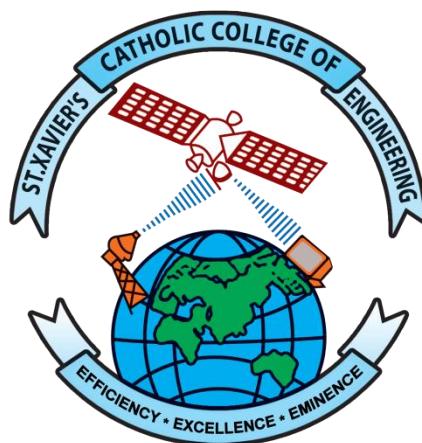


B.E. Degree
in
COMPUTER SCIENCE AND ENGINEERING
(CYBER SECURITY)

CURRICULUM & SYLLABUS (CBCS)
Innovation and Product Development for Sustainability
(For students admitted from the Academic Year 2026-2027)



DEPARTMENT OF COMPUTER SCIENCE AND
ENGINEERING
(CYBER SECURITY)

St. XAVIER'S CATHOLIC COLLEGE OF ENGINEERING
CHUNKANKADAI, NAGERCOIL – 629 003.
KANYAKUMARI DISTRICT, TAMIL NADU, INDIA

VISION OF THE INSTITUTION

To be an institution of eminence of optimal human development, excellent engineering education and pioneering research towards developing a technically-empowered humane society.

MISSION OF THE INSTITUTION

To transform the (rural) youth into top class professionals and technocrats willing to serve local and global society with ethical integrity, by providing vibrant academic experience of learning, research and innovation and stimulating opportunities to develop personal maturity and professional skills, with inspiring and high caliber faculty in a quality and serene infrastructural environment.

VISION OF THE PROGRAMME

To be a centre of excellence in Cyber Security education and research by producing competent professionals with strong technical knowledge, ethical values, research aptitude and entrepreneurial skills to address global cyber challenges.

MISSION OF THE PROGRAMME

To provide quality education in Computer Science and Cyber Security through advanced training and industry-oriented practices.

To promote innovation and research for developing solutions to emerging cyber security challenges.

To impart value-based education that nurtures ethical professionals with leadership and social responsibility.

To encourage entrepreneurship and the development of innovative cyber security solutions and start-ups.

PROGRAMME EDUCATIONAL OBJECTIVES

Apply technical and research skills in diverse Cyber Security careers.

Demonstrate ethical responsibility in securing digital infrastructure.

Pursue lifelong learning, leadership, innovation and entrepreneurship in evolving technologies.

PROGRAMME OUTCOMES

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. **(Cognitive Level:Apply)**

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

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) **(Cognitive Level: Evaluate/Create)**

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).**(Cognitive Level: Create)**

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) **(Psychomotor: Mechanism, Complex Overt Response, Adaptation and Origination)**

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)

KNOWLEDGE AND ATTITUDE PROFILE (WK)

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, re use 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.

PROGRAMME SPECIFIC OUTCOMES

Apply programming proficiency and core computing knowledge to analyze, design and implement secure software and systems that solve complex engineering and cyber security problems.

Build, manage and secure IT infrastructure by utilizing advanced cyber security tools, modelling and prediction techniques and resources to address real-world challenges in digital environments.

Comprehend lifelong learning and technological advancements in the evolving field of cyber security, while upholding professional ethics and social responsibility for the welfare of society.

SEMESTER: I

Number of Courses: 12

Total Credits: 22

Course Code	Course Title	Course Type	Classroom Instruction(CI) (in Hours per Semesters)		Lab Instruction(LI) (in Hours per Semesters)	Term Work(TW) and Self Learning(SL) (in Hours per Semesters)	Total Number of Hours (in Hours per Semesters)	Total Credits (C)=(Total Hours/30)	STG Goal Mapped	Category
			L	T	P					
IP26C01	Induction Programme ***	IP	40	16	24	40	120	0	3,4,8,16	MNC
MA26C01	Matrices and Applied Calculus (Lab Integrated)	TCP C	45	0	30	45	120	4	4,9	BSC

PH26C02	Physics for Computer Engineers	TC	30	0	0	30	60	2	3,4,7	BSC
CH26C02	Environmental Science	TC	30	0	0	30	60	2	3,4,6,7,9,11,12,13,17	BSC
CS26C01	Problem Solving using C	TC	45	0	0	45	90	3	4,8,9,12	ESC
CY26101	Cyber Security Essentials	TC	45	0	0	45	90	3	4,8,9,12	ESC
EN26C01	Technical Communication	TC	15	15	0	30	60	2	4,8,10	HS MC
TA26C01	Heritage of Tamils	TC	15	0	0	15	30	1	3,4,10,11,12	HS MC
CS26C03	C Programming Laboratory	PC	0	0	60	0	60	2	4,8,9,12	ESC
ME26C02	Engineering Workshop and Makerspace	PC	0	0	60	0	60	2	4,9	ESC
SD26C01	Employability Skills-I *	PC	0	0	30	30	60	1	3,4,5,8,16	MN C
-	NSS/NCC/NSO/YRC**		-	-	-	-	-	-	-	-
Total			225	15	180			22		

SEMESTER: II

Number of Courses: 12

Total Credits: 22

Course Code	Course Title	Course Type	Classroom Instruction (CI) (in Hours per Semester)		Lab Instruction (LI) (in Hours per Semester)	Term Work (TW) and Self Learning (SL) (in Hours per Semester)	Total Number of Hours (in Hours per Semesters)	Total Credits (C)=(Total Hours/30)	SDG Goal Mapped	Category
			L	T	P					
IP26C02	Universal Human Values-II **	IP	15	0	0	15	30	0	2,4,1,3,16	IP
MA26C02	Statistics and Numerical Methods (Lab Integrated)	TCP C	30	0	30	60	120	4	4,9,1,3	BSC

PH26 C01	Engineering Physics (Lab Integrated)	TCP C	30	0	30	30	90	3	3,4,9	BSC
CH26 C01	Applied Chemistry (Lab Integrated)	TCP C	30	0	30	30	90	3	3,6,7,9,11,12,13	BSC
EE26 C02	Basic Electrical and Electronics Engineering	TCP C	30	0	30	30	90	3	4,7,9,11,12	ESC
CY26 201	Data Structures	TC	45	0	0	45	90	3	4,9	PCC
EN26 C02	Professional Communication	TC	15	0	30	15	60	2	4,8,9	HSM C
TA26 C02	Tamils and Technology	TC	15	0	0	15	30	1	2,4,6,8,9,11,12,14	HSM C
CY26 202	Data Structures Laboratory	PC	0	0	60	0	60	2	4,9	PCC
SD26 S02	Employability Skills-II*	PC	0	0	60	60	120	1	3,4,8,9,16	SD
Total			195	0	270			22		

SEMESTER: I

MA26C01	MATRICES AND APPLIED CALCULUS (Lab Integrated)	L	T	P	TW/SL	Total	C	SDG
		45	0	30	45	120	4	4,9
COURSE OBJECTIVES:								
- To develop the use of matrix algebra techniques used by engineers for practical applications. - To introduce the basic concept of solving system of equations. - To familiarize the students with differential calculus. - To make the students understand various techniques in solving ordinary differential equations. - To acquaint the students with the concept of vector calculus which naturally arise in many branches of engineering.								
COURSE CONTENT:								
Unit I	Matrices	9	0	6	9	24		4,9
Characteristic equation – Eigenvalues and eigenvectors of a real symmetric matrix – Problems based on properties of eigenvalues and eigenvectors – Problem solving using Cayley-Hamilton method – Orthogonal transformation of a symmetric matrix to diagonal form. Practical: Computing eigenvalues and eigenvectors of a symmetric matrix using simulation software. Activity: Principal component analysis for data reduction/Power system stability analysis/Vibration analysis of a two-mass spring system/Signal decorrelation and noise reduction using eigenvalues/Structural stability and mode shape analysis of a frame.								
Unit II	Solution of Linear Equations	9	0	6	9	24		4,9
Definition: Algebraic and transcendental equations – Solution of linear system of equations – Direct Methods: Gauss elimination and Gauss-Jordan methods – Diagonally dominant – Iterative methods: Gauss-Jacobi and Gauss-Seidel methods. Practical: Solving the system of equations by Gauss-Seidel method and Gauss elimination method using simulation software. Activities: Node voltage analysis in electronic circuits/Node voltages in an electrical circuit/Load flow analysis in power systems/Traffic flow analysis at an intersection/Page rank computation using iterative methods/Heat transfer application.								
Unit III	Differential Calculus	9	0	6	9	24		4,9
Representation of functions – Limit of a function – Derivatives – Differentiation rules: sum, product, quotient and chain rules – Maximum and minimum values of polynomial functions: Critical point, Increasing and decreasing functions, First derivative test – Point of inflection – Concavity. Practical: Plotting of single variable functions and finding its extreme values using simulation software. Activity: Optimization of piston motion in an engine/Condition for maximum power dissipation in a resistive circuit/Algorithm performance optimization/Minimize cost or maximize strength using polynomial models in structural designs/Stress-strain curve approximation.								
Unit IV	Ordinary Differential Equations	9	0	6	9	24		4,9

Order – Degree – Differential operator – Linear differential equations of second and higher order with constant coefficients – Methods for finding particular integrals of exponential (e^{ax}), trigonometric (sin ax, cos ax) and polynomial functions – Method of variation of parameter (trigonometric functions only).

Practical: Solving higher order ordinary differential equations using simulation software.

Activity: Vibration Analysis of a mass-spring-damper system/Transient response of current in a series RLC circuit supplied by a DC voltage source/Dynamic resource adjustment using differential equations/Structural response prediction using differential equation.

Unit V	Vector Calculus	9	0	6	9	24		4,9
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Vector differential operator – Gradient, divergence and curl (excluding vector identities) – Directional derivative of a scalar point function – Irrotational and solenoidal vector fields – Integral theorem: Green's theorem and Gauss divergence theorem (Statement only) – Simple applications involving cubes and rectangular parallelepiped.

Practical: Finding directional derivative of a function using simulation software.

Activities: Rotation in image processing vector fields/Electric field from a scalar potential function/Seepage analysis in dams and foundations by computing total out flow/Power flow analysis in vector fields.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Apply the Cayley-Hamilton theorem for matrix inversion and orthogonal transformation of symmetric matrices.

CO2: Solve system of linear equations using direct and iterative methods.

CO3: Interpret differentiation techniques to determine the maximum and minimum values of polynomial functions.

CO4: Solve higher order ordinary differential equations in engineering fields.

CO5: Utilize concepts of vector calculus in solving engineering problems.

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Internal Examinations (30%), Practical (10%), Activity (10%)

TEXT BOOKS:

1.	Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, Reprint 2021.
2.	Grewal. B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, Forty fifth edition, Reprint 2024.

REFERENCES:

1.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, Twenty fifth edition, Reprint 2022.
2.	Anton. H. , Bivens. I. and Davis. S., "Calculus", Wiley, Twelfth edition, Reprint 2024.

3.	Jain. R.K. and Iyengar. S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, Fifth edition, Reprint 2020.
4.	Kreyszig. E., “Advanced Engineering Mathematics”, Wiley India Publications, Eleventh edition, 2025.
5.	Bali. N., Goyal. M., “A Text book of Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, Ninth edition, Reprint 2020.
E resources/E materials:	
1.	System of Linear Equations, Eigen values and Eigenvectors: https://www.nptelvideos.com/lecture.php?id=134162
2.	Matrix Diagonalization: https://www.nptelvideos.com/lecture.php?id=13481
3.	SCILAB: https://www.scilab.org/

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	3	2	1	1	1	-	-	-	-	-	1
CO 2	3	2	1	1	1	-	-	-	-	-	1
CO 3	3	2	1	1	1	-	-	-	-	-	1
CO 4	3	2	1	1	1	-	-	-	-	-	1
CO 5	3	2	1	1	1	-	-	-	-	-	1
Average	3	2	1	1	1	-	-	-	-	-	1

PH26C02	Physics for Computer Engineers	L	T	P	TW/SL	Total	C	SDG
		30	0	0	30	60	2	3,4,7,9,12
COURSE OBJECTIVES:								
• To provide fundamental knowledge of conducting, semiconducting, magnetic and superconducting materials essential for engineering applications. • To introduce semiconductor physics and basic electronic devices used in modern electronic systems. • To familiarize students with magnetic and superconducting materials along with their applications in engineering field. • To give insight on quantum structure and quantum computing • To equip learners with knowledge of nanomaterials and nanodevices.								
COURSE CONTENT:								
Unit 1	Conducting Materials	6	0	0	6	12		3,4,9
Classical free electron theory – merits and limitations - expression for electrical conductivity – Fermi- Dirac distribution function – Density of energy states – Energy bands in solids –Electron effective mass (Concept only) - concept of holes – Computed Tomography scan. Activity*: Temperature dependence of conductivity – Demo								
Unit 2	Semiconducting Materials	6	0	0	6	12		4,9
Introduction - intrinsic and extrinsic semiconductors - direct and indirect band gap semiconductors – Carrier concentration: intrinsic semiconductors – Hall effect: Determination of Hall coefficient – Display technology: OLED Activity*: Semiconductor market mapping activity – Poster								
Unit 3	Magnetic and Superconducting Materials	6	0	0	6	12		3,4,7,9
Magnetic materials: review of fundamental terms – Giant magneto resistance effect – GMR sensors – Superconductors – Meissner effect-critical field-critical current – Type I and Type II superconductors – Josephson effect - applications: Magnetic levitation, Superconducting qubits. Activity*: Magnetic materials and Superconductors – Puzzle								
Unit 4	Quantum Computing	6	0	0	6	12		4,9,7
Introduction – quantum confinement – quantum structures: quantum wells, wires and dots - Quantum system for information processing - quantum states – classical bits – qubits – Single qubits – Bloch sphere - CNOT gate. Activity*: Quantum structures and Quantum Computing – Quiz								
Unit 5	Nano materials	6	0	0	6	12		3,4,9,12

Introduction to nanomaterials – synthesis by sol gel method – properties: physical, optical and magnetic properties - Coulomb blockade effect - Single electron transistor - Carbon nanotubes: properties and applications – Nanotechnology application in electric vehicle.

