CK COLLEGE OF ENGINEERING AND TECHNOLOGY
AN AUTONOMOUS INSTITUTION
CAVINKARE PATRONIZED INSTITUTION

C.K. COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, Affiliated to Anna University & Recognized under UGC section 2(f) & 12(B)
Accredited by NAAC with 'A' grade and ISO 9001:2015 Certified Institution

Jayaram Nagar, Chellangkuppam, Cuddalore-607 003, Tamil Nadu, India.

DEPARTMENT OF
ARTIFICIAL INTELLIGENCE (AI) AND DATA SCIENCE

CURRICULUM AND SYLLABI

I & II SEMESTER

(UNDER CKCET AUTONOMOUS REGULATION)

REGULATION 2026

Academic Year 2026-27 onwards

C. K. COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

UNDERGRADUATE CURRICULUM

Department : Artificial Intelligence & Data Science

Programme : B. Tech. - Artificial Intelligence & Data Science

Regulations : 2026, with effect from the AY 2026 - 27 to all the students of Under Graduate Programme

OVERVIEW OF CREDITS

Semester / Category	BS	ES (G)	HUM	SD	ES (PC)	ES (PE)	OE	Total
Semester - I	10	06	03	–	03	–	–	22
Semester - II	04	03	06	02	08	–	–	23
Semester - III	04	–	–	02	19	–	–	25
Semester - IV	04	–	–	02	16	–	–	22
Semester - V	04	–	–	02	12	03	–	21
Semester - VI	–	–	–	02	11	06	03	22
Semester - VII	–	–	02	03	11	06	–	22
Semester - VIII	–	–	–	08	–	–	–	08
Total Credits	**26**	**09**	**11**	**21**	**80**	**15**	**03**	**165**
Percentage (%)	**15.76**	**5.45**	**6.67**	**12.73**	**48.48**	**9.09**	**1.81**	**100**

CATEGORY OF COURSES

HUM	Humanities (Languages, Management, Heritage and others)	BS	Basic Science (Mathematics, Physics, Chemistry)
P	Laboratory Course	T	Theory Course
SD	Skill Development	MC	Mandatory Course
OE	Open Elective	SLC	Self-Learning Course
ES (G)	Engineering Science (General)	LIT	Laboratory Integrated Theory
ES (PC)	Engineering Science (Programme Core)	ES (PE)	Engineering Science (Programme Elective)

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

Recommended by
Board of Studies of AI&DS Dept.
Meeting No.: 01 Dated: 28.3.26

Knowledge and Attitude Profile (WK)

The Knowledge and Attitude Profile (WK) is intended to define the essential knowledge base and professional attitudes expected of program graduates. It ensures alignment with OBE principles and equips graduates with the capability to effectively analyze and address complex engineering problem.

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Educational Objectives (PEOs):

PEO1: Utilize their proficiencies in the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to build systems that require management and analysis of large volumes of data.

PEO2: Advance their technical skills to pursue pioneering research in the field of AI and Data Science and create disruptive and sustainable solutions for the welfare of ecosystems.

PEO3: Think logically, pursue lifelong learning and collaborate with an ethical attitude in a multidisciplinary team.

PEO4: Design and model AI based solutions to critical problem domains in the real world.

PEO5: Exhibit innovative thoughts and creative ideas for effective contribution towards economy building.

Program Specific Outcomes (PSOs):

PSO1: Design, develop, and deploy intelligent systems for real-world applications.

PSO2: Utilize modern tools for innovative solutions in the field of AI and Data Science.

PSO3: Demonstrate research aptitude, implement ethical practices and collaborate in multidisciplinary teams.

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Semester – I							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26MAC01T	Applied Calculus	T	3-1-0	4	4	BS
2.	26ENC01T	English Essentials – I	T	2-0-0	2	2	HUM
3.	26TLC01T	தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
4.	26PHC01L	Physics for Information Sciences	LIT	2-0-2	4	3	BS
5.	26CYC01L	Chemistry for Information Sciences	LIT	2-0-2	4	3	BS
6.	26CSC01L	Problem Solving using C Programming	LIT	2-0-2	4	3	ES (PC)
7.	26EEC01L	Basic Electrical and Electronics Engineering	LIT	2-0-2	4	3	ES (G)
8.	26MEC01L	Engineering Drawing	LIT	2-0-2	4	3	ES (G)
9.	---	Physical Education – I	P	0-0-1	1	NC	MC
10.	---	Induction Program	---	---	---	NC	MC
Total Credits					**28**	**22**	

Semester – II							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26MAC02T	Linear Algebra	T	3-1-0	4	4	BS
2.	26CYC01T	Climate Change and Sustainability	T	2-0-0	2	2	HUM
3.	26TLC02T	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
4.	26AD201T	Python Programming	T	3-0-0	3	3	ES (PC)
5.	26ENC02L	English Essentials – II	LIT	1-0-2	3	2	HUM
6.	26CSC03L	Digital Principles and Computer Organization	LIT	2-0-2	4	3	ES (G)
7.	26CSC04L	Data Structures using C	LIT	2-0-2	4	3	ES (PC)
8.	26MEC01P	Engineering Practices and Re-Engineering Laboratory	P	0-0-4	4	2	SD
9.	26AD202P	Python Programming Laboratory	P	0-0-4	4	2	ES (PC)
10.	---	Foreign Language	P	0-0-2	2	1	HUM

11.	---	Foundations of Problem Solving	T	3-0-0	3	NC	MC
12.	---	Physical Education – II	P	0-0-1	1	NC	MC
13.	---	Self-Learning Course – I	---	---	---	NC	SLC
14.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
15.	---	NSS/NCC/NSO	---	---	---	NC	MC
Total Credits					**35**	**23**	

Semester – III							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26MAC04T	Discrete Mathematics	T	3-1-0	4	4	BS
2.	26AD301T	Artificial Intelligence	T	3-0-0	3	3	ES (PC)
3.	26AD302T	Operating System	T	3-0-0	3	3	ES (PC)
4.	26AD303T	Database Management Systems	T	3-0-0	3	3	ES (PC)
5.	26AD304L	Industry Oriented Course - I	LIT	2-0-2	4	3	ES (PC)
6.	26AD305L	Data Curation and Visualization	LIT	2-0-2	4	3	ES (PC)
7.	26AD307P	Artificial Intelligence Laboratory	P	0-0-4	4	2	ES (PC)
8.	26AD308P	Database Management Systems Laboratory	P	0-0-4	4	2	ES (PC)
9.	26AD306P	Career readiness & professional skills – Basic level	P	0-0-2	2	1	SD
10.	26AD309P	Project work – I	P	0-0-2	2	1	SD
11.	---	Self-Learning Course – II	---	---	---	NC	SLC
12.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
Total Credits					**33**	**25**	

Semester – IV							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26MAC07T	Probability and Statistics	T	3-1-0	4	4	BS
2.	26AD401T	Machine Learning	T	3-0-0	3	3	ES (PC)

3.	26AD402T	Fundamentals of Data Science and Analytics	T	3-0-0	3	3	ES (PC)
4.	26AD403T	Design and Analysis of Algorithm	T	3-0-0	3	3	ES (PC)
5.	26AD404L	Industry Oriented Course - II	LIT	2-0-2	4	3	ES (PC)
6.	26AD407P	Machine Learning Laboratory	P	0-0-4	4	2	ES (PC)
7.	26AD408P	Data Science and Analytics Laboratory	P	0-0-4	4	2	ES (PC)
8.	26AD406P	Career Readiness & Professional Skills – Intermediate Level	P	0-0-2	2	1	SD
9.	26AD409P	Project work – II	P	0-0-2	2	1	SD
10.	---	Self-Learning Course – III	---	---	---	NC	SLC
11.	---	Student Transformation & Enrichment Programme (STEP)	---	---	---	NC	MC
Total Credits					**29**	**22**	

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26MAC09T	Optimization Techniques	T	3-1-0	4	4	BS
2.	26AD502T	Natural Language Processing	T	3-0-0	3	3	ES (PC)
3.	26AD501L	Object Oriented Programming with JAVA	LIT	2-0-2	4	3	ES (PC)
4.	26AD503L	Industry Oriented Course - III	LIT	2-0-2	4	3	ES (PC)
5.	26AD504L	Data Privacy, Ethics and Security	LIT	2-0-2	4	3	ES (PC)
6.	26AD0XXX	Programme Elective – I	LIT	2-0-2	4	3	ES (PE)
7.	26AD504P	Career Readiness & Professional Skills – Advance Level	P	0-0-2	2	1	SD
8.	26AD506P	Project work – III	P	0-0-2	2	1	SD
9.	---	Self-Learning Course – IV	---	---	---	NC	SLC
10.	---	Student Transformation & Enrichment Programme	---	---	---	NC	MC
Total Credits					**28**	**21**	

For Honours Degree							
1.		Capstone Design Project – I	CDP	0-0-12	12	6	SD
Or							
1.		Honours Elective – I	T	3-0-0	3	3	
2.		Honours Elective – II	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – I	T	3-0-0	3	3	
2.		Minor Elective – II	T	3-0-0	3	3	

Semester – VI							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1	26AD601T	Reinforcement Learning	T	3-0-0	3	3	ES (PC)
2.	26CSC12T	Deep Learning	T	3-0-0	3	3	ES (PC)
3.	26AD0XXX	Open Elective I	T	3-0-0	3	3	OE
4.	26AD602L	Industry Oriented Course - IV	LIT	2-0-2	4	3	ES (PC)
5.	26AD0XXX	Programme Elective II	LIT	2-0-2	4	3	ES (PE)
6.	26AD0XXX	Programme Elective III	LIT	2-0-2	4	3	ES (PE)
7.	26CSC13P	Deep Learning Laboratory	P	0-0-4	4	2	ES (PC)
8.	26AD603P	Career Readiness & Professional Skills – Placement Level	P	0-0-2	2	1	SD
9.	26AD604P	Project work – IV	P	0-0-2	2	1	SD
10.	---	Self-Learning Course – V	---	---	---	NC	SLC
11.	---	Student Transformation & Enrichment Programme	---	---	---	NC	MC
Total Credits					**29**	**22**	

For Honours Degree							
1.		Capstone Design Project – II	CDP	0-0-12	12	6	SD
Or							
1.		Honours Elective – III	T	3-0-0	3	3	
2.		Honours Elective – IV	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – III	T	3-0-0	3	3	

2.		Minor Elective – IV	T	3-0-0	3	3	

Semester – VII							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26AD701T	Big Data and Advanced Database Systems	T	3-0-0	3	3	ES (PC)
2.	26MGC01T	Engineering Entrepreneurship Development	T	2-0-0	2	2	HUM
3.	26AD703L	Industry Oriented Course - V	LIT	2-0-2	4	3	ES (PC)
4.	26AD0XXX	Programme Elective IV	LIT	2-0-2	4	3	ES (PE)
5.	26AD0XXX	Programme Elective –V	LIT	2-0-2	4	3	ES (PE)
6.	26AD704L	Industry Oriented Course - VI	LIT	2-0-2	4	3	ES (PC)
7.	26AD705P	Big Data Analytics Laboratory	P	0-0-4	4	2	ES (PC)
8.	26AD706P	Major project - Phase I	P	0-0-4	4	2	SD
9.	26AD707P	Internship	P	0-0-0	0	1	SD
10.	---	Indian Constitution	T	3-0-0	3	0	MC
Total Credits					**32**	**22**	

For Honours Degree							
1.		Capstone Design Project – III	CDP	0-0-12	12	6	SD
Or							
1.		Honours Elective – V	T	3-0-0	3	3	
2.		Honours Elective – VI	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – V	T	3-0-0	3	3	
2.		Minor Elective – VI	T	3-0-0	3	3	

Semester – VIII							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.	26AD801P	Major Project - Phase II	P	0-0-16	16	8	SD
Total Credits					**16**	**8**	

