Corrosion and Control	6
Chemical and electrochemical corrosions, galvanic series, factors influencing corrosion, Electrochemical protection. Organic and inorganic coating.	
Unit V- Batteries	6
Conventional, Contemporary and emerging battery storage technologies, Primary and secondary batteries, Battery pack, Battery materials, Performance parameters, Testing, Safety aspects.	

TOTAL: 30 PERIODS**List of Experiments:**

1. Analysis of alkalinity, hardness and dissolved oxygen.
2. Preparation of nanoparticles by Sol-Gel method.
3. Conductometric titrations
4. Corrosion study by weight loss and salt spray method.
5. Potentiometry/UV-visible spectrophotometer.
6. Measurement of EMF, Internal Resistance, Charge and Discharge Characteristics.

TOTAL: 30 PERIODS**Textbooks:**

1. Jain, P. C., and Jain, M., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, 2015.
2. Dara, S. S. "A Textbook of Engineering Chemistry", Chand Publications, 2004.

References:

1. Sachdeva, M. V. "Basics of Nano Chemistry", Anmol Publications Pvt Ltd., 2011.
2. Friedrich, E. "Engineering Chemistry", Medtech, 2014.

E-resources:

1. Water and Wastewater Engineering (Prof. Ligy Philip, IIT Madras) - <https://nptel.ac.in/courses/105106202>.
2. Electrochemical Energy Systems (Prof. S. Mitra, IIT Madras) - <https://nptel.ac.in/courses/113106028>.
3. Corrosion (Prof. Kallol Mondal, IIT Kanpur) - <https://nptel.ac.in/courses/112104088>
4. Chemistry of Battery Systems (Prof. V. R. Marathe, IIT Madras) - <https://nptel.ac.in/courses/115106130>
5. Resource on all battery types, testing, and safety -
6. <https://batteryuniversity.com/articles>

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	2	3	-	-	2	-	2	-	-	-
2	3	3	2	3	3	-	-	-	2	-	2	-	-	-
3	3	3	2	3	3	2	-	-	2	-	2	-	-	-
4	3	3	3	3	3	2	2	-	2	-	2	-	-	-
5	3	3	3	3	3	2	-	-	2	-	2	-	-	-
Avg.	3	3	2.4	2.8	2.8	2.3	2	-	2	-	2	-	-	-

CS25C01	COMPUTER PROGRAMMING: C	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> To equip engineering students with the foundational knowledge and practical skills in 'C' programming to analyse and solve computational problems effectively. To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains 				
Course Outcomes The students will be able to				Knowledge Level	
C01	Apply problem-solving strategies and algorithmic thinking to design and develop structured C programs.				K3
C02	Implement decision-making and looping constructs along with functions to solve computational problems efficiently.				K3
C03	Apply arrays, strings, pointers, and dynamic memory allocation to manipulate and manage data effectively in C programs.				K3
C04	Implement structures, unions, and enumerations to model and manage complex data in software applications.				K3
C05	Apply file handling techniques and standard/user-defined libraries to develop modular and application-oriented C programs.				K3

Unit I - Introduction to C	6
Problem solving, Problem analysis chart, Developing an algorithm, Flowchart and pseudocode, Program structure, Compilation and execution process, Interactive and script mode, Comments, Indentation, Error messages, Primitive data types, Constants, Variables, Reserved words, Arithmetic, Relational, Logical, Bitwise, Assignment, Conditional operators, Input/Output functions, Built-in functions.	
Unit II - Control Structures and Functions	6
Control Structures: if, if-else, nested if, switch-case, while, do-while, for, nested loops, Jump statements. Functions: Function declaration, Definition and calling, Function parameters and Return types, Call by value and Call by reference, Recursive functions, Scope and lifetime of variables, Header files and Modular programming	
Unit III - Strings and Pointers	6
One-dimensional and multi-dimensional arrays, Array operations and traversals, String handling: String declaration, input/output, string library functions, Pointer arithmetic, Pointers and arrays, Pointers to function, Dynamic memory allocation.	

Unit IV – Structures, Unions and File Operations	6
Defining and using structures, Array of structures, Pointers to structures, Unions and their uses, Enumerations, Open, read, write, close file operations, Binary vs Text files, File pointers, Error handling in file operations.	
Unit V- Standard Libraries and Header Files	6
Using standard libraries like stdio.h, stdlib.h, string.h, math.h, Creating and using user-defined header files and libraries.	
TOTAL: 30 PERIODS	
List of Experiments:	
<ol style="list-style-type: none"> 1. Create Problem Analysis Charts, Flowcharts and Pseudocode for simple C programs (Minimum three). 2. Usage of conditional logics in programs. (Minimum three) 3. Usage of functions in programs. (Minimum three) 4. Programs using pointers, dynamic memory, pointer arithmetic, string manipulations, array operations. (Minimum three). 5. Program to use structures and unions. 6. Programs reading/writing data in text and binary files (Minimum three). 7. Use of standard and user-defined libraries in solving problems. (Minimum three), Project (Minimum Two) 	
TOTAL: 30 PERIODS	
Textbooks:	
<ol style="list-style-type: none"> 1. Thareja, R. "Programming in C", Oxford University Press, 2021. 2. Balagurusamy, E. "Programming in ANSI C", McGraw Hill Education, 2019. 	
References:	
<ol style="list-style-type: none"> 1. Kanetkar, Y. "Let us C", BPB Publications, 2020. 2. Kalicharan, N. "Learn to program with C: An introduction to programming using the C language", Apress, 2022. 3. Forouzan, B. A., and Afyouni, H. "Computer science: A structured programming approach in C", Cengage, 2023. 	
E-resources:	
<ol style="list-style-type: none"> 1. Learn-C.org - https://www.learn-c.org/ 2. GeeksforGeeks - C Programming - https://www.geeksforgeeks.org/c-programming-language/ 3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/ 4. "Introduction to C Programming", Swayam MOOC Course, https://onlinecourses.swayam2.ac.in/imb25_mg71/MIT 5. APP INVENTOR software: https://appinventor.mit.edu/ 	

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	1	1	-	-	-	1	-	1	3	1	1
2	3	2	2	1	2	-	-	-	1	-	1	3	2	1
3	3	3	2	2	2	-	-	-	-	-	1	3	2	1
4	3	2	2	1	2	-	-	-	-	-	1	2	2	1
5	3	2	2	2	3	-	1	1	1	1	2	2	3	1
Avg.	3.0	2.2	2.0	1.4	2.0	-	1	1	1	1	1.2	2.6	1.8	1.2

CS25C03	ESSENTIALS OF COMPUTING	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> • To introduce the basic components and operations of computers. • To develop problem-solving and computational thinking skills. • To enable learners to design simple solutions using algorithms and flowcharts. • To provide hands-on experience in visual programming and basic app development. 				
Course Outcomes				Knowledge Level	
The students will be able to					
C01	Explain the basic concepts of computers, and perform basic data operations using spreadsheets.				K2
C02	Describe the principles of computational thinking, and Boolean logic, and their applications in representing real-world information as computable data.				K2
C03	Apply problem-solving techniques to solve basic computational problems.				K3
C04	Develop algorithms and represent solutions in different programming paradigms.				K3
C05	Build simple programs and applications using Scratch programming.				K3

Unit I - Computers	6
Computer, Characteristics of computers, History of computers, Classification of computers, Applications of computers, Basic organization of a computer, Data representation using spread sheets for basic operations on data and visualize the data.	
Unit II - Computational Thinking	6
What is computational thinking, Decomposition, Abstraction, Real world information to computable data, Number systems, Conversions among number systems, what is logic, Boolean logic, Applications of propositional logic.	
Unit III - Problem Solving Basics	6
Problem Definition, Logical reasoning, Decomposition, Software design concept of an algorithm, Algorithm representation – Algorithm discovery – Iterative structures – Recursive structures – Efficiency and correctness - Implementation of algorithms - Fundamental algorithms: Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of fibonacci sequence, Reversing the digits of an	

integer, Base conversion.	
Unit IV - Programming Languages	6
Program development life cycle, Program design tools, Algorithms, Flowcharts, Pseudocodes, Role of algorithms, Programming languages, Programming paradigms traditional programming concepts, Procedural units, Language implementation, Declarative programming	
Unit V- Scratch Programming and App Development	6
What is scratch, Scratch programming environment, Paint editor, Scratch blocks, Arithmetic operators and functions, Use motion commands, Pen commands and easy draw, Looks palette, Sound palette, Power of repeat, Data types, Variables, Getting input from users. Making decisions, Comparison operators, Decision structures, Logical operators, Repetition, loop blocks, Stop commands, Counters, Nested loops, Recursion, String processing, String manipulation, Lists, Dynamic lists, Numerical lists, Searching and Sorting lists. Building Apps using problem, solving techniques on any app development platform, Modeling, incremental and iterative, reuse, modularization, algorithmic thinking, abstracting and modularizing, decomposition, testing and debugging.	
TOTAL: 30 PERIODS	
List of Experiments: <ol style="list-style-type: none"> 1. Office Software for documentation and presentation 2. Spread sheets for calculations and data. Visualization 3. Solving problems based on number systems and logics. 4. Creation of Functional Block for simple mathematical problems 5. Drawing and Painting operations 6. Scratch Animation for understanding Conditional and Loop statements. 7. Draw artistic, geometric patterns and create games. 8. Scratch Programs for applied scientific computing and data manipulations 9. Sample App Developments for societal problems. 	
TOTAL: 30 PERIODS	
Textbooks: <ol style="list-style-type: none"> 1. Thareja, R. "Fundamentals of computers", Oxford University Press, 2020. 2. Rajaraman, V., and Adabala, N. "Fundamentals of computers", PHI Learning, 2014. 	
References: <ol style="list-style-type: none"> 1. Brookshear, J. G., and Brylow, D. "Computer science: An overview", Pearson, 2015. 2. Dromey, R. G. "How to solve it by computer", Prentice Hall International, 	

1982.

3. Marji, M. "Learn to program with Scratch: A visual introduction to programming with games, art, science and math", No Starch Press, 2014.
4. Riley, D. D., and Hunt, K. A. "Computational thinking for the modern problem solver", CRC Press, 2014.
5. Venkatesh, G., and Mukund, M. "Computational thinking", Notion Press, 2021.

E-resources:

1. Brennan and Resnick's CT Framework 2012:
<https://scratched.gse.harvard.edu/ct/files/AERA2012.pdf>
2. CS50X 2025 Scratch YouTube lectures by Prof. David J Malan, Harvard University: <https://www.youtube.com/watch?v=2WtPyqwTLKM>
3. <https://teachinglondoncomputing.org/resources/developing-computational-thinking/>
4. Scratch software: <https://scratch.mit.edu/>
5. MIT APP INVENTOR software: <https://appinventor.mit.edu/>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	2	-	-	-	-	-	1	1	2	1
2	3	2	-	-	-	-	-	-	-	-	1	3	1	2
3	3	3	1	1	-	-	-	-	-	-	1	3	1	1
4	3	3	2	1	1	-	-	-	-	-	1	3	2	2
5	3	3	2	2	2	-	-	1	-	-	1	2	3	3
Avg.	3	3	1.8	1.3	1.8	-	-	-	-	-	1	2.4	1.8	1.8

UC25A01	LIFE SKILLS FOR ENGINEERS – I	L	T	P	C
		1	0	2	1
Course Objectives:	<ul style="list-style-type: none">• To equip engineering students with essential life skills encompassing personal and emotional development, effective management of time and stress, financial literacy, digital safety, and civic responsibility.• To enhance self-awareness, interpersonal skills, and resilience to prepare students for the professional and personal challenges of engineering careers and life beyond academics.				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Explain the importance of self-awareness, emotional intelligence, and personal development for improving individual effectiveness and well-being.			K2	
CO2	Apply time management and stress management techniques to balance academic, professional, and personal responsibilities.			K3	
CO3	Describe the principles of financial literacy, digital safety, and responsible citizenship in modern society.			K2	
CO4	Apply interpersonal communication and teamwork skills to interact effectively in professional and social environments.			K3	
CO5	Demonstrate resilience, ethical behavior, and problem-solving abilities to handle real-life and workplace challenges.			K3	

Unit I - Personal and Emotional Development	10
Self-awareness and personality, Emotional intelligence and empathy, Positive thinking, Right attitude, Stress and anger management, Goal-setting and Time management, Growth mindset and resilience.	
Unit II - Management Skills	5
Financial literacy: Budgeting and saving, Nutrition, Health, and Hygiene, Digital literacy and Online safety, Civic responsibility and ethics.	
TOTAL: 15 PERIODS	

Textbooks:

1. Khera, S. "You can win", Macmillan, 2003
2. Levesque, H. (n.d.). Life skills 101: A practical guide to leaving home and living on your own.

References:

1. Mitra, B. K. "Personality development and soft skills", 3rd impression, Oxford University Press, 2017.
2. ICT Academy of Kerala. "Life skills for engineers", McGraw Hill Education (India) Private Ltd, 2016.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	2	2	-	1	-	2	-	-	-
2	-	1	-	-	-	2	2	-	1	-	2	-	-	-
3	-	-	-	-	-	2	2	-	1	-	2	-	-	-
4	-	-	-	-	-	1	1	3	3	-	2	-	-	-
5	-	-	-	-	-	2	3	2	2	-	2	-	-	-
Avg.	-	1	-	-	-	1.8	2	2.5	1.6	-	2	-	-	-

UC25A02	PHYSICAL EDUCATION - I	L	T	P	C
		0	0	4	1
Course Objectives:	<ul style="list-style-type: none"> To impart the fundamentals of physical education for development of students' physical, mental, and social well-being. To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship. 				
Course Outcomes The students will be able to					Knowledge Level
CO1	Understand and analyze personal development evaluate their impact on overall well-being.				K4
CO2	Explain, apply, and assess the rules, regulations, and techniques of major athletic events.				K3
CO3	Demonstrate and analyze skills in selected outdoor games (basketball, volleyball, football, kabaddi, cricket, hockey, handball, ball badminton, kho-kho, tennis), evaluate performance, and create strategies for team success.				K3/K4/ K5
CO4	Demonstrate and analyze skills in selected indoor games, evaluate techniques, and develop strategies to improve performance.				K3/K4/ K5
CO5	Exhibit and evaluate teamwork, leadership, discipline, and sportsmanship during participation, and create a personal or team development plan for long-term physical fitness and professional conduct.				K5/K6

Unit I - Introduction to Physical Education	4
Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid Practices.	
Unit II - Participation of Athletic Events	4
Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles.	