Activity*: Nano vs Micro vs Macro – size comparison with common objects

* Students can do either a mini project for the entire course or all the activities given in each unit.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Utilize free-electron theory and band theory to interpret the Physics of electrical and thermal conduction in solids.

CO2: Apply the properties of semiconductors, carrier concentrations and Hall effect, in basic semiconductor devices.

CO3: Use the magnetic and superconducting properties of materials to various applications of modern technology.

CO4: Demonstrate the use of quantum structures, classical bits, and qubits in solving problems related to quantum information processing.

CO5: Integrate the properties of nanomaterials in explaining the working principles of nanoscale devices.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Internal Assessment Test (70%) Activities (30%)

TEXT BOOKS:

1.	Shatendra Sharma & Jyotsna Sharma , “ <i>Engineering Physics</i> ”, Second edition, Pearson India Education Services Pvt Ltd., 2024.
2.	S. O. Kasap , “ Principles of Electronic Materials and Devices ”, Fourth edition, McGraw-Hill, 2020.

REFERENCES:

1.	Donald A Neamen, “ Semiconductor Physics and Devices ”, Fourth Edition, McGraw-Hill, 2021.
2.	H.K. Malik & A.K. Singh , “ <i>Engineering Physics</i> ”, Second Edition, McGraw Hill Education (India) Pvt Ltd., 2021.
3.	K. K. Chattopadhyay & A. N. Banerjee , “ Introduction to Nanoscience and Nanotechnology ”, First edition, PHI Learning, 2022.
4.	Kittel, C. “Introduction to Solid State Physics”, Ninth Edition, Wiley, 2018
5.	Chris Bernhardt, “Quantum computing for everyone”, First edition, MIT press, 2020

E resources/E materials:	
1.	Physics of Materials , nptel course, https://nptel.ac.in/courses/113106039
2.	Solid State Physics , MIT Open Course Ware, https://ocw.mit.edu/courses/8-231-physics-of-solids-i-fall-2006/download/
3.	Research articles on semiconductors, Superconductors, and nanomaterials , IEEE Xplore Digital Library, https://ieeexplore.ieee.org/Xplore/home.jsp
4.	Band theory, semiconductors, and material science modules, Khan Academy, https://www.khanacademy.org/
5.	Basics of Quantum Computing, http://lab.quantumflytrap.com

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	-	1	-	-	1	-	-	-
CO2	3	2	-	-	-	-	-	1	-	-	1	-	-	-
CO3	3	2	-	-	-	-	-	1	-	-	1	-	1	-
CO4	3	2	-	-	-	-	-	1	-	-	1	-	1	-
CO5	3	2	-	-	-	-	-	1	-	-	1	-	-	-
Average	3	2	-	-	-	-	-	1	-	-	1	-	1	-

		L	T	P	TW/SL	Total	C	SDG
CH26C02	Environmental Science	30	0	0	30	60	2	3,4,6,7,9,11,12,13,17
COURSE OBJECTIVES:								
- To provide knowledge of the components of the environment and the various processes within it. - To explore green chemistry, sustainable practices and pollution prevention methods. - To examine the effects of chemicals on ecosystem and human health. - To evaluate the environmental risks and develop appropriate management strategies. - To promote sustainable development and encourage social responsibility.								
COURSE CONTENT:								
Unit 1	Ecosystem and Biodiversity	6	0	0	6	12		14,15,13
Environment- Components of the environment - Ecosystem- Structure and function - Biodiversity- Values - Threats to biodiversity - Endemic and Endangered species - Conservation of biodiversity. Activity - Chart preparation on conservation of biodiversity.								
Unit 2	Natural resources	6	0	0	6	12		12,7,6,13
Natural resources – Forest resources – Deforestation – causes, consequences and control measures. Water resources – Overexploitation – effects and control measures. Food resources – Impacts of modern agriculture – Land resources – Soil erosion, landslides – Effects and control measures. Activity – Case study on deforestation in India.								
Unit 3	Environmental pollution and Management	6	0	0	6	12		3,6,11,13
Pollution – Pollutants - Air pollution, Water pollution, Land pollution – causes, effects and control measures. Waste water treatment – Solid waste management – E-waste management. Activity – Prepare a report analyzing various alternatives to plastics and their significance.								
Unit 4	Social issues and the environment	6	0	0	6	12		9,11,13,17
Climate change - Global warming – Climate change and public health – Climate change and food security. Food Adulteration – Common adulterants and the method to detect them – Sustainable food processing techniques. Activity – Prepare a report analyzing the presence of adulterants in five commonly used food items through appropriate testing methods.								
Unit 5	Environment and Sustainability	6	0	0	6	12		4,7,12,13

Sustainable Development Goals (SDGs) –Environmental Impact Assessment (EIA) – Life cycle assessment – Risk assessment –Environment auditing –Concept of Carbon credit, Carbon foot print, Ecological foot print - Importance and applications - Environmental protection acts - Green chemistry –Principles and applications – Eco mark and Eco products.

Activity – Creating models based on Eco products.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1 – Implement ecological and biodiversity methods to conserve ecosystems and species.

CO2 – Use sustainable techniques to manage forests, water, Land and Agriculture.

CO3 – Apply pollution control and waste management methods to reduce environmental hazards.

CO4 – Implement climate change mitigation and food safety practices to assess risks and ensure food security.

CO5 – Apply environmental and green strategies to minimize ecological impact.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Activity (30%), Internal Assessment Test (70%).

TEXT BOOKS:

- | | |
|----|--|
| 1. | Gilbert M. Masters & Wendell P. Ela, “Introduction to Environmental Engineering and Science”, Third Edition, Pearson education India, January 2022 |
| 2. | Erach Barucha, “Text book of Environmental studies for under graduate courses”, Fourth Edition, Universities Press (I) PVT Ltd, Hyderabad, 2023. |

REFERENCES:

- | | |
|----|---|
| 1. | William P. Cunningham, Mary Ann Cunningham, “Principles of Environmental Science: Inquiry & Applications”, Tenth Edition, McGraw –Hill Education, 2025. |
| 2. | Vir Singh, “Text book of Environment and Ecology”, First edition, Springer, 2024. |
| 3. | Gopal Kumar Sharma et al, “Food adulterants and contaminants”, New India Publishing Agency, 2024. |
| 4. | Niko Roorda, “Fundamentals of Sustainable Development”, Fourth Edition, Routledge, 2025. |

E resources/E materials:

- | | |
|----|---|
| 1. | Environment and Development, nptel course - https://nptel.ac.in/courses/109103186 |
| 2. | Biodiversity protection, Farmers and Breeders rights, nptel course, https://nptel.ac.in/course/129105008 |

3.	Sustainable Engineering Concepts and Life Cycle Analysis, nptel course, https://nptel.ac.in/courses/105105157
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Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO1	2	2	2	1	-	2	2	1	-	-	1	-	-	-
CO2	2	2	3	1	-	2	2	1	-	-	1	-	-	-
CO3	2	3	3	2	2	2	2	1	-	-	1	-	-	-
CO4	2	3	2	3	2	2	2	1	-	-	1	-	-	-
CO5	2	2	3	1	1	2	2	1	-	-	1	-	-	-
Average	2	3	3	2	1	2	2	1	-	-	1	-	-	-

CS26C01	PROBLEM SOLVING USING C	L	T	P	TW/SL	Total	C	SDG
		45	0	0	45	90	3	4,8,9,12
COURSE OBJECTIVES:								
- To develop clarity in problem solving methods and understanding program structure, syntax rules, and execution flow. - To enable students to implement decision-making using branching statements. - To develop skills in writing reusable functions for modular code design. - To enable learners to declare, initialize, and manipulate arrays, structures and Union. - To enable students to design and implement programs that combines pointers and file handling techniques.								
COURSE CONTENT:								
Unit 1	Problem Solving Techniques and Basics of C	9	0	0	9	18		4,9
Problem Solving Strategies: Algorithm, Flowchart and Pseudocode - Structure of C Program - Compiling and Executing C Programs - Comments - C tokens - Character Set - Data Types - Keywords - Identifiers - Variables - Constants - Formatted/Unformatted Input Output Statements - Operators - Expression - Operator Precedence - Preprocessor Directives.								
Activities: Chart Preparation, Quiz								
Unit 2	Decision Control and Looping Statements	9	0	0	9	18		9

Conditional Statements: if, if-else, if-else-if, switch case - Iterative Statements: while, do-while, for loop - Nested Loops - break and continue statements - goto statement.

Activities: Quiz, Code Debugging

Unit 3	Functions and Strings	9	0	0	9	18		8
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Function: Declaration/Prototype - Definition - Function Call - return statement - Passing Parameters to Functions: Call by Value - Function Invocation Types - Storage Classes – Recursion. Strings: Reading and Writing - Operations on Strings – String functions.

Activities: Code Debugging, Think-Pair-Share

Unit 4	Arrays, Structure and Union	9	0	0	9	18		9
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Arrays: Declaration of 1D,2D Arrays - Initialization - Accessing the elements of an Array - Linear Search & Binary Search - Matrix Operations - Structure: Declaration - Initialization - Access the members of Structure - Nested Structure - Array of Structure - Union: Declaration - Initialization - Access the members.

Activities: Quiz, Pair Programming

Unit 5	Pointers and Files	9	0	0	9	18		4,12
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Pointers: Declaration - Pointer Arithmetic - Null Pointers - Generic Pointers - Array of Pointers - Passing Parameters to Functions: Call by reference - Dynamic Memory Allocation - Files: Types - Modes - Open, Close, Read and Write Functions - Sequential and Random File Processing.

Activities: Case Based Learning, Assignment

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- CO1** : Use problem-solving methods to design algorithms and develop basic C programs for solving simple computational problems.
- CO2** : Develop C programs that integrate branching and looping statements.
- CO3** : Solve simple problems using functions and strings.
- CO4** : Implement solutions that combine arrays, structures and union.
- CO5** : Develop programs by using pointers and file handling techniques.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Activities (30%), Internal Assessment Test (70%)

TEXT BOOKS:

1. Reema Thareja, “Programming in C”, Third Edition, Oxford University Press, 2023.

2.	Balagurusamy, “Programming in ANSI C”, Ninth Edition, McGraw Hill, 2024.
REFERENCES:	
1.	Slobodan Dmitrović , “Modern C for Absolute Beginners: A Friendly Introduction to the C Programming Language”, Second Edition, Apress (Springer Nature), 2024.
2.	Robert C. Seacord, “Effective C”, Second Edition, No Starch Press, 2024.
3.	Jens Gustedt, “Modern C”, Third Edition, Manning Publications, 2025.
4.	Jignesh Shah, “Programming in C”, Second Edition, CPH Books, 2023.
5.	Yashvant Kanetkar , “Let Us C”, Twenty-first Edition, BPB Publications, 2025.
6.	Ashok N. Kamthane, “Programming in C”, Second Edition, Pearson India, 2024.
E resources/E materials:	
1.	https://nptel.ac.in/courses/106104128
2.	https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/
3.	https://www.geeksforgeeks.org/c/c-programming-language/
4.	https://www.learn-c.org/
5.	https://www.programiz.com/c-programming
6.	https://www.cprogramming.com/tutorial/c-tutorial.html
7.	https://www.codechef.com/learn/course/c
8.	https://www.w3schools.com/c/
9.	https://www.w3resource.com/c-programming-exercises/

Mapping of Course Outcomes to Program Outcomes

Course Outcomes	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3

Activities: Poster Making- Web User Side Browser Attacks.									
Unit 2	SECURITY IN OPERATING SYSTEM & NETWORKS	9	0	0	9	18		4,9	
Security in Operating Systems - Security in the Design of Operating Systems - Rootkit - Networking basics- Networking Protocols -Security of Protocols -Cyber Warfare- Cyberspace and the Law- Cyber Crime. Activities: Comparison Chart Preparation-HTTP vs HTTPS , FTP vs SFTP , TCP vs UDP									
Unit 3	DIGITAL SECURITY	9	0	0	9	18		9	
Basics of Digital Security- Protecting Personal Computers and Devices- Virus and Malware Protection – Identity, Authentication and Authorization- Need for Strong Credentials- Protecting Servers using Physical and Logical Security- Security of Browser to Web Server Interaction. Activities: Quiz-All topics									
Unit 4	PRIVACY IN CYBERSPACE	9	0	0	9	18		4,9	
Introduction to cyber-attacks- application security- Operations Security-Principles of Data Security - Confidentiality, Integrity and Availability-Data Privacy- Data breaches-Preventing attacks using Security Controls,-Computer Ethics. Activities: Review report preparation - Compliance standards									
Unit 5	MANAGEMENT AND INCIDENTS	9	0	0	9	18		9,12	
Security Planning - Business Continuity Planning - Handling Incidents Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting. Activities: Case study analysis - Handling Incidents									
COURSE OUTCOMES:									
At the end of the course, the students will be able to: CO1: Apply fundamental concepts of computer security to identify threats, harms, vulnerabilities and appropriate controls. CO2: Apply operating system and network security concepts to analyze rootkits, protocols and application hosting mechanisms. CO3: Apply security methods to protect devices, credentials, servers, and browser-server interactions from threats and vulnerabilities. CO4: Apply knowledge of cyber-attacks, application and operations security and data security principles to assess compliance standards and ethical practices. CO5: Apply cybersecurity planning and risk analysis techniques to develop disaster recovery strategies and evaluate emerging technologies and legal frameworks in cyberspace.									
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%									
Assessment Methodology: Activities (30%), Internal Assessment Test(70%)									