PROGRAMME ELECTIVE COURSES – STREAMS

Vertical - I	Vertical - II	Vertical - III	Vertical - IV	Vertical - V	Vertical - VI
AI and Machine Intelligence	**Applied Data Intelligence**	**Autonomous Systems**	**Secure Computing Systems**	**Next-Generation Computing**	**Connected Devices and Applications**
Explainable AI	Stream Data Analytics	Robot Operating System	Big Data Frameworks	Quantum Computing	Dynamic Paradigm for IoT
Computational Neuroscience	Social Network Analytics	Materials Informatics	Cloud Computing	Vibe Coding	Smart IoT Architecture
Generative AI	Bioinformatics	Robotics Vision and Sensing	Cyber Security	GPU Programming	Wearable Computing
MLOps	Edge AI	Expert Systems	Cyber Forensics	Real Time Operating Systems	IoT in 5G Networks
Federated Learning	Time Series Analysis	Multiagent Systems	Quantum Cryptographic Techniques	Hardware Architectures for AI	IoT and Smart Cities
AI Ethics and Governance	Predictive Analytics	Autonomous Systems Design	Blockchain Technology	Neuromorphic Computing	Industrial IoT
Computer Vision	Text Mining and Analytics	Human Robot Interaction	Data Privacy and Protection	Augmented Reality	Smart Healthcare Systems
Deep Learning Architectures	Business Intelligence	Swarm Intelligence	Network Security	Digital Twin Technology	IoT Security
---	Statistical Learning	Robot Motion Planning	Database Security	6G and Beyond Networks	Edge Computing for IoT
---	---	Cognitive Robotics	Secure Software Development	Sustainable Computing	IoT Data Analytics

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LIST OF PROGRAMME ELECTIVE COURSES: VERTICALS

VERTICAL 1: AI AND MACHINE INTELLIGENCE

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1	26AD0XXX	Explainable AI	LIT	2-0-2	4	3	ES (PE)
2	26AD0XXX	Computational Neuroscience	LIT	2-0-2	4	3	ES (PE)
3	26AD0XXX	Generative AI	LIT	2-0-2	4	3	ES (PE)
4	26AD0XXX	MLOps	LIT	2-0-2	4	3	ES (PE)
5	26AD0XXX	Federated Learning	LIT	2-0-2	4	3	ES (PE)
6	26AD0XXX	AI Ethics and Governance	LIT	2-0-2	4	3	ES (PE)
7	26AD0XXX	Computer Vision	LIT	2-0-2	4	3	ES (PE)
8	26AD0XXX	Deep Learning Architectures	LIT	2-0-2	4	3	ES (PE)

VERTICAL 2: APPLIED DATA INTELLIGENCE

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1	26AD0XXX	Stream Data Analytics	LIT	2-0-2	4	3	ES (PE)
2	26AD0XXX	Social Network Analytics	LIT	2-0-2	4	3	ES (PE)
3	26AD0XXX	Bioinformatics	LIT	2-0-2	4	3	ES (PE)
4	26AD0XXX	Edge AI	LIT	2-0-2	4	3	ES (PE)
5	26AD0XXX	Time Series Analysis	LIT	2-0-2	4	3	ES (PE)
6	26AD0XXX	Predictive Analytics	LIT	2-0-2	4	3	ES (PE)
7	26AD0XXX	Text Mining and Analytics	LIT	2-0-2	4	3	ES (PE)
8	26AD0XXX	Business Intelligence	LIT	2-0-2	4	3	ES (PE)
9	26AD0XXX	Statistical Learning	LIT	2-0-2	4	3	ES (PE)

VERTICAL 3: AUTONOMOUS SYSTEMS

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1	26AD0XXX	Robot Operating System	LIT	2-0-2	4	3	ES (PE)
2	26AD0XXX	Materials Informatics	LIT	2-0-2	4	3	ES (PE)
3	26AD0XXX	Robotics Vision and Sensing	LIT	2-0-2	4	3	ES (PE)
4	26AD0XXX	Expert Systems	LIT	2-0-2	4	3	ES (PE)
5	26AD0XXX	Multiagent Systems	LIT	2-0-2	4	3	ES (PE)

6	26AD0XXX	Autonomous Systems Design	LIT	2-0-2	4	3	ES (PE)
7	26AD0XXX	Human Robot Interaction	LIT	2-0-2	4	3	ES (PE)
8	26AD0XXX	Swarm Intelligence	LIT	2-0-2	4	3	ES (PE)
9	26AD0XXX	Robot Motion Planning	LIT	2-0-2	4	3	ES (PE)
10	26AD0XXX	Cognitive Robotics	LIT	2-0-2	4	3	ES (PE)

VERTICAL 4: SECURE COMPUTING SYSTEMS

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1	26AD0XXX	Big Data Frameworks	LIT	2-0-2	4	3	ES (PE)
2	26AD0XXX	Cloud Computing	LIT	2-0-2	4	3	ES (PE)
3	26AD0XXX	Cyber Security	LIT	2-0-2	4	3	ES (PE)
4	26AD0XXX	Cyber Forensics	LIT	2-0-2	4	3	ES (PE)
5	26AD0XXX	Quantum Cryptographic Techniques	LIT	2-0-2	4	3	ES (PE)
6	26AD0XXX	Blockchain Technology	LIT	2-0-2	4	3	ES (PE)
7	26AD0XXX	Data Privacy and Protection	LIT	2-0-2	4	3	ES (PE)
8	26AD0XXX	Network Security	LIT	2-0-2	4	3	ES (PE)
9	26AD0XXX	Database Security	LIT	2-0-2	4	3	ES (PE)
10	26AD0XXX	Secure Software Development	LIT	2-0-2	4	3	ES (PE)

VERTICAL 5: NEXT-GENERATION COMPUTING

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1	26AD0XXX	Quantum Computing	LIT	2-0-2	4	3	ES (PE)
2	26AD0XXX	Vibe Coding	LIT	2-0-2	4	3	ES (PE)
3	26AD0XXX	GPU Programming	LIT	2-0-2	4	3	ES (PE)
4	26AD0XXX	Real Time Operating Systems	LIT	2-0-2	4	3	ES (PE)
5	26AD0XXX	Hardware Architectures for AI	LIT	2-0-2	4	3	ES (PE)
6	26AD0XXX	Neuromorphic Computing	LIT	2-0-2	4	3	ES (PE)
7	26AD0XXX	Augmented Reality	LIT	2-0-2	4	3	ES (PE)
8	26AD0XXX	Digital Twin Technology	LIT	2-0-2	4	3	ES (PE)
9	26AD0XXX	6G and Beyond Networks	LIT	2-0-2	4	3	ES (PE)
10	26AD0XXX	Sustainable Computing	LIT	2-0-2	4	3	ES (PE)

VERTICAL 6: CONNECTED DEVICES AND APPLICATIONS

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1	26AD0XXX	Dynamic Paradigm for IoT	LIT	2-0-2	4	3	ES (PE)
2	26AD0XXX	Smart IoT Architecture	LIT	2-0-2	4	3	ES (PE)
3	26AD0XXX	Wearable Computing	LIT	2-0-2	4	3	ES (PE)
4	26AD0XXX	IoT in 5G Networks	LIT	2-0-2	4	3	ES (PE)
5	26AD0XXX	IoT and Smart Cities	LIT	2-0-2	4	3	ES (PE)
6	26AD0XXX	Industrial IoT	LIT	2-0-2	4	3	ES (PE)
7	26AD0XXX	Smart Healthcare Systems	LIT	2-0-2	4	3	ES (PE)
8	26AD0XXX	IoT Security	LIT	2-0-2	4	3	ES (PE)
9	26AD0XXX	Edge Computing for IoT	LIT	2-0-2	4	3	ES (PE)
10	26AD0XXX	IoT Data Analytics	LIT	2-0-2	4	3	ES (PE)

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LIST OF OPEN ELECTIVE COURSES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories)

S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.	26AD901L	Introduction to Artificial Intelligence	LIT	2-0-2	4	3	OE
2.	26AD902L	Fundamentals of Data Science	LIT	2-0-2	4	3	OE
3.	26AD903L	AI for Everyday Applications	LIT	2-0-2	4	3	OE
4.	26AD904L	Intelligent Decision Support Systems	LIT	2-0-2	4	3	OE
5.	26AD905T	AI in Business and Management	T	3-0-0	3	3	OE
6.	26AD906T	Digital Transformation and Industry 4.0	T	3-0-0	3	3	OE
7.	26AD907T	AI Ethics and Responsible Computing	T	3-0-0	3	3	OE
8.	26AD908T	Data Privacy and Digital Governance	T	3-0-0	3	3	OE
9.	26AD909T	Sustainable Technologies and Green Computing	T	3-0-0	3	3	OE
10.	26AD910T	Technology Policy and Cyber Awareness	T	3-0-0	3	3	OE
11.	26AD911L	AI in Healthcare Systems	LIT	2-0-2	4	3	OE
12.	26AD912L	AI for Smart Agriculture	LIT	2-0-2	4	3	OE
13.	26AD913L	Smart Infrastructure and Intelligent Transportation	LIT	2-0-2	4	3	OE
14.	26AD914L	AI Applications in Mechanical Systems	LIT	2-0-2	4	3	OE
15.	26AD915L	AI for Electrical and Energy Systems	LIT	2-0-2	4	3	OE
16.	26AD916L	Basics of Internet of Things	LIT	2-0-2	4	3	OE
17.	26AD917L	Smart Sensors and Intelligent Devices	LIT	2-0-2	4	3	OE
18.	26AD918T	Connected Smart Environments	T	3-0-0	3	3	OE
19.	26AD919T	Wearable Technologies and Applications	T	3-0-0	3	3	OE
20.	26AD920L	Python for Intelligent Applications	LIT	2-0-2	4	3	OE
21.	26AD921L	Data Visualization and Storytelling	LIT	2-0-2	4	3	OE
22.	26AD922T	Fundamentals of Cloud and Edge Computing	T	3-0-0	3	3	OE

Semester - I

26MAC01T	Applied Calculus (Common to all Branches)	Category	L	T	P	C
		BS	3	1	0	4

Prerequisites:

- Fundamental knowledge of Algebra, Functions, Trigonometry, Differentiation and basic Integration.

Course Objectives:

- To provide a strong foundation in differential and integral calculus for Engineering applications.
- To develop analytical skills in solving functions of several variables and optimization problems.
- To enable students to apply integral calculus concepts in computing arc length, area and surface area.
- To introduce multiple integrals and their evaluation in Cartesian, polar, cylindrical and spherical coordinate systems.

Differential Calculus

Functions and graphs - New functions from old functions - Limit of a function - Continuity - Limits at infinity - Derivative as a function - Differentiation rules - Maxima and minima of functions of a single variable - Mean value theorem - Effect of derivatives on the shape of a graph- Applications.

Activities: Open-source Software: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Functions of several variables

Partial derivatives - Higher-order partial derivatives - Total derivative - Chain rule - Taylor's formula for functions of two variables - Maxima and minima of functions of two variables - Method of Lagrange multipliers - Engineering applications.

Activities: Open-source Software: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Integral Calculus

Fundamental theorem of calculus - Indefinite integrals and the net change theorem - Techniques of integration - Improper integrals - Arc length - Area of a plane region - Area of a surface of revolution - Applications.

Activities: Open-source Software: Definite and Indefinite Integrals, Determination of Area, Solving of Competitive Examination questions (Ex. GATE).

Multiple Integrals

Double integrals - Iterated integrals and Fubini's theorem - Change of order of integration - Change of variables: Cartesian to polar coordinates - Triple integrals - Change of variables: Cartesian to cylindrical and spherical coordinates - Engineering applications.

Activities: Open-source Software: Double integrals and triple integrals using open-source software, Solving of Competitive Examination questions (Ex. GATE).

Total periods (L: 45; T: 15): 60

Text Books:

1. Grewal, B. S. (2017). Higher Engineering Mathematics. Khanna Publishers. 44th Edition.
2. Kreyszig, E. (2016). Advanced Engineering Mathematics. John Wiley & Sons. 10th Edition.