Unit III - Skill Development in any one of the Following Outdoor Games	4
Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.	
Unit IV - Skill Development in any one of the Following Indoor Games	3
Shuttle Badminton, Chess and Table Tennis.	
TOTAL: 15 PERIODS	
References: <ol style="list-style-type: none"> 1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers. 2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co. 3. Mangal, S. K. (2009). Psychology of sports performance. Sports Publication. 	
E-Resources: <ol style="list-style-type: none"> 1. https://www.who.int/health-topics/physical-activity 	

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	2	2	-	1	-	2	-	-	-
2	-	1	-	-	-	2	2	-	1	-	2	-	-	-
3	-	-	-	-	-	2	2	-	1	-	2	-	-	-
4	-	-	-	-	-	1	1	3	3	-	2	-	-	-
5	-	-	-	-	-	2	3	2	2	-	2	-	-	-
Avg.	-	1	-	-	-	1.8	2	2.5	1.6	-	2	-	-	-

ME25C04	MAKERSPACE	L	T	P	C
		0	0	4	2
Course Objectives:	<ul style="list-style-type: none"> To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques. To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Safely handle tools and perform dis-assembly and assembly of home appliances, air-conditioners, refrigerators, and bicycles.	K3			
CO2	Prepare base materials, select appropriate welding techniques, and perform MAW, GMAW, and GTAW on carbon steel and stainless steel for simple fabrication.	K3			
CO3	Safely use electrical installation tools and perform wiring for distribution boards, lighting, fans, motors, and UPS systems.	K3			
CO4	Identify, assemble, and solder electronic components, integrate sensors and actuators with microcontrollers, and demonstrate basic PLC circuits.	K3/K4			
CO5	Create solid and assembly models of components, fabricate parts using 3D printers, and perform precise cutting of wood and metal using laser cutting technology.	K3/K6			

LIST OF EXPERIMENTS:

1. Dis-assembly & Assembly Practices
 - i. Tools and its handling techniques.
 - ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.
 - iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.
 - iv. Dis-assembly and assembly of a Bicycle.
2. Welding Practices
 - i. Welding Procedure, Selection & Safety Measures.

- ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.
- iii. Hands-on session of preparing base material & Joint groove for welding.
- iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Steel plates / pipes, for fabrication of a simple part.
- 3. Electrical Wiring Practices
 - i. Electrical Installation tools, equipment & safety measures.
 - ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box.
 - iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells.
 - iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.
- 4. Electronics Components / Equipment Practices
 - i. Electronic components, equipment & safety measures.
 - ii. Dis-assembly and assembly of Computers.
 - iii. Hands-on session of Soldering Practices in a Printed Circuit Board.
 - iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier.
 - v. Hands-on session of integration of sensors and actuators with a Microcontroller.
 - vi. Demonstration of Programmable Logic Control Circuit.
- 5. Contemporary Systems
 - i. Demonstration of Solid Modelling of components.
 - ii. Demonstration of Assembly Modelling of components.
 - iii. Fabrication of simple components / parts using 3D Printers.
 - iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

TOTAL: 60 PERIODS

References:

1. Stephen Christena, "Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics", Crestline Books, 2014.
2. H. Lipson, "Fabricated - The New World of 3D Printing", Wiley, 1st Edition, 2013.
3. Code of Practice for Electrical Wiring Installations (IS 732:2019).

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	-	-	-	-	-	1	-	-	1	1	2	-	-
2	2	3	2	2	-	-	1	-	3	2	2	2	-	-
3	1	1	2	-	1	-	3	-	-	1	2	3	3	2
4	1	3	2	3	-	3	1	-	3	3	2	1	3	2
5	-	-	1	-	-	-	-	-	-	3	2	1	3	2
Avg.	1.5	2.33	1.75	2.5	1	3	1.5	-	3	2	1.8	1.8	3	2

SEMESTER II

MA25C02	LINEAR ALGEBRA	L	T	P	C
		3	1	0	4
Course Objectives:	<ul style="list-style-type: none"> To impart foundational knowledge in linear algebra essential for analysing and solving problems in engineering applications. To provide the knowledge on computation using software and interpret key linear algebra concepts using software 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Understand the fundamental concepts of matrices, systems of linear equations, and matrix operations.				K2
CO2	Apply methods such as Gaussian elimination and matrix inversion to solve systems of linear equations.				K3
CO3	Compute eigenvalues and eigenvectors and apply them in solving engineering and mathematical problems.				K3
CO4	Analyze vector spaces, linear independence, basis, and dimension of vector spaces.				K4
CO5	Apply inner product concepts and orthogonalization techniques such as Gram-Schmidt process.				K3

Unit I - Vector Spaces	9+3
Introduction to vector spaces examples, Subspaces, Linear combinations span, Generating sets	
Unit II - Linear Bases and Dimensions	9+3
Linear dependence and independence, Basis and dimension, Dimension of subspaces.	
Unit III - Linear Transformations and Diagonalization	9+3
Null space, Range, Dimension theorem (statement only), Matrix representation of a linear transformation, Eigenvalues and eigenvectors, Diagonalizability.	
Unit IV - Inner Product Spaces	9+3
Inner product, Norms, Cauchy, Schwarz inequality, Gram, Schmidt orthogonalization, Simple problems (up to R^3).	
Unit V - Matrix Decomposition	9+3
Orthogonal transformation of a symmetric matrix to diagonal form - Positive definite matrices, QR decomposition, Singular value decomposition (SVD), Least squares solutions- simple problems (up to 3×3 matrices).	
TOTAL (L:45, T:15): 60 PERIODS	
Textbooks: <ol style="list-style-type: none"> Friedberg, S. H., Insel, A. J., and Spence, L. E. "Linear algebra", Pearson, 2022. Lay, D. C., Lay, S. R., and McDonald, J. J. "Linear algebra and its applications with MATLAB". Pearson, 2020. 	

References:

1. Bronson, R. "Schaum's outline of matrix operations", McGraw-Hill Education, 2011.
2. Strang, G., and Thomson, R. "Linear algebra and its applications" Brooks/Cole, 2005.
3. Lipschutz, S., and Lipson, M. "Schaum's outline of linear algebra" McGraw-Hill, 2009.
4. Kreyszig, E. "Advanced engineering mathematics". Wiley India, 2018.

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	-	-	-	-	-	-	1	-	-	-
2	3	3	1	-	-	-	-	-	-	-	1	-	-	-
3	3	2	1	-	-	-	-	-	-	-	1	-	-	-
4	3	3	1	-	-	-	-	-	-	-	1	-	-	-
5	3	2	1	-	-	-	-	-	-	-	1	-	-	-
Avg.	3	3	1	-	-	-	-	-	-	-	1	2	1	-

EE25C01	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3
Course Objectives:	• To impart foundational knowledge in principles and applications of electrical and electronics engineering.				
Course Outcomes			Knowledge Level		
The students will be able to					
CO1	Analyze basic DC circuits using sources, R, L, and C components with fundamental circuit laws.				K4
CO2	Apply AC and three-phase system concepts with electrical safety practices.				K3
CO3	Apply core principles of electrical machines and transformers in practical engineering applications.				K3
CO4	Explain and apply the working and applications				K3
CO5	Analyze and design digital circuits using Boolean algebra and logic gates and explain microcontroller architecture and applications.				K4

Unit I - DC Fundamentals	9
Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Kirchhoff's law, Series parallel combination of R, L and C components, Voltage divider and Current divider rules.	
Unit II – AC Fundamentals	9
Faraday's Laws of Electro-magnetic Induction, Definition of self and mutual inductances, Generation of sinusoidal voltage, Instantaneous & RMS values of sinusoidal signals, Introduction to 3-phase systems, Electrical safety, Fuses and Earthing.	
Unit III- Electric Machines	9
DC Machines, Transformers, Star and delta connections, Three phase induction motors, Synchronous generators, Single phase induction motors, Stepper motor, Universal motor and BLDC motor.	
Unit IV - Semiconductor Devices	9
PN junction diodes, Zener diode, Voltage regulator, BJT & FET transistors, Timers, Operational amplifiers.	
Unit V - Digital Electronics And Microcontrollers	9
Boolean algebra, Basic and Universal gates, Adders, Multiplexers, Demultiplexers and Flip-flops, Microcontrollers: Introduction, Architecture, Potential Applications.	
TOTAL: 45 PERIODS	

Textbooks:

1. Mehta, V. K., & Mehta, R. "Principles of electrical engineering and electronics", S. Chand Publishing, 2006.

References:

1. Del Toro, V. "Electrical engineering fundamentals", Pearson Education, 2022.
2. Hambley, A. R. "Electrical engineering: Principles and applications", 7th Edition, Pearson Publisher, 2019.

E-resources:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science>
2. <https://www.khanacademy.org/science/electrical-engineering>

Mapping of COs with POs / PSOs

POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	1	-	2	-	-	-	-	-	1	1	3	1
2	3	2	1	-	2	3	2	-	-	-	1	1	3	1
3	3	2	2	-	2	2	-	-	-	-	1	2	3	1
4	3	2	2	-	2	-	-	-	-	-	1	2	3	2
5	3	3	3	1	3	-	-	1	1	1	2	2	3	2
Avg.	3	2.4	1.8	1	2.2	2.5	2	1	1	1	1.2	1.6	3	1.4

CS25C06	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
		3	1	0	4
Course Objectives:	<ul style="list-style-type: none"> To impart knowledge on digital logic and provide functional concepts of computer systems with necessary illustrations. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Apply digital logic circuits for evaluating computer architecture performance.	K3			
CO2	Design the architectural structure and functional interconnections of various computer classes.	K3			
CO3	Design and analyze combinational and sequential logic circuits.	K3			
CO4	Analyze various processor architectures and identify the hardware hazards.	K4			
CO5	Analyze the hierarchical organization of memory and I/O systems by evaluating cache performance.	K4			

Unit I - Digital Logic	9+3
Digital systems, Integer arithmetic, Addition and subtraction of signed numbers, Boolean algebra, Theorems and postulates, Functions, Truth table, Canonical and standard forms, Simplification using K-Maps, Digital logic gates, Universal gates, Implementation of logic gates, Integrated circuits.	
Unit II - Computer System	9+3
Basic structure of a computer, Classes of computer, Functional units - Interconnection of components, Von Neumann architecture and Harvard architecture - Instruction execution cycle, Performance metrics: MIPS, MFLOPS, CPI, Throughput.	
Unit III - Arithmetic and Logic Unit	9+3
Combinational Circuits: Adders, Binary adder, Binary parallel adder, Subtractor, Multiplexers, Decoders, Design of fast adder, Multiplication of signed and unsigned numbers, Fast multiplication - Integer division, Floating point numbers and operations, Booth's algorithm for signed multiplication, Sequential circuits: Flip-Flops, Registers, Counters.	
Unit IV - Processing and Pipelining	9+3
Instruction set architecture: RISC vs CISC, Addressing modes, Hardwired control and micro programmed control unit, Concepts of pipelining, Pipeline stages and timing diagram, Hazards: Structural, Data and Control Hazards, Instruction-level parallelism, Parallel processing concepts: SIMD, MIMD, Superscalar processors, Vector and Array processor.	
Unit V- Memory and I/O Systems	9+3
Memory hierarchy: Registers, Cache, Main memory - RAM - ROM: PROM, EPROM, EEPROM - Secondary storage, HDD, SSD, Cache organization, Cache	

replacement policies, NUMA – DMA – ECC, I/O Techniques: Programmed, Interrupt-Driven, DMA, I/O devices and interface standards: PCI, USB, SATA, Interrupt types and priority handling, Buses and bus arbitration, Peripheral communication

TOTAL (L:45, T:15): 60 PERIODS

Textbooks:

1. Mano, M. M., & Ciletti, M. D. "Digital design: With an introduction to the Verilog HDL, VHDL, and System Verilog", Pearson, 2018.
2. Patterson, D. A., & Hennessy, J. L. "Computer organization and design: The hardware/software interface", Morgan Kaufmann, 2012.