TEXT BOOKS:	
1.	Charles P. Pleegeer, Shari Lawrence Pleegeer and Jonathan Margulies, “Security in Computing”, Sixth Edition, Pearson Education, 2023.
2.	Nihad A Hassan and <u>Rami Hijazi</u> , “Cybersecurity: A Practical Introduction”, CRC Press, 2025.
REFERENCES:	
1.	William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Fifth Edition, Pearson Education, 2024.
2.	Chuck Easttom, “Computer Security Fundamentals”, Fifth Edition, Oreilly, 2023.
3.	Falgun Rathod, “A Guide to Cyber Security and Data Privacy”, Writer's Pocket, 2025.
4.	Randall J Boyle and Raymond R, Panko, “Corporate Computer Security”, Fifth Edition, Pearson Education,2024.
5.	James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach”, Eighth Edition, Pearson Education,2021.
E resources/E materials:	
1.	https://www.coursera.org/professional-certificates/google-cybersecurity
2.	https://www.netacad.com/courses/introduction-to-cybersecurity?courseLang=en-US
3.	https://tryhackme.com/

Mapping of Course Outcomes to Program Outcomes

Course Outcomes	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	—	2	—	—	—	—	—	2	3	-	-
CO2	3	3	2	—	2	—	—	—	—	—	2	3	-	-
CO3	3	3	3	2	2	—	—	—	-	—	2	3	-	-
CO4	3	3	3	2	2	—	—	—	2	—	2	3	-	-
CO5	3	2	1	—	2	—	—	—	2	—	2	3	-	-
CO	3	3	2	2	2	—	—	—	2	—	2	3	-	-

EN26C01	Technical Communication	L	T	P	TW/SL	Total	C	SDG
		15	15	0	30	60	2	4,8, 10
COURSE OBJECTIVES:								
- To develop basic listening and speaking competence through interactive tasks - To strengthen reading and writing abilities by exposing learners to diverse texts - To equip students with practical communication skills - To foster creativity, confidence, and presentation skills - To build interpersonal and professional communication skills								
COURSE CONTENT:								
Unit 1	Foundations of Communication Skills	3	3	0	6	12		4
Listening: Listening for Local/Global Comprehension Speaking: Introducing oneself (formal and informal), Introducing others Reading: Reading Comprehension, Brochures, Advertisements Writing: Hints Development Language Study: Sentence/Types of sentences Vocabulary: Parts of Speech Self study: Process Description								
Unit II	Effective Communication	3	3	0	6	12		4
Listening: Summarizing News Speaking: News report presentation Reading: Biographies and Newspaper Writing: Paragraph Writing (Narrative, Descriptive, Compare and Contrast) Language Study: Types of questions, Question Tag – Wh Vocabulary: Synonyms, Antonyms and Word Formation Self study: Vocabulary - Journal (Creating mini word Bank)								
Unit III	English for Contextual Communication	3	3	0	6	12		8
Listening: Listening to Instructions and Directions Speaking: Giving Directions and Instructions Reading: Advertisements and Process Manuals Writing: Letter Writing (Formal and Informal) Language Study: Punctuations and Capitalization Vocabulary: One word substitution Self study: Spell Bee								
Unit IV	Interpersonal Communication	3	3	0	6	12		8
Listening: Listening to Dialogues and Interviews Speaking: Role Play (Professional Situations) Reading: Articles and Short Stories Writing: Technical Report Writing Language Study: Auxiliary verbs and modal verbs Vocabulary: Homonyms and Homophones Self study: Dialogue Writing (Formal)								
Unit V	Enhancing Presentation Skills	3	3	0	6	12		10

Listening: Listening to Speeches and Presentations

Speaking: Public Speaking/Oral presentations

Reading: Reviews (Books and Projects)

Writing: Essay Writing and Creative Writing

Language Study: Concord

Vocabulary: Idioms and Phrases

Self study: Presentation on a technical topic

COURSE OUTCOMES:

At the end of the course, the students will be able to:

Course Outcomes (COs)

CO1: Demonstrate confidence and clarity in professional seeking and active listening.

CO2: Apply effective reading strategies to comprehend, analyze, and interpret varieties of texts.

CO3: Write grammatically accurate and coherently technical reports and letters.

CO4: Use appropriate vocabulary and grammar to enhance presentation skills

CO5: Integrate interpersonal skills for ideal communication in professional contexts

Weightage: Continuous Assessment: 40%, End Semester Examination: 60%

Assessment Methodology: Internal Assessment Test(70%), Activities(30%)

TEXT BOOKS:

- | | |
|----|--|
| 1. | Meenakshi Raman, Sangeeta Sharma, "Technical Communication: Principles and Practice", Oxford University Press, 2020. |
| 2. | Sanjay Kumar, Pushp Lata, "Communication Skills", Oxford University Press, 2021. |

REFERENCES:

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| 1. | Courtland L. Bovee, John V. Thill, "Business Communication Today", Pearson Education, 2022. |
| 2. | John Seely, "Oxford Guide to Effective Writing and Speaking", Oxford University Press, 2020. |
| 3. | Raymond Murphy, "English Grammar in Use", Cambridge University Press, 2023. |
| 4. | M. Ashraf Rizvi, "Effective Technical Communication", McGraw Hill Education, 2022. |

E resources/E materials:

- | | |
|----|---|
| 1. | British Council, Learn English, https://learnenglish.britishcouncil.org |
| 2. | Purdue University, Purdue OWL (Online Writing Lab), https://owl.purdue.edu |
| 3. | BBC, BBC Learning English, https://www.bbc.co.uk/learningenglish |

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO4	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	2	3	-	2	-	-	-
Average	-	-	-	-	-	-	-	2	3	-	2	-	-	-

TA26C01	தமிழர் மரபு	L	T	P	TW/SL	Total	C	SDG
		15	0	0	15	30	1	3,4,10,11,12,13 ,15,16

COURSE OBJECTIVES:

Obj1: மாணவர்கள் தமிழ் இலக்கிய வரலாற்றை புரிந்துகொள்ள உதவுதல்.
 Obj2: மாணவர்கள் தமிழர்களின் மரபு சார்ந்த,ஓவியங்கள் மற்றும் இசைக்கருவிகளை புரிந்துகொள்ள உதவுதல்.
 Obj3: மாணவர்கள் தமிழர்களின் பாரம்பரிய கலைகளை புரிந்துகொள்ள உதவுதல்.
 Obj4: மாணவர்கள் தமிழர்களின் வாழ்வியல் மற்றும் அதன் மதிப்புகள் குறித்து விழிப்புணர்வு உருவாக்குதல்.
 Obj5: இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்களிப்பு மற்றும் தாக்கத்தைப் புரிந்துகொள்ளுதல்.

COURSE CONTENT:

Unit 1	மொழி மற்றும் இலக்கியம்	3	0	0	3	6		4,10
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இந்திய மொழிக் குடும்பங்கள்- திராவிட மொழி குடும்பம் - சங்க இலக்கியங்கள் - பதினெண்கீழ்கணக்கு நூல்கள்- திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள்(ஐம்பெரும் காப்பியங்கள்) - பக்தி இலக்கியம், (ஆழ்வார்கள் மற்றும் நாயன்மார்கள்)

Activities: தமிழ் இலக்கியம் என்ற தலைப்பில் போஸ்டர் தயாரித்தல்.

Unit 2	மரபு - பாறை ஓவியங்கள்	3	0	0	3	6		11,12
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	முதல் நவீன ஓவி சிற்பக் கலை							
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சிற்பிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு- சிற்பங்கள் - ஐம்பொன் சிலைகள்- குமரிமுனையில் திருவள்ளுவர் சிலை-பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், - தேர் செய்யும் கலை - தமிழர் இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம்
Activities: இலக்கியம் அடிப்படையிலான வினாடி வினா

Unit 3	நாட்டுப்புறக் கலைகள் மற்றும் விளையாட்டுகள்:	3	0	0	3	6		3,4
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தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், , சிலம்பாட்டம், வளரி, நாட்டுப்புறத் தெய்வங்கள்-தமிழர்களின் விளையாட்டுகள். ஏறு தழுவுதல்- இளவட்டக்கல்-சடுகுடு-உறியடித்தல்-வழுக்கு மரம்-மாட்டுவண்டி

Activities: பாத்திரப் பங்கு: கலைகளை நடித்தல்

Unit 4	தமிழர்களின் திணைக் கோட்பாடுகள்	3	0	0	3	6		13,15
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தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் கல்வியின் முக்கியத்துவம் - சங்ககால நகரங்களும் துறை முகங்களும் -சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி.

Activities: சங்க கால வாழ்க்கை என்ற தலைப்பில் போஸ்டர் தயாரித்தல்

Unit 5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3	0	0	3	6		4,16
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இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - சுயமரியாதை இயக்கம்- சித்த மருத்துவம் - கல்வெட்டுகள்- கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு

Activities: குழு விளக்கம்: விடுதலைப் போராட்டம்

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: தமிழ் மொழியின் முக்கியத்துவத்தையும் தமிழ் இலக்கியத்தின் வகைகளையும் விவரிக்க முடியும்.

CO2: பாறை ஓவியங்களிலிருந்து நவீன கலை வரை தங்களின் அறிவை விவரிக்க முடியும்..

CO3: போர்க்கலைகளில் வலுவான அடிப்படை அறிவை வெளிப்படுத்த முடியும்.

CO4: தமிழர்களின் திணை கருத்தையும் அதன் மதிப்புகளையும் விளக்க முடியும்.

CO5: இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்களிப்பை விவரிக்க இயலும்

TEXT BOOKS:

- | | |
|----|--|
| 1. | முனைவர் ஆ. பூபாலன் , தமிழர் மரபு, VRB Publishers Pvt Ltd, 2023 |
| 2. | ஜெயந்தி ரவிகிருஷ்ணன், தமிழர் மரபு, Sri Krishna Publication, 2023 |

REFERENCES:

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|----|---|
| 1. | முனைவர் பாக்கியமேரி ,வகைமை நோக்கில் இலக்கிய வரலாறு, நியூ செஞ்சுரி புக் ஹவுஸ், 2011 |
| 2. | முனைவர் கே.கே. பிள்ளை , தமிழக வரலாறும் மக்களும் பண்பாடும், உலகத் தமிழராய்ச்சி நிறுவனம், 2002 |
| 3. | டாக்டர் மு. வரதராசனார், மொழி வரலாறு, திருநெல்வேலித் தென்னிந்திய சைவசித்தாந்த நூற்பதிப்புக் கழகம் லிமிடெட், 1954 |
| 4. | கால்டுவெல், திராவிட மொழிகளின் ஒப்பிலக்கணம், வள்ளுவர் பண்ணை : சென்னை,1959 |
| 5. | முனைவர் பாக்கியமேரி, காலம்தோறும் தமிழர் கலைகள் , பாவேந்தன் பதிப்பகம், 2008. |
| 6. | முனைவர் தே. லூர்து, நாட்டார் வழக்காற்றியல் சில அடிப்படைகள், நாட்டார் வழக்காற்றியல் ஆய்வு மையம், 2000 |

E resources/E materials:

- | | |
|----|---|
| 1. | https://www.tamilvu.org/ |
| 2. | https://tamildigitallibrary.in/ |

TA26C01	Heritage of Tamils	L	T	P	TW/SL	Total	C	SDG
		15	0	0	15	30	1	3,4,10,11,12,13 ,15,16

COURSE OBJECTIVES:

- Obj1: To help students understand the history of Tamil literature.
- Obj2: To help students understand the heritage of Tamils, including paintings and musical

instruments.

Obj3: To help students understand the traditional arts of Tamils.

Obj4: To create awareness among students about the lifestyle of Tamils and its values.

Obj5: To understand the contribution and influence of Tamils in Indian culture.