Reference Books:

1. K Kandasamy, K Thilagavathy and K Gunavathy K (2026). Engineering Mathematics. S. Chand Publishing.
2. Anton, H., Bivens, I. C., & Davis, S. (2012). Calculus: Early Transcendentals. John Wiley & Sons. 10th Edition.
3. Larson, R., & Falvo, D. C. (2013). Calculus: An Applied Approach. Cengage Learning. 9th Edition.
4. Stewart, J., Clegg, D., & Watson, S. (2021). Calculus: Early Transcendentals. Cengage Learning. 9th Edition.
5. Thomas, G. B., Weir, M. D., Hass, J., & Heil, C. (2018). Thomas' Calculus: Early Transcendentals. Pearson Education. 14th Edition.
6. Singh, K. (2019). Engineering Mathematics through Applications. Bloomsbury Publishing. 2nd Edition.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply the concepts of limits, continuity and differentiation to analyze the behaviour of single-variable functions and solve optimization problems.
CO2	Apply partial differentiation, Taylor's expansion and the method of Lagrange multipliers to solve optimization problems involving functions of several variables.
CO3	Evaluate definite and improper integrals and apply them to compute arc length, plane area and surface area of revolution.
CO4	Evaluate double and triple integrals using appropriate coordinate systems and apply them to Engineering problems.

26ENC01T	English Essentials – I (Common to all Branches)	Category	L	T	P	C
		HUM	2	0	0	2

Prerequisites:

- Basic knowledge on English communication skills (writing, speaking, reading and listening).

Course Objectives:

- To improve Listening and Pronunciation Skills.
- To develop effective verbal and non-verbal skills.
- To enhance Reading and Comprehension abilities.
- To develop Professional Writing Skills.

Listening & Pronunciation Skills

Listening to academic and workplace conversations - Recorded interview - Pronunciation drills: Stress, Intonation, Phonetics basics - Accent neutralization - Listening comprehension tasks.

Grammar: Introduction to Parts of Speech, Word Syllable, Synonyms & Antonyms.

Activities: Audio Exercises, Minimal Pair Practice, Listening Tests.

Basic Grammar and Communication

Self-introduction: Formal, Informal - Making requests and giving instructions - Expressing opinions and ideas - Conversation.

Grammar: Articles, Tenses, Subject Verb & Agreement, Phrasal Verbs, Collocations, Word Formation, One Word Substitution.

Activities: Self-Introduction, Listen Short Podcasts, Just A Minute (JAM) Video Recording, Situational Role Plays, Spell Bee, Group Discussion.

Reading and Language Skills

Reading strategies: Skimming, Scanning, Predicting - Intensive reading: Short passages, Long passages on suggested theme - Reading comprehension passages.

Grammar: Sentence Patterns, Prefixes and Suffixes, Idioms and Phrases, Prepositions - Gerunds - Conjunctions.

Activities: Reading - Newspaper and Digital Articles, Cloze, Reading Comprehension, Note Making and Summarising.

Written Communication

Discourse markers - Completing sentences - Jumbled sentences - Paragraph writing - Essay writing - Report writing.

Grammar: Active and Passive Voice - Direct and Indirect Questions - Wh-Questions - Yes/No Questions.

Activities: Describe a Product, Apply/Request for Internship Program, Listening and Repeating, Gap Filling Exercises, Note-Taking.

Total periods: 30

Reference Books:

1. Tiwari, A. (2022). Communication Skills in English.
2. Murphy, R. (2019). English Grammar in Use. Cambridge University Press. 5th Edition.
3. English Edge (2025). Speaking. Orient BlackSwan.
4. Sharma, S., & Mishra, B. (2024). Communication Skills for Engineers and Scientists. PHI Learning. 2nd Edition.

E - Resources:

1. Cambridge English - https://www.cambridgeenglish.org/learningenglish/grammar-and-vocabulary/
2. Perfect English Grammar - https://www.perfect-english-grammar.com/
3. British Council - Learn English - https://learnenglish.britishcouncil.org/grammar
4. SpSDhling - https://spSDhling.com/
5. mePro by Pearson - https://mepro.pearson.com/
6. TED Talks - https://www.ted.com/

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Demonstrate improved listening skills in academic and real-life contexts.
CO2	Use basic grammatical structures accurately in spoken communication.
CO3	Apply reading strategies to understand and interpret technical and professional texts.
CO4	Develop clear, coherent and professional writing skills.

26TLC01T	தமிழர் மரபு (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

மொழி மற்றும் இலக்கியம்

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செம்மொழி இலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மை கருத்துக்கள் - தமிழ்க் காப்பியங்கள் - தமிழர்களின் சமண, பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம்: ஆழ்வார்கள், நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார், பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை

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

நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்

தெருக்கூத்து - கரகாட்டம் - வில்லுப்பாட்டு - கணியான் கூத்து - ஒயிலாட்டம் - தோற்பாவைக் கூத்து - தமிழர்களின் வீர விளையாட்டுகள்: சிலம்பாட்டம், வளரி, புலியாட்டம், ஜல்லிக்கட்டு, கபடி, வழுக்குமரம்.

தமிழர்களின் திணைக் கோட்பாடுகள்

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம், புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும், துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி, இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள் – கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

Total periods: 15

References:

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

26TLC01T	Heritage of Tamils (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

Language and Literature

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 Thirukkural - Tamil epics - Impact of Buddhism, Jainism in Tamil land - Bhakti literature: Azhwars, Nayanmars - Forms of minor poetry - Development of modern literature in Tamil - Contribution of Bharathiyar, Bharathidhasan.

Heritage - Rock Art Paintings to Modern Art - Sculpture

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 - Musical instruments: Mridangam, Parai, Veena, Yazh, Nadaswaram - Role of temples in social and economic life of Tamils.

Folk and Martial Arts

Therukoothu - Karagattam - Villu pattu - Kaniyan koothu - Oyilattam - Leather puppetry - Sports and games of Tamils: Silambattam, Valari, Tiger dance.

Thinai Concept of Tamils

Flora and fauna of Tamils - Aham, Puram concepts from Tholkappiyam and Sangam literature - Aram concept of Tamils - Education and literacy during Sangam age - Ancient cities, ports of Sangam age - Export, import during Sangam age - Overseas conquest of Cholas.

Contribution of Tamils to Indian National Movement and Indian Culture

Contribution of Tamils to Indian freedom struggle - Cultural influence of Tamils over other parts of India - Self-respect movement - Role of Siddha medicine in indigenous systems of medicine - Inscriptions, manuscripts - Print history of Tamil books.

Total periods: 15

References:

1. தமிழர் வரலாறு - மக்கள் பண்பாடு - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணியன் பூங்குன்றன் - முதன்மை நூல் - இல. சுந்தரம் (விடியல் பதிப்பகம்).
3. தமிழ் - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) - A joint publication of TNTB & ESC and RMRL - (in print).
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).

9. Keeladi - Sangam City Civilization on the banks of river Vaigai (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

26PHC01L	Physics for Information Sciences (Common to AI&DS, CSE and IT)	Category	L	T	P	C
		BS	2	0	2	3

Prerequisites:

- Basic knowledge of Physics fundamentals, including wave optics and Oscillations.
- Understanding of elementary mathematics, such as algebra and logarithms.
- Introductory knowledge of semiconductors and electronic devices.

Course Objectives:

- Understand the principles of waves, oscillations and resonance.
- Learn binary systems, logic gates and simplification techniques for digital circuits.
- Study quantum effects and nanodevices for modern electronics.
- Understand magnetic materials and the working of sensors for engineering applications.
- Learn fundamentals of quantum mechanics and quantum computing.

Oscillations, Waves and Fiber Optics

Oscillations: Oscillation and types - Differential Equation of SHM - Damped Harmonic Oscillator - Forced Vibrations.

Waves: Wave characteristics - types of waves - travelling and standing waves - reflection and transmission at boundaries - stationary waves and harmonics.

Fiber Optics: Optical fiber structure - acceptance angle and numerical aperture (Qualitative) - types of optical fibers - fiber optic communication system.

Practical:

1. Melde's string experiment - Frequency of an electrically vibrating metal tip.
2. Simple harmonic oscillations of cantilever.
3. Determination of acceptance angle in an optical fiber.

Logic Gates

Conversion of Binary to decimal - decimal to binary – binary coded decimal code-logic gates: OR and, NOT, NAND and NOR–Ex OR gates - simplification based on basic Boolean theorems: sum of products, product of sums expression - simplification by Karnaugh Map method.

Practical:

4. Logic gates using Digital Trainer Kit.

Nano – Devices

Introduction - electron density in bulk material - size dependence of Fermi energy - quantum confinement - quantum structures: quantum wells, wires and dots - band gap of nanomaterials. Tunnelling- Coulomb blockade - single electron transistor - resonant - tunnelling diode.

Practical:

5. Virtual demonstration of Coulomb Blockade effect in a Single Electron Transistor

Magnetic Materials and Sensors

Magnetic Materials: Magnetization of matter - ferromagnetic materials, ferrimagnetism - soft and hard magnetic materials - GMR sensor - magnetic data storage: hard disk

Sensors: Ultrasonic proximity sensors - capacitive proximity sensors - hall-effect switching sensors - photodiodes - phototransistors - fibre-optic sensors - LIDAR sensor- semiconductor temperature sensor - pyroelectric sensor.

Practical:

6. Hysteresis curve - Determination of energy loss of a coil.

Quantum mechanics and Quantum computing

Quantum mechanics: Inadequacy of classical mechanics - Blackbody radiation - photoelectric effect - wave-particle duality - de Broglie hypothesis and matter waves - Wave function - Schrodinger wave equation: time-independent - particle in a 1D box.

Quantum Computing: 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.

Practical:

7. Photo-electric effect- Determination of Planck's constant

Total periods (L + P): 60

Text Books:

1. Avadhanulu, M. N., & Kshirsagar, P. G. (2012). Engineering Physics. S. Chand Publishing.
2. Kasap, S. O. (2007). Principles of Electronic Materials and Devices. McGraw-Hill Education.
3. Pillai, S. O. (2010). Solid State Physics. New Age International Publishers.
4. Senthil Kumar, G. (2025). Applied Physics (CSIE)-II. VRB Publishers.

Reference Books:

1. Fraden, J. (2016). Handbook of Modern Sensors: Physics, Designs and Applications (5th ed.). Springer.
2. Bernhardt, C. (2016). Quantum Computing for Everyone. MIT Press.
3. Hanson, G. W. (2006). Fundamentals of Nanoelectronics. Pearson Education.
4. Mano, M. M., & Ciletti, M. D. (2018). Digital Design (6th ed.). Pearson.
5. De Silva, C. W. (2007). Sensors and Actuators: Engineering System Instrumentation. CRC Press.
6. Jacob Fraden. (2004). Handbook of Modern Sensors (3rd ed) AIP Press is an imprint of Springer-Verlag, Inc.
7. Kittel, C. (2005). Introduction to Solid State Physics (8th ed.). Wiley.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply wave and oscillation principles to analyze waves, SHM, damped/forced oscillators and superposed motions.
CO2	Apply Boolean algebra and Karnaugh map techniques to design and simplify digital logic circuits.
CO3	Explain quantum confinement, nanodevices and their electronic applications.
CO4	Apply magnetic material and sensor principles for data storage and sensing applications.
CO5	Solve quantum mechanics problems and apply quantum computing principles using qubits and quantum gates.

26CYC01L	Chemistry for Information Sciences (Common to AI&DS, CSE and IT)	Category	L	T	P	C
		BS	2	0	2	3

Prerequisites:

- Fundamental concepts of chemistry
- Basic understanding of electrochemistry
- Introductory knowledge of materials chemistry

Course Objectives:

- To understand electrochemical cells, batteries and energy storage devices.
- To learn the basic properties and uses of electronic materials.
- To understand chemical sensors and methods for water analysis and purification.
- To study nanomaterials, their properties, uses and e-waste management.
- To learn basic processes involved in electronics manufacturing like chip and PCB fabrication.

Electrochemistry & Energy storage

Electrochemical cell – electrode potential – emf of a cell – dependence of emf on electrolyte concentration – Nernst equation. Batteries – primary battery - Leclanche cell, Lithium battery – secondary battery – Lead-acid battery and Lithium-ion battery. Supercapacitors – Sodium-ion, Lithium-ion super capacitors.

Practical:

1. Estimation of Fe^{2+} by redox titration.
2. Determination of ferric ion in water sample using potentiometry

Electronic Materials

Inorganic semiconductors – energy band theory of elemental Si and Ge – doping mechanisms – compound semiconductors (GaAs, GaN) – band gap engineering. Organic semiconductors – conjugated polymers - mechanism of charge transport, doping, material properties. OLED and OPV – working principle - applications.