References:

1. Stallings, W. "Computer organization and architecture: Designing for performance", Pearson, 2015.

E-resources:

1. NPTEL Courses (Indian MOOCs – Free & Government Certified):
 - a. Computer Architecture: Computer Architecture - Course
 - b. Computer Architecture and Organization: Computer Architecture and Organization - Course
2. Digital Circuit Simulator: Circuit Verse - Online Digital Logic Circuit Simulator
3. Cloud environment: <https://www.cloudbus.org/cloudsim/>

Mapping of COs with POs / PSOs

POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	-	-	-	-	-	-	1	1	3	1
2	3	3	1	-	-	-	-	-	-	-	1	2	3	2
3	3	2	1	-	-	-	-	-	-	-	1	2	3	2
4	3	3	1	-	-	-	-	-	-	-	1	2	3	2
5	3	2	1	-	-	-	-	-	-	-	1	1	3	2
Avg.	3	3	1	-	-	-	-	-	-	-	1	1.6	3	1.8

UC25H02	தமிழர்களும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1
Course Objectives:	<ul style="list-style-type: none"> To enable students to understand the technological developments of the Tamil civilization. 				
Course Outcomes					Knowledge Level
The students will be able to					
CO1	Understand and explain the technological knowledge of weaving and ceramic technology of the Sangam Age.				K2
CO2	Describe ancient Tamil design and construction technologies.				K2
CO3	Explain the manufacturing and industrial technologies of ancient Tamil society.				K2
CO4	Explain agricultural and irrigation technologies of ancient Tamils.				K2
CO5	Describe the development of Scientific Tamil and Tamil Computing.				K2

அலகு I - நெசவு மற்றும் பானைத் தொழில்நுட்பம்	3
சங்க காலத்தில் நெசவுத் தொழில், பானைத் தொழில்நுட்பம், கருப்பு சிவப்பு பாண்டங்கள், பாண்டங்களில் கீறல் குறியீடுகள்	
அலகு II - வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு, சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள், மாமல்லபுரச் சிற்பங்களும், கோவில்களும், சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள், மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ, சாரோசெனிக் கட்டிடக் கலை.	
அலகு III - உற்பத்தித் தொழில் நுட்பம்	3
கப்பல் கட்டும் கலை, உலோகவியல், இரும்புத் தொழிற்சாலை, இரும்பை உருக்குதல், எஃகு, வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள், நாணயங்கள் அச்சடித்தல், மணி உருவாக்கும் தொழிற்சாலைகள், கல்மணிகள், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள், எலும்புத்துண்டுகள், தொல்லியல் சான்றுகள், சிலப்பதிகாரத்தில் மணிகளின் வகைகள்	
அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	3
அணை, ஏரி, குளங்கள், மதகு, சோழர்காலக் குழித் தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள், வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள், கடல்சார் அறிவு, மீன்வளம், முத்து மற்றும் முத்துக்குளித்தல், பெருங்கடல் குறித்த பண்டைய	

அறிவு, அறிவுசார் சமூகம்	
அலகு V அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	3
அறிவியல் தமிழின் வளர்ச்சி, கணினித்தமிழ் வளர்ச்சி, தமிழ் நூல்களை மின்பதிப்பு செய்தல், தமிழ் மென்பொருட்கள் உருவாக்கம், தமிழ் இணையக் கல்விக்கழகம், தமிழ் மின் நூலகம், இணையத்தில் தமிழ் அகராதிகள், சொற்குவைத் திட்டம்.	
TOTAL: 15 PERIODS	
Textbooks: <ol style="list-style-type: none"> 1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2. கணினித் தமிழ், முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). 	
References: <ol style="list-style-type: none"> 1. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு). 2. பொருறை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	-	-	-	1	-	-	-	-	1	-	-	-
2	2	1	1	-	-	2	-	-	-	-	1	-	-	-
3	2	2	1	-	-	2	-	-	-	-	1	-	-	-
4	2	2	1	-	-	3	-	-	-	-	1	-	-	-
5	2	1	-	-	2	1	-	-	1	-	2	-	-	-
Avg.	2	1.4	1	-	2	1.8	-	-	1	-	1.2	-	-	-

UC25H02	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1
Course Objectives:	<ul style="list-style-type: none"> To enable students to understand the technological developments of the Tamil civilization. 				
Course Outcomes The students will be able to					Knowledge Level
CO1	Understand and explain the technological knowledge of weaving and ceramic technology of the Sangam Age.				K2
CO2	Describe ancient Tamil design and construction technologies.				K2
CO3	Explain the manufacturing and industrial technologies of ancient Tamil society.				K2
CO4	Explain agricultural and irrigation technologies of ancient Tamils.				K2
CO5	Describe the development of Scientific Tamil and Tamil Computing.				K2

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 Stonebeads, 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 Thoompuof 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

Textbooks:

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.

References:

1. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
2. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	-	-	-	1	-	-	-	-	1	-	-	-
2	2	1	1	-	-	2	-	-	-	-	1	-	-	-
3	2	2	1	-	-	2	-	-	-	-	1	-	-	-
4	2	2	1	-	-	3	-	-	-	-	1	-	-	-
5	2	1	-	-	2	1	-	-	1	-	2	-	-	-
Avg.	2	1.4	1	-	2	1.8	-	-	1	-	1.2	-	-	-

PH25C03	APPLIED PHYSICS (CSIE) - II	L	T	P	C
		2	1	0	3
Course Objectives:	<ul style="list-style-type: none"> To provide a comprehensive understanding of physics concepts in computer science and engineering applications. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Explain GMR principles in different magnetic storage devices.				K2
CO2	Simplify logic circuits using K-Map.				K3
CO3	Explain the quantum confinement effects in nanomaterials.				K2
CO4	Apply quantum transport principles in tunneling phenomena.				K3
CO5	Explain the operation of single- and multi-qubit quantum gates.				K2

Unit I - Magnetic Materials	7+2
Parameters, Ferromagnetic materials, Ferrites - soft and hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Magnetic data storage.	
Unit II - Logic Gates	7+2
Conversion of binary to decimal - decimal to binary – binary coded decimal code-logic gates (OR, AND, NOT, NAND and NOR)–Exclusive OR gate- simplification based on basic boolean theorems (sum of products, product of sums expression)-simplification by Karnaugh Map method (don't care conditions).	
Unit III – Nano-Devices	7+2
Introduction – electron density in bulk material – size dependence of fermi energy-quantum confinement – quantum structures: quantum wells, wires and dots – band gap of nanomaterials.	
Unit IV - Quantum Transport	7+2
Tunneling- Coulomb blockade - single electron transistor - resonant-tunneling diode- Carbon nanotubes: Properties and applications.	
Unit V- Quantum Computing	7+2
Quantum system for information processing - quantum states – classical bits – quantum bits or qubits – Bloch sphere -CNOT gate – Single and multiple qubits – quantum gates (Pauli – X, Y and Z Gates, Hadamard gate, Phase gate - T gate. CNOT Gate) – advantage of quantum computing over classical computing.	
TOTAL (L:35, T:10): 45 PERIODS	
Textbooks: <ol style="list-style-type: none"> 1. Kasap, S. O. " Principles of electronic materials and devices", McGraw-Hill education, 2007. 2. Bernhardt, C. "Quantum computing for everyone", MIT Press, 2019. 	
References: <ol style="list-style-type: none"> 1. Hanson, G. W., "Fundamentals of nanoelectronics". Pearson Education, 2009. 	

E-resources:

1. Single electron Transistor: <https://youtu.be/MTT729LtBo?si=RGaEhGgmyWJWcZb>
2. Basics of quantum computing- <https://lab.quantumflytrap.com>
3. Single electron transistor - <http://vlabs.iitkgp.ac.in/tcad>
4. Quantum Computing:
<http://www.digimat.in/nptel/courses/video/106106232/L01.html>
5. Review article: Claude Chappert, Albert Fert and Frédéric Nguyen Van Dau, "The emergence of spin electronics in data storage" Nature Publishing 2007

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	1	1	2	1	-	-	-	-	2	-	-	-
2	3	2	2	1	2	1	1	-	-	-	2	-	-	-
3	3	2	1	2	2	2	-	-	-	-	3	-	-	-
4	3	2	2	2	-	2	-	-	-	-	3	-	-	-
5	3	3	2	1	2	1	1	-	1	-	3	-	-	-
Avg.	3	2.4	1.6	1.4	2	1.4	1	-	1	-	2.6	-	-	-

AD25201	PYTHON FOR DATA SCIENCE	L	T	P	C
		3	0	2	4
Course Objectives:	<ul style="list-style-type: none">• To impart knowledge on Python programming and how it can be used for solving problems.• To illustrate how to handle, clean, and analyze data using Python libraries• To make use of Python tools and open datasets for real-world data science applications.				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Apply basic Python programming concepts to develop simple programs.				K3
CO2	Apply the data science process to handle real-world data problems.				K3
CO3	Examine data using descriptive statistical techniques to identify patterns and variations.				K4
CO4	Interpret multi-dimensional data using NumPy and Pandas for meaningful insights.				K4
CO5	Analyze data patterns and insights using appropriate visualization techniques.				K4

Unit I - Basics of Python, Functions and Files	9
What is Python, Python interpreter, Python language basics: Language semantics, Data types, Variables, Basic functions, Operators, Flow control statements, Data structures and sequences: List, Tuple, Set, Dictionaries, Functions and Files: Defining a function, Passing arguments, Return values, Passing a list, Creating and using a class, Strings: Working with strings, String methods, Files: Reading from a file, Writing to a file, Exceptions, Python libraries: Importing libraries.	
Unit II - Foundations of Data Science	9
Introduction to data science- Applications of data science - Data science process: Overview, Defining research goals, Retrieving data - Data preparation: Data wrangling- Handling missing data- Data transformation, Outlier/noise and anomalies, Exploratory data analysis, Build the model, Present findings, Data mining, Data warehousing.	
Unit III – Descriptive Analytics	9
Facets of data, Types of variables, Statistical description of data, Describing data with tables and graphs, Describing data with averages, Describing variability, Normal distributions and standard (z) scores, Correlation, Scatter plots, Correlation coefficient for quantitative data – Computational formula for correlation coefficient, Regression, Regression line, Least squares regression line.	
Unit IV - Numpy and Pandas Libraries	9
Creating Arrays, attributes, Numpy Arrays objects, Basic operations (Array Join-split- search- sort), Indexing, Slicing and iterating, Copying arrays, Arrays shape manipulation, Identity array, eye function. Exploring data using series- Exploring data using data frames, Index objects- reindex, Drop entry, Selecting entries-Data alignment, Rank and sort, Summary statistics, Index hierarchy.	

Unit V- Data Visualization	9
Introduction to Matplotlib, Plots, Making subplots, Controlling axes, Ticks, Labels and legends, Annotations and drawing on subplots, Saving plots to files, Seaborn library, Making sense of data through advanced visualization, Controlling the properties of chart, Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot, Styling your plot, 3D plot of surface.	
TOTAL: 45 PERIODS	
List of Experiments <ol style="list-style-type: none"> 1. Programs using conditional and looping constructs 2. Programs using different data frames like list, tuple, set and dictionary. 3. Programs using functions and classes. 4. Programs using strings and files 5. Data Creation and Mathematical operations 6. Graphs and Plotting 7. Statistical description of data without libraries 8. Generation of correlation coefficient 9. Linear regression model. 10. Creation of 1D, 2D, and 3D NumPy arrays 11. Array Slicing and Indexing operations 12. Reindexing, and aligning data across multiple Data Frames 13. Line plot, bar plot, histogram, and box plot 14. Seaborn plots, plot styling and customization 	
TOTAL: 30 PERIODS	
Textbooks: <ol style="list-style-type: none"> 1. Grus, J. "Data science from scratch", 2nd Edition, O'Reilly Media, Inc, 2019. 2. McKinney, W. "Python for data analysis: Data wrangling with pandas, NumPy, and IPython", O'Reilly Media, Inc, 2018. 	
References: <ol style="list-style-type: none"> 1. VanderPlas, J. T. "Python data science handbook: Essential tools for working with data", O'Reilly Media, Inc, 2017. 2. Thereja, R. "Data science and machine learning using Python", 1st Edition, Tata McGraw Hill, 2022. 	
E-resources: <ol style="list-style-type: none"> 1. https://numpy.org/doc/ 2. https://pandas.pydata.org/docs/ 3. NPTEL course in Python for Data Science by Prof. Ragunathan Rengasamy-IIT Madras. https://onlinecourses.nptel.ac.in/noc22_cs32/preview. 4. Coursera course in Python for Data Science by Fractal Analytics. https://www.coursera.org/learn/python-data-science. 5. Coursera course in Introduction to Data Science in Python by Christopher Brooks. https://www.coursera.org/learn/python-data-analysis 	

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	-	-	1	1	1	1	1	-	2	2	3	1
2	2	3	2	2	3	2	3	3	3	3	3	3	3	2
3	3	1	-	2	1	-	-	-	-	-	-	2	3	3
4	2	2	2	3	3	1	2	1	2	2	3	3	3	3
5	2	-	3	2	1	3	-	1	2	-	2	1	2	2
Avg.	2.2	1.75	2.33	2.25	1.8	1.6	2	1.5	2	2.5	2.5	2.6	3.0	2.4

EN25C02	ENGLISH ESSENTIALS-II	L	T	P	C
		1	0	2	2
Course Objectives:	<ul style="list-style-type: none"> • Enable learners to improve fluency and accuracy in spoken and written communication. • Develop learners' ability to articulate ideas clearly and effectively in formal and informal spoken interactions. • Help learners construct well-organised written documents relevant to academic and workplace contexts. 				
Course Outcomes The students will be able to				Knowledge Level	
C01	Identify and explain the types of oral communication (verbal and non-verbal) and their appropriate use in conversation.				K2
C02	Apply effective oral communication strategies in different situations.				K3
C03	Prepare clear, concise, and professional emails and formal letters for academic and workplace communication.				K3
C04	Prepare well-structured academic texts by paraphrasing, summarizing, and writing different types of essays.				K3
C05	Produce effective teamwork by assuming roles such as team leader or team player during collaborative task				K4

Unit I - Oral Communication – Fundamentals	3
Types of Oral Communication: Verbal and Non-verbal, Interpersonal Communication, Group Communication.	
Unit II - Oral Communication – Applied Skills	3
Telephonic Conversation, Formal Speeches (Welcome, Vote of Thanks, Introducing Guests), Listening and responding to short podcasts.	
Unit III - Business Correspondence	3
Email Communication, Formal Letters (Types), Business Meetings (Agenda and Minutes of the Meeting).	
Unit IV - Academic Writing	3
Paraphrasing, Summarizing, Essay Writing, Instructions and Recommendations.	
Unit V- Team Work	3
Leadership Skills (Team building, Team leader, Team player), Negotiation and Problem-solving Skills.	
TOTAL: 30 PERIODS	
List of Experiments: <ol style="list-style-type: none"> 1. Short presentations, Debates 2. Formal speeches, Listening tasks and responses 3. Agenda and Minutes of the Meeting 	

4. Email writing, Letter writing (Complaint, Request, Permission)
5. Essay writing (Cause and Effect, Argumentative, Persuasive)
6. Summarizing and Paraphrasing
7. User guides / manuals / policy documents
8. SWOT Analysis, Brainstorming and Group discussions

TOTAL (L:15, P: 15): 30 PERIODS

Textbooks:

1. Taylor, Shirley and Chandra. V. "Communication for Business A Practical Approach. India: Pearson Longman", 2010.
2. Koneru Aruna. "English Language Skills for Engineers. McGraw Hill Education", 2020.