COURSE CONTENT:

Unit 1	Language and Literature	3	0	0	3	6		4,10
Indian language families – Dravidian language family – Sangam literature – Pathinenkeezhkanakku texts – Management concepts in the Tirukkural – Tamil epics (The Five Great Epics) – Bhakti literature (Alvars and Nayanmars)								
Activities: Design a poster titled Tamil Literature.								
Unit 2	Heritage – From Rock Paintings to Modern Painting and Sculpture Art	3	0	0	3	6		11,12
Minor literary works – Development of modern Tamil literature – Contributions of Subramania Bharati and Bharathidasan to Tamil literary growth – Sculptures – Panchaloha (five-metal) idols – Thiruvalluvar Statue – Tribal communities and their handicrafts – Chariot making art – Tamil musical instruments: Mridangam, Parai, Veena, Yazh, Nadaswaram								
Activities: Quiz Based on Literature								
Unit 3	Folk Arts and Games	3	0	0	3	6		3,4
Therukoothu, Karagattam, Villupattu, Kaniyan Koothu, Oyilattam, Silambam, Valari – Folk deities – Traditional Tamil games: Jallikattu (bull embracing), Ilavattakkal, Sadugudu, Uriyadi, Slippery pole climbing, Bullock cart								
Activities: Role Play: Performing Arts								
Unit 4	Tamil Landscape (Thinai) Concepts	3	0	0	3	6		13,15
Akam and Puram concepts in Tolkappiyam and Sangam literature – Ethical principles followed by Tamils – Importance of education in the Sangam period – Sangam age cities and ports – Export and import during the Sangam period								
Activities: Preparing a Poster on the Theme Life in the Sangam Age								
Unit 5	Indian National	3	0	0	3	6		4,16

1.	https://www.tamilvu.org/
2.	https://tamildigitallibrary.in/

Mapping of Course Outcomes to Programme Outcomes and Programme Specific Outcomes

COURSE OUTCOMES	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
TA26C01 CO 1	2	2	1	-	-	1	-	-	2	-	1	-	-	-
TA26C01 CO 2	2	2	2	-	-	1	-	-	2	-	1	-	-	-
TA26C01 CO 3	2	1	1	-	-	2	-	2	-	-	1	-	-	-
TA26C01 CO 4	1	2	1	-	-	3	2	-	-	-	1	-	-	-
TA26C01 CO 5	2	2	2	-	-	2	2	-	2	-	1	-	-	-

CS26C03	C PROGRAMMING LABORATORY	L	T	P	TW/S L	Total	C	SDG
		0	0	60	0	60	2	4,8,9, 12

COURSE OBJECTIVES:

- To familiarize students with using office software for documenting algorithms and flowchart.
- To develop skills in writing C programs using conditional statements and loops for decision-making and iteration.
- To train students to handle arrays, pointers, and structures for efficient data manipulation and memory management.
- To implement searching (linear, binary) and sorting (bubble, selection) algorithms to solve real-world problems.
- To build proficiency in creating modular programs using functions, string operations, and structures in C.

PRACTICAL EXPERIMENTS:

1. Design algorithms and draw flowcharts for given problems using office software tools.
2. Write C programs using conditional statements (if, if-else, switch) to solve simple problems.
3. Develop C programs using looping constructs (for, while, do-while) for iterative computations.
4. Write programs to perform operations on arrays such as traversal, searching, and basic manipulations.
5. Develop programs using pointers:
 - a. Swapping two numbers using pointers

- b. Demonstrating pointer arithmetic
- 6. Implement searching techniques:
 - a. Linear Search
 - b. Binary Search
- 7. Implement sorting techniques:
 - a. Bubble Sort
 - b. Selection Sort
- 8. Write programs using user-defined functions with different parameter passing and return types.
- 9. Develop programs for string manipulation using standard library functions (strlen, strcpy, strcmp, strcat).
- 10. Write structure-based programs to store and process grouped data.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- CO1** : Apply knowledge of the evolution and organization of computers to design algorithms and flowcharts for solving simple problems.
- CO2** : Apply conditionals, loops for decision-making & iteration.
- CO3** : Apply arrays, pointers for efficient data handling.
- CO4** : Design search & sort algorithms.
- CO5** : Create modular C programs using functions, strings, structures.

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Model Practical (25%), Evaluation of Student's Work, Observation, Record, etc. (75%)

TEXT BOOKS:

- | | |
|----|--|
| 1. | Reema Thareja, "Programming in C", Third Edition, Oxford University Press, 2023. |
| 2. | Balagurusamy, "Programming in ANSI C", Ninth Edition, McGraw Hill, 2024. |

REFERENCES:

- | | |
|----|--|
| 1. | Slobodan Dmitrović , "Modern C for Absolute Beginners: A Friendly Introduction to the C Programming Language", Second Edition, Apress (Springer Nature), 2024. |
| 2. | Robert C. Seacord, "Effective C", Second Edition, No Starch Press, 2024. |
| 3. | Jens Gustedt, "Modern C", Third Edition, Manning Publications, 2025. |
| 4. | Jignesh Shah, "Programming in C", Second Edition, CPH Books, 2023. |
| 5. | Yashvant Kanetkar , "Let Us C", Twenty-first Edition, BPB Publications, 2025. |

E resources/E materials:

1.	https://nptel.ac.in/courses/106104128
2.	https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with-examples/
3.	https://www.geeksforgeeks.org/c/c-programming-language/
4.	https://www.learn-c.org/
5.	https://www.programiz.com/c-programming
6.	https://www.cprogramming.com/tutorial/c-tutorial.html
7.	https://www.codechef.com/learn/course/c
8.	https://www.w3schools.com/c/
9.	https://www.w3resource.com/c-programming-exercises/

Mapping of Course Outcomes to Program Outcomes

Course Outcomes	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	2	1	1	1	—	—	—	—	—	2	3	-	-
CO2	2	2	1	1	1	—	—	—	—	—	1	3	-	-
CO3	1	2	2	2	1	—	—	—	—	—	1	3	-	-
CO4	1	2	3	2	1	—	—	—	—	—	2	3	-	-
CO5	1	2	2	2	1	—	—	—	—	—	1	3	-	-
CO	1	2	2	2	1	-	-	-	-	-	1	3	-	-

3-High, 2-Medium, 1-Low

ME26C02	ENGINEERING WORKSHOP AND MAKERSPACE	L	T	P	TW/SL	Total	C	SDG
		0	0	60	0	60	2	4,9

COURSE OBJECTIVES:

- To provide fundamental knowledge of tools, equipment, fastening methods, and safe handling practices used in basic engineering operations.
- To develop the ability to disassemble, analyze, and reassemble common household appliances

with an understanding of their components and functions.

- To impart practical skills in carpentry, plumbing, and machining operations for fabrication and maintenance tasks.
- To introduce modern manufacturing techniques such as additive manufacturing (3D printing) and laser cutting for basic component fabrication.
- To familiarize students with basic electronics, PCB soldering, circuit simulation, and Arduino-based interfacing for simple engineering applications.

LIST OF ACTIVITIES:

1. **Tools, Equipment, and Handling Techniques**

- 1.1. Understanding various hand tools, power tools, and measuring instruments used in mechanical dis-assembly, assembly, fabrication, plumbing, and digital manufacturing operations.
- 1.2. Safety guidelines and practices, maintenance of tools, and correct usage techniques.
- 1.3. Overview of fastening methods and plumbing fittings.
- 1.4. Introduction to Machine Tools:
 - 1.4.1. Familiarization with Drilling Machine – components, working principles, and basic exercise.
 - 1.4.2. Familiarization with Cutting Machine – components, working principles, and basic exercise.

2. **Dis-assembly and Assembly of Home Appliances**

- 2.1. Study, dis-assembly, and assembly procedures for household electrical appliances:
 - 2.1.1. Mixer Grinder
 - 2.1.2. Ceiling Fan/Table Fan
- 2.2. Identification of key components, functional study, and common fault diagnosis.
- 2.3. Practical re-assembly ensuring correct alignment, balance, and operation testing.

3. **Carpentry, Plumbing and Machining Practices**

Carpentry Practice:

- 3.1. Introduction to carpentry: study of woodworking tools, materials, wood joints and safety measures.
- 3.2. Overview of carpentry hand tools and power tools.
- 3.3. Preparation of marking wood surfaces, measurement techniques and cutting practice.
- 3.4. Hands-on practice in:
 - 3.4.1 Cutting, chiseling, planning and filing wood operations.
 - 3.4.2 Fabrication of simple wood joints (Lap Joint and T – Joint)
- 3.5. Demonstration of Basic Operations using CNC Router.

Plumbing Practice

- 3.6. Familiarization with pipes, fittings, valves, plumbing materials, and tools.
- 3.7. Hands-on practice in pipe cutting, threading, joining, and leak-proof connections.

Machining Practice

- 3.8. Introduction to lathe machine: study of lathe components, cutting tools, work piece materials, basic machining operations, and safety measures.
- 3.9. Hands-on practice in turning, drilling and tapping operations in the given work piece

4. **Additive Manufacturing and Laser Cutting**

3D Printing

- 4.1. Understanding the principles of 3D printing.
- 4.2. Machine setup and slicing process.
- 4.3. Demonstration on preparing and printing mechanical parts.

Laser Cutting

- 4.4. Introduction to laser cutting principles and safety precautions.
- 4.5. Setting up the machine, material selection, and cutting parameters.
- 4.6. Demonstration of simple and complex Shapes using Laser Cutting Machine.

5. Electronic Engineering Practices

Basic Electronics Practices

- 5.1. Introduction to active and passive components.
- 5.2. Hands-on session of Soldering Practices in a Printed Circuit Board.
- 5.3. Simulation of Simple Electronic Circuits.

Arduino Interfacing and PCB

- 5.4. Introduction to Arduino and sensors.
- 5.5. Hands-on session using Arduino: Blinking LED and Relay Switching.
- 5.6. Demonstration of PCB fabrication machine, including basic operation, layout transfer, drilling, and safety practices.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1:	Identify and use various hand tools, power tools, measuring instruments, fastening methods, and machine tools following appropriate safety practices.
CO2:	Demonstrate the disassembly, inspection, fault diagnosis, and reassembly of common household appliances.
CO3:	Perform basic carpentry, plumbing, and machining operations, including wood joint fabrication, pipe fitting, and lathe operations.
CO4:	Apply principles of additive manufacturing and laser cutting to prepare and fabricate simple components.
CO5:	Develop and test basic electronic circuits, perform PCB soldering, and implement simple Arduino-based interfacing applications.

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%

Assessment Methodology: Evaluation of Student's work, Observation, Record, Activities etc.(75%), Model Practical Test(25%)

REFERENCES:

1.	Kalpakkian, S., and Schmid, S. R., Manufacturing Engineering and Technology, Seventh Edition, Pearson Education, 2021.
2.	Raghuwanshi, B. S., Workshop Technology, Vol. 1 & 2, Dhanpat Rai Publications, 2021.
3.	Kaplan, D. M., Hands-On Electronics: A Practical Introduction to Analog and Digital Circuits, Cambridge University Press, 2020.
4.	Blum, J., Exploring Arduino: Tools and Techniques for Engineering Wizardry, Wiley, 2020.
5.	Chua, C. K., Leong, K. F., and Lim, C. S., 3D Printing and Additive Manufacturing: Principles and Applications, Fifth Edition, World Scientific, 2021.
E resources/E materials:	
1.	MIT FABLAB Tutorials, (n.d.). <i>Massachusetts Institute of Technology</i> , https://fablab.mit.edu/
2.	3D Printing Basics – 3D Systems Learning Center, (n.d.). <i>3D Systems</i> , https://www.3dsystems.com/learn
3.	Carpentry and Woodworking Basics – Carpentry.edu, (n.d.). <i>Carpentry Training Resources</i> , https://www.carpentry.edu/
4	Machine Tools and Workshop Practice – NPTEL, 2022. <i>NPTEL Online Courses</i> , https://nptel.ac.in/

Mapping of Course Outcomes to Programme Outcomes and Programme Specific Outcomes

Course outcomes	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	-	3	2	2	3	1	1	-	-	-	-
CO2	3	3	2	2	2	1	1	2	2	1	-	-	-	-
CO3	3	2	3	1	2	2	2	2	2	1	1	-	-	-
CO4	3	2	3	2	3	1	2	2	1	1	1	-	-	-
CO5	3	3	3	2	3	1	1	2	2	2	1	-	-	-
CO	3	2	1	-	3	2	2	3	1	1	1	-	-	-

SD26C01	Employability Skills I	L	T	P	TW/SL	Total	C	SDG
		0	0	30	30	60	1	3,4,5,8,16

COURSE OBJECTIVES:

- To develop students' oral and written communication skills through structured speaking, listening, and grammar activities.
- To enhance interpersonal and professional etiquette skills required for workplace readiness and team environments.
- To build critical thinking, logical reasoning, and analytical problem-solving abilities through debate and decision-making exercises.
- To strengthen English grammar fundamentals including parts of speech, tenses, punctuation, and sentence construction.
- To foster confidence, body language awareness, and non-verbal communication through experiential and theatrical activities.