Practical:

3. Estimation of iron content of the water sample using spectrophotometer.
4. Determination of strength of acids in a mixture of acids using conductivity meter.

Chemical Sensors & water Chemistry

Chemical Sensors: Sensors – basic components. Electrochemical sensor – ion-selective electrode (pH) – metal oxide gas sensor – CO_2 sensor – Humidity sensor – principle, applications. Chemi-resistive sensor (Chemiresistor) - principle, application – Water quality parameters – standards – purification methods: ion exchange, reverse osmosis.

Practical:

5. Analysis of hardness, alkalinity and DO in water sample.

Nanomaterials and Green Chemistry

Basics of nanomaterials – classification – size-dependent properties – optical, electrical, mechanical and magnetic properties. Synthesis of nanomaterials: solvothermal, electrospinning and electrodeposition. Application of nanomaterials – Electronics, sensors and semiconductors. E-

waste management: E-Waste hazards – RoHS Compliance – E-waste management rules of India (2011 & 2016) – Recycling.

Practical:

6. Preparation of nanomaterial (ZnO, CuO) by solvothermal synthesis.

Electronics Manufacture

Microchip fabrication – wafer processing - Fabrication facilities – clean rooms – maintenance. PCB fabrication – Electroless plating and electroplating of copper and nickel – Principle, bath chemistries and process parameters, formation of copper track on plastic board. Ultrapure water – specifications.

Practical:

7. Estimation of copper content of the given solution by Iodometry.
8. Anodizing of aluminium and determination of thickness of anodised film.

Total periods: 60

Text Books:

1. Shashi Chawla (2022), A Textbook of Engineering Chemistry, Dhanpat Rai & Co., New Delhi, 6th Edition.
2. Cowie J.M.G. and Valeria Arrighi (2016), Polymers: Chemistry and Physics of Modern Materials, CRC Press, London, 3rd Edition.
3. William D. Callister Jr. (2017), Materials Science and Engineering, Wiley India, 10th Edition.

Reference Books:

1. Peter Van Zant (2014), Microchip Fabrication: A Practical Guide to Semiconductor Processing, McGraw Hill, 6th Edition.
2. Derek Pletcher and Frank C. Walsh (1993), "Industrial Electrochemistry", Chapman and Hall, 2nd Edition.
3. Florinel-Gabriel Banica (2012), Chemical Sensors and Biosensors – Fundamentals and Applications, John Wiley and Sons Ltd., 1st Edition.
4. Vogel's Textbook of Quantitative Chemical Analysis, 8th edition, 2014.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ce03/preview
2. https://onlinecourses.nptel.ac.in/noc23_cy19/preview

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand the principles of electrochemical cells, EMF, batteries and supercapacitors.
CO2	Explain the properties and applications of inorganic and organic electronic materials.
CO3	Understand the working principles of chemical sensors and methods for water quality analysis and purification.
CO4	Describe nanomaterials, their synthesis methods, properties and applications.
CO5	Explain the basic processes involved in microchip and PCB fabrication in electronics manufacturing.

26CSC01L	Problem Solving using C Programming (Common to AI&DS, BME, CSE, ECE, EEE and IT)	Category	L	T	P	C
		ES (PC)	2	0	2	3

Prerequisite:

- Basic knowledge of mathematics and logical reasoning.
- Familiarity with fundamental computer concepts such as input, output and memory.
- Ability to understand simple problem statements and step-by-step procedures.

Course Objectives:

- To develop problem-solving skills by understanding problem definition, analysis and designing algorithms using flowcharts and pseudocode.
- To introduce the fundamentals of C programming, including syntax, data types, operators, control structures and error handling for writing efficient programs.
- To enable modular programming skills through functions, recursion, parameter passing and structured program design techniques.
- To provide knowledge of advanced C concepts such as arrays, strings, pointers, user-defined data types and file handling for building real-world applications.

Problem Solving and Algorithmic Thinking

Problem Solving: Problem definition, problem analysis, problem solving techniques, problem analysis chart – Algorithms: Characteristics, design, representation – Flowcharts: Symbols, construction, examples – Pseudocode: Writing structured pseudocode – Program Design Techniques: Top-down approach, modular approach.

C Fundamentals and Programming Constructs

Introduction to Programming Languages: History of C, structure of C program, compilation, execution process – Preprocessor Directives, Comments, Documentation, Indentation, Coding Standards – Types of Errors: Syntax, runtime, logical – Tokens, Delimiters: Keywords, identifiers, constants, variables, data types, reserved words – Operators: Arithmetic, relational, logical, bitwise, assignment, conditional, special operators, precedence, associativity – Input, Output Functions – Control Structures: if, if else, nested if, switch case, while, do while, for, nested loops, jump statements.

Functions and Modular Programming

Functions: Declaration, definition, calling, function parameters, return types, parameter passing: call by value, call by reference using pointers, recursive functions – Variables: Scope, lifetime, storage classes – Header Files – Modular Programming Concepts.

Arrays, Strings and Pointers

Arrays: One-dimensional arrays, multi-dimensional arrays, array processing, array as function argument – Strings: String declaration, input, output, string handling functions – Pointers: Pointer declaration, initialization, pointer arithmetic, pointers and arrays, pointers and functions.

User Defined Data Types and File Processing

Structures, Unions: Defining structures, using structures, array of structures, pointers to structures, unions, applications – Enumerations, Typedef – File Processing: File operations: open, read, write, close, text files, binary files, file pointers, error handling, sequential access, random access – Dynamic Memory Allocation – Command Line Arguments

Total periods (L): 30

List of Experiments:

1. Basic: Algorithm, Flowchart, Pseudocode.
2. Decision Making statements: Simple If, If – else, Nested-If, Switch- case.
3. Looping Statements: For, While, do – while, Jump, Go-to, break and continue statement.
4. Pass by value and pass by reference, Recursion using functions.
5. One-dimensional arrays and multi-dimensional arrays.
6. Operations on Strings.
7. String handling operations using pointers.
8. Structures and unions.
9. File operations and command line arguments.
10. Dynamic Memory Allocation.
11. Write a C program for Authentication and string comparison.
12. Write a C program for ATM Withdrawal System.

Total periods (P): 30

Total periods (L + P): 60

Text Books:

1. Thareja, R. (2016). Programming in C. Oxford University Press. 2nd Edition.
2. Forouzan, B. A., & Afyouni, H. (2023). Computer Science: A Structured Programming Approach in C. Cengage Learning. 4th Edition.

Reference Books:

1. Balagurusamy, E. (2024). Programming in ANSI C. McGraw Hill Education. 9th Edition.
2. Gustedt, J. (2020). Modern C. Manning Publications. 2nd Edition.
3. Kanetkar, Y. (2020). Let Us C. BPB Publications.
4. Kalicharan, N. (2022). Learn to Program with C: An Introduction to Programming using the C Language. Apress.

E - Resources:

1. NPTEL. (n.d.). Programming in C (IIT Kharagpur). Available at: https://nptel.ac.in
2. GNU Project. (n.d.). GDB Manual. Available at: https://sourceware.org/gdb
3. Valgrind Developers. (n.d.). Valgrind Quick Start Guide. Available at: https://valgrind.org/docs
4. GeeksforGeeks.(n.d.). C Programming Tutorial. Available at: https://www.geeksforgeeks.org/

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply problem-solving techniques to design algorithms, flowcharts and pseudocode for computational problems.
CO2	Develop C programs using fundamental concepts such as data types, operators, control structures and input/output functions.
CO3	Implement modular programming using functions, recursion and parameter passing techniques.

CO4	Develop programs using arrays, strings, pointers, user-defined data types and file handling for real-world applications.
CO5	Apply problem-solving techniques to design algorithms, flowcharts and pseudocode for computational problems.

26EEC01L	Basic Electrical and Electronics Engineering (Common to AI&DS, CSE and IT)	Category	L	T	P	C
		ES (G)	2	0	2	3

Prerequisites:

- Basic knowledge of Physics, particularly electricity, magnetism and simple circuits.
- Familiarity with fundamental mathematics, including algebra, basic trigonometry and complex numbers.

Course Objectives:

- To understand the basic concepts of electrical circuits and power systems.
- To study the operating principles of electrical machines and transformers used in power conversion systems.
- To understand semiconductor devices and analog electronic circuits.
- To learn digital electronics and logic circuits used in computer hardware systems.
- To introduce electrical protection, measurement systems and computer power supply systems such as SMPS and UPS.

Electrical Circuit Fundamentals

Electrical quantities – Current, Voltage, Power, Energy – Passive elements: R, L, C – Ohm's law – Kirchhoff's laws: Voltage law, Current law – Series and parallel circuits – Mesh and nodal analysis – AC fundamentals: RMS value, Average value – Power: Active Power, Reactive power, Apparent power – Power factor – Phasor representation – Simple AC circuits: RL, RC, RLC series circuits.

Magnetic Circuits & Machines

Electromagnetic induction – Induced currents, Faraday's law, Induction and energy, Motional emf, Lenz's law – Magnetic field – Magnetic circuit – Inductance, Mutual inductance.
Electrical machines – Construction and principle of operation: DC generators, DC motors, Transformers, three phase induction motor (Qualitative).

Semiconductor Devices and Analog Electronics

Semiconductor materials – Intrinsic, Extrinsic semiconductors – PN junction diode characteristics – Zener diode: Voltage regulation – Bipolar junction transistor: BJT – MOSFET – Rectifier circuits: Half-wave, Full-wave – Filters, Basic power supply circuits – Operational amplifier: Basics, Applications.

Electrical Supply System

Domestic wiring – Types, Accessories – General safety requirements as per IE rules – Single line diagram of electric power supply system – Single phase, Three phase supply system.
Need for electrical protection – Earthing, Grounding – Protective devices: Fuse, MCB, RCCB.

UPS Systems and Transducers

UPS – Need for UPS in computer systems – Types: Off-line, Line-interactive, On-line UPS – Components: Filters, Front-end battery charger, Boost charger.
Transducers – Classification of transducers – Types: Strain gauges, RTD, Thermocouples, Piezo-electric, LVDT, Thermoelectric transducers.

Total periods (L): 30

List of Experiments:

13. Verification of Ohm's Law and Kirchhoff's Laws
14. Measurement of power and power factor in AC circuits
15. V–I Characteristics of PN junction diode
16. Characteristics of BJT
17. Characteristics of MOSFET
18. Verification of logic gates using ICs

Total periods (P): 30

Total periods (L + P): 60

Text Books:

1. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraHill, 2015.
2. Electronic Devices and Circuit Theory – Robert L. Boylestad & Louis Nashelsky, Pearson.
3. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
4. Basic Electrical and Electronics Engineering – 2nd Edition – R. Muthusubramanian, S. Salivahanan, McGraw Hill 25 October 2024.
5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

Reference Books:

1. Engineering Circuit Analysis – William H. Hayt, Jack E. Kemmerly & Steven M. Durbin, McGraw-Hill.
2. Microelectronic Circuits – Adel S. Sedra & Kenneth C. Smith, Oxford University Press.
3. Ned Mohan, "Power Electronics: A First course", John Wiley, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO	Apply the fundamental laws and principles of electrical circuits to analyze DC and AC circuits and determine electrical quantities and power parameters.
CO2	Explain the principles of electromagnetic induction, magnetic circuits, and the construction and operation of basic electrical machines.
CO3	Analyze the characteristics and applications of semiconductor devices, rectifiers, filters, power supplies, and operational amplifiers in basic electronic circuits.
CO4	Explain electrical power supply systems, domestic wiring, earthing, grounding, and the operation of electrical protective devices for safe electrical installations.
CO5	Describe the working principles, types, and applications of UPS systems and commonly used electrical transducers in computer and measurement systems.

26MEC01L	Engineering Drawing (Common to AI&DS, BME, CIVIL, CSE, EEE, IT, Mechanical and R&A)	Category	L	T	P	C
		ES (G)	2	0	2	3

Prerequisites:

- Basic knowledge of geometry, including lines, angles, circles and simple shapes.
- Familiarity with basic mathematical concepts such as measurements, proportions and scaling.
- Basic computer literacy for operating CAD software and handling digital drawing tools.