References:

1. Ian Badger, et al., "Listening: B2 (Collins English for Life: Skills), Collins", 2014.
2. Raymond Murphy, "Grammar in Use, Cambridge University Press", 2019.

E-Resources:

1. Communication for Business Success
<https://open.umn.edu/opentextbooks/textbooks/8>
2. TED Talks – <https://www.ted.com/>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	3	2	3	-	2	-	-	-
2	2	2	-	3	2	3	-	3	3	2	3	-	-	-
3	2	-	-	2	-	3	3	3	3	2	3	-	-	-
4	3	3	-	2	-	3	3	2	3	2	2	-	-	-
5	2	2	-	1	2	3	3	3	3	2	2	-	-	-
Avg.	2.25	2.33	-	2	2	3	3	2.6	3	2	2.4	-	-	-

UC25A03	LIFE SKILLS FOR ENGINEERS-II	L	T	P	C
		1	0	2	1
Course Objectives:	<ul style="list-style-type: none"> To impart and cultivate analytical reasoning, innovative thinking, effective collaboration, and ethical leadership to prepare students for complex challenges in professional and personal environments. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Apply the importance of leadership in professional and personal life.			K3	
CO2	Apply creatively problem-solving techniques for innovative solutions.			K3	
CO3	Demonstrate management skills in teamwork situations effectively.			K3	
CO4	Analyze problems scientifically in engineering & real-world contexts.			K4	
CO5	Analyze leadership decisions for goal-oriented solutions ethically.			K4	

Unit I - Foundations of Creativity & Critical Thinking	3
Creativity: Meaning and Importance - Critical Thinking: Meaning and Need - Creativity vs Critical Thinking, Sources of creativity, Myths of creativity, Imagination, Intuition, and Experience, Multiple Intelligence.	
Unit II - Thinking Processes & Reasoning Skills	3
Convergent and Divergent Thinking, Lateral Thinking, Analytical Thinking, Numeric Reasoning, Symbolic, Graphic Reasoning - Scientific Temperament and Logical thinking.	
Unit III - Problem Solving & Decision Making	3
Problem-solving techniques, Decision-making process, Six Thinking Hats - Mind Mapping - Forced Connections.	
Unit IV - Collaboration & Leadership Skills	3
Collaboration - Leadership Styles and Self-Assessment - Communication and Active listening - Teamwork and Delegation.	
Unit V - Ethical & Situational Leadership Practices	3
Empathy in Leadership, Integrity and Conflict management, Crisis Leadership Simulation, Vision, Motivation & Goal Setting, Responsibility in Decision Making.	
TOTAL (L:15): 15 PERIODS	
Textbooks:	
1. Sobana, S., Mahalakshmi, A. Life Skills For Engineering – II. VK Publications, 2025.	
References:	
1. DeBono,E., "Six thinking hats", Little, Brown Book Group, 2017.	
2. Facione,P.A. "Critical thinking: What it is and why it counts", Insight Assessment", 2015.	

3. Kahneman,D., "Thinking, fast and slow. Farrar, Straus and Giroux", 2011.
4. Whetten, D.A., & Cameron,K.S., "Developing management skills", Pearson, 2016.

E-resources:

1. https://www.mindtools.com/pages/main/newMN_TMC.htm
2. <https://www.skillsyouneed.com/ips/problem-solving.html>
3. https://www.mindtools.com/pages/main/newMN_TED.htm
4. <https://www.skillsyouneed.com/ips/decision-making.html>
5. <https://www.mindmapping.com/>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2	1	1	2	2	1	2	3	1	2	-	-	-
2	2	2	2	1	2	2	2	2	3	2	2	-	-	-
3	2	3	2	2	1	3	2	2	3	2	2	-	-	-
4	1	2	2	2	2	2	1	2	3	2	2	-	-	-
5	2	2	3	2	3	2	2	3	3	2	2	-	-	-
Avg.	1.8	2.2	2	1.6	2	2.2	1.6	2.2	3	1.8	2	-	-	-

UC25A04	PHYSICAL EDUCATION - II	L	T	P	C
		0	0	4	1
Course Objectives:	<ul style="list-style-type: none"> To impart knowledge on gymnastic exercises and pressing needs for upskilling in a particular game 				
Course Outcomes The students will be able to					Knowledge Level
CO1	Recall the basic concepts of warming-up exercises, safety education, and suitable lead-up games in gymnastics.				K1
CO2	Explain the principles of movement education, balance walk, floor exercises, and tumbling/acrobatics in basic gymnastics.				K2
CO3	Apply the techniques of grip, release, swinging, and exercises on parallel bars and horizontal bars during gymnastics practice.				K3
CO4	Demonstrate skills in any one athletic event such as broad jump, high jump, relay sprint, javelin throw, discus throw, shot put, or running events.				K3
CO5	Analyze and perform gymnastics movements an athletic activities to improve coordination, balance, and overall physical fitness.				K4

Unit I - Basic gymnastics exercises	10
Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.	
Unit II - Upskilling in any one of the athletics	10
Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discuss Throw, Shot Put, Short and Long-distance Running.	
TOTAL:15 PERIODS	
References: <ol style="list-style-type: none"> Singh, A. "Essentials of physical education. Kalyani Publishers", 2008. Kamlesh, M. L., "Psychology in physical education and sport", (3rd edition). Metropolitan Book Co., 2006. Mangal, S. K., "Psychology of sports performance", Sports Publication, 2009. Kandappan, K. "Foundations of physical education", Friends Publications, 2004. 	
E-resources: <ol style="list-style-type: none"> https://www.who.int/health-topics/physical-activity 	

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	1	-	-	2	-	2	1	-	-	1	-	-	-
2	2	2	-	-	2	-	2	2	-	-	1	-	-	-
3	-	2	3	-	2	-	1	2	-	-	1	-	-	-
4	-	1	3	2	3	-	1	3	-	-	2	-	-	-
5	-	2	2	3	3	-	2	3	-	-	2	-	-	-
Avg.	2.5	1.6	2.6	2.5	2.4	-	1.6	2.2	-	-	1.4	-	-	-

FOREIGN LANGUAGE^

UC25F01	DEUTSCH – I	L	T	P	C
		1	0	2	1
Course Objectives:	• To impart fundamentals of the Deutsch language, including reading, writing systems, pronunciation, and speaking.				
Course Outcomes The students will be able to				Knowledge Level	
C01	Demonstrate basic proficiency in German pronunciation, greetings, introductions, numbers, and simple sentence structures.				K2
C02	Apply fundamental German grammar, including personal pronouns, articles, and present tense verb forms, to construct simple sentences.				K3
C03	Use essential German vocabulary related to everyday life, such as family, school, food, colors, and common objects, in simple conversations.				K3
C04	Communicate effectively in routine situations by asking and answering questions, giving directions, telling time, ordering food, and describing daily activities in German.				K3
C05	Demonstrate awareness of basic German culture and etiquette, including formal and informal communication, and participate appropriately in simple intercultural interactions.				K3

Unit I - Basics and Introduction	5
German alphabet and pronunciation, Basic greetings and farewells, Introducing yourself and others (Ich heiße..., Wer bist du?), Numbers 1–100 and days of the week, Personal pronouns (ich, du, er, sie...), Sentence structure (SVO word order), Alphabet spelling game, short skits, Use color-coded cards for SVO sentences.	
Unit II - Grammar Essentials and Everyday Vocabulary	5
Present tense of regular verbs (spielen, arbeiten, machen...), Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Articles and gender (der, die, das; ein, eine), Simple questions and negation (nicht, kein), Describing people and things: adjectives and colors, Family, school, food, and common objects vocabulary, Conjugate regular and irregular verbs, "Question Chain" game, Create a simple family tree.	
Unit III - Everyday Communication in German	5
Asking for and giving directions, Telling the time and talking about schedules,	

Ordering food and drinks at a café or restaurant, Talking about hobbies, weather, and daily routines, Listening to short conversations and responding appropriately, Introduction to German culture and formal/informal language use (du vs Sie), Ordering food and drinks, Give directions, Formal / Informal greetings, Do's and Don'ts.

TOTAL:15 PERIODS

References:

1. Funk, H., Kuhn, C., and Demme, S. Menschen A1: Deutsch als Fremdsprache Kursbuch. Hueber Verlag, 2015.

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	3	-	2	-	-	-
2	-	-	-	-	-	-	-	-	3	-	2	-	-	-
3	-	-	-	-	-	-	-	1	3	-	2	-	-	-
4	-	-	-	-	-	-	-	2	3	-	2	-	-	-
5	-	-	-	-	-	2	-	2	3	-	2	-	-	-
Avg.	-	-	-	-	-	2	-	1.6	3	-	2	-	-	-

UC25F02	JAPANESE – I	L	T	P	C
		1	0	2	1
Course Objectives:	<ul style="list-style-type: none"> To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation, and speaking. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Understand reading, writing, and pronunciation of basic Hiragana and Katakana characters and use common greetings, numbers, and simple expressions in Japanese.				K2
CO2	Apply fundamental Japanese grammar, including particles, sentence structure, and present tense verb forms, to construct simple sentences and questions.				K3
CO3	Use essential Japanese vocabulary related to family, food, colors, daily activities, and common objects in basic written and spoken communication.				K3
CO4	Communicate effectively in everyday situations such as self-introduction, asking for directions, ordering food, expressing preferences, and discussing daily routines using simple Japanese expressions.				K3
CO5	Demonstrate awareness of Japanese cultural practices, etiquette, and formal/informal language usage to interact appropriately in basic social contexts.				K2

Unit I - Writing Systems and Basic Communication	5
Introduction to Hiragana: vowels, basic characters, reading and writing, Introduction to Katakana: basic characters and usage, Basic greetings and farewells (こんにちは, おはようございます, さようなら), Introducing yourself (名前 出身、年齢), Basic sentence structure: Subject-Object- Verb, Numbers 1-100, days of the week, classroom expressions, Games and writing drills, Self-introduction, Numbers and datematching, Greeting expressions, Listening to audio.	
Unit II - Grammar and Everyday Vocabulary	5
Particles: は (wa), を (wo), の (no), へ (e), に (ni), Present tense verbs: です, ます-form conjugation (たべます、のみます), Negative forms: ではありません, ません, Describing people and objects using adjectives (い and な), Question formation: なに、どこ、だれ、い, Vocabulary for family, food, colors, and basic actions, Verb conjugation drills, Guessing game, Picture description, "Shopping" with food vocab and counters.	

Unit III - Conversation and Cultural Etiquette	5
Talking about routines and schedules (daily verbs, time expressions), Asking and giving simple directions (～はどこですか?), Ordering food and making polite requests (～をください、～をおねがいします), Expressing likes and dislikes (すき・きらい), Listening to short conversations and identifying key phrases, Introduction to formal/informal speech and Japanese etiquette, Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.	
TOTAL:15 PERIODS	
References: <ol style="list-style-type: none"> 1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., and Tokashiki, K. Genki I, "An integrated course in elementary Japanese", The Japan Times, 2011. 2. The Japan Foundation. Marugoto Japanese language and culture starter (A1) course book for communicative language activities. Goyal Publishers, 2017. 	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	3	-	-	-	-	-
2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
3	-	-	-	-	-	-	-	1	3	-	-	-	-	-
4	-	-	-	-	-	-	-	2	3	-	-	-	-	-
5	-	-	-	-	-	2	2	2	3	-	2	-	-	-
Avg.	-	-	-	-	-	2	2	1.6	3	-	2	-	-	-

UC25F03	KOREAN – I	L	T	P	C
		1	0	2	1
Course Objectives:	<ul style="list-style-type: none"> To impart fundamentals of the Korean language, including reading, writing systems, pronunciation, and speaking. 				
Course Outcomes The students will be able to					Knowledge Level
C01	Demonstrate the ability to read, write, and pronounce basic Hangul characters and use common Korean greetings, introductions, numbers, and simple expressions.				K2
C02	Apply fundamental Korean grammar, including particles, sentence structure, and present tense verb conjugation, to construct simple sentences and questions.				K3
C03	Use essential Korean vocabulary related to everyday life, such as family, food, shopping, time, and common activities, in basic written and spoken communication.				K3
C04	Communicate effectively in routine situations such as self-introduction, shopping, ordering food, asking for directions, and discussing daily schedules using simple Korean expressions.				K3
C05	Demonstrate awareness of Korean cultural practices, etiquette, and polite speech levels to interact appropriately in basic social and professional contexts.				K2

Unit I - Fundamentals of Korean	5
Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (SubjectObject-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요), Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.	
Unit II - Essential Grammar and Vocabulary	5
Particles (은/는, 이/가, 을/를) and usage, Basic verbs and present tense conjugation, Sentence patterns: affirmative, negative, interrogative, Common adjectives and descriptive sentences, Expressing possession and location,	

Asking simple questions (어디, 뭐, 누구), Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.

Unit III - Everyday Korean Communication

5

Polite speech levels and honorifics introduction, Talking about time, dates, and schedules, Ordering food, shopping phrases, counting objects, Simple directions and transportation vocabulary, Listening practice with short dialogues, Cultural notes on etiquette and communication, Role-play ordering at a restaurant or buying items, Listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.