COURSE CONTENT:

Unit 1	COMMUNICATION FOUNDATIONS AND SELF-EXPRESSION			6	6	12		4,8
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Introducing Your Friend – Self Introduction techniques and structure, Peer Introduction exercises and feedback, Confidence building strategies for public speaking, Speaking clarity – articulation, pace and tone, Extempore speaking – thinking on the spot, Structuring ideas quickly using mind maps, Public speaking basics – audience awareness and eye contact, Verbal communication – sentence formation and fluency improvement, Vocabulary usage in everyday and professional contexts, Communication activities and group interaction exercises, Reflective feedback sessions and self-assessment techniques

Activities

- ## 1. Self-Introduction and Peer Introduction
- ## 2. Extempore Speaking Session

Unit 2	BODY LANGUAGE, PROFESSIONAL ETIQUETTE AND WORKPLACE READINESS			6	6	12		3,4
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Body language fundamentals – posture and its impact, Eye contact – significance and practice, Gestures and facial expressions in communication, Theatrical – expression activities and role plays, Non-verbal communication signals and interpretation, Professional etiquette – workplace conduct and formal communication, Grooming and personal presentation standards, Dress code norms and first impression management, Mock professional scenarios – interviews, meetings and presentations, Practical activities for formal greeting and introduction, Feedback and reflection on professional behavior

1. Body Language and Non-Verbal Communication Workshop
2. Theatrix – Expression and Role Play Activity
3. Mock Professional Scenario Simulation

Interpersonal skills – active listening techniques, Empathy in communication and relationship building, Team vs Wild – team collaboration and leadership roles, Decision making under pressure and group consensus, Conflict resolution strategies and de-escalation techniques, Handling feedback positively in workplace settings, Workplace communication – formal and informal registers, Effective written workplace communication – emails and memos, Team activities and group challenges for leadership development, Peer evaluation and constructive critique in team settings

1. Team vs Wild – Team Collaboration and Leadership Challenge
2. Conflict Resolution and Feedback Handling Role Play

Who Gets the Heart – logical decision making scenarios, Ethical reasoning and value-based judgment activities, Debate fundamentals – argument building and structuring, Critical thinking skills – identifying assumptions and biases, Rebuttal techniques and counter-argument strategies, Analytical thinking and structured problem solving frameworks, Logical reasoning games and puzzle-based discussion activities, Cause-and-effect reasoning in communication contexts, Organizing ideas for persuasive communication, Group debate activities and moderated discussions

1. Who Gets the Heart – Logical Decision-Making Activity
2. Formal Debate Session

Types of nouns – proper, common, countable and uncountable, Personal, reflexive and relative pronouns with usage exercises, Subject-verb agreement – rules and common errors, Sentence correction using agreement principles, Action, linking, helping and modal verbs – forms and usage, Regular and irregular verb forms and conjugation activities, Pronoun reference rules – agreement in number and gender, Types of prepositions – time, place and direction with practice, Present, past and future tenses – continuous and perfect forms, Synonyms, antonyms, word formation and paragraph writing, Types of adjectives and adverbs – comparative and superlative forms, Definite and indefinite articles, quantifiers and demonstratives, Common idioms and phrasal verbs with contextual usage, Active and passive voice transformation exercises, Punctuation rules – full stop, comma, colon, semicolon, apostrophe and quotation marks, Coordinating and subordinating conjunctions, interjections and sentence formation, Collocations, gerunds and infinitive forms with

error correction

Activities

1. Grammar Practice – Nouns, Pronouns and Subject-Verb Agreement
2. Grammar Practice – Verbs, Tenses and Voice
3. Vocabulary Building and Paragraph Writing Activity
4. Grammar Practice – Articles, Prepositions and Adjectives
5. Idioms, Phrasal Verbs and Conversational English Activity
6. Punctuation, Conjunctions and Integrated Writing Exercise

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Remember and recall key concepts of verbal communication, grammar rules, and professional etiquette norms required in workplace and academic contexts.

CO2: Understand and explain the principles of interpersonal communication, body language, active listening, and team collaboration in professional scenarios.

CO3: Apply grammar structures, vocabulary, sentence formation techniques, and punctuation rules accurately in spoken and written communication activities.

CO4: Analyze communication breakdowns, logical reasoning problems, conflict situations, and debate arguments to develop structured and effective responses.

CO5: Evaluate and create well-organized public speaking presentations, professional interaction scripts, and written paragraphs demonstrating integrated soft skills competencies.

Weightage: Continuous Assessment: 100%

Assessment Methodology:

Assessment Type	Weightage	Marks	Mode of Evaluation
Continuous Skill Assessment (CSA)	60%	60	Continuous, rubric-based evaluation through communication activities, grammar exercises, presentations and participation
Terminal Skill Assessment (TSA)	40%	40	Weekly assessment + communication practical + presentation/interview + portfolio viva
Total	100%	100	—

A. Continuous Skill Assessment (CSA)

Component	Description	CO(s)	Marks
Daily Topical Assessment	Short assessment at the close of each session evaluating communication concepts, grammar application, logical reasoning or professional etiquette, recorded continuously.	CO1, CO3	10
Communication Activities & Participation	Rubric-based evaluation of classroom activities including Self & Peer Introduction, Extempore, Theatrix, Team vs Wild, Who Gets the Heart, Role Plays and other communication exercises.	CO2, CO5	10
Group Discussion, Debate & Team Activities	Continuous assessment of participation in group discussions, debates, leadership activities, conflict resolution exercises and collaborative problem-solving.	CO2, CO4	10
Grammar & Written	Evaluation of grammar worksheets, vocabulary	CO1,	10

Communication Exercises	activities, sentence correction, paragraph writing, email drafting and integrated writing tasks.	CO3	
Presentation & Public Speaking	Assessment of extempore speaking, public speaking, persuasive presentations and audience engagement based on predefined rubrics.	CO3, CO5	10
Professional Portfolio & Reflective Journal	Evaluation of professional emails, reflective journal, self-assessment reports, peer feedback and communication portfolio.	CO4, CO5	10
Subtotal (CSA)			60

B. Terminal Skill Assessment

Component	Description	CO(s)	Marks
Weekly Assessment	Cumulative score of weekly consolidation tests assessing communication concepts, grammar, vocabulary, logical reasoning and workplace communication.	CO1, CO3	10
Communication Practical Examination	Practical assessment comprising extempore speaking, role play, group discussion or workplace communication scenario demonstrating verbal and non-verbal communication skills.	CO2, CO5	15
Presentation / Professional Interview	Individual presentation or panel-based mock interview assessing communication, confidence, body language, professional etiquette and critical thinking.	CO3, CO4	10
Portfolio Viva-Voce	Review of communication portfolio, written assignments, reflective journal and professional communication artefacts through viva.	CO4, CO5	5
Subtotal (TSA)			40

C. Common Evaluation Rubrics

Evaluation Criterion	Descriptor	Weight
Knowledge & Application	Demonstrates understanding of concepts and applies them appropriately in communication activities, discussions and written tasks.	25%
Communication & Language	Uses appropriate grammar, vocabulary, fluency, articulation and clarity in spoken and written communication.	25%
Critical Thinking & Problem Solving	Demonstrates logical reasoning, analytical thinking, decision-making and the ability to respond effectively in different situations.	20%
Professionalism & Teamwork	Exhibits confidence, body language, etiquette, collaboration, leadership, active listening and respect for others.	20%
Participation & Presentation	Shows active participation, preparedness, creativity, organization, time management and overall presentation quality.	10%

TEXT BOOKS:

1.	Barun K. Mitra and Basundhara Mitra, <i>Personality Development and Soft Skills</i> , 3rd Edition, Oxford University Press, 2024.
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2.	Wren, P.C. and Martin, H. <i>High School English Grammar and Composition</i> , Regular Edition, S. Chand Publishing, 2024.
3.	Sanjay Kumar and Pushp Lata, <i>Communication Skills</i> , 3rd Edition, Oxford University Press, 2024.

REFERENCES:

1.	Dr. K. Alex, <i>Soft Skills: Know Yourself and Know the World</i> , Revised Edition, S. Chand Publishing, 2025.
2.	Dale Carnegie, <i>"How to Win Friends and Influence People"</i> , Revised Edition, Gallery Books (Simon and Schuster), 2022.
3.	Raymond Murphy, <i>English Grammar in Use: A Self-study Reference and Practice Book for Intermediate Learners of English</i> , 5th Edition, Cambridge University Press & Assessment, 2019.
4.	Meenakshi Raman and Sangeeta Sharma, <i>Technical Communication: Principles and Practice</i> , 4th Edition, Oxford University Press, 2024.
5.	Stephen R. Covey, <i>The 7 Habits of Highly Effective People</i> , 30th Anniversary Edition, Simon & Schuster, 2020.

Web / Online Resources

1.	Soft Skills Development – NPTEL Course (NPTEL) — https://nptel.ac.in/courses/109/105/109105095/
2.	Developing Your Personal and Professional Brand – Communication Skills (Coursera) — https://www.coursera.org/learn/communication-skills
3.	English Grammar and Essay Writing – UC Berkeley (Coursera) — https://www.coursera.org/learn/grammar-punctuation

Mapping of Course Outcomes to Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	–	–	–	–	–	2	1	3	–
CO2	2	2	–	–	–	1	–	2	3	3	–
CO3	2	2	1	–	1	–	–	1	2	3	1
CO4	2	3	2	1	–	1	–	2	3	3	1
CO5	2	3	3	1	1	1	–	2	3	3	2
Average CO Attainment	2.0	2.2	1.2	0.4	0.4	0.6	0.0	1.4	2.4	3.0	0.8

SEMESTER: II

MA26C02	Statistics and Numerical Methods (Lab Integrated)	L	T	P	TW/S L	Total	C	SDG
		30	0	30	60	120	4	4,9,13
COURSE OBJECTIVES:								
• To acquire knowledge of hypothesis testing for both small and large samples, which plays an important role in real life problems. • To encourage students to develop a practical understanding of Analysis of Variance. • To acquaint the knowledge of non-parametric tests which plays an important role in real life problems. • To acquaint the knowledge of various numerical methods of solving ordinary differential equations. • To introduce numerical integration techniques used in engineering and technology disciplines.								
COURSE CONTENT:								
Unit 1	Testing of Hypothesis	9	0	3	12	24		4,9,13
Statistical hypothesis –Type I and Type II errors – Large sample test for single mean and difference of means – Test based on t distribution for single mean and equality of means – Test based on F distribution for equality of variances. Practical: Testing of hypothesis for equality of variances using simulation software. Activities: Comparison of manufacturing process variability/Vibration and noise analysis/Soil property analysis.								
Unit 2	Design of Experiments	9	0	3	12	24		4,9,13
General principles – Analysis of variance (ANOVA) – One-way classification – Completely randomized design (CRD) – Two-way classification – Randomized block design (RBD) – Three-way classification – Latin square design (LSD). Practical: Analysis of variance for randomized block design using simulation software. Activities: ANOVA in machine learning models/Network traffic analysis/Heat transfer experiments/Concrete mix design.								
Unit 3	Non-Parametric Test	9	0	3	12	24		4,13
Chi square test for single variance – Independence of attributes – Contingency table: Analysis of $r \times c$ tables – Kolmogorov-Smirnov test for goodness of fit. Practical: Testing of hypothesis of independence of attributes using simulation software. Activities: Goodness of fit in software testing/Quality control in manufacturing/Structural damage analysis.								
Unit 4	Numerical Solution of Ordinary Differential Equations	9	0	3	12	24		4,9,13

Single-step methods: Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi-step methods: Milne's predictor corrector method – Adam's Bashforth predictor corrector method for solving first order equations.

Practical: Solving ordinary differential equations by fourth order Runge-Kutta method using simulation software.

Activities: Gradient based learning equations/RLC circuit equations/Equation of motion/Simulate dynamic behavior of mechanisms.

Unit 5	Numerical Solution of Integration	9	0	3	12	24		4,9,13
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Numerical integration using Trapezoidal and Simpson's 1/3, 3/8 rules – Numerical double integration: Trapezoidal and Simpson's rules.

Practical: Evaluating integration by Trapezoidal rule using simulation software.

Activities: Area under frequency response curve/Numerical estimation of signal power using Simpson's rule/Work done by variable force/Velocity-distance calculation.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Apply large sample test, t and F-tests to analyze real world engineering data and draw statistically valid conclusions.

CO2: Utilize one-way and multi-way ANOVA techniques for experimental data analysis and statistical decision making.

CO3: Interpret variance, goodness of fit and independence of attributes using Chi-square and Kolmogorov–Smirnov tests in real life problems.

CO4: Solve first order differential equations using single-step and multi-step methods.

CO5: Make use of Trapezoidal and Simpson's rules in numerical integration.

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Internal Examinations (30%), Practical (10%), Activity (10%)

TEXT BOOKS:

1.	Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", Khanna Publishers, New Delhi, Eleventh edition, Reprint 2021.
2.	Johnson. R.A., Miller. I. and Freund. J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, Ninth edition, Reprint 2023.

REFERENCES:

1.	Burden. R.L. and Faires. J.D., "Numerical Analysis", Cengage Learning, Tenth edition, Reprint 2024.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, Ninth edition, Reprint 2023.
3.	Gerald. C.F., and Wheatley. P.O., "Applied Numerical Analysis", Pearson Education,

	Asia, New Delhi, Seventh edition, Reprint 2023.
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill, Fourth edition, Reprint 2024.
5.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, Tenth edition, Reprint 2024.
E resources/E materials:	
1.	https://onlinecourses.nptel.ac.in/noc19_bt19/preview
2.	https://onlinecourses.nptel.ac.in/noc23_bt13/preview

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Program Outcomes										PSO			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	-	-	-	-	-	1	-	-	1
CO 2	3	2	1	1	1	-	-	-	-	-	1	-	-	1
CO 3	3	2	1	1	1	-	-	-	-	-	1	-	-	1
CO 4	3	2	1	1	1	-	-	-	-	-	1	-	-	1
CO 5	3	2	1	1	1	-	-	-	-	-	1	-	-	1
Average	3	2	1	1	1	-	-	-	-	-	1	-	-	1

PH26C01	Engineering Physics (Lab Integrated)	L	T	P	TW/SL	Total	C	SDG
		30	0	30	30	90	3	3,4,9

COURSE OBJECTIVES:

- To provide fundamental knowledge of physical principles relevant to engineering applications.
- To enable students to understand ultrasonic wave generation, propagation, and its industrial applications.
- To introduce quantum mechanics concepts essential for modern engineering materials and devices.
- To explain the principles of photonics, lasers, and fiber optics for communication and sensing applications.
- To strengthen the understanding of the mechanical properties of matter and their importance in structural engineering.

COURSE CONTENT:

Unit 1	Ultrasonics	6	0	6	6	18		3,4,9
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Ultrasonics – properties - production: piezoelectric oscillator –acoustic grating: wavelength and velocity of ultrasonic waves in liquids – applications: ultrasonic flaw detector - sonography.