Course Objectives:

- To impart knowledge on dimensions and drawing standards.
- To explore the orthographic projection of lines and solids.
- To provide the understanding of orthographic, isometric and perspective views.

Fundamentals

Drawing instruments, Drawing standards (BIS), Lettering in engineering, Sheet layout, elements of dimensioning, Systems of dimensioning. Free hand sketching of 2D & 3D objects, Conics – Ellipse, Parabola and Hyperbola.

Activities: Virtual Demonstration of Conics and Cycloids.

Orthographic Projection

First angle projection, Projection of points, straight lines and planes.

Projection of Solids

Projection of Simple Solids when the axis is inclined to one reference plane.

Activities: Development of models of various solids and virtual demonstration of sectioning and development of Surfaces. CAD modelling of 2D objects.

Isometric Projection

Isometric Scale, Projection of Simple solids.

Activities: Conversion of 3D into 2D orthographic views, CAD modelling of 3D objects.

Perspective Projection

Simple solids projection.

Activities: Virtual demonstration of perspective views.

Project: Development of 2D objects and 3D objects using CAD tools.

Total Periods (L: 30; P:30): 60

Reference Books:

1. Natarajan, K. V. (2025). A Text Book of Engineering Graphics. Dhanalakshmi Publisher.
2. K. Venugopal and V. Prabhu Raja (2022). Engineering Drawing with AutoCAD. New Age International Publishers. 6th Edition.

E–Resources:

1. CAD Software – https://www.freecadweb.org/
2. Engineering Drawing and Computer Graphics, Prof. Rajaram Lakkaraju (IIT Kharagpur) – https://onlinecourses.nptel.ac.in/noc22_me105/preview

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply standard drawing practices, including BIS conventions, lettering, dimensioning and sheet layout, in engineering drawings.
CO2	Construct and interpret freehand sketches and conic sections (ellipse, parabola, hyperbola) for basic engineering applications.
CO3	Develop orthographic projections of points, lines, planes and simple solids using first–angle projection methods.
CO4	Create isometric and perspective projections of simple solids and convert between 2D and 3D representations.
CO5	Utilize CAD tools to model and visualize 2D and 3D objects.

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

Recommended by
Board of Studies of AI&DS Dept.
Meeting No.: 01 Dated: 28.3.26

Semester - II

26MAC02T	Linear Algebra (Common to AI&DS, CSE, IT, Mech and R&A)	Category	L	T	P	C
		BS	3	1	0	4

Prerequisites:

- Basic knowledge of matrices and systems of linear equations.

Course Objectives:

- Understand the structure of vector spaces and analyze subspaces, linear combinations, span, basis and dimension.
- Examine linear transformations by computing null space, range, matrix representations, eigenvalues, eigenvectors and determining diagonalizability.
- Apply concepts of inner product spaces including norms, orthogonality, Cauchy–Schwarz inequality and Gram–Schmidt orthogonalization.
- Perform matrix decompositions such as diagonalization of symmetric matrices, QR decomposition and Singular Value Decomposition (SVD) and solve least squares problems.

Vector Spaces

Introduction to vector spaces, examples - subspaces - linear combinations - span, generating sets - linear dependence, linear independence - basis - dimension, dimension of subspaces.

Activities: Open-Source software: Exercises to test linear dependence and independence using rank, compute span and basis of a set of vectors, determine the dimension of subspaces and illustrate the concept of subspace and basis in R^2/R^3 with visualization.

Linear Transformations and Diagonalization

Linear Transformations: Null space, range, dimension theorem (statement only) matrix representation of a linear transformation - Eigen values, Eigen vectors, diagonalizability.

Activities: Open-Source software: Exercises to compute the matrix representation of a linear transformation, find the null space and range of a matrix and compute Eigen values and Eigen vectors of a matrix.

Inner Product Spaces

Inner Product Spaces: Inner product, norms, Cauchy Schwarz inequality, triangle inequality – Orthogonalization: Gram Schmidt orthogonalization, simple problems up to R^3.

Activities: Open-Source software: Exercises to compute inner products and vector norms.

Matrix Decomposition

Matrix Transformations: Orthogonal transformation of a symmetric matrix to diagonal form, positive definite matrices – Decompositions: QR decomposition, singular value decomposition (SVD) - Least Squares: Least squares solutions, simple problems up to R^3.

Activities: Open-Source software: Exercises to check if a matrix is positive definite, perform QR decomposition and SVD using built-in functions.

References:

1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). Linear algebra. Pearson.
2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). Linear algebra and its applications with MATLAB. Pearson.

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

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand and apply the fundamental concepts of vector spaces, including subspaces, span, linear dependence/ independence, basis and dimensions.
CO2	Analyze linear transformations by computing null space, range, matrix representation, Eigen values and Eigen vectors and determining diagonalizability.
CO3	Apply inner product space concepts to compute norms, verify inequalities and construct orthonormal bases using Gram-Schmidt orthogonalization.
CO4	Use matrix decomposition techniques (orthogonal diagonalization, QR, SVD) and least squares methods to analyze matrices using open-source computational tools.

26CYC01T	Climate Change and Sustainability (Common to all Branches)	Category	L	T	P	C
		HUM	2	0	0	2

Prerequisites:

- Fundamental knowledge of science subjects studied at higher secondary level.
- Awareness of current environmental issues and sustainability practices.

Course Objectives:

- To understand the basics of climate and weather, atmospheric structure and the factors affecting climatic conditions.
- To learn about climate change, global warming, greenhouse effect, air pollution and their impacts on environment and human life.
- To gain knowledge on urbanization, sustainable development, waste management, green energy and sustainable urban planning.
- To study adaptation and mitigation measures for climate change using green engineering, green technologies and climate resilient infrastructure.
- To understand sustainable technologies and international efforts such as Kyoto Protocol, carbon credit and Paris Agreement for reducing greenhouse gas emissions.

Climate

Climate and weather – Composition and structure of atmosphere. Factors influencing weather – Insolation, Temperature, Humidity, Pressure, Wind, Precipitation, Topography. Climate change and variability – Atmospheric stability - Inversions.

Activity: Assignment on regional climate change.

Climate Change

Climate change – Global warming – Greenhouse effect- Air pollution, Carbon footprint, carbon cycle, carbon sequestration. Impact of climate change on water cycle, agriculture, forest, urban areas, biodiversity human health.

Activity: Case Study on Air Pollution.

Urbanization and sustainable development

Urbanisation and Industrialization – problems – Urban sprawl. Urban planning – Zoning of land use – Sustainable development, Green energy, Waste management, 3R concepts, sustainable transport, sustainable urbanization.

Activity: Field visit to waste management plant.

Adaptation and mitigation strategies

Green Engineering, Green technologies, circular economy. Climate change and infrastructure planning, Climate resilient cities, climate resilient infrastructure – nature based solutions in disaster management. Adaptations and strategies for combating climate change.

Activity: Poster presentation about Green Building.

Sustainable technologies

Sustainability Engineering, United Nations Framework Convention on climate change – Climate change action plans – Kyoto mechanisms to reduce GHG emission – Clean development mechanism – Joint implementation – Case studies – Carbon credit, Paris Agreement.

Total periods: 30

Text Books:

1. J. Tompkins and T. Taylor, Sustainability: A comprehensive Foundation, 1st Edition, 12th Media Services, 2018.
2. K. Karthilk, Green Building Guidance: The Ultimate Guide for IGBC Accredited Professional Examination Book, 1st Edition. NVICO Notion Press, 2019.
3. D.S. Lal, Climatology, Latest Edition. Sharda Pustak Bhavan, ISBN 8186204121.
4. J.T. Houghton and J. Pasternak, Climate Change: Causes, Effects and Solutions, 1st Edition, Wiley Publications, 2003.

E - Resources:

1. D. T. Allen and D. R. Shonnard, Sustainability Engineering: Concepts, Design and Case Studies, 1st Edition, Prentice Hall, 2001.
2. J. W. Twidell and A. D. Weir, Renewable Energy Resources, 2nd Edition, Taylor & Francis, 2006.
3. A. S. Bradley, A. O. Adebayo and P. Maria, Engineering Applications in Sustainable Design and Development, 1st Edition, Cengage Learning, 2015.
4. N. B. Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, 1st Edition, McGraw-Hill Professional, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Explain the basic concepts of climate, weather, atmospheric structure and factors influencing climatic conditions.
CO2	Discuss climate change, global warming, greenhouse effect, air pollution and their environmental and social impacts.
CO3	Analyze the issues related to urbanization and apply principles of sustainable development, waste management and green energy.
CO4	Apply adaptation and mitigation strategies using green technologies, circular economy and climate resilient infrastructure concepts.
CO5	Describe sustainable technologies and international climate agreements and evaluate measures for reducing greenhouse gas emissions.

26TLC02T	தமிழர்களும் தொழில்நுட்பமும் (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு, சிவப்பு பானைகள் மற்றும் கீறல் குறியீடுகள்.

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்

சங்க காலத்தில் வடிவமைப்பு, கட்டுமானங்கள் - சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகற்களும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்கள், கோவில்கள் - சோழர் காலத்து பெருங்கோயில்கள், பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல் - மதுரை மீனாட்சி அம்மன் ஆலயம், திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

உற்பத்தித் தொழில் நுட்பம்

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

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்

அணை - ஏரி - குளங்கள் - மதகு - சோழர் காலக் குமிழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்

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

Total periods: 15

References:

1. தமிழர் வரலாறு - மக்கள் பண்பாடு - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் - முனைவர் இள. சுந்தரம் (விகடன் பதிப்பகம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) - A joint publication of TNTB & ESC and RMRL - (in print).
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi - Sangam City Civilization on the banks of river Vaigai (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

26TLC02T	Tamils and Technology (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	0	1

Weaving and Ceramic Technology

Weaving industry during Sangam age - Ceramic technology - Black, Red ware potteries (BRW) - Graffiti on potteries.

Design and Construction Technology

Designing, Structural construction of houses during Sangam age - Design in household materials during Sangam age - Building materials, Hero stones of Sangam age - Details of stage constructions in Silappathikaram - Sculptures, Temples of Mamallapuram - Great temples of Cholas, Other worship places - Temples of Nayaka period - Type study: Madurai Meenakshi temple - Thirumalai Nayakar mahal - Chettinad houses - Indo-Saracenic architecture at Madras during British period.

Manufacturing Technology

Art of ship building - Metallurgical studies - Iron industry - Iron smelting - Steel - Copper, Gold coins as sources of history - Minting of coins - Bead making industries: Stone beads, Glass beads, Terracotta beads, Shell beads, Bone beads - Archaeological evidences - Gemstone types described in Silappathikaram.

Agriculture and Irrigation Technology

Dam - Tank - Ponds - Sluice - Significance of Kumizhi thoompu of Chola period - Animal husbandry - Wells designed for cattle use - Agriculture, Agro processing - Knowledge of sea - Fisheries - Pearl, Conch diving - Ancient knowledge of ocean - Knowledge-based society.

Scientific Tamil & Tamil Computing

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 periods: 15

References:

1. தமிழர் வரலாறு - மக்கள் பண்பாடு - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இள. சுந்தரம் (விகடன் பதிப்பகம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr. K.K. Pillay) - A joint publication of TNTB & ESC and RMRL - (in print).
6. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi - Sangam City Civilization on the banks of river Vaigai (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

26AD201T	Python Programming	Category	L	T	P	C
		ES (PC)	3	0	0	3

Prerequisites:

- Basic understanding of computers and programming fundamentals (variables, data types and simple logic).
- Familiarity with control structures such as conditional statements and loops.
- Basic knowledge of functions and problem-solving techniques.
- Logical thinking ability; prior exposure to any programming language is an added advantage.