TOTAL:15 PERIODS

References:

1. King, R., Yeon, J., and Brown, A. "Elementary Korean" (2nd edition). Tuttle Publishing, 2015.
2. Cho, Y., Lee, H., Schulz, C., Sohn, H.-M., and Sohn, S.-O., "Integrated Korean: Beginning 1", University of Hawai'i Press, 2001.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	3	-	2	-	-	-
2	-	-	-	-	-	-	-	-	3	-	2	-	-	-
3	-	-	-	-	-	-	-	1	3	-	2	-	-	-
4	-	-	-	-	-	-	-	2	3	-	2	-	-	-
5	-	-	-	-	-	2	2	2	3	-	2	-	-	-
Avg.	-	-	-	-	-	2	2	1.6	3	-	2	-	-	-

ME25C05	RE-ENGINEERING FOR INNOVATION	L	T	P	C
		0	0	4	2
Course Objectives:	<ul style="list-style-type: none"> To cultivate foundational skills in prototyping, and automation for development of prototypes with real-world applications. To provide a comprehensive, hands-on exposure to product development through reverse engineering concepts. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Explain the concepts of product development, product life cycle, and reverse engineering through analysis of simple products.				K2
CO2	Perform disassembly of products, take basic measurements, and prepare sketches for reverse engineering and CAD modeling.				K3
CO3	Develop CAD models of disassembled components and Perform virtual assembly of parts using appropriate software tools.				K3
CO4	Interface sensors with embedded system platforms and implement simple automation applications.				K3
CO5	Design and fabricate prototype components using reverse engineering concepts and rapid prototyping techniques such as 3D printing.				K4

LIST OF EXPERIMENTS:
<p>Boot camp 1: Introduction to Product Development, Reverse Engineering, Overview of the product lifecycle, Hands-on disassembly of simple products, Practice of basic measurements and sketching, Introduction to CAD modeling of disassembled parts, Virtual assembly of parts.</p> <p>Boot camp 2: Embedded System Programming (Open-source platforms), Practice of interfacing sensors, reading data, automation in home, healthcare and agriculture.</p>
REVERSE ENGINEERING:
<ul style="list-style-type: none"> Reverse Engineering: Sketch and prototype alternative designs, Group brainstorming sessions, Manufacture prototype parts using 3D printing and / or workshop tools, Assemble prototype product.
TOTAL: 60 PERIODS
References:
<ol style="list-style-type: none"> Wang, W., "Reverse engineering: Mechanisms, structures, systems and materials", CRC Press, 2010. Margolis, M. Arduino cookbook: Recipes to begin, expand, and enhance your projects (3rd edition). O'Reilly Media, 2020.

E-resources:

1. GrabCAD – <https://grabcad.com/>
2. GitHub – <https://github.com/>

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2	1	-	1	-	-	1	-	-	1	1	1	-
2	2	2	2	-	2	-	-	1	-	-	1	2	2	-
3	2	2	3	1	3	-	-	1	-	-	1	2	3	1
4	2	3	2	1	3	-	-	1	-	-	1	2	3	1
5	2	2	3	1	3	-	-	2	-	-	2	3	3	2
Avg.	2.0	2.2	2.2	1	2.4	-	-	1.2	-	-	1.2	2	2.4	1.3

SEMESTER III

Common to CSE, AI&DS and IT

MA25302	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4
Course Objectives:	<ul style="list-style-type: none"> • To understand the fundamental concepts of logic and proof techniques used in mathematical reasoning. • To develop problem-solving skills in combinatorics including counting methods, recurrence relations, and generating functions. • To gain knowledge of graph theory concepts and their applications in computer science. • To study and analyze algebraic structures such as groups, rings, and fields. • To understand the theory of lattices and Boolean algebra and their applications in logical and algebraic systems. 				
Course Outcomes					Knowledge Level
The students will be able to					
CO1	Apply the principles of propositional logic, predicates, and proof techniques in logical reasoning.				K3
CO2	Apply counting principles and combinatorial techniques to solve mathematical and computational problems.				K3
CO3	Apply graph theoretic concepts to solve problems in computer science and engineering.				K3
CO4	Analyze algebraic structures such as semigroups, groups, rings, and fields and apply them in mathematical problem solving.				K3
CO5	Apply the concepts of lattices and Boolean algebra in logical circuit design and computer science applications.				K3

Unit I - LOGIC AND PROOFS	9+3
Propositional logic – Connectives – Tautology - Propositional equivalences – Normal forms – Theory of inference - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.	

Unit II - COMBINATORICS	9+3
Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Solving non-homogeneous recurrence relations with constant coefficients - Generating functions – Inclusion and exclusion principle and its applications.	
Unit III - GRAPHS	9+3
Graphs and graph models – Graph terminology - Special types of graphs – Matrix representation of graphs - Graph isomorphism – Connectivity – Euler and Hamilton paths.	
Unit IV - ALGEBRAIC STRUCTURES	9+3
Algebraic systems – Semi groups and monoids – Groups - Properties of Groups – Subgroups – Homomorphisms – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.	
Unit V- LATTICES AND BOOLEAN ALGEBRA	9+3
Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sublattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Sub Boolean algebra – Boolean homomorphism.	
TOTAL (L:45, T:15): 60 PERIODS	
Text Books:	
<ol style="list-style-type: none"> 1. Rosen K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017. 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:	
<ol style="list-style-type: none"> 1. Grimaldi R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013. 2. Koshy T. "Discrete Mathematics with Applications", Elsevier Publications, 2006. 3. Lipschutz S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010. 	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	-	-	-	-	-	-	-	1	-	1	-	-	-
2	3	2	1	2	2	-	-	-	1	1	1	2	1	-
3	3	2	2	2	2	-	-	-	1	-	1	2	1	-
4	3	2	2	2	2	-	-	-	1	-	1	2	1	-
5	3	2	2	2	2	-	-	-	1	-	1	2	-	-
Avg.	2.80	2	1.75	2	2	-	-	-	1	1	1	2	1	-

CS25301	DATA STRUCTURES	L	T	P	C
		3	0	0	3
Course Objectives:	<ul style="list-style-type: none"> To understand the concepts and operations of linear and non-linear data structures. To apply linked lists, stacks, and queues in problem solving. To analyze tree and graph structures with traversal techniques. To understand searching, sorting, and multiway search tree algorithms. To apply hashing techniques for efficient data organization and retrieval. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Explain the concepts, classifications, and operations of linear data structures such as linked lists, stacks, and queues.			K2	
CO2	Apply stack and queue operations to solve computational problems.			K3	
CO3	Analyze tree structures and perform operations on binary search trees and AVL trees.			K4	
CO4	Apply graph algorithms and multiway search tree techniques for efficient data processing.			K3	
CO5	Analyze searching, sorting, and hashing techniques for data organization and retrieval.			K4	

UNIT I – LISTS	9
Classification of data structures – Operations on data structures – Introduction to linked list – Singly linked lists – Circularly linked lists – Doubly-linked lists – Circular Doubly Linked Lists – Applications of linked lists.	
UNIT II - STACKS AND QUEUES	9
Array representation of stacks - Operations on a stack - Linked representation of stacks - Operations on a linked stack - Applications of stacks - Introduction to queues - Array representation of queues - Linked representation of queues - Types of queues - Applications of queues.	
UNIT III - TREES	9
Introduction - Types of trees - Creating a binary tree from a general tree - Traversing a binary tree - Huffman's tree - Binary search trees - Operations on binary search trees - AVL trees - Trie and Generalized Trie (G - Trie) – Operations and Applications.	

UNIT IV - MULTIWAY SEARCH TREES AND GRAPHS	9
Multi-way Search Trees: B-Tree – B+ Tree – Application of B+ tree in file system - Graphs: Representation of Graphs – Graph traversal algorithms– Topological sort - Shortest Path Algorithms: Minimum spanning tree – Prim's algorithm- Kruskal's algorithm -Dijkstra's algorithm.	
Unit V- SEARCHING, SORTING AND HASHING TECHNIQUES	9
Introduction to searching – Linear search – Binary search - Introduction to sorting – Selection sort – Insertion sort –Quick sort - Merge sort – Heap sort – Hashing – Collisions – Applications of hashing.	
TOTAL (L:45): 45 PERIODS	
Text Books: <ol style="list-style-type: none"> 1. Reema Thareja, "Data Structures Using C", 2nd Edition, Oxford University Press, 2016. 2. Horowitz, Sahni and Anderson – Freed, "Fundamentals of Data Structures in C", 2nd Edition, Universities Press, 2008. 	
References <ol style="list-style-type: none"> 1. Langsam Y., Augenstein M. J., and Tanenbaum A. S., "Data Structures Using C and C++", 2nd Edition, Pearson Education, 2015. 2. Cormen T. H., Leiserson C. E., Rivest R. L., and Stein C., "Introduction to Algorithms", 4th Edition, MIT Press / McGraw-Hill Education, 2022. 3. Levitin A., "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2021. 4. Sridhar S., "Design and Analysis of Algorithms", 2nd Edition, Oxford University Press, 2023. 	
E-resources: <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106102064 2. https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011 	

Mapping of COs with POs / PSOs														
Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	2	3	-	-	-	-	-	2	3	1	-
2	3	3	2	2	3	-	-	-	-	-	2	3	2	-
3	3	3	2	3	3	-	-	-	-	-	2	3	2	-
4	3	3	3	3	3	1	-	-	-	-	2	3	3	-
5	3	3	2	3	3	-	-	-	-	-	2	3	2	-
Avg.	3.0	2.8	2.2	2.6	3.0	1.0	-	-	-	-	2.0	3.0	2.0	-

AI25301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> To understand Object Oriented Programming concepts and basic characteristics of Java To know the principles of inheritance and interfaces and I/O Streams To define exception handling and multithreading To develop a java application with generics and collection frameworks To design and build simple GUI applications using JavaFX and JDBC. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Understand object-oriented programming concepts and Java programming fundamentals.				K2
CO2	Implement exception handling multithreading and file handling techniques in Java applications.				K3
CO3	Apply generic programming concepts and collection framework techniques in Java applications.				K3
CO4	Develop GUI based applications using JavaFX controls layouts and event handling mechanisms.				K3
CO5	Design and develop database driven applications using JDBC connectivity.				K3

UNIT I - INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	6
Introduction to Object Oriented Programming – Features of Java – Basic Program Structure – Data Types and Variables – Operators and Expressions – Control Statements – Classes and Objects – Constructors and Methods – Strings and Packages.	
UNIT II - INHERITANCE, INTERFACES AND I/O STREAMS	6
Inheritance Concepts – Superclass and Subclass – Constructor Chaining – Abstract Classes – Final Classes and Methods – Interfaces and Implementation – Polymorphism – File Handling using Streams – Console and File I/O Operations.	
UNIT – III EXCEPTION HANDLING AND MULTITHREADING	6
Exception Basics – Exception Hierarchy – Try-Catch-Finally Blocks – Built-in Exceptions – User Defined Exceptions – Thread Concepts – Thread Creation and Lifecycle – Multithreading – Thread Synchronization.	

UNIT – IV – GENERICS AND COLLECTION FRAMEWORK	6
Introduction to Generics – Generic Classes – Generic Methods – Collection Framework Overview – List Interface and ArrayList – Set Interface and HashSet – Queue Interface – Map Interface and HashMap – Iterators and Collection Traversal.	
UNIT – V JAVAFX EVENT HANDLING AND JDBC	6
Introduction to JavaFX – Event Handling – JavaFX Controls – Layout Management – Menus and MenuBar – GUI Application Development – JDBC Architecture – JDBC Drivers – Database Connectivity using JDBC.	
TOTAL (L:30): 30 PERIODS	
PRACTICAL EXERCISES	30 PERIODS
<ol style="list-style-type: none"> 1. Implement Java programs for sequential search, binary search, selection sort, and insertion sort. 2. Develop stack and queue applications using classes and objects in Java. 3. Design an Employee payroll system using inheritance concepts and generate pay slips with salary calculations. 4. Develop applications to calculate the area of Rectangle, Triangle, and Circle using abstract classes and interfaces. 5. Implement exception handling mechanisms and create user-defined exceptions in Java. 6. Develop a multithreaded Java application for random number generation and computation of square/cube operations. 7. Write Java programs to demonstrate generic classes, collection framework concepts, and file handling operations. 8. Develop JavaFX applications using controls, layouts, menus, event handling, and JDBC database connectivity. 	
HARDWARE / SOFTWARE REQUIRED:	
HARDWARE:	
i5 processor, 8GB RAM & Windows 10/11	
SOFTWARE:	
JDK 8 or above, Eclipse IDE / NetBeans IDE / IntelliJ IDEA	
TOTAL (L:30,P:30): 60 PERIODS	
Text Books:	
<ol style="list-style-type: none"> 1. Herbert Schildt, –Java The complete reference, 13th Edition, McGraw Hill Education, 2024 for Units I, II, III, IV. 	

2. Cay S. Horstmann —Core Java Volume –I Fundamentals, 11th Edition, Pearson, 2020 for Unit V.

References:

1. Allen B.Downey & Chris Mayfield Think Java, 2nd Edition, Oreilly, 2023.
2. MarcLoy,Patrick Niemeyer & Daniel LeuckLearning Java: An Introduction To Realworld Programming With Java, Sixth Edition Grayscale Indian Edition, 6th edition , Oreilly.
3. Kathy sierra, Bert Bates & Trisha Gee, Head First Java: A Brain Friendly Guide Third edition , Shroff Publishers ,June 2022.