Practical: Determination of velocity of ultrasonic waves in liquid medium

Activity: Ultrasonics – Puzzle

Unit 2	Quantum Mechanics	6	0	6	6	18		4,9
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Introduction - Black body radiation - Wien's displacement law - Rayleigh Jean's law - Planck's radiation law (Derivation) – Schrodinger's Time independent wave equation - particle confined in one dimensional infinite square well potential- eigen values and eigen functions - Introduction to Quantum Computing.

Practical: Photoelectric effect – Determination of Planck's constant

Activity: Light effect vs Electrons – Virtual lab

Unit 3	Photonics	6	0	6	6	18		3,4,9
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Theory of laser action: stimulated absorption, spontaneous emission and stimulated emission - Einstein's A and B coefficients – population inversion and pumping mechanisms – laser systems: Nd-YAG laser, LIDAR in Archaeology – photo diode.

Practical: Laser - wavelength of laser using diffraction grating and particle size determination

Activity: LED vs Semiconductor laser – A comparison

Unit 4	Fiber Optics	6	0	6	6	18		3,4,9
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Optical fiber - principle – propagation of light through fiber - Fiber fabrication: Double crucible method – Fiber optic communication system - Endoscope - fiber optic pressure sensor.

Practical: Optical fiber - Numerical aperture and Acceptance angle of an optical fiber

Activity: Fiber optic temperature sensor - Demo

Unit 5	Properties of Matter	6	0	6	6	18		4,9
Elasticity - stress, strain - types of elastic moduli – factors affecting elasticity – Internal bending moment - Determination of Young’s modulus: Cantilever - uniform bending - weighing system. Practical: Uniform bending - Young’s modulus of the material of the beam Activity: Case study – Compare how Young’s modulus of materials influence their uses.								
COURSE OUTCOMES:								
At the end of the course, the students will be able to: CO1: Use the principles of ultrasonic wave generation, their properties to identify and solve some industrial problems. CO2: Calculate energy eigen values and wave functions of basic physical systems using quantum mechanical principles. CO3: Apply the principle of stimulated emission in the operation of laser, its characteristics and applications. CO4: Demonstrate the use of optical fibers in communication systems and Endoscopy. CO5: Determine the elastic moduli of materials through experimental methods by using their mechanical properties.								
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%								
Assessment Methodology: Internal Assessment Test (30%) Practical (10%), Activities (10%)								
TEXT BOOKS:								
1.	Shatendra Sharma & Jyotsna Sharma , “ <i>Engineering Physics</i> ”, Second edition, Pearson India Education Services Pvt Ltd., 2024.							
2.	Gaur, R.K. & Gupta, S.L. , “ <i>Engineering Physics</i> ”, Eight edition, Dhanpat Rai Publications, 2024.							
REFERENCES:								
1.	R Shankar, “Fundamentals of Physics II: Electromagnetism, Optics and Quantum Mechanics”, Expanded edition, Yale University Press, 2020.							
2.	David Halliday, Robert Resnick & Jearl Walker , “ <i>Principles of Physics</i> ”, Twelfth edition, John Wiley & Sons, 2023.							
3.	Young H D & Freedman R A , “ University Physics with Modern Physics ”, Fifteenth edition, Pearson publishers, 2020.							
4.	H.K. Malik & A.K. Singh , “ <i>Engineering Physics</i> ”, Second Edition, McGraw Hill Education (India) Pvt Ltd., 2021.							
5.	Avadhanulu, M.N. & Kshirsagar, P.G. , “ <i>A Textbook of Engineering Physics</i> ”, Eleventh Edition, S. Chand & Company, 2024.							

E resources/E materials:	
1.	Engineering Physics, nptel Course - https://nptel.ac.in/courses/122103011
2.	Virtual Labs – MHRD (Ultrasonics, Photonics, Fiber Optics) https://www.vlab.co.in/broad-area-physical-sciences
3.	MIT Open Course Ware – Introduction to Quantum Mechanics https://ocw.mit.edu/courses/5-73-quantum-mechanics-i-fall-2018/pages/lecture-notes/
4.	Virtual Labs – Young's Modulus: Bending Experiments https://amv-au.vlabs.ac.in/advanced-mechanics/Youngs_Modulus_Uniform_Bending/
5.	SPIE Digital Library – Introductory Photonics Tutorials https://www.spiedigitallibrary.org/search?term=Introductory+Photonics+Tutorials

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	1	-	-	1	-	-	1	-	1	-
CO2	3	2	-	-	1	-	-	1	-	-	1	-	-	1
CO3	3	2	-	-	1	-	-	1	-	-	1	-	-	1
CO4	3	2	-	-	1	-	-	1	-	-	1	-	-	-
CO5	3	2	-	-	1	-	-	1	-	-	1	-	1	-
Average	3	2	-	-	1	-	-	1	-	-	1	-	1	1

CH26C01	Applied Chemistry (Lab integrated)	L	T	P	TW/SL	Total	C	SDG
		30	0	30	30	90	3	3,6, 7, 9,11,12, 13

COURSE OBJECTIVES:

- To enable students to understand water quality and its treatment methods.
- To provide knowledge of polymers and their applications.
- To develop an understanding of electrochemical cells and their applications.
- To impart knowledge of corrosion and its protection methods.
- To familiarize students with the principles of photochemistry.

COURSE CONTENT:

Unit 1	Water Technology	6	0	6	6	18		6,3,12
Water quality parameters – Hardness – Estimation (EDTA method) - Alkalinity – DO - Softening methods – Electrochemical water softening – Solar desalination of sea water – Reverse Osmosis. Practical: 1. Determination of total hardness of water sample (EDTA method). 2. Estimation of Alkalinity in water sample. Activity: Case study on water quality analysis.								
Unit 2	Polymer Chemistry	6	0	6	6	18		9,12,13
Polymers – Engineering plastics - preparation, properties and uses of PET, PVC, Polyurethane, PTFE – Conducting polymers - Shape memory polymers - Biodegradable polymers - properties, applications. Practical: 1. Determination of molecular weight of polymer by viscosity average method using Ostwald Viscometer. Activity: Preparation of poster comparing normal plastics with biodegradable plastics.								
Unit 3	Electrochemistry	6	0	6	6	18		7,9,12
Electrochemical cells- Electro chemical reactions- Electrodes – pH determination – Conductometric and Potentiometric titrations –Electroplating - Electroless plating. Practical: 1. Determination of strength of HCl by pH meter. 2. Conductometric titration of mixture of acids (HCl and CH₃COOH). Activity: Electrochemical cell simulation.								
Unit 4	Corrosion chemistry	6	0	6	6	18		9,11,12
Corrosion –Theories and Preventive methods - Protective coatings – Paints - Components and their uses – Types - Nanotechnology based coating - Polymer modified asphalt coating. Practical: 1. Estimation of Ferrous ion in rust. Activity: Case study on factors influencing the corrosion in underground pipelines.								
Unit 5	Photochemistry	6	0	6	6	18		7,13,9
Photochemical laws- Jablonski diagram- Fluorescence – Phosphorescence - Chemiluminescence – Photosensitization - Photo catalysis – Mechanism and applications. Practical: 1. Estimation of potassium Oxalate using Potassium Permanganate by a photochemical reaction. Activity: Report on the list of fluorescence and Phosphorescence in everyday life.								
COURSE OUTCOMES:								

At the end of the course, the students will be able to:

CO1: Use water quality analysis techniques to implement water treatment, softening and desalination methods.

CO2: Apply polymer chemistry principles to select and use engineering and special polymers in practical applications.

CO3: Demonstrate electrochemical principles by operating electrochemical cells and industrial plating processes.

CO4: Apply corrosion principles to implement corrosion prevention and protective coating methods.

CO5: Perform and apply photochemical principles to carryout photochemical reactions for industrial applications.

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%

Assessment Methodology: Activity (10%), Practical (10%), Internal Assessment Test (30%).

TEXT BOOKS:

- | | |
|----|--|
| 1. | Jain P. C., & Jain M, " <i>Engineering Chemistry</i> ", Seventeenth edition, Dhanpat Rai Publishing Company (P) Ltd, 2025. |
| 2. | Umare S.S., Dara S. S, " <i>A textbook of Engineering Chemistry</i> , Chand Publications, 2024. |

REFERENCES:

- | | |
|----|---|
| 1. | Wang L. K, Sung M.-H, & Shammas N. K, " <i>Water and wastewater engineering</i> ", Fourth Edition, John Wiley & Sons, 2024. |
| 2. | Ahamed S, Ali R, & Osmani, " <i>Handbook of biodegradable polymers - Applications in Biomedical Sciences, Industry, and the Environment</i> ", Jenny Stanford Publishing, 2024. |
| 3. | Ravikrishnan A, " <i>Engineering chemistry</i> ", Sri Krishna Hitech Publishing Company Pvt. Ltd, 2021. |
| 4. | Revie R. W, & Uhlig H. H, " <i>Corrosion and Corrosion control</i> ", Fifth Edition, Wiley, 2025. |
| 5. | Rohatgi-Mukherjee K.K, " <i>Fundamentals of Photochemistry</i> ", New Age International Private Limited, 2021. |

E resources/E materials:

- | | |
|----|---|
| 1. | Water and waste water treatment, nptel course - http://nptel/courses/video/105107207/L13.html |
| 2. | Corrosion Protection Methods, nptel course - https://nptel.ac.in/courses/113104108 |

CY26201	DATA STRUCTURES	L	T	P	TW/S L	Total	C	SDG
		45	0	0	45	90	3	4,9

COURSE OBJECTIVES:

- To understand Abstract Data Types and implement various types of linked lists and their applications.
- To understand stack and queue operations and apply them in expression evaluation and problem solving.
- To understand tree data structures and perform operations on binary trees, BSTs, AVL trees, heaps, and B-trees.
- To understand graph representations and apply graph traversal and shortest path/minimum spanning tree algorithms.
- To understand searching, sorting, and hashing techniques and apply them in real-world applications such as library management systems.

COURSE CONTENT:

UNIT I	LINEAR DATA STRUCTURES – LIST	9	0	0	9	18		4,9
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Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT.

Activities:

1. Debugging Activity- Linked list implementation
2. Chart Preparation- Array vs Linked List

UNIT II	LINEAR DATA STRUCTURES – STACKS, QUEUES	9	0	0	9	18		4,9
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Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions- Infix to Postfix conversion – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues.

Activities:

Expression Evaluation Relay - Evaluating arithmetic expressions

UNIT III	NON-LINEAR DATA STRUCTURES – TREES	9	0	0	9	18		4,9
Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree, AVL Trees, Binary Heap- B-Tree. Activities: Concept Mapping- Binary Search Tree, AVL Trees								
UNIT IV	NON-LINEAR DATA STRUCTURES – GRAPHS	9	0	0	9	18		4,9
Graph Definition – Representation of Graphs – Types of Graph - Breadth-first traversal – Depth-first traversal – Topological Sort – Shortest path algorithms - Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm Activities: Problem-Solving- 1. Perform BFS/DFS for given graph 2. Find shortest path using Dijkstra 3. Construct MST using Prims/Kruskal								
UNIT V	SEARCHING, SORTING AND HASHING	9	0	0	9	18		4,9
Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing. CASE STUDY: Library Management Systems Activities: 1. Concept Mapping- Sorting								
COURSE OUTCOMES:								
At the end of the course, the students will be able to: CO1: Implement the linear data structure List. CO2: Implement stack and queue data structures. CO3: Use appropriate non-linear data structure operations for solving a given problem. CO4: Apply appropriate graph algorithms for graph applications. CO5: Apply different searching, sorting and hashing techniques.								
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%								
Assessment Methodology: Activities (30%), Internal Assessment Test(70%)								
TEXT BOOKS:								
1.	Reema Thareja, “Data Structures Using C”, Third Edition, Oxford University Press, 2023.							
2.	E. Balagurusamy, “Data Structures Using C”, Second Edition, Mc Graw Hill,							

	2025.
REFERENCES:	
1	Yashavant Kanetkar, “Data Structures Through C”, Fifth Edition, BPB Publications, 2020.
2	<u>Dr. Shaik Fairouz</u> , <u>Mr. V. Ramu</u> , <u>Mrs. R. Pavithra</u> , “Data Structures using C ”, Kindle Edition, 2025.
3	<u>A. K. Sharma</u> , “Data Structures using C”, Second Edition, Pearson Education, 2024.
4	<u>Dheeraj Malhotra</u> , <u>Neha Malhotra</u> , “Data Structures and Program Design Using C: A Self-Teaching Introduction ”, Second Edition, Mercury Learning and Information, 2025.
5	<u>Ritika Mehra</u> , “Data Structures Using C”, Pearson, 2021.
E resources/E materials:	
1.	https://www.geeksforgeeks.org/dsa/dsa-tutorial-learn-data-structures-and-algorithms/
2.	https://www.simplilearn.com/free-data-structures-algorithms-course-skillup
3.	https://www.mygreatlearning.com/academy/learn-for-free/courses/data-structures-in-c .
4.	https://onlinecourses.nptel.ac.in/noc25_cs81/preview

Course Outcome s	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	1	2	-	-	-	-	-	1	3	-	-
CO2	3	2	3	1	2	-	-	-	-	-	1	3	-	-
CO3	3	2	2	1	3	-	-	-	-	-	1	3	-	-
CO4	3	2	2	2	3	-	-	-	-	-	1	3	-	-
CO5	3	2	2	2	3	-	-	-	-	-	1	3	-	-
CO	3	2	2	1	3	-	-	-	-	-	1	3	-	-