Course Objectives:

- To introduce the fundamentals of Python programming including tokens, data types, operators, expressions, input/output functions and control flow statements for problem solving.
- To develop modular programming skills using functions, parameter passing techniques, recursion, lambda expressions and advanced string operations.
- To enable students to use and manipulate Python collection data structures such as lists, tuples, dictionaries and sets for efficient data handling.
- To equip students with the ability to perform file handling, implement exception

Foundations of Python Programming

Introduction To Python Programming – History, Features Of Python – Execution Modes: Interactive Mode, Script Mode – Tokens: Identifiers, Variables, Keywords, Literals, Comments – Data Types: Numeric, Boolean, String – Type Casting – Indentation Rules – Operators, Operator Precedence – Expressions – Input, Output Functions – Conditional Statements: Simple If, If-Else, Nested If, If-Elif-Else Ladder – Looping Statements: While Loop, For Loop, Nested Loops, Else With Loops – Loop Control Statements: Break, Continue, Pass

String Manipulation and Functions

Functions – Definition, Types: Built-In Functions, User-Defined Functions – Function Syntax, Structure – Parameters, Arguments: Positional Arguments, Keyword Arguments, Default Parameters, Variable-Length Arguments – Scope, Lifetime Of Variables: Local Scope, Global Scope – Recursive Functions – Anonymous Functions: Lambda Functions – Strings: Creation, Manipulation, Formatting Techniques, Comparison Operations, Indexing, Slicing, Methods: Splitting, Stripping, Pattern Matching Operations

Managing Data: Python Collections

Lists: Creation of Lists, Accessing Elements Using Indexing, Slicing Techniques, Negative Indices – Built-In List Methods – List Comprehensions: Efficient Data Processing. Tuples: Creation of Tuples, Indexing, Slicing Operations – Immutability Concept – Common Operations On Tuples. Dictionaries: Creation of Dictionaries, Accessing Elements Using Keys – Adding, Updating Key-Value Pairs – Common Dictionary Operations, Methods. Sets: Creation Of Sets – Properties: Uniqueness, Unordered Nature – Set Operations: Union, Intersection, Difference, Membership Testing

File I/O, Exception Handling and Package Management File Handling – Text File Processing – File Handling Modes – File Input, Output Operations – Appending Data to Files – Errors: Types of Errors – Exception Handling: Try, Except, Else, Finally Blocks – Handling Multiple Exceptions – Raising Custom Exceptions – Command Line Arguments – Modular Programming – Modules: Creation, Reuse – Packages: Organization – Importing Techniques
Principles of Object-Oriented Design in Python Object Oriented Programming – Classes, Objects – Class Attributes, Methods – Object Instantiation – Constructor – Method Overriding – Operator Overloading – Polymorphism: Implementation in Python Programs – Inheritance – Super () Method – Types of Inheritance
Total periods: 45
Text Books: 1. Paul Deitel and Harvey Deitel (2021). Python for Programmers. Pearson Education. 1st Edition. 2. John V Guttag (2021). Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data. MIT Press. 3rd Edition. **Reference Books:** 1. Allen B. Downey (2016). Think Python: How to Think Like a Computer Scientist. O'Reilly Publishers. 2nd Edition 2. Martin C. Brown (2018). Python: The Complete Reference. Mc-Graw Hill. 4th Edition. 3. Karl Beecher (2017). Computational Thinking: A Beginner's Guide to Problem Solving and Programming. BCS Learning and Development Limited. 1st Edition.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply Python programming constructs, operators, conditional statements, loops, and control statements to develop solutions for basic computational problems.
CO2	Develop Python programs using functions, recursion, lambda functions, and string manipulation techniques to solve computational problems.
CO3	Apply appropriate Python collection types and operations to efficiently organize, process, and manipulate data.
CO4	Develop Python programs using file handling, exception handling, command-line arguments, modules, and packages for robust and modular applications.
CO5	Implement object-oriented programming concepts such as classes, objects, constructors, inheritance, polymorphism, method overriding, and operator overloading in Python applications.

26ENC02L	English Essentials - II (Common to all Branches)	Category	L	T	P	C
		HUM	1	0	2	2

Prerequisites:

- Fundamental communication skills required for academic and professional contexts.

Course Objectives:

- To enhance practical communication skills through lab-based activities.
- To train students in professional and workplace communication.
- To improve listening, presentation and teamwork skills.
- To equip students with essential skills for interviews and career readiness.

Communication Concepts

Types of communication: Verbal, Non-verbal, Written - Process of communication - Interpersonal, Intrapersonal communication - Barriers to communication - Ways to overcome barriers - Listening skills - Active listening.

Lab Activities: Listening practice using audio clips: Note-taking - Role-play: Formal, Informal communication - Group activity: Identify communication barriers in real-life cases - Short self-introduction: Record, Review - Think-pair-share discussions.

Business Correspondence

Email writing - Cover letter, Resume writing - LinkedIn, Profile building basics - SOP writing.

Lab Activities: Write professional emails: Leave request, Complaint, Enquiry - Resume preparation: ATS-friendly format - Cover letter drafting: Internships, Jobs - Peer review of resumes - Email etiquette - Email writing: Request for education loan, Internship, Placement - Spot-the-error in business email.

Presentation Skills

Public speaking techniques - Structuring a presentation - Body language, Voice modulation - Use of visual aids: PPT - Poster making - Use of AI tools.

Lab Activities: 2-3-minute speech on technical, General topics - PPT presentation - Mirror practice for confidence building - Record, Analyse student presentations - Body language activity: Gesture control, Posture.

Workplace Readiness

Interviews - Types of interviews - Preparing for interviews - Mock interviews - Group discussion - Types of GDs - Preparing for GD - Parameters used for evaluating GD - Telephone, Video call etiquette.

Lab Activities: Simulated job interview: Peer panel - 5-minute group discussion on a given topic - Picture-based non-verbal communication exercise.

Total periods (L: 15; P: 30): 45

Text Books:

1. Raman, M., & Sharma, S. (2008). Technical Communication: English Skills for Engineers. Oxford University Press.
2. Subhashini, B., et al. (2025). English for Technical Communication. RK Publications.
3. Ibbotson, M. (2008). Cambridge English for Engineering. Cambridge University Press.

E - Resources:

1. Cambridge English - https://www.cambridgeenglish.org/learningenglish/grammar-and-vocabulary/
2. Communication for Business Success-https://open.umn.edu/opentextbooks/textbooks/8
3. TED Talks - https://www.ted.com/
4. Speechling - https://speechling.com/
5. mePro by Pearson - https://mepro.pearson.com/

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Demonstrate improved listening and pronunciation skills.
CO2	Draft effective business emails, resumes and cover letters.
CO3	Deliver structured and impactful presentations.
CO4	Apply workplace communication skills including group discussion and interviews.

26CSC03L	Digital Principles and Computer Organization (Common AI&DS, CSE and IT)	Category	L	T	P	C
		ES (G)	2	0	2	3

Course Objectives:

- To design and analyze combinational logic circuits.
- To study sequential circuits such as flip-flops, registers, counters.
- To understand processor organization and pipelining concepts.
- To analyze memory systems and model digital circuits using Verilog HDL.

Design of Combinational Circuits

Code Converters: Design procedure, BCD to excess 3, binary to Gray, Gray to binary, BCD to 7 segment converters – Adder Circuits: Parallel adder, carry look ahead adder, BCD adder, subtractor – Comparator: Magnitude comparator – Decoders, Encoders: Encoders, priority encoder – Multiplexers, Demultiplexers – Three State Gates – Design Examples

Sequential Logic

Sequential Circuits: Introduction to sequential circuits – Flip Flops: SR flip flop, JK flip flop, T flip flop, D flip flop, master slave flip flop, triggering of flip flops, analysis, design of clocked sequential circuits, state minimization, state assignment, circuit implementation – Counters: Ripple counters, ring counters – Registers: Serial in serial out, serial in parallel out, parallel in serial out, parallel in parallel out, universal shift register.

Computer Fundamentals

Functional Units of a Digital Computer: Von Neumann architecture, Harvard architecture – Computer Hardware: Operation, operands, instructions, instruction set architecture: memory location, address, operation – Instruction Execution: Instruction execution cycle, instruction sequencing – Performance Metrics: MIPS, MFLOPS, CPI, throughput – Addressing Modes, Instruction Encoding: Addressing modes, encoding of machine instruction – Language Interaction: Interaction between assembly language, high level language..

Processing and Pipelining

Computer Architecture: RISC vs CISC, addressing modes, hardwired control unit, microprogrammed control unit – Pipelining: Concepts of pipelining, pipeline stages, timing diagram, hazards: structural hazards, data hazards, control hazards – Instruction Level Parallelism – Parallel Processing: SIMD, MIMD.

Memory and Introduction to Verilog HDL

Memory Hierarchy: Registers, cache memory, main memory, RAM, ROM: PROM, EPROM, EEPROM, secondary storage, HDD, SSD – Cache: Cache mapping techniques, cache organization, cache replacement policies, DMA – Verilog HDL: Data types: value set, wire, register, input, output, inout – Operators: Arithmetic, relational, bitwise, logical, conditional, concatenation, shift, reduction – Modules: Continuous assignment, module instantiation – Procedural Blocks: Always blocks, initial blocks, conditional statements – HDL Models: Simple combinational circuits, sequential circuits.

Total periods (L): 30

List of Experiments

Combinational Logic Circuit Design

1. Design of Adder, Subtractors and Four-bit (Modulo 16) Adder/Subtractor.
2. Construction of 1-bit Comparator using 74xx and verification of 4-bit Comparator IC 7485.
3. Design and Implementation of Multiplexer, Demultiplexer and Code Converter (Gray to Binary).
4. Design and Verification of Decoders using IC 74147 and Encoder using IC 7445.

Sequential Logic Circuit Design

1. Verification of various Flip-flops using gates.
2. Verification of Shift Registers – SIPO/SISO & PIPO/PISO.
3. Design of 4-bit Sequence Generator.
4. Design of Mod N Asynchronous and Synchronous Counter using IC 7490 and IC 74192.
5. Design of 1-bit ALU using logic gates and study of 4-bit ALU using IC 74181.
6. Design of Digital Clock to display minutes and seconds using 7-segment (IC 7447).

Simulation using Verilog HDL

1. Design of combinational circuits.
2. Design of sequential circuits.

Total Periods (P): 30

Total Periods (L + P): 60

Reference Books:

1. Mano, M. M., & Ciletti, M. D. (2018). Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog. Pearson Education (6th ed.).
2. Patterson, D. A., & Hennessy, J. L. (2020). Computer Organization and Design: The Hardware/Software Interface. Morgan Kaufmann.
3. Tanenbaum, A. S., & Austin, T. (n.d.). Structured Computer Organization. Pearson Education.
4. Hennessy, J. L., & Patterson, D. A. (2019). Computer Architecture: A Quantitative Approach. Morgan Kaufmann.
5. Shen, J. P., & Lipasti, M. H. (n.d.). Modern Processor Design: Fundamentals of Superscalar Processors. Waveland Press

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply digital logic principles to design and simulate combinational circuits.
CO2	Design and evaluate synchronous sequential circuits using flip-flops and finite state models.
CO3	Examine instruction sets, processor organization, memory hierarchy and performance metrics to evaluate computing systems.
CO4	Analyze modern processor architectures and parallel computing techniques to enhance system performance.
CO5	Analyze memory systems and implement digital circuits using Verilog HDL.

26CSC04L	Data Structures using C (Common AI&DS, CSE, EEE and IT)	Category	L	T	P	C
		ES (PC)	2	0	2	3

Prerequisites:

- Basic knowledge of C programming concepts such as variables, data types, operators, control flow and functions is required.
- Understanding of pointers, pointer arithmetic and dynamic memory allocation is essential.
- Familiarity with structures, user-defined data types and recursion is needed.
- Basic mathematical concepts such as logarithms, summations and powers of 2 should be known.
- Awareness of asymptotic notations such as Big-O, Big-Omega and Big-Theta is desirable.

Course Objectives:

- Understand the need for data structures and implement linear structures – arrays and linked lists in C.
- Implement stack and queue ADTs using arrays and linked lists and apply them to solve real-world problems.
- Understand and implement tree-based non-linear data structures and perform standard traversals.
- Apply graph algorithms including BFS, DFS, shortest path and minimum spanning tree techniques.
- Apply searching, sorting and hashing algorithms for efficient data organization and retrieval.