E-resources:

1. <https://docs.oracle.com/javase/tutorial/>
2. <https://nptel.ac.in/courses/106105191>
3. <https://www.geeksforgeeks.org/java/>

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	3	-	2	-	-	1	-	-	-	3	3	2
2	3	3	2	1	3	-	-	1	-	-	-	2	3	2
3	2	3	2	1	3	-	-	1	-	-	-	2	3	3
4	2	2	3	1	3	-	-	1	-	-	-	3	3	2
5	3	3	3	1	3	1	-	1	-	-	-	3	3	3
Avg	2.6	2.6	2.6	0.8	2.8	0.2	0	1.0	0	0	0	2.6	3.0	2.4

CS25303	OPERATING SYSTEMS	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> To understand the fundamentals and services of operating systems. To analyze process management, scheduling, and concurrency concepts. To understand process synchronization and deadlock handling techniques. To analyze memory and storage management mechanisms. To understand file system organization and management concepts. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Explain operating system concepts, services, system calls, and virtualization.				K2
CO2	Apply process management, concurrency, and CPU scheduling techniques.				K3
CO3	Apply synchronization and deadlock handling techniques.				K3
CO4	Utilize memory management, virtual memory, and disk scheduling techniques.				K3
CO5	Explain file system structures, allocation methods, and free-space management techniques.				K2

UNIT I - INTRODUCTION TO OPERATING SYSTEMS	6
Introduction to operating systems – Computer system organization and architecture – Resource management – Virtualization – Operating system structures and services – Operating system interface – System calls.	
UNIT II - PROCESS MANAGEMENT	6
Processes: Process concept and Process scheduling - Inter process Communication (IPC) - Threads & Concurrency: Multicore programming - Multithreading models - Thread libraries - Implicit threading - Threading issues - CPU Scheduling: Scheduling algorithms (FCFS, SJF, RR and PS) - Multi-Processor scheduling - Real-Time CPU scheduling.	
UNIT III - PROCESS SYNCHRONISATION AND DEADLOCKS	6
Synchronization Tools: Critical section problem – Hardware support for synchronization – Mutex locks – Semaphores – Classic problems of synchronization – Deadlock - Methods for handling deadlocks - Deadlock prevention and avoidance - Deadlock detection and Recovery.	

UNIT IV – MEMORY AND STORAGE MANAGEMENT	6
Memory Management: Contiguous memory allocation – Paging - Virtual Memory: Demand paging – Page replacement – Allocation of frames – Thrashing. HDD scheduling - FCFS, SCAN, C – SCAN.	
Unit V- FILE SYSTEM	6
File System Interface: File concept - Access methods – Directory structure – Protections - Memory mapped files - File-System structure: File-System operations - Directory implementation - Allocation methods - Free-Space management – Case study on virtualization.	
TOTAL (L:30): 30 PERIODS	
PRACTICAL EXERCISE	30 PERIODS
1. Installation of windows operating system. 2. Illustrate UNIX commands and shell programming. 3. Write C programs to implement the various CPU scheduling algorithms. 4. Implement mutual exclusion by Semaphore. 5. Write C programs to avoid Deadlock and using Banker's Algorithm. 6. Write C programs for the implementation of various disk scheduling algorithms. 7. Write C programs to Implement the various file organization techniques. 8. Install any guest operating system like UNIX using VMware.	
TOTAL (L:30, P:30): 60 PERIODS	
Text Books: <ol style="list-style-type: none"> 1. Silberschatz Abraham, Greg Gagne, Peter B. Galvin. "Operating System Concepts", 11th Edition, Wiley, 2023. 1. Andrew S. Tanenbaum, "Modern Operating Systems", 5th Edition, Pearson Education, 2024. 	
References: <ol style="list-style-type: none"> 1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Education, 2010. 2. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016. 3. Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2009. 	
E-resources: <ol style="list-style-type: none"> 1. https://ocw.mit.edu/courses/6-828-operating-system-engineering-fall-2012/ 2. https://nptel.ac.in/courses/106106144 	

Mapping of COs with POs / PSOs														
Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	1	2	-	-	-	-	-	2	3	1	-
2	3	3	2	2	3	-	-	-	-	-	2	3	2	-
3	3	3	2	3	3	-	-	-	-	-	2	3	2	-
4	3	3	2	2	3	-	-	-	-	-	2	3	2	-
5	3	2	1	1	2	-	-	-	-	-	2	3	1	-
Avg.	3.0	2.6	1.6	1.8	2.6	-	-	-	-	-	2.0	3.0	1.6	-

AI25302	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3
Course Objectives:	This course enables students to: <ul style="list-style-type: none"> • Understand the fundamentals of Artificial Intelligence and intelligent agents. • Learn problem-solving methods and search techniques in AI. • Understand game playing strategies and constraint satisfaction problems. • Learn logical reasoning and knowledge representation techniques. • Explore probabilistic reasoning and decision-making under uncertainty. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Understand intelligent agents environments rationality and search techniques used in Artificial Intelligence.	K2			
CO2	Apply heuristic search and optimization techniques to solve Artificial Intelligence problems.	K3			
CO3	Analyze game playing strategies and constraint satisfaction techniques for complex problem solving.	K4			
CO4	Apply logical reasoning and inference mechanisms using propositional and first order logic.	K3			
CO5	Explain probabilistic reasoning Bayesian networks and decision making under uncertainty.	K2			

UNIT I - INTELLIGENT AGENTS	9
Introduction to artificial intelligence – Agents and environments – Concept of rationality – Nature of environments – Structure of agents – Problem solving agents – Search algorithms – Uninformed search strategies.	
UNIT II - PROBLEM SOLVING	9
Heuristic search strategies – Heuristic functions – Local search and optimization problems – Local search in continuous space – Search with non-deterministic actions – Search in partially observable environments – Online search agents and unknown environments.	

UNIT III - GAME PLAYING AND CSP	9
Game theory – Optimal decisions in games – Alpha-beta search – Monte-carlo tree search – Stochastic games – Partially observable games – Constraint satisfaction problems – Constraint propagation – Backtracking search for CSP – Local search for CSP – Structure of CSP.	
UNIT IV - LOGICAL REASONING	9
Knowledge-based agents – Propositional logic – Propositional theorem proving – Propositional model checking – Agents based on propositional logic – First-order logic – Syntax and semantics – Knowledge representation and engineering – Inferences in first-order logic – Forward chaining – Backward chaining – Resolution.	
UNIT V- PROBABILISTIC REASONING	9
Acting under uncertainty – Bayesian inference – Naïve bayes models – Probabilistic reasoning – Bayesian networks – Exact inference in bayesian networks – Approximate inference in bayesian networks – Causal networks.	
TOTAL(L:45) : 45 PERIODS	
Text Books:	
1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.	
References:	
1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007	
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008	
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006	
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013.	
E - Resources	
1. NPTEL – Introduction to Artificial Intelligence https://nptel.ac.in/courses/106102220	
2. NPTEL – Artificial Intelligence: Search Methods for Problem Solving https://nptel.ac.in/courses/106106139	
3. MIT OpenCourseWare – Artificial Intelligence https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/	
4. Stanford University – Artificial Intelligence Principles and Techniques https://web.stanford.edu/class/cs221/	
5. Python Official Documentation https://docs.python.org/3/	

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	-	2	-	-	-	-	-	1	3	2	2
2	3	3	2	2	3	-	-	-	-	-	1	3	3	2
3	2	3	2	3	2	-	-	-	-	-	1	2	3	3
4	2	3	1	2	2	-	-	-	-	-	1	2	3	3
5	2	2	1	2	2	1	-	-	-	-	1	2	2	3
Avg	2.4	2.6	1.4	1.8	2.2	0.2	0	0	0	0	1	2.4	2.6	2.6

AI25303	DATA ANALYTICS	L	T	P	C
		3	0	0	3
Course Objectives:	This course enables students to: <ul style="list-style-type: none"> • Study the basic inferential statistics and sampling distribution. • Understand the concept of estimation of parameters using fundamental tests and testing of hypotheses. • Understand the techniques of analysis of variance. • Gain knowledge in predictive analytics techniques. • Perform a case study with any available sample data sets. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Understand sampling concepts sampling distributions and the fundamentals of hypothesis testing.			K2	
CO2	Apply hypothesis testing techniques for statistical decision making using sample data.			K3	
CO3	Perform statistical tests including t tests and analysis of variance for data analysis.			K3	
CO4	Analyze data using predictive analytics techniques to identify patterns trends and inferences.			K4	
CO5	Apply statistical and predictive analytics tools for analyzing real world datasets.			K3	

UNIT I - INFERENCEAL STATISTICS I	9
Population and Sample Concepts - Random Sampling Techniques - Sampling Distribution - Sampling Distribution of Means - Standard Error of the Mean - Other Sampling Distributions - Fundamentals of Hypothesis Testing - Z-Test and Test Statistics - Decision Making and Interpretation	
UNIT II – INFERENCEAL STATISTICS II	9
Purpose of Hypothesis Testing - One-Tailed and Two-Tailed Tests - Statistical Decision Making - Case Studies in Hypothesis Testing - Influence of Sample Size - Power Analysis and Sample Size Estimation - Point Estimation - Confidence Intervals – Effect of sample size on estimation	
UNIT III – T-TEST	9
One-Sample T-Test - Sampling Distribution of t - Degrees of Freedom - Standard Error Estimation - T-Test Procedure - Independent Samples T-Test - Related Samples T-Test - P-Value and Statistical Significance - Case Studies in T-Test	

Applications	
UNIT IV – ANALYSIS OF VARIANCE	9
F-Test Fundamentals - One-Way ANOVA - Effect Size in ANOVA - Multiple Comparison Procedures - Repeated Measures ANOVA - Two-Factor Experiments - Two-Factor ANOVA - Other ANOVA Models - Introduction to Chi-Square Tests	
UNIT V – PREDICTIVE ANALYTICS	9
Linear Least Squares Regression - Model Implementation and Goodness of Fit - Linear Model Testing - Weighted Resampling Techniques - Multiple Regression Analysis - Logistic Regression - Parameter Estimation and Accuracy Assessment - Time Series Analysis and Moving Averages - Missing Values, Autocorrelation and Survival Analysis	
TOTAL (L: 45): 45 PERIODS	
Text Books: <ol style="list-style-type: none"> 1. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. 2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014. 	
References: <ol style="list-style-type: none"> 1. David Spiegelhalter, "The Art of Statistics: Learning from Data", Pelican Books, 2020. 2. Peter Bruce, Andrew Bruce, and Peter Gedeck, "Practical Statistics for Data Scientists", Second Edition, O'Reilly Publishers, 2020. 3. Charles R. Severance, "Python for Everybody: Exploring Data in Python 3", CreateSpace Publishers, 2017. 4. Bradley Efron and Trevor Hastie, "Computer Age Statistical Inference", Cambridge University Press, 2016. 5. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. 	
E - Resources <ol style="list-style-type: none"> 1. NPTEL – Python for Data Science https://nptel.ac.in/courses/106106212 2. NPTEL – Introduction to Probability and Statistics https://nptel.ac.in/courses/111106112 3. Coursera – Data Analysis with Python by IBM https://www.coursera.org/learn/data-analysis-with-python 4. Scikit-learn – Documentation https://scikit-learn.org/stable/ 5. Tableau – Learning Resources https://www.tableau.com/learn 	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	1	2	-	-	-	-	-	1	1	2	2
2	3	3	1	2	2	-	-	-	-	-	1	2	3	3
3	3	3	1	3	2	-	-	-	-	-	1	2	3	3
4	2	3	2	3	3	-	-	-	-	-	1	3	3	3
5	2	2	2	2	3	1	-	-	-	-	1	3	3	3
Avg	2.6	2.6	1.2	2.2	2.4	0.2	0.0	0.0	0.0	0.0	1.0	2.2	2.8	2.8

AI25304	ARTIFICIAL INTELLIGENCE AND DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2
Course Objectives:	This course enables students: <ul style="list-style-type: none"> • To understand Artificial Intelligence search, reasoning, and optimization techniques. • To apply game playing, constraint satisfaction, and probabilistic reasoning methods. • To acquire, preprocess, and analyze real-world datasets. • To perform statistical analysis and hypothesis testing on data. • To develop AI and Data Analytics solutions for real-world applications. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Implement Artificial Intelligence search and optimization techniques for problem solving.	K3			
CO2	Apply logical and probabilistic reasoning methods in Artificial Intelligence applications.	K3			
CO3	Apply the data science lifecycle for data collection preparation and exploration.	K3			
CO4	Analyze data using statistical and predictive analytics techniques.	K4			
CO5	Develop Artificial Intelligence and Data Analytics solutions for real world problems.	K5			

LIST OF EXPERIMENTS:

1. Apply search strategies to solve Artificial Intelligence problems such as 8-Puzzle, 8-Queens, and Cryptarithmic problems.
2. Implement informed search and optimization techniques using A* Search, Memory-Bounded A*, and Local Search algorithms.
3. Apply game playing and constraint satisfaction techniques using Minimax with Alpha-Beta Pruning and Constraint Satisfaction Problems.
4. Develop logical and probabilistic reasoning systems using Propositional Model Checking, Forward Chaining, Backward Chaining, Naïve Bayes, and Bayesian Networks.
5. Design and implement an intelligent agent for a partially observable environment to solve a real-world problem.
6. Apply the data science lifecycle to acquire, inspect, and organize a real-world dataset from open data sources.
7. Analyze and prepare data by performing cleansing, integration, transformation, and exploratory data analysis.