EN26C02	Professional Communication	L	T	P	TW/SL	Total	C	SDG
		15	0	30	15	60	2	4,8,9
COURSE OBJECTIVES:								
- To enhance interactive and analytical communication skills - To develop critical and purposeful communication abilities - To apply language skills and enhance their creative expression - To equip learners with employability and workplace communication skills - To strengthen technical and service-oriented communication								
COURSE CONTENT								
Unit I	Interactive Communication	3	3	0	6	12		4
Listening: Listening to panel discussions Speaking: Group discussion Reading: Reading technical documents Writing: Email writing Language Study: Tenses Vocabulary: Connectives, Articles Self study: Poster Presentation								
Unit 2	Technical Writing	3	3	0	6	12		4
Listening: Listening to Ted Talks Speaking: Extempore Reading: Case studies Writing: Instructions Language Study: Active and Passive Voice Vocabulary: Purpose statement Self study: Case Study								
Unit 3	English for Creativity	3	3	0	6	12		8
Listening: Short Documentaries/Podcast Speaking: Narrating events, vlog Reading: Travelogues Writing: Checklist, Note making Language Study: Reported Speech Vocabulary: Spotting the errors Self study: Creating Portfolio (Short story/Poem)								
Unit 4	English for Employability	3	3	0	6	12		8
Listening: Listening to Job interviews Speaking: Mock Interview Reading: Workplace Etiquettes Writing: Job application Letter and Resume, Preparing Professional Portfolio Language Study: Sentence Structures (Simple, Compound and Complex) Vocabulary: Technical Vocabulary Self study: Preparing a Resume								
Unit 5	English for Technical Interaction	3	3	0	6	12		9
Listening: Product reviews Speaking: Reviewing a Product Reading: Gadget reviews and User manuals								

Writing: Interpretation of Charts and Graphs
Language Study: Cause and Effect expressions
Vocabulary: Technical Abbreviations and Acronyms
Self study: FAQ sheet for a commonly used gadget

COURSE OUTCOMES:

At the end of the course, the students will be able to:

Course Outcomes (COs)

CO1: Display active listening and analytical speaking to present logical arguments in professional settings.

CO2: Apply critical and purposeful communication skills to express ideas logically.

CO3: Demonstrate cross-cultural awareness and innovative thinking to create inclusive, effective and ethically sound technical communication.

CO4: Use appropriate formats and effective writing to prepare documents and handle interviews effectively.

CO5: Employ technical vocabulary appropriately in professional communication.

Weightage: Continuous Assessment: 40%, End Semester Examination: 60%

Assessment Methodology: Internal Assessment Test (70%), Activities (30%)

TEXT BOOKS:

- | | |
|----|---|
| 1. | Swan, Michael. Practical English Usage. Fourth Edition, Oxford University Press, 2021. |
| 2. | Kumar, Sanjay & Pushp Lata. Communication Skills. Third Edition, Oxford University Press, 2020. |

REFERENCES:

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|----|--|
| 1. | Murphy, Raymond. English Grammar in Use. Fifth Edition, Cambridge University Press, 2022. |
| 2. | Hewings, Martin. Advanced Grammar in Use. Cambridge University Press, 2021. |
| 3. | Guffey, Mary Ellen & Loewy, Dana. Business Communication: Process and Product. 10 th Edition, Cengage Learning, 2021. |
| 4. | Lannon, John M. & Gurak, Laura J. Technical Communication. Fifteenth Edition, Pearson, 2022. |
| 5. | Mitra, Barun K. Personality Development and Soft Skills. Second Edition, Oxford University Press, 2020. |

E resources/E materials:

- | | |
|----|---|
| 1. | British Council, Learn English, https://learnenglish.britishcouncil.org |
| 2. | NPTEL, Technical Communication Courses – India, https://nptel.ac.in |
| 3. | BBC Learning English, https://www.bbc.co.uk/learningenglish |

Mapping of Course Outcomes to Programme Outcomes

Course Outcomes	Programme Outcomes											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO3	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO4	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO5	-	-	-	-	-	-	-	2	3	-	2	-	-	-
Average	-	-	-	-	-	-	-	2	3	-	2	-	-	-

TA26C02	தமிழரும் தொழில்நுட்பமும்	L	T	P	TW/SL	Total	C	SDG
		15	0	0	15	30	1	2,4,6,8,9,11,12,14

COURSE OBJECTIVES:

Obj1: சங்ககால நெசவு மற்றும் பாணை (செராமிக்) தொழில்நுட்பத்தை மாணவர்கள் புரிந்துகொள்ள உதவுதல்.

Obj2: சங்ககாலத்தில் தமிழர்களின் கட்டிட வடிவமைப்பைப் பற்றி விழிப்புணர்வு ஏற்படுத்துதல்

Obj3: பழங்கால உற்பத்தித் தொழில்நுட்பத்தின் பல்வேறு நிலைகளை மாணவர்கள் வேறுபடுத்திக் காண உதவுதல்.

Obj4: வேளாண்மை மற்றும் பாசனத் தொழில்நுட்பத்தில் உள்ள பண்டைய அறிவை புரிந்துகொள்ளுதல்

Obj5: தமிழ்மொழியின் டிஜிட்டல்மயத்தை (Digitalization) மாணவர்கள் புரிந்துகொள்ளச் செய்தல்.

COURSE CONTENT:

Unit 1	நெசவு மற்றும் பாணைத் தொழில்நுட்பம்	3	0	0	3	6		8,12
சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - சுடுமண் சிற்பங்கள் -பாண்டங்களில் கீறல் குறியீடுகள். தொல்லியல் சான்றுகள்								
Activities: பாட அடிப்படையிலான வினாடி வினா								
Unit 2	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3	0	0	3	6		9,11

சங்க காலத்தில் கட்டுமானங்கள்-நடுகல்-சிலப்பதிகாரத்தில் மேடை அமைப்பு - மாமல்லபுரம் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள், தஞ்சை பெரியக்கோயில், கங்கை கொண்ட சோழபுரம் கோயில், தாராசுரம் கோயில் - நாயக்கர் காலக் கோயில்கள்- திருமலை நாயக்கர் மகால் - மதுரை மீனாட்சி அம்மன் கோயில் -ஆங்கிலேயர் கால இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

Activities: ஒவ்வொரு குழுவும் ஒரு கால கட்டிடத்தை விளக்குதல்

Unit 3	உற்பத்தித் தொழில் நுட்பம்:	3	0	0	3	6	8,9
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உலோகவியல், இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு -வரலாற்றுச் சான்றுகளான நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் முறைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

Activities: நாணயங்கள் & மணிகள் அடையாளம் காணுதல்.

Unit 4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	3	0	0	3	6	2,6,14
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அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம்- கிணறுகள் - கால்நடை பராமரிப்பு - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - பெருங்கடல் குறித்த பண்டைய அறிவு - கப்பல் கட்டும் கலை - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - அறிவுசார் சமூகம்.

Activities: Map Activity: கடல் வர்த்தக பாதை வரைதல்

Unit 5	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3	0	0	3	6	4.9
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அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Activities: Project: தமிழ் டிஜிட்டல் உலகம்.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: சங்க கால நெசவு மற்றும் பாணை தொழில்நுட்பத்தின் முக்கியத்துவத்தை விவரிக்க முடியும்.

CO2: சங்க காலத்தில் தமிழர்களின் கட்டிட வடிவமைப்புக்கான அறிவை விவரிக்க முடியும்.

CO3: பண்டைய தமிழர்களின் உற்பத்தித் தொழில்நுட்பத்தில் வலுவான

அடிப்படை அறிவை வெளிப்படுத்த முடியும்

CO4: தமிழர்களின் பண்டைய வேளாண்மை மற்றும் பாசனத் தொழில்நுட்பத்தின் முக்கியத்துவத்தை விவரிக்க முடியும்

CO5: தமிழ் மொழியின் டிஜிட்டல்மயமாக்கல் (Digitalization) என்ற கருத்தை விளக்க முடியும்

TEXT BOOKS:

1.	முனைவர் ஆ. பூபாலன், தமிழரும் தொழில்நுட்பமும், VRB Publishers Pvt Ltd, 2023.
2.	ஜெயந்தி ரவிகிருஷ்ணன், தமிழரும் தொழில்நுட்பமும், Sri Krishna Publication, 2023

REFERENCES:

1.	முனைவர் கா. ராஜன், தொல்லியல் நோக்கில் சங்ககாலம், உலகத் தமிழாராய்ச்சி நிறுவனம், 2010
2.	முனைவர் கோ. தெய்வநாயகம், தமிழர் கட்டிடக் கலை, உலகத் தமிழாராய்ச்சி நிறுவனம், 2002
3.	தொல்லியல் துறை , கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம், தமிழ்நாடு அரசு தொல்லியல் துறை வெளியீடு, 2019
4.	தொல்லியல் துறை, பொருளை- ஆற்றங்கரை நாகரிகம், தமிழ்நாடு அரசு தொல்லியல் துறை வெளியீடு, 2021
5.	முனைவர் இல. சுந்தரம், கணிணித் தமிழ், விகடன் பிரசுரம், 2018

E resources/E materials:

1.	https://www.tamilvu.org/
2.	https://tamildigitallibrary.in/

TA26C02	Tamils Technology	and	L	T	P	TW/SL	Total	C	SDG
			15	0	0	15	30	1	2,4,6,8,9,11,12,14

COURSE OBJECTIVES:

Obj1: To help students understand the weaving and pottery (ceramic) technology of the Sangam period.

Obj2: To create awareness among students about the architectural designs of the Tamils during the Sangam period.

Obj3: To help students differentiate between the various stages of ancient production technologies.

Obj4: To understand the ancient knowledge in agriculture and irrigation technology.

Obj5: To enable students to understand the digitalization of the Tamil language.

COURSE CONTENT:

Unit 1	Weaving and Pottery Technology	3	0	0	3	6		8,12
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Weaving industry during the Sangam period – Pottery technology – Black and red ware – Terracotta sculptures – Graffiti marks on pottery – Archaeological evidence.

Activities: Quiz: Based on artifacts and concepts

Unit 2	Design and Construction Technology	3	0	0	3	6		9,11
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Constructions during the Sangam period – Hero stones (Nadukal) – Stage setting in the Silappathikaram – Sculptures and temples of Mamallapuram – Great temples of the Chola period such as the Brihadeeswarar Temple (Thanjai Periya Kovil), Gangaikonda Cholapuram Temple, and Airavatesvara Temple – Temples of the Nayak period – Thirumalai Nayakkar Mahal – Meenakshi Amman Temple – Indo-Saracenic architecture during the British period.

Activities: Each group presents a building from a particular historical period.

Unit 3	Production Technology	3	0	0	3	6		8,9
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Metallurgy – Iron industry – Smelting of iron – Steel – Historical evidence such as coins – Minting of coins – Methods of bead making – Stone beads – Glass beads – Terracotta beads – Conch shell beads – Bone fragments – Types of beads mentioned in the Silappathikaram.

Activities: Identifying coins and beads.

Unit 4	Agricultural and Irrigation Technology	3	0	0	3	6		2,6,14
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Dams, lakes, ponds, and sluices – Importance of the Kumizhi (sluice system) during the Chola period – Wells – Cattle maintenance – Agriculture and allied activities – Maritime knowledge – Ancient knowledge of the ocean – Shipbuilding technology – Fisheries – Pearls and pearl diving – Knowledge-based society.

Activities: Map Activity: Drawing maritime trade routes.

Unit 5	Scientific Tamil and Computer Tamil	3	0	0	3	6		4.9
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Development of Scientific Tamil – Development of Computer Tamil – Digitization of Tamil texts – Development of Tamil software – Tamil Virtual Academy – Tamil Digital Library – Tamil dictionaries on the internet – Lexicon (Sorkuvai) project.

Activities: Project: The Digital World of Tamil.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Able to explain the importance of weaving and pottery technology during the Sangam period.

CO2: Able to describe the knowledge of architectural design of the Tamils during the Sangam period.

CO3: Able to demonstrate a strong foundational understanding of the production technologies of ancient Tamils.

CO4: Able to explain the importance of ancient Tamil agricultural and irrigation technologies.

CO5: Able to explain the concept of digitalization of the Tamil language.

TEXT BOOKS:

1.	Dr. N. Kavitha Tamils and Technology VRB Publishers Pvt. Ltd., 2023.
2.	Mrs. G. Jayanthi Ravikrishnan Tamils and Technology Sri Krishna Publication, 2023

REFERENCES:

1.	Dr. Ka. Rajan, Sangam Age from an Archaeological Perspective, International Institute of Tamil Studies, 2010.
2.	Dr. K. Deivanayagam, Architecture of the Tamils, International Institute of Tamil Studies, 2002.
3.	Department of Archaeology, Keeladi – Sangam Age Urban Civilization on the Banks of the Vaigai River, Tamil Nadu State Department of Archaeology Publication, 2019.
4.	Department of Archaeology, Porunai (Tamiraparani) River Valley Civilization, Tamil Nadu State Department of Archaeology Publication, 2021.