Linear Data Structures - Lists

Abstract data types, need, classification of data structures – Arrays: Array representation, operations, sparse matrix representation – Linked Lists: Singly linked list, doubly linked list, circular linked list, insertion, deletion, traversal, searching – Applications: Polynomial addition, sparse matrix using linked lists – Complexity Analysis: Time complexity, space complexity, Big O notation, Big Theta notation, Big Omega notation, best case analysis, worst case analysis, average case analysis

Linear Data Structures - Stacks and Queues

Stack ADT: Array implementation, linked list implementation, applications: balanced parentheses, arithmetic expression evaluation, function call stack – Queue ADT: Array implementation, linked list implementation, circular queue, priority queue, deque, applications of queues

Non-Linear Data Structures - Trees

Tree ADT: Terminologies – Binary Trees: Array representation, linked representation, tree traversals: inorder, preorder, postorder – Binary Search Trees: Insertion, deletion, searching – AVL Trees: Rotations: LL, RR, LR, RL – Heaps: Max heap, min heap, heap operations, priority queue using heap – Applications of Trees: Expression trees, B tree array representation, linked representation

Non-Linear Data Structures - Graphs

Graph ADT: Terminologies, adjacency matrix representation, adjacency list representation – Graph Traversals: BFS, DFS – Topological Sort – Shortest Path: Dijkstras algorithm – Minimum Spanning Tree: Prims algorithm, Kruskals algorithm – Applications: Computer networks routing, social graph analysis OS, CN linkage

Searching, Sorting and Hashing Techniques

Searching: Linear search, binary search – Sorting Algorithms: Insertion sort, merge sort, quick sort, heap sort – Hashing: Hash functions, collision resolution: separate chaining, open addressing: linear probing, quadratic probing, double hashing, rehashing – Applications of Hashing: Database indexing, caching, password storage.

Total periods (L): 30

List of Experiments:

1. Implement Linked Lists (Singly/Doubly/Circular) with insert, delete, search and display operations.
2. Implement Stack and Queue using both array and linked list and apply stack for balanced parentheses checking.
3. Implement Prefix and Postfix expression evaluation and conversion using stack.
4. Implement Circular Queue and Priority Queue using arrays with enqueue, dequeue, display and overflow/underflow handling.
5. Implement Polynomial Addition using Linked Lists and display the resultant polynomial.
6. Implement Binary Search Tree (BST) with insertion, deletion, search and tree traversals (Inorder, Preorder, Postorder).
7. Implement an AVL Tree with insertion, perform rotations (LL, RR, LR, RL) and display height and balance factor.
8. Develop a simple application (such as a map or network) to represent a graph and use BFS and DFS to explore it. Implement any one feature such as finding the shortest path or connecting all points with minimum cost.
9. Implement Merge Sort and Quick Sort, run them on the same dataset and compare their execution steps.
10. Implement a Hash Table using Separate Chaining and Open Addressing (Linear Probing), including collision handling.

Total periods (P): 30

Total periods (L + P): 60

Text Books:

1. Thareja, R. (2023). *Data Structures Using C*. Oxford University Press (3rd ed.).
2. Tenenbaum, A. M., Langsam, Y., & Augenstein, M. J. (2024). *Data Structures Using C*. Pearson (Updated ed.).
3. Aho, A. V., Hopcroft, J. E., & Ullman, J. D. (2024). *Data Structures and Algorithms – Modern Approach*. Springer (Revised ed.).

Reference Books:

1. Horowitz, E., Sahni, S., & Anderson-Freed, S. (2023). *Fundamentals of Data Structures in C*. Universities Press (Updated ed.).
2. Samanta, D. (2023). *Classic Data Structures*. PHI Learning (2nd ed., Updated reprint).
3. Kanetkar, Y. (2023). *Data Structures Through C*. BPB Publications (Latest revised ed.).

E-Resources:

1. NPTEL – Data Structures & Algorithms (IIT Madras)
   - https://nptel.ac.in/courses/106106127
2. VisuAlgo – Algorithm Visualization - https://visualgo.net
3. MIT OpenCourseWare – Introduction to Algorithms (6.006)
   - https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020
4. CS50 – Harvard Open Online Course (2024 Edition) - https://cs50.harvard.edu/x

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Implement linear data structures (arrays, linked lists, stacks and queues) and demonstrate their operations and applications.
CO2	Implement tree-based data structures (BST, AVL, Heap) and apply standard traversal and balancing techniques.
CO3	Apply graph representations and algorithms (BFS, DFS, Dijkstra's, Prim's, Kruskal's) to solve connectivity and path problems.
CO4	Apply sorting, searching and hashing techniques to organize and retrieve data efficiently.

26MEC01P	Engineering Practices and Re-Engineering Laboratory (Common to all Branches)	Category	L	T	P	C
		SD	0	0	4	2

Prerequisites:

- Basic understanding of science concepts (Physics fundamentals like force, electricity and energy).
- Familiarity with basic tools, measurements and safety practices (school-level exposure is sufficient).
- Basic awareness of computers and simple programming concepts (intro level).
- Willingness to engage in hands-on activities and teamwork.

Course Objectives:

- To develop practical skills in fabrication, assembly and disassembly of everyday products using appropriate tools and safety practices.
- To provide hands-on training in electrical wiring, electronic components, sensors and microcontroller-based automation.
- To expose students to modern fabrication technologies including 3D printing and laser cutting.
- To cultivate product thinking through reverse engineering - sketching, measuring, modelling and proposing design improvements.
- To build confidence and problem-solving ability in students, particularly those with limited prior exposure to engineering tools and concepts.

List of Experiments

Tools, Safety and Hands - on - Fabrication

1. Identification and safe handling of common workshop and electrical tools - spanners, screw drivers, pliers, multimeter, soldering iron, drill machine.
2. Dis-assembly and assembly of common household appliances: Mixer-Grinder, Ceiling Fan / Table Fan, Washing Machine - understanding of mechanisms, bearings, switches and motor connections.
3. Dis-assembly and assembly of Refrigerator / Air-Conditioner - introduction to refrigeration cycle components (compressor, condenser, expansion valve, evaporator).
4. Dis-assembly and assembly of a Bicycle - chain drive, gearing, brake mechanism and frame joints.
5. Welding Practices: Safety measures, types of joints, hands-on session on SMAW and GMAW on mild steel / stainless steel plates.

Electrical Wiring and Electronics

1. Electrical installation tools and safety measures; handling of Fuses, Miniature Circuit Breakers (MCB) and Distribution Boards.
2. Hands-on wiring for domestic loads: Lights (series and parallel), Fans, Calling Bells.
3. Hands-on wiring for motors and UPS - single-phase motor starter circuit.
4. Electronic components identification: resistors, capacitors, diodes, transistors, LEDs, relays - safe use and testing using multimeter.

5. Soldering practices on Printed Circuit Board (PCB) - soldering, desoldering and inspection.
6. Hands-on construction and testing of a Bridge Rectifier circuit and an Op-Amp based amplifier.

Microcontroller Programming and Automation

1. Introduction to open-source microcontroller platforms (Arduino / ESP32) - architecture, IDE setup, pin configuration, digital and analog I/O.
2. Interfacing digital and analog sensors: temperature sensor (LM35 / DHT11), light sensor (LDR), soil moisture sensor, ultrasonic distance sensor.
3. Interfacing actuators: LED, buzzer, relay, DC motor with L298N driver, servo motor.
4. Mini Project 1 - Home Automation: Automatic light control using LDR sensor and relay.
5. Mini Project 2 - Agricultural Application: Soil moisture-based water pump automation.
6. Mini Project 3 - Healthcare Application: Temperature monitoring with alert system.

Digital Fabrication and Reverse Engineering Project

1. Introduction to Solid Modelling - demonstration and practice on CAD software (Fusion 360 / SolidWorks / Creo) for simple components.
2. 3D Printing - introduction to FDM technology, slicing software (Cura), printing parameters; fabrication of a simple mechanical component.
3. Laser Cutting - demonstration of cutting wood and acrylic sheets into complex profiles for mechanical parts / enclosures.
4. Reverse Engineering Activity (Group of 3-4 students): Select a familiar product (e.g., hand pump, door latch, bicycle brake, water tap, pressure cooker safety valve). Perform: complete disassembly; dimensional measurement using vernier calipers / screw gauge; freehand engineering sketching of each part; CAD modelling of at least two key parts; virtual assembly; identification of one design improvement; fabrication of improved part using 3D printing or workshop tools; presentation of the reverse-engineered model.

Total periods: 60

Text Books:

1. Christena, S. (2014). Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics. Crestline Books.
2. Lipson, H., & Kurman, M. (2013). Fabricated: The New World of 3D Printing. Wiley.
3. Wang, W. (2010). Reverse Engineering: Mechanisms, Structures, Systems & Materials. CRC Press.
4. Margolis, M. (2020). Arduino Cookbook: Recipes to Begin, Expand and Enhance Your Projects. O'Reilly Media. 3rd Edition.
5. Bureau of Indian Standards (2019). Code of Practice for Electrical Wiring Installations (IS 732:2019).

E - Resources:

1. GrabCAD (Free CAD models library) - https://grabcad.com/.
2. GitHub (Open-source microcontroller code repositories) - https://github.com/.
3. Tinkercad (Free browser-based CAD and Arduino simulation) - https://www.tinkercad.com/.

4. NPTEL - Workshop Technology / Manufacturing Processes - https://nptel.ac.in/.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Apply appropriate tools and safety measures to disassemble, inspect and reassemble common household appliances and mechanical systems.
CO2	Execute basic electrical wiring and electronic circuit connections for domestic and industrial applications.
CO3	Interface sensors and actuators with a microcontroller to realise simple automation systems relevant to home, agriculture and healthcare contexts.
CO4	Fabricate simple components using 3D printing and demonstrate cutting operations using laser cutting machines.
CO5	Reverse-engineer a given product by disassembling it, taking measurements, preparing sketches, creating a CAD model and identifying scope for design improvement.
CO6	Design and build a working prototype of an improved or alternative product using workshop tools, 3D printing and embedded system programming.

26AD202P	Python Programming Laboratory	Category	L	T	P	C
		ES (PC)	0	0	4	2

Prerequisites:

- Basic knowledge of programming concepts (variables, data types, operators, control structures).
- Familiarity with functions and simple modular programming.
- Understanding of basic data structures such as lists/arrays and problem-solving techniques.
- Logical thinking ability and exposure to basic object-oriented concepts is desirable.

Course Objectives

- To understand the basic syntax, data types, operators and control structures of Python programming.
- To apply functions, string manipulation techniques and modular programming concepts to develop efficient Python programs.
- To use Python's built-in collection data structures such as lists, tuples, dictionaries and sets for effective data organization and processing.
- To implement file handling, exception handling and package management techniques for building robust Python applications.

List of Experiments

1. Design a dynamic grading system using weighted components, conditional normalization and branching logic under varied academic policies.
2. Print various numeric and star patterns using nested loops — simulate a visual output engine for a digital display board.
3. Build a menu-driven calculator supporting arithmetic operations with operator precedence validation and error handling for invalid inputs.
4. A research lab develops a menu-driven recursive computational engine that evaluates nested arithmetic expressions (+, −, *, /) with parentheses, enforces operator precedence and raises exceptions for division by zero.
5. Construct a payroll module applying progressive tax slabs, performance incentives and statutory deductions using higher-order functions and lambda expressions.
6. Build a string analysis system that detects substrings, computes frequency distributions and implements custom Caesar/ Vigenere cipher transformations with optimal complexity
7. Create a real-time record management system using lists and dictionaries for insertion, deletion, ranking and statistical analysis of student performance data.
8. Design an immutable product catalog (tuples) with a mutable stock-level dictionary. Implement search, update and summary statistics using comprehensions.
9. Develop a file-based storage mechanism ensuring atomic write operations, multi-exception handling and graceful recovery from file corruption scenarios.
10. Design a terminal-based log analyzer that reads large-scale log files, extracts patterns, computes linguistic metrics (word frequency, line count, unique tokens) with optimized time complexity.

11. Construct a library system where borrowing limits and penalty rules are resolved at runtime using method overriding. Demonstrate polymorphism across Student, Faculty and Guest member classes.
12. Design a transactional banking simulator enforcing minimum balance constraints, exception-driven rollback for failed operations and transaction integrity logging.