8. Compute and analyze measures of central tendency, variability, and distribution characteristics for a given dataset.
9. Analyze and interpret relationships among variables using correlation analysis and simple regression modeling.
10. Apply hypothesis testing techniques using z-test and t-test to draw statistical inferences from sample data.
HARDWARE / SOFTWARE REQUIRED:
HARDWARE: i5 processor, 8GB RAM & Windows 10/11
SOFTWARE: <ul style="list-style-type: none"> Python IDLE / VS Code / Jupyter Notebook / Google Colab
TOTAL: 60 PERIODS

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	3	-	-	-	-	-	1	3	3	1
2	3	3	2	2	3	-	-	-	-	-	1	3	3	1
3	2	2	2	2	3	-	-	-	-	-	1	2	3	3
4	2	3	2	3	3	-	-	-	-	-	1	2	3	3
5	3	3	3	3	3	1	1	1	1	1	2	3	3	3
Avg	2.6	2.8	2.2	2.4	3.0	0.2	0.2	0.2	0.2	0.2	1.2	2.6	3.0	2.2

CS25306	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2
Course Objectives:	<ul style="list-style-type: none"> To understand and implement basic data structures such as stack, queue, and linked list. To apply data structures for solving problems like expression evaluation and polynomial manipulation. To implement tree data structures such as BST, AVL trees, and heaps. To develop programs for graph algorithms like Dijkstra's and Prim's algorithm. To implement and analyze searching and sorting techniques 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Implement linear data structures such as stack, queue, circular queue, and linked lists.	K3			
CO2	Apply linked list concepts for applications like stack, queue, and polynomial manipulation.	K3			
CO3	Develop programs for expression conversion and evaluation using stacks.	K3			
CO4	Implement tree structures and priority queues such as BST, AVL trees, and heaps.	K3			
CO5	Apply graph algorithms, searching, and sorting techniques to solve problems	K3			

LIST OF EXPERIMENTS:

1. Implementation of Singly linked list.
2. Array implementation of Stack, Queue and Circular Queue ADTs
3. Linked list implementation of Stack and Linear Queue ADTs
4. Implementation of polynomial manipulation using linked list
5. Implementation of evaluating Postfix expressions, Infix to Postfix conversion
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Implementation of Dijkstra's algorithm and Prim's algorithm
10. Implementation of linear search and Binary Search
11. Implementation of sorting algorithms.

HARDWARE / SOFTWARE REQUIRED:

SOFTWARE:

- Turbo C3

TOTAL: 60 PERIODS

Mapping of COs with POs / PSOs														
Pos												Pos		
Cos	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	2	3	-	-	-	-	-	2	-	-	1
2	3	3	2	2	3	-	-	-	-	-	2	3	-	2
3	3	3	2	2	3	-	-	-	-	-	2	3	2	2
4	3	3	3	3	3	-	-	-	-	-	2	3	2	2
5	3	3	3	3	3	1	-	-	-	-	2	3	2	2
Avg	3.0	2.8	2.4	2.4	3.0	1.0	-	-	-	-	2.0	3.0	2.0	1.8

SEMESTER IV

MA25401	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4
Course Objectives:	<ul style="list-style-type: none"> • Develop a strong foundation in probability theory and random variables for engineering and managerial applications • Understand discrete and continuous probability distributions and apply them to real-life problems. • Introduce statistical methods such as estimation and hypothesis testing for data analysis. • Analyze correlation and regression techniques to study relationships between variables. • Apply probability and statistical concepts to solve practical problems in engineering, science, and decision-making. 				
Course Outcomes				Knowledge Level	
The students will be able to					
CO1	Apply statistical and probabilistic methods to solve computing and engineering problems.				K3
CO2	Analyze data and identify relationships among variables for informed decision-making.				K4
CO3	Apply statistical inference techniques to estimate and interpret population characteristics.				K3
CO4	Apply appropriate statistical methods for data analysis under different conditions.				K3
CO5	Apply quality control and performance evaluation techniques to improve system and process reliability.				K3

UNIT I - PROBABILITY AND RANDOM VARIABLES	9+3
Axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions – Standard discrete and continuous probability distributions: Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Functions of a random variable.	
UNIT II - DIMENSIONAL RANDOM VARIABLES	9+3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Simple linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random	

variables).	
UNIT III - ESTIMATION THEORY	9+3
Unbiased estimators – Efficiency – Consistency – Sufficiency – Robustness – Method of moments – Method of maximum Likelihood – Interval estimation of Means – Difference between means – Variance – Ratio of two variances.	
UNIT IV – NON-PARAMETRIC TESTS	9+3
Introduction – Basic distribution – Tests based on runs – Test of randomness – Median test – Sign test – Mann-Whitney-Wilcoxon U test.	
Unit V- STATISTICAL QUALITY CONTROL	9+3
Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c, and np charts) – Tolerance limits – Acceptance sampling.	
TOTAL (L:45, T:15): 60 PERIODS	
Text Books:	
<ol style="list-style-type: none"> 1. Veerarajan T., "Probability, Statistics and Random Processes with Queueing theory and Queueing Networks", Tata McGraw Hill Education (India) Pvt Ltd, New Delhi, 4th Edition. 2. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics" Sultan Chand & Sons, New Delhi, 10th revised Edition. 	
References:	
<ol style="list-style-type: none"> 1. Johnson R.A., Miller I.R and Freund J.E, "Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016. 2. Milton J. S. and Arnold J.C. "Introduction to Probability and Statistics: Principles and Applications for Engineering and Computing Sciences", Tata Mc Graw Hill, 4th Edition, 2007. 	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2	-	1	2	2	-	2	1	1	-	3	1	1
2	3	3	2	2	2	3	1	3	2	3	2	3	2	2
3	2	3	2	3	3	3	1	3	2	3	3	3	3	3
4	2	3	3	3	3	3	2	3	3	3	3	3	3	3
5	2	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.2	2.8	2.5	2.4	2.6	2.8	1.75	2.8	2.2	2.6	2.75	3	2.4	2.4

CS25401	DATABASE MANAGEMENT SYSTEMS	L 3	T 0	P 0	C 3
Course Objectives:	<ul style="list-style-type: none">• To understand database concepts and database system architecture.• To analyze relational database design and SQL query processing.• To understand advanced SQL features and database programming concepts.• To analyze transaction management and concurrency control mechanisms.• To understand storage organization and indexing techniques in database systems.				
Course Outcomes			Knowledge Level		
The students will be able to					
CO1	Describe database system concepts and design relational schemas using E-R modeling techniques.			K3	
CO2	Analyze relational models and formulate SQL queries for database operations.			K4	
CO3	Examine advanced SQL concepts and database programming mechanisms for data management.			K3	
CO4	Apply transaction management and concurrency control techniques for maintaining database			K3	
CO5	Assess storage organization and indexing methods for efficient database performance.			K3	
UNIT I - DATABASE SYSTEM				9	
Purpose of database system - View of data - Database languages – Database engine - Database and application architecture - Database design using the E-R model (Complex Attributes, Mapping Cardinalities) - Reducing E-R diagrams to relational schemas.					
UNIT II - RELATIONAL MODEL & SQL				9	
Structure of relational databases - Database schema – Keys - Relational algebra – Introduction to SQL: SQL data definition – Basic structure of SQL queries and additional basic operations – Set operations and null values - Aggregate functions – Nested subqueries – Modification of databases.					
UNIT III - INTERMEDIATE AND ADVANCED SQL				9	
Join expressions – Views – Transactions – Integrity constraints - Accessing SQL from a programming language - Functions and Procedures - Triggers - Recursive queries.					

UNIT IV - TRANSACTION MANAGEMENT	9
Transaction concepts and model – ACID properties (Atomicity, Consistency, Isolation and Durability) – Serializability – Concurrency Control: Lock based protocols – Deadlock handling – Multiple granularity - Timestamp- Based protocols - Validation-Based protocols.	
UNIT V- STORAGE AND MANAGEMENT INDEXING	9
Storage interfaces – RAID – Disk block access – File organization - Organization of records in files - Data-Dictionary storage - Database buffer - Storage organization in main-memory databases – Indexing: Order indices.	
TOTAL (L:45): 45 PERIODS	
Text Books: <ol style="list-style-type: none"> 1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill Education, 2019. 2. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006. References: <ol style="list-style-type: none"> 1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2017. 2. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems: The Complete Book", 2nd Edition, Pearson Education, 2011. 3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 2nd Edition, McGraw-Hill Education, 1999. Resources: <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106105175 2. https://www.w3schools.com/sql/ 	

Mapping of COs with POs / PSOs														
COs	Pos											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	3	1	2	-	-	-	-	-	2	2	1	-
2	3	3	2	2	3	-	-	-	-	-	2	3	2	-
3	3	3	2	2	3	-	-	-	-	-	2	2	1	-
4	3	3	2	3	3	-	-	-	-	-	2	2	1	1
5	3	3	2	3	3	1	-	-	-	1	2	2	1	-
Avg	3.0	2.8	2.2	2.2	2.8	1.0	-	-	-	1.0	2.0	2.2	1.2	1

CS25402	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		2	0	2	3
Course Objectives:	<ul style="list-style-type: none"> • To understand algorithm design and analysis techniques. • To apply searching, sorting, and graph algorithms for problem solving. • To analyze algorithm efficiency using time complexity measures. • To implement algorithmic paradigms such as divide-and-conquer and dynamic programming. • To develop practical solutions for computational problems using advanced algorithms. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Explain algorithm design principles and analyze algorithm efficiency using asymptotic notations.	K2			
CO2	Apply brute-force and divide-and-conquer techniques to solve computational problems.	K3			
CO3	Implement dynamic programming and greedy algorithms for optimization and graph problems.	K3			
CO4	Analyze and solve combinatorial optimization problems using backtracking and branch-and-bound techniques.	K4			
CO5	Analyze computational complexity classes and apply approximation and randomized algorithms.	K4			

UNIT I - INTRODUCTION TO ALGORITHMS	6
Fundamentals of algorithmic problem solving - The analysis framework - Asymptotic notations and Basic efficiency classes - Mathematical analysis of Non-recursive algorithms - Mathematical analysis of recursive algorithms - Example: Computing the n^{th} fibonacci number - Empirical analysis of algorithms.	
UNIT II - BRUTE FORCE SEARCH AND DIVIDE & CONQUER	6
Brute force search: Sequential search and Brute-Force string matching - First search - Divide-and-Conquer: Mergesort - Multiplication of large integers and Strassen's matrix multiplication.	
UNIT III - DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	6
Dynamic Programming: The Knapsack problem and memory functions - Optimal binary search trees - Warshall's and Floyd's algorithms - Greedy Technique:	

Prim's algorithm - Kruskal's algorithm - Dijkstra's algorithm - Huffman trees and codes - Iterative Improvement: The Maximum-Flow problem.	
UNIT IV - BACKTRACKING AND BRANCH AND BOUND	6
Backtracking: n-Queens problem - Hamiltonian circuit problem - Subset-Sum problem - Branch-and-Bound : Assignment problem - Traveling salesman problem - Space and Time Trade-Offs: Horspool's algorithm - Boyer-Moore algorithm.	
Unit V - TRACTABLE AND ADVANCED TOPICS	6
Tractable and Intractable Problems: Computability of algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques - Approximation algorithms: Traveling salesman problem, Randomized algorithms: Randomized quick sort.	
TOTAL (L:30): 30 PERIODS	
PRACTICAL EXERCISES	30 PERIODS
<ol style="list-style-type: none"> 1. Implement linear search and analyze the time required for different input sizes n; plot time vs n graph. 2. Implement recursive binary search and analyze the time required for different input sizes; plot time vs n graph. 3. Implement pattern matching to find all occurrences of a pattern in a given text. 4. Implement Dijkstra's algorithm to find the shortest path from a given source vertex. 5. Implement Prim's algorithm to find the minimum cost spanning tree of a graph. 6. Implement Floyd's algorithm for the All-Pairs shortest path problem. 7. Implement Warshall's algorithm to compute the transitive closure of a directed graph. 8. Implement advanced algorithms such as N-Queens using Backtracking, Travelling salesperson Problem (approximation), or Randomized algorithm for kth smallest element as a case study/mini exercise. 	
TOTAL (L:30, P:30): 60 PERIODS	
Text Books:	
<ol style="list-style-type: none"> 1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, New York (2021). 	

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

References:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.
3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Computer Algorithms/C++", Orient Blackswan, 2nd Edition, 2019.

E-resources:

1. <https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/>
2. <https://nptel.ac.in/courses/106101060>

Mapping of COs with POs / PSOs														
Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	2	-	-	-	-	-	2	3	1	-
2	3	3	3	2	3	-	-	-	-	-	2	3	2	-
3	3	3	3	3	3	-	-	-	-	-	2	3	2	-
4	3	3	3	3	3	1	-	-	-	-	2	3	2	-
5	3	3	2	3	3	-	-	-	-	-	2	3	2	-
Avg	3.00	3.00	2.60	2.60	2.80	1.00	-	-	-	-	2.00	3.00	1.80	-

AI25401	MACHINE LEARNING	L	T	P	C
		3	0	0	3
Course Objectives:	<ul style="list-style-type: none"> • To understand the fundamentals of machine learning including learning systems data preparation model development evaluation techniques applications and challenges. • To apply supervised learning algorithms for regression classification and predictive analytics problems. • To analyze unsupervised learning techniques for clustering association analysis and dimensionality reduction. • To apply ensemble learning methods for improving classification and regression performance. • To implement reinforcement learning techniques for intelligent decision making and sequential problem solving. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Explain machine learning concepts learning systems machine learning processes data preparation model evaluation applications and challenges.				K2
CO2	Apply supervised learning algorithms for regression classification and predictive modeling tasks.				K3
CO3	Analyze unsupervised learning techniques for clustering association mining and dimensionality reduction.				K4
CO4	Apply ensemble learning techniques for improving classification and regression performance.				K3
CO5	Implement reinforcement learning techniques for sequential decision making and intelligent systems.				K3

UNIT I INTRODUCTION TO MACHINE LEARNING	9
Introduction to Machine Learning – Learning Systems – Types of Machine Learning – Machine Learning Process – Data Collection and Data Preparation – Data Preprocessing – Feature Selection and Feature Extraction – Model Building and Model Evaluation – Applications and Challenges of Machine Learning.	
UNIT II - SUPERVISED LEARNING	9
Linear Regression – Multiple Linear Regression – Logistic Regression – Naïve Bayes Classifier – Decision Tree Learning – K-Nearest Neighbour Algorithm – Support Vector Machines – Artificial Neural Networks – Performance Evaluation Metrics.	