5.	Dr. Il. Sundaram, Computer Tamil, Vikatan Publications, 2018.
E resources/E materials:	
1.	https://www.tamilvu.org/
2.	https://tamildigitallibrary.in/

Mapping of Course Outcomes to Programme Outcomes and Programme Specific Outcomes

COURSE OUTCOMES	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
TA26C02 CO 1	2	2	1	-	-	2	-	-	-	-	1	-	-	-
TA26C02 CO 2	2	2	2	-	-	2	-	-	-	-	1	-	-	-
TA26C02 CO 3	3	2	2	2	2	1	-	-	-	-	1	-	-	-
TA26C02 CO 4	2	2	1	-	-	3	-	-	-	-	1	-	-	-
TA26C02 CO 5	2	1	2	-	3	1	-	-	2	-	2	-	-	-

CY26202	DATA STRUCTURES LABORATORY	L	T	P	TW/SL	Total	C	SDG
		0	0	60	0	60	2	4,8,9, 12
COURSE OBJECTIVES:								
To understand Abstract Data Types and implement various types of linked lists and their applications.								
To understand stack and queue operations and apply them in expression evaluation and problem solving.								
To understand tree data structures and perform operations on binary trees, BSTs, AVL trees, heaps, and B-trees.								
To understand graph representations and apply graph traversal and shortest path/minimum spanning tree algorithms.								
To understand searching, sorting, and hashing techniques and apply them in real-world applications such as library management systems.								
PRACTICAL EXPERIMENTS:								
1	Linked list implementation of List ADT, Stack ADT and Queue ADT.							
2	Implementation of Doubly Linked List and Circularly Linked List.							
3	Polynomial Addition, Subtraction and Multiplication using Linked List.							

4	Balancing Symbols, Evaluation of Postfix Expression and Infix to Postfix conversion.
5.	Implementation of Double Ended Queue.
6.	Implementation of binary tree and its operations with relevant traversals.
7.	Implementation of binary search tree.
8.	Graph representations, Implementation of BFS & DFS.
9.	Shortest path using Dijkstra's algorithm.
10.	Minimum spanning tree using Prim's algorithm.
11.	Implementation of Sorting Algorithms and Searching Algorithms
12.	Hashing using separate chaining & open addressing.
TOTAL: 60 PERIODS	
COURSE OUTCOMES:	
At the end of the course, the students will be able to: CO1: Implement the linear data structure List. CO2: Implement stack and queue data structures. CO3: Use appropriate non-linear data structure operations for solving a given problem. CO4: Apply appropriate graph algorithms for graph applications. CO5: Apply different searching, sorting and hashing techniques.	
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%	
Assessment Methodology: Model Practical (25%), & Evaluation of Student's Work, Observation, Record, etc. (75%)	
TEXT BOOKS:	
1	Reema Thareja, "Data Structures Using C", Third Edition, Oxford University Press, 2023.
2	<u>E. Balagurusamy</u> , "Data Structures Using C", Second Edition, Mc Graw Hill, 2025.
REFERENCES:	
1	Yashavant Kanetkar, "Data Structures Through C", Fifth Edition, BPB Publications, 2020.
2	<u>Dr. Shaik Fairouz</u> , <u>Mr. V. Ramu</u> , <u>Mrs. R. Pavithra</u> , "Data Structures using C ", Kindle Edition, 2025.

framework – story building blocks and narrative structure, Creativity and imagination exercises for engineering contexts, Picture Connector – visual thinking and observation techniques, Pattern linking and symbolic interpretation, Tourism Pitch – structure of a persuasive presentation, Persuasion principles and storytelling for professional pitching, Non-verbal communication – body language, eye contact, posture, Active listening skills and their role in effective communication, Group presentation dynamics and collaborative communication strategies

Activities

1. Story Mason – Story Building and Imagination Exercise
2. Picture Connector – Visual Thinking and Pattern Linking
3. Tourism Pitch – Persuasive Presentation and Storytelling
4. Reporter Activity – Questioning, Listening, and Summarization
5. Shopping Role Play – Negotiation and Real-World Communication
6. Insane Inventor – Creative Thinking and Product Pitching

Unit 2	EMOTIONAL INTELLIGENCE AND PERSONAL DEVELOPMENT			12	12	24		3,16
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Emotional Quotient (EQ) – definition, components, and relevance in professional settings, Self-awareness – identifying strengths, weaknesses, and emotional triggers, Empathy – understanding perspectives and building interpersonal trust, Emotional control techniques – managing stress, conflict, and pressure at workplace, Habit formation – Atomic Habits framework and behavioral change science, Discipline and consistency in professional growth, Positive behavioral practices for engineering students, SMART Goal Setting – Specific, Measurable, Achievable, Relevant, Time-bound framework, Short-term and long-term career planning strategies, Reflection activities and journaling for personal development

Activities

1. Emotional Quotient Workshop – Self-Awareness and Empathy Activities
2. Habit Formation and SMART Goal Setting Workshop

Unit 3	SPEED ARITHMETIC AND QUANTITATIVE APTITUDE – PART I			12	12	24		4,8
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Introduction to Vedic mathematics and mental arithmetic principles, Speed addition techniques and fast subtraction methods, Shortcut calculations and mental arithmetic practice drills, Quick multiplication tricks using base values (10, 100, 1000), Rapid multiplication using cross-multiplication and multi-digit shortcuts, Fast division techniques and reverse calculation methods, Multiplication shortcuts using 5-based and 9-based calculations, Quick percentage estimations and simplified arithmetic tricks, Approximation techniques and logical calculation shortcuts, Prime factorization, shortcut methods for HCF and LCM, Divisibility rules and their application in aptitude problems, Common percentage-to-fraction conversions and memorization strategies

Activities

1. Speed Arithmetic Practice – Addition, Subtraction, and Multiplication Shortcuts
2. Speed Arithmetic Practice – Division, Percentages, HCF, LCM, and Fraction Shortcuts

Unit 4	CRITICAL THINKING, LOGICAL REASONING AND DEBATE			12	12	24		4, 8
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Finding square roots quickly using Vedic math and approximation strategies, Cube root shortcut methods and cube pattern recognition, Fast cube calculation techniques and cube multiplication shortcuts, Fraction addition and subtraction shortcuts using LCM-based methods, Multi-step arithmetic shortcuts and nested calculation techniques, Logical simplification approaches for competitive aptitude problems, Advanced number manipulation tricks and rapid comparison techniques, Mental computation strategies for competitive examinations, Error checking techniques and divisibility validation methods, Quick verification methods for arithmetic accuracy, Advanced mental calculation techniques and rapid arithmetic simplifications, Speed math assessment preparation and timed practice strategies

Activities

1. Vedic Math and Advanced Arithmetic – Squares, Cubes, and Mental Computation

Unit 5	COMPUTATIONAL THINKING, NO-CODE DEVELOPMENT, AND CAREER READINESS			12	12	24		8,9
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Understanding problems and solution approaches in engineering contexts, Steps in problem solving and basics of algorithms and flowcharts, Logical thinking exercises and real-world problem-solving activities, Number patterns, mathematical reasoning, and number-based puzzles, Visual reasoning concepts, grid-based thinking, and pathfinding activities, Pattern recognition and introductory graph and maze-solving exercises, Sequential thinking and writing simple pseudocode, Conditional statements, decision-making logic, and looping concepts, Introduction to no-code platforms – UI design basics and drag-and-drop app development, Creating simple workflows, publishing and testing basic apps, Resume building – structure, content, ATS optimization, and formatting, LinkedIn profile optimization – headline, summary, skills, and connections, Reporter technique – questioning, listening, and summarization skills, HR and technical interview simulation and career readiness frameworks

Activities

1. Logical Thinking, Flowchart Design, and Pseudocode Writing
2. No-Code App Development – UI Design and Workflow Creation
3. Resume Building and LinkedIn Profile Optimization
4. Mock Interview, Feedback Session, and Career Readiness Assessment

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1: Remember and recall key concepts of professional communication, emotional intelligence, habit formation, and goal-setting frameworks relevant to engineering workplace scenarios

CO2: Understand and explain mental arithmetic techniques, Vedic math shortcuts, percentage-fraction conversions, and quantitative aptitude concepts applicable to competitive examinations

CO3: Apply storytelling, creative thinking, presentation skills, negotiation strategies, and role-play techniques to real-world professional communication contexts.

CO4: Analyze logical problems, design step-by-step algorithms, construct flowcharts, and develop solutions using no-code platforms and computational thinking approaches.

CO5: Evaluate personal career readiness and create professional artifacts including resumes, LinkedIn profiles, and interview responses through simulated HR and technical interview assessments.

Weightage: Continuous Assessment: 100%

Assessment Methodology:

Assessment Type	Weightage	Marks	Mode of Evaluation
Continuous Skill Assessment (CSA)	60%	60	Continuous, rubric-based evaluation through communication activities, aptitude practice, computational thinking exercises and career readiness tasks
Terminal Skill Assessment (TSA)	40%	40	Weekly assessment + practical skill demonstration + presentation/interview + portfolio viva
Total	100%	100	—

A. Continuous Skill Assessment

Component	Description	CO(s)	Marks
Daily Topical Assessment	Short assessment at the close of each session evaluating communication concepts, emotional intelligence, speed arithmetic, logical reasoning and computational thinking.	CO1, CO2	10
Creative Communication Activities & Participation	Rubric-based evaluation of Story Mason, Picture Connector, Tourism Pitch, Reporter Activity, Shopping Role Play and Insane Inventor through presentations, storytelling and collaborative communication.	CO1, CO3	10
Personal Development & Team Engagement	Evaluation of participation in Emotional Intelligence workshops, SMART Goal Setting, Habit Formation activities, reflective journaling and collaborative learning exercises.	CO1, CO5	10
Speed Mathematics & Logical Reasoning Practice	Continuous assessment through Vedic Mathematics exercises, mental arithmetic drills, aptitude worksheets and timed calculation challenges.	CO2, CO4	10
Computational Thinking & No-Code Development	Assessment of flowcharts, pseudocode, logical reasoning exercises, no-code application development and workflow implementation activities.	CO4, CO5	10
Career Readiness Portfolio	Evaluation of resume, LinkedIn profile, no-code project documentation, interview preparation, reflective journal and professional development portfolio.	CO3, CO5	10
Subtotal (CSA)			60

B. Terminal Skill Assessment (TSA)

Component	Description	CO(s)	Marks
Weekly Assessment	Cumulative score of weekly consolidation tests covering communication, emotional intelligence, speed mathematics, computational thinking and career readiness concepts.	CO1, CO2	10
Integrated Practical Assessment	Practical assessment comprising communication presentation, speed mathematics problem solving, computational thinking task, algorithm/flowchart design or no-code application development.	CO2, CO4	15

Professional Presentation / Mock Interview	Individual presentation, product pitch or HR/technical interview simulation assessing communication, creativity, confidence, problem-solving and professionalism.	CO3, CO5	10
Portfolio Viva-Voce	Evaluation of resume, LinkedIn profile, no-code project, reflective journal and career readiness portfolio through viva.	CO4, CO5	5
Subtotal (TSA)			40

C. Common Evaluation Rubric

Evaluation Criterion	Descriptor	Weight
Knowledge & Application	Demonstrates understanding and effective application of communication, emotional intelligence, quantitative aptitude, computational thinking and career readiness concepts in practical situations.	25%
Communication & Presentation	Communicates ideas clearly with appropriate language, confidence, presentation skills, active listening and effective interpersonal interaction.	20%
Critical Thinking & Problem Solving	Demonstrates logical reasoning, analytical thinking, creativity and systematic problem-solving while selecting appropriate solution strategies.	25%
Professionalism & Collaboration	Exhibits teamwork, leadership, emotional intelligence, ethical behaviour, responsibility, workplace etiquette and positive participation.	20%
Innovation & Task Completion	Demonstrates originality, creativity, organization, timely completion and quality of assigned tasks and deliverables.	10%

TEXT BOOKS:

1.	Meenakshi Raman and Sangeeta Sharma, <i>Technical Communication: Principles and Practice</i> , 4th Edition, Oxford University Press, 2022.
2.	Asha Kaul, <i>Effective Business Communication</i> , 3rd Edition, PHI Learning, 2023.
3.	R. S. Aggarwal, <i>Quantitative Aptitude for Competitive Examinations</i> , Revised Edition, S. Chand Publishing, 2025.

REFERENCES:

1.	Rajendra Pal and J. S. Korlahalli, <i>"Essentials of Business Communication"</i> , 16th Edition, Sultan Chand and Sons, 2019.
2.	Arun Sharma, <i>"Quantitative Aptitude for Competitive Examinations"</i> , 7th Edition, McGraw Hill Education, 2018
3.	Dale Carnegie, <i>How to Win Friends and Influence People: Updated for the Next Generation of Leaders</i> , Revised Edition, Gallery Books (Simon & Schuster), 2022.

4.	James Clear, <i>Atomic Habits: An Easy and Proven Way to Build Good Habits and Break Bad Ones</i> , 1st Edition, Penguin Random House, 2018.
5.	Nishit K. Sinha, <i>Quantitative Aptitude for CAT</i> , 7th Edition, Pearson Education, 2025.
Web / Online Resources	
1.	Soft Skills – Communication and Personality Development (NPTEL) — https://nptel.ac.in/courses/109/104/109104183/
2.	Effective Business Communication (Coursera) — https://www.coursera.org/learn/effective-business-communication
3.	Aptitude – Quantitative Aptitude Tutorials and Practice (GeeksforGeeks) — https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Mapping of Course Outcomes to Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	—	—	—	1	—	2	2	3	1
CO2	3	3	1	1	—	—	—	—	—	1	—
CO3	2	2	2	—	1	1	—	1	3	3	1
CO4	3	3	3	2	3	—	—	—	1	1	1
CO5	2	2	2	1	1	1	—	2	2	3	2
Average CO Attainment	2.4	2.2	1.6	0.8	1.0	0.6	0.0	1.0	1.6	2.2	1.0