Total periods: 60

References:

1. Paul Deitel and Harvey Deitel (2021). Python For Programmers. Pearson Education. 1st Edition.
2. G Venkatesh and Madhavan Mukund (2021). Computational Thinking: A Primer for Programmers and Data Scientists. Notion Press. 1st Edition.
3. John V Guttag (2021). Introduction To Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data. MIT Press. 3rd Edition.
4. Eric Matthes (2019). Python Crash Course: A Hands-On Project Based Introduction to Programming. No Starch Press. 2nd Edition.
5. Martin C. Brown (2018). Python: The Complete Reference. Mc-Graw Hill. 4th Edition.
6. Website: https://www.python.org/

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Identify and use Python tokens, data types, operators and control structures to develop simple Python programs.
CO2	Design and implement Python programs using built-in and user-defined functions, recursion, lambda functions and string operations.
CO3	Apply Python collection data structures — lists, tuples, dictionaries and sets — to store, retrieve and manipulate data efficiently.
CO4	Develop Python programs incorporating file handling, exception handling, command line arguments and modular programming using packages.

26FLC01P	Foreign Language (German) (Common to all Branches)	Category	L	T	P	C
		HUM	0	0	2	1

Course Objectives:

- To enable students to communicate in everyday situations using basic German vocabulary, greetings, numbers and simple sentence structures.
- To develop foundational German grammar skills including verb conjugation, articles, pronouns, question formation and basic tenses.
- To build practical communicative competence through dialogue, role-play and short writing tasks in real-life contexts such as food, travel, city navigation and social interactions.

GUTEN TAG!

1. To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages.
2. Vocabulary: related to the topic.
3. Grammar: W - Questions, Verbs & Personal pronouns I.

FREUNDE, KOLLEGEN UND ICH

1. To speak about hobbies, jobs, learn numbers from 20; build dialogues and frame simple questions & answers.
2. Vocabulary: related to the topic.
3. Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural.

IN DER STADT

1. To know places, buildings, question, know transport systems, understand international words; build dialogues and write short sentences.
2. Vocabulary: related to the topic.
3. Grammar: Definite & indefinite articles, Negotiation, Imperative with Sie verbs.

GUTEN APPETIT!

1. To speak about food, shop, converse; Vocabulary: related to the topic; build dialogues and write short sentences.
2. Grammar: Sentence position, Accusative, Accusative with verbs, personal pronouns & prepositions, Past tense of haben & sein verbs.

TAG FÜR TAG/ZEIT MIT FREUNDEN

1. To learn time related expressions, speak about family, about birthdays, understand & write invitations, converse in the restaurant; ask excuse, fix appointments on phone.
2. Vocabulary: related to the topic.
3. Grammar: Time related prepositions, Possessive articles, Modalverbs.

Total periods: 30

Text Books:

1. Dengler, S. (2013). Netzwerk A1.1. Klett-Langenscheidt GmbH.
2. Evans, S., & Pude, A. (2012). Menschen A1. Hueber Verlag.

Reference Books:

1. Funk, H., & Kuhn, C. (2009). Studio d A1. Goyal Publishers & Distributors Pvt. Ltd.
2. Dallapiazza, R.-M. (2004). Tangram Aktuell 1 (Deutsch als Fremdsprache). Max Hueber Verlag.
3. Lemcke, C., & Rohrmann, L. (2012). Grammatik Intensivtrainer A1. Goyal Publishers & Distributors Pvt. Ltd.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Use basic greetings, alphabet, numbers (1-20), telephone numbers and email conventions and identify countries and languages in German.
CO2	Describe hobbies and professions, form W-questions and yes/no questions and construct simple dialogues using correct verb forms and articles.
CO3	Identify places and buildings in a city, ask for and give directions, interpret transport-related information and use imperative and negation correctly.
CO4	Converse about food and shopping, apply accusative case with verbs, pronouns and prepositions and use past tense of haben and sein in context.
CO5	Express time and appointments, describe family and birthday events, write simple invitations and use modal verbs and possessive articles appropriately.

26FLC02P	Foreign Language (Japanese) (Common to all Branches)	Category	L	T	P	C
		HUM	0	0	2	1

Course Objectives:

- To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation and speaking.

Writing Systems & Basic Communication

Introduction to Hiragana: vowels, basic characters, reading & 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.

Activities: Flashcard games and writing drills, Self-introduction, Numbers & date matching, greeting expressions, Listening to audio.

Grammar & Everyday Vocabulary

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、いつ, Vocabulary for family, food, colors and basic actions.

Activities: Verb conjugation drills, Guessing game, Picture description, “Shopping” with food vocab and counters.

Conversation & Cultural Etiquette

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 spSDh and Japanese etiquette.

Activities: Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.

Activities: Practice worksheets and flashcards for hiragana, Writing drills and reading simple katakana words, Dialogue practice for greetings and self-introduction, Sentence construction exercises with basic SOV structure, Particle usage exercises and short dialogues, Role-play scheduling, shopping and telling time, Verb conjugation drills for common verbs, Descriptive sentence exercises using adjectives, Practice Q&A dialogues forming questions and negations, Kanji writing practice and quizzes for basic characters, Vocabulary tests and conversational practice on daily topics, Oral presentations and listening comprehension quizzes.

Total periods: 30

References:

1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K. (2011). Genki I: An integrated course in elementary Japanese. The Japan Times.
2. The Japan Foundation. (2017). Marugoto Japanese language and culture starter (A1) course book for communicative language activities. Goyal Publishers.

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand simple spoken Japanese in everyday contexts.
CO2	Communicate with widely used Japanese words effectively.
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.

26FLC03P	Foreign Language (Korean) (Common to all Branches)	Category	L	T	P	C
		HUM	0	0	2	1

Course Objectives:

- To impart fundamentals of the Korean language, including reading, writing systems, pronunciation and speaking.

Fundamentals of Korean

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 (Subject-Object-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요).

Activity: Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.

Essential Grammar and Vocabulary

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).

Activity: Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.

Everyday Korean Communication

Polite spSDh 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.

Activity: Role-play ordering at a restaurant or buying items, listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.

Total periods: 30

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Understand simple spoken Korean in everyday contexts.
CO2	Communicate with widely used Korean words effectively.
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Korean language.

	Foundations of Problem Solving	Category	L	T	P	C
		MC	3	0	0	NC

Course Objectives:

- To impart high-speed mental arithmetic techniques (Vedic Mathematics and derivative systems) covering addition, subtraction, multiplication, squaring, division and approximation.
- To develop numerical intuition and estimation abilities that support quantitative aptitude, data interpretation and engineering calculations.
- To build visual and spatial problem-solving skills for non-verbal reasoning, figure analysis and diagrammatic interpretation.
- To cultivate lateral and lexical reasoning through word-puzzles, cryptarithms and language-logic games.

Speed Mathematics – I (Saw, OZ, Mirror Method)

Introduction to Vedic mathematics: Sixteen sutras, Thirteen sub-sutras, Mental-math mindset, Relevance in aptitude tests: TCS NQT, Infosys, Accenture, CAT, GATE aptitude.

SAW method (Split-and-weave): High-speed addition, Subtraction of multi-digit numbers, Carry-less addition, Column-compression techniques.

OZ method (One-zero technique): Multiplication near powers of 10, Base-method multiplication, Use of deficiencies, Surplus.

Mirror method: Left-to-right multiplication of 2-digit × 2-digit, 3-digit × 2-digit numbers, Applications in currency conversion, Instant percentage computation – Classroom drills: 50-problem speed rounds, Target < 60 seconds per set.

Speed Mathematics – II (High5, Minion, Butterfly Methods)

High5 method: Rapid squaring of numbers ending in 5, Squaring close to 50, 100, Instant computation: 55^2, 95^2, 105^2, 995^2.

Minion method: Multiplication of two 2-digit numbers: Same tens digits, Units digits sum to 10, General criss-cross (Urdhva-Tiryagbhyam) for 2×2, 3×2 multiplication.

Butterfly method: Fast addition, Subtraction of fractions without LCM, Instant comparison of fractions, Application in ratio-proportion, Data interpretation problems – Division shortcuts: Nikhilam, Paravartya division, Approximate division for percentage DI questions – Timed drill: 30 questions in 8 minutes, Target accuracy ≥ 85%.

Speed Mathematics – III (Inception, Golden Eye Method)

Inception method: Recursive approximation for square-roots, Cube-roots, Powers – Digit-sum-based verification of computations.

Golden-eye method: Estimation, Approximation heuristics for large-number arithmetic, Rounding-and-adjust technique for advanced data interpretation (CAT-level caselets).

Percentage, Ratio, Average shortcuts: Conversion of fractions to percentages, Allegation, Weighted-average tricks – Application bridge to placement tests: Mapping shortcuts to TCS NQT, AMCAT, eLitmus, CAT question types.

Thinking with numbers and Number-Sense reasoning

Number-sense development: Divisibility rules: 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, Composite divisors, Unit-digit patterns, Last-two-digit patterns, Cyclicity of powers – Number series, Pattern recognition: Arithmetic, Geometric, Squares, Cubes, Mixed, Wrong-term identification – Logical arithmetic puzzles: Cryptarithms (SEND + MORE = MONEY), Alpha-numeric puzzles, Kakuro-style number placements – Magic squares, Number-grid puzzles, Sudoku.

Mini-project: Each student maintains a personal "trick-log" notebook of at least 25 speed-math shortcuts with worked examples.

Visual Problem Solving and Word Puzzles

Problem solving with visual information: Figure series, Analogy, Odd-one-out, Embedded figures, Water images, Mirror images, Paper folding, Cutting problems – Spatial reasoning: Cube, Dice problems, Rotation of 3-D figures, Counting of figures, Pattern completion – Word puzzles: Anagrams, Word ladders, Palindromes, Logical deductions from verbal statements, Syllogism warm-ups – Cross-word, Coded-word puzzles, Lateral-thinking riddles, Introduction to Fermi-style estimation questions.

Group workshop: Teams of 3-4 students solve a 10-puzzle sprint in 30 minutes and present solution strategies to the class.

Total Periods: 45

Text Books:

1. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publishing, Revised Edition, 2017. (Units I–IV)

Reference Books:

1. Dhaval Bathia, "Vedic Mathematics Made Easy", Jaico Publishing House, Revised Edition, 2019.
2. Kenneth Williams, "The Cosmic Calculator: A Vedic Mathematics Course for Schools", Motilal Banarsidass Publishers, 2nd Edition, 2015.
3. Jagadguru Sri Bharati Krishna Tirthaji, "Vedic Mathematics", Motilal Banarsidass Publishers, Revised Edition, 2015.
4. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education, 10th Edition, 2023.
5. Shakuntala Devi, "Puzzles to Puzzle You & More Puzzles", Orient Paperbacks, Revised Edition, 2020.

Online Resources / MOOCs:

1. Vedic Maths Forum India - free video lectures and printable drill sheets (https://www.vedicmathsindia.org)
2. PrepInsta Aptitude Daily - TCS NQT pattern quantitative drills (https://prepinsta.com)
3. IndiaBIX Aptitude section - topic-wise unlimited practice (https://www.indiabix.com)
4. NPTEL / SWAYAM - "Speed Mathematics" and "Developing Soft Skills & Personality" MOOCs (https://nptel.ac.in)

COURSE OUTCOMES:

At the end of the course, students will be able to:	
CO1	Execute Vedic-math and derivative speed techniques (SAW, OZ, Mirror, High5, Minion, Butterfly, Inception, Golden-Eye) to perform multi-digit arithmetic mentally within target time limits.
CO2	Apply number-sense, divisibility rules and pattern-recognition heuristics to solve quantitative-aptitude and number-series problems with ≥ 85 % accuracy.
CO3	Interpret and solve visual, spatial and non-verbal reasoning problems encountered in placement aptitude tests and competitive examinations.
CO4	Crack word puzzles, cryptarithms and lateral-thinking problems, demonstrating improved cognitive agility and logical fluency.

Approved by
Academic Council Meeting
No.: 01 Dated: 21.4.26

Recommended by
Board of Studies of AI&DS Dept.
Meeting No.: 01 Dated: 28.3.26

CK COLLEGE OF ENGINEERING AND TECHNOLOGY

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