UNIT III UNSUPERVISED LEARNING	9
Introduction to Unsupervised Learning – K-Means Clustering – Hierarchical Clustering – Density-Based Clustering – Fuzzy C-Means Clustering – Association Rule Mining – Principal Component Analysis – Independent Component Analysis – Dimensionality Reduction Techniques.	
UNIT IV ENSEMBLE LEARNING	9
Introduction to Ensemble Learning – Bagging – Bootstrap Aggregation – Random Forest – Boosting – AdaBoost Algorithm – Ensemble Methods for Classification – Ensemble Methods for Regression – Applications of Ensemble Learning.	
UNIT V REINFORCEMENT LEARNING	9
Introduction to Reinforcement Learning – Reinforcement Learning Framework – Agent and Environment – Markov Decision Process – Value Function – Policy Learning – Q-Learning – SARSA Algorithm – Applications of Reinforcement Learning.	
TOTAL(L:45) : 45 PERIODS	
Text books: <ol style="list-style-type: none"> 1. S. Sridhar and M. Vijayalakshmi, Machine Learning, 2nd Edition, Oxford University Press India, 2026. 2. Ethem Alpaydin, Introduction to Machine Learning, 5th Edition, MIT Press, 2025. 	
References: <ol style="list-style-type: none"> 1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Pvt. Ltd., Reprint Edition, 2017. 2. Christopher M. Bishop and Hugh Bishop, Deep Learning: Foundations and Concepts, Springer, 2024. 3. Stephen Marsland, Machine Learning: An Algorithmic Perspective, 3rd Edition, CRC Press, 2023. 4. Zhi-Hua Zhou, Ensemble Methods: Foundations and Algorithms, CRC Press, 2012. 5. Lior Rokach, Ensemble Learning: Pattern Classification using Ensemble Methods, 2nd Edition, World Scientific, 2019. 	
E-resources: <ol style="list-style-type: none"> 1. Machine learning algorithms, model evaluation, and practical implementations. https://scikit-learn.org/stable 2. Video lectures covering supervised, unsupervised, and deep learning concepts. https://nptel.ac.in/courses/106106139 	

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2	-	-	1	-	-	-	-	-	1	2	3	-
2	3	3	2	1	3	-	-	-	-	-	1	3	3	3
3	3	3	2	3	3	-	-	-	-	-	1	3	3	3
4	3	3	2	2	3	-	-	-	-	-	1	3	3	3
5	3	3	3	2	3	1	-	-	-	-	1	3	3	3
Avg	2.8	2.8	1.8	1.6	2.6	0.2	0.0	0.0	0.0	0.0	1.0	2.8	3.0	3.0

AI25402	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3
Course Objectives:	<ul style="list-style-type: none"> To understand the concepts and significance of Big Data Analytics. To learn scalable storage and distributed processing approaches for large-scale data. To understand NoSQL data management techniques for heterogeneous data. To study Hadoop architecture and MapReduce analytics for distributed computing. To explore Hadoop ecosystem tools for big data processing and analytics. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Understand the fundamentals ecosystem and applications of Big Data Analytics.				K2
CO2	Apply NoSQL database models and distributed data management techniques for handling large scale data.				K3
CO3	Implement MapReduce programming and YARN based resource management for big data processing.				K3
CO4	Analyze Hadoop architecture HDFS components and distributed storage mechanisms.				K4
CO5	Apply Hadoop ecosystem tools such as HBase Pig and Hive for processing and analyzing large scale datasets.				K3

UNIT I FOUNDATIONS OF BIG DATA ANALYTICS	9
Introduction to Big Data – Evolution of Data Management – Characteristics of Big Data – Types of Data – Sources of Big Data – Challenges in Big Data Processing – Big Data Ecosystem – Data Analytics Lifecycle – Industrial Applications and Emerging Trends.	
UNIT II - NOSQL DATA MANAGEMENT	9
Limitations of Relational Databases – Introduction to NoSQL Databases – Aggregate Data Models – Key-Value Data Model – Column Family Data Model – Document Data	

Model – Graph Databases – Data Distribution, Replication and Consistency – MongoDB and Cassandra Applications.	
UNIT III MAPREDUCE ANALYTICS	9
MapReduce Programming Model – Anatomy of a MapReduce Job – MapReduce Workflows – YARN Architecture – Resource Scheduling – Input and Output Formats – Shuffle and Sort Mechanism – Task Execution and Failure Handling – Analytical Applications using MapReduce.	
UNIT IV HADOOP FRAMEWORK AND DISTRIBUTED STORAGE	9
Introduction to Hadoop – Hadoop Architecture – Hadoop Distributed File System (HDFS) – HDFS Components and Working Principles – Data Storage and Replication – Data Flow in HDFS – Hadoop I/O Operations – Compression and Serialization Techniques – Hadoop Integration with NoSQL Systems.	
UNIT V HADOOP ECOSYSTEM AND ANALYTICAL TOOLS	9
HBase Architecture – HBase Data Model – Introduction to Pig and Pig Latin – Data Processing using Pig – Hive Architecture – Hive Data Types and File Formats – HiveQL for Data Definition – HiveQL for Data Manipulation – Big Data Case Studies and Industrial Applications.	
TOTAL(L:45) : 45 PERIODS	
Text books:	
<ol style="list-style-type: none"> 1. Seema Acharya and Subhashini Chellappan, <i>Big Data Analytics</i>, Wiley India Pvt. Ltd., 2nd Edition, 2019. 2. Tom White, <i>Hadoop: The Definitive Guide</i>, O'Reilly Media, 4th Edition, 2015. 	
References:	
<ol style="list-style-type: none"> 1. Judith Hurwitz, Alan Nugent, Fern Halper and Marcia Kaufman, <i>Big Data for Dummies</i>, Wiley Publications, 2016. 2. Bill Franks, <i>Taming the Big Data Tidal Wave</i>, Wiley Publications, 2016. 3. Jiawei Han, Micheline Kamber and Jian Pei, <i>Data Mining: Concepts and Techniques</i>, Morgan Kaufmann, 4th Edition, 2022. 	
E-resources:	
<ol style="list-style-type: none"> 1. NPTEL – Big Data Computing https://nptel.ac.in/courses/106106142 	

2. **Apache Hadoop – Official Documentation**
<https://hadoop.apache.org/docs/current/>
3. **MongoDB – Official Documentation**
<https://www.mongodb.com/docs/>
4. **Apache Hive – Official Documentation**
<https://hive.apache.org/docs/latest/>
5. **YouTube – Big Data Analytics Full Course**
<https://www.youtube.com/watch?v=eQMICY86sP4>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	2	-	-	-	-	-	1	2	2	2
2	3	3	2	2	3	-	-	-	-	-	1	2	3	3
3	3	3	2	2	3	-	-	-	-	-	1	2	3	3
4	3	3	3	3	3	-	-	-	-	-	1	3	3	3
5	3	3	3	3	3	-	-	-	-	-	1	3	3	3
Avg	3.0	2.8	2.0	2.0	2.8	0.0	0.0	0.0	0.0	0.0	1.0	2.40	2.80	2.80

CY25401	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L	T	P	C
		3	0	0	3
Course Objectives:	<ul style="list-style-type: none"> • To introduce the basic concepts of environment, ecosystems, and biodiversity, with emphasis on the biodiversity of India and its conservation. • To impart knowledge of the causes, effects, control, and prevention measures of environmental pollution and natural disasters. • To facilitate understanding of the global and Indian scenarios of renewable and non-renewable resources, the causes of their degradation, and measures for their conservation. • To create awareness of sustainable development goals and environmentally responsible practices for sustainable living. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Understand the structure and functions of the environmental ecosystem.	K2			
CO2	Recognize the types of biodiversity and their conservation.	K2			
CO3	Identify the causes and effects of environmental pollution and natural disasters, and contribute to preventive measures in society.	K3			
CO4	Explain major environmental issues and evaluate their impact on society and sustainable development.	K2			
CO5	Understand the Sustainable Development Goals (SDGs) and their role in promoting sustainable practices.	K2			

Unit I – ENVIRONMENTAL ECOSYSTEM	9
Environmental studies, Environmental impacts of urbanization, Ecosystem-Food chains and webs-Types, structure and functions of an ecosystem, Energy flow through an ecosystem, Ecological pyramids, Ecological Succession.	
Unit II – BIODIVERSITY	9
Types of biodiversity, Values of biodiversity, India as a mega- diversity nation, Biodiversity Hot-spots, Threats to biodiversity, Endangered and Endemic species of India, Conservation of biodiversity (In- situ and ex-situ)- Man-wild life conflicts.	

Unit III – ENVIRONMENTAL POLLUTION	9
Sources, Effects and Preventive measures of Air, water, soil and noise pollutions, Solid waste, Hazardous waste and E waste management, Pollution Control Board regulations and environmental legislation in India, Role of an individual in prevention of pollution, Pollution case studies.	
Unit IV – SOCIAL ISSUES AND THE ENVIRONMENT	9
Urban problems related to energy, Water conservation, Watershed management, Ozone layer depletion, Global warming and climate change, Green chemistry, Wasteland reclamation, Consumerism and waste generation, Resettlement and rehabilitation of people (case studies), Public awareness.	
Unit V – SUSTAINABILITY AND PRACTICES	9
From unsustainability to sustainability, Sustainability Development Goals (SDG), Life cycle assessment, Environmental impact assessment, Environmental ethics, Value education, Biogeochemical cycles (Carbon Cycle and Nitrogen Cycle).	
TOTAL: 45 PERIODS	
Text Books:	
1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2016.	
2. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6 th Edition, New Age International Publishers 2018.	
References:	
1. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.	
2. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media. 38 th Edition 2010.	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2	-	-	-	-	3	-	-	-	-	-	-	-
2	1	2	-	-	-	-	3	-	-	-	-	-	-	-
3	2	3	2	1	-	2	3	-	1	-	-	-	-	-
4	-	2	-	-	-	3	2	2	1	1	-	-	-	-
5	1	2	2	-	-	2	3	2	1	-	1	-	-	-
Avg.	1.5	2.2	2	1	-	2.3	2.8	2	1	1	1	-	-	-

AI25403	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2
Course Objectives:	<ul style="list-style-type: none"> • To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis. • To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance. • To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance. • To build the graph based learning models for standard data sets. • To compare the performance of different ML algorithms and select the suitable one based on the application. 				
Course Outcomes The students will be able to				Knowledge Level	
CO1	Apply hypothesis space search algorithms such as Candidate Elimination to identify consistent models.				K3
CO2	Implement supervised learning algorithms and evaluate their performance.				K3
CO3	Apply probabilistic and graphical models for decision making problems.				K3
CO4	Apply unsupervised learning algorithms and regression techniques for data analysis.				K3
CO5	Analyze and compare the performance of different machine learning algorithms and select suitable models for applications.				K4

LIST OF EXPERIMENTS:

1.	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2.	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
5. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to construct a Bayesian network to diagnose CORONA infection using standard WHO Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw graphs.
10. Implement and compare supervised machine learning models (Decision Tree, Naïve Bayes, k-NN, and SVM) on a real-world dataset. Evaluate their performance using accuracy, precision, recall, F1-score, and k-fold cross-validation, and identify the best-performing model.

TOTAL: 60 PERIODS

HARDWARE / SOFTWARE REQUIRED:

HARDWARE:

i5 processor, 8GB RAM & Windows 11

SOFTWARE:

Pyhton IDLE or VS Code & UI Path Studio

Mapping of COs with POs / PSOs														
POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	3	-	-	-	-	-	1	3	3	1
2	3	3	3	2	3	-	-	-	-	-	1	3	3	2
3	3	3	3	2	3	1	-	-	-	-	1	3	3	2
4	3	3	3	2	3	1	-	-	-	-	1	3	3	2
5	3	3	3	2	3	1	1	1	1	1	2	3	3	2
Avg	3.00	3.00	2.80	2.00	3.00	0.60	0.20	0.20	0.20	0.20	1.20	3.00	3.00	1.80

CS25405	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2
Course Objectives:	<ul style="list-style-type: none"> To understand database design and relational schema development. To apply SQL commands for database creation and manipulation. To perform data retrieval and integrity enforcement using SQL operations. To implement advanced SQL concepts for database processing. To develop database applications using procedures, triggers, and transaction control. 				
Course Outcomes		Knowledge Level			
The students will be able to					
CO1	Design ER diagrams and construct relational schemas for database applications.	K3			
CO2	Apply SQL commands and integrity constraints for database creation and data manipulation.	K3			
CO3	Execute data retrieval operations using SQL queries, grouping, set operations, and subqueries.	K3			
CO4	Develop database solutions using joins, views, stored procedures, and functions.	K3			
CO5	Implement triggers and transaction control mechanisms for maintaining database consistency.	K3			

LIST OF EXPERIMENTS:

1. Implement an ER diagram and relational schema for a simple application.
2. Implement database and table creation using SQL DDL commands.
3. Implement insertion, Updation and deletion of records using SQL DML commands.
4. Implement simple data retrieval using SELECT statements with filtering and sorting.
5. Implement the use of primary key, foreign key, unique, and check constraints.
6. Implement aggregate functions and grouping operations on database tables.
7. Implement SQL set operations and NULL value handling.
8. Implement single-row and multi-row subqueries for data retrieval.
9. Implement different types of join operations on multiple tables.
10. Implement views for customized data access.
11. Implement stored procedures and functions for simple database operations.
12. Implement triggers and basic transaction control using COMMIT and ROLLBACK.

HARDWARE / SOFTWARE REQUIRED:														
SOFTWARE:														
<ul style="list-style-type: none"> MySQL / PostgreSQL / Oracle 														
													TOTAL: 60 PERIODS	

Mapping of COs with POs / PSOs														
Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	3	2	3	-	-	-	-	-	2	3	1	1
2	3	3	2	2	3	-	-	-	-	-	2	3	2	1
3	3	3	2	2	3	-	-	-	-	-	2	2	2	1
4	3	3	3	2	3	-	-	-	-	-	2	3	2	2
5	3	3	2	3	3	-	-	-	-	-	2	3	2	2
Avg	3.00	3.00	2.40	2.20	3.00	-	-	-	-	-	2.00	2.8	1.8	1.4