



MRK INSTITUTE OF TECHNOLOGY, CUDDALORE

AN AUTONOMOUS INSTITUTION

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
KATTUMANNARKOIL-608 301, CUDDALORE DISTRICT, TAMILNADU, INDIA

CHOICE BASED CREDIT SYSTEM

Programme: B.E., Mechanical Engineering

Regulations: 2025

Abbreviations:

HUM – Humanities (Languages, Management, Heritage, and others)

BS – Basic Science (Mathematics, Physics, Chemistry)

ES – Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**) & Emerging Technology (**ET**))

SD – Skill Development

SL – Self Learning

CDP–Capstone Design Project

OE – Open Elective

L –Laboratory Course

T – Theory

LIT –Laboratory Integrated Theory

PW – Project Work

IPW–Internship cum Project Work

DIC – Department Introductory Course

TCP –Total Contact Period(s)

Program Outcomes

1. **Engineering Knowledge:** Apply math, science, and engineering fundamentals to complex problems.
2. **Problem Analysis:** Identify and analyze complex problems using research and sustainability principles.
3. **Design Solutions:** Design systems and processes considering health, safety, cost, culture, and environment.
4. **Investigations:** Use experiments, modelling, and data analysis to reach valid conclusions.
5. **Engineering Tools:** Apply modern tools for modelling and problem-solving, recognizing their limits.
6. **Society & Environment:** Assess societal, legal, and environmental impacts of engineering solutions.
7. **Ethics:** Commit to ethics, human values, diversity, and legal compliance.
8. **Teamwork:** Work effectively as an individual and in multidisciplinary teams.
9. **Communication:** Communicate clearly in reports, presentations, and documentation across diverse groups.
10. **Management & Finance:** Apply management and economic principles in projects and teamwork.
11. **Lifelong Learning:** Engage in continuous learning, adapt to new technologies, and think critically.



Dr. K. ANANDEVELU, B.E., M.E., Ph.D.,
D.I.S., I.G.C.O.H.S., M.I.S.T.E., M.S.E.A (T),
PRINCIPAL
MRK Institute of Technology
Kattumannarkoil - 608 301.

Program Specific Outcomes:

PSO1 Design and develop efficient Mechanical systems in real time applications

PSO2 Utilize modern techniques and tools for addressing engineering challenges in the fields of Mechanical Engineering and providing sustainable innovation solutions.

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

Semester-I							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.	MA25C01	Applied Calculus	T	3-1-0	4	4	BS
2.	ME25C03	Introduction to Mechanical Engineering	T	2-1-0	3	3	ES (PC) – DIC
3.	ME25C01	Engineering Drawing	LIT	2-0-4	6	4	ES (G)
4.	PH25C01	Applied Physics – I	LIT	2-0-2	4	3	BS
5.	CY25C01	Applied Chemistry – I	LIT	2-0-2	4	3	BS
6.	UC25H01	தமிழர் மரபு /Heritage of Tamils	T	1-0-0	1	1	HUM
7.	EN25C01	English Essentials – I	T	2-0-0	2	2	HUM
8.	CS25C02	Computer Programming Python	LIT	2-0-2	4	3	ES (PC)
9.	ME25C04	Makerspace	L	0-0-4	4	2	SD
10.	UC25A01	Life Skills for Engineers – I	---	1-0-2	3	1	HUM
11.	UC25A02	Physical Education – I	---	0-0-4	4	1	HUM
12.		NCC / NSS / NSO	---	---	---	---	---
Total Credits					39	27	



Semester-II							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.	MA25C02	Linear Algebra	T	3-1-0	4	4	BS
2.	ME25C02	Engineering Mechanics	T	3-1-0	4	4	ES (G)
3.	EE25C01	Basic Electrical and Electronics Engineering	T	3-0-0	3	3	ES (G)
4.	PH25C05	Applied Physics (ME) – II	T	2-1-0	3	3	BS
5.	CY25C03	Applied Chemistry (ME) – II	T	2-0-0	2	2	BS
6.	UC25H02	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
7.	ME25C05	Re-Engineering for Innovation	L	0-0-4	4	2	SD
8.	EN25C02	English Essentials – II	LIT	1-0-2	3	2	HUM
9.	UC25A03	Life Skills for Engineers – II	---	1-0-2	3	1	HUM
10.	UC25A04	Physical Education – II	---	0-0-4	4	1	HUM
11.		Foreign Language^	LIT	1-0-2	3	1	HUM
Total Credits					34	24	

^Deutsch / Japanese / Korean

Semester-III							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.	MA25C03	Computational Differential Equations	T	3-1-0	4	4	BS
2.	ME25C07	Applied Engineering Mechanics	T	3-0-0	3	3	ES (PC)
3.	ME25301	Engineering Thermodynamics	T	4-0-0	4	4	ES (PC)
4.	CE25C11	Strength of Materials	LIT	3-0-2	5	4	ES (PC)
5.	ME25C08	Metallurgy and Materials Science	T	3-0-0	3	3	ES (PC)
6.	EC25C17	Embedded Systems	T	3-0-0	3	3	ES (G)
7.	EN25C03	English Communication Skills Laboratory - I	L	0-0-2	2	1	HUM
8.		Skill Development Course – I	LIT	1-0-2	3	2	SD
Total Credits					27	24	



Semester-IV							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.	CS25C16	Applied Data Science	T	3-0-0	3	3	ES (ET)
2.	ME25C09	Kinematics and Dynamics of Machines	LIT	3-0-2	5	4	ES (PC)
3.	CE25C12	Fluid Mechanics and Machinery	LIT	3-0-2	5	4	ES (PC)
4.	ME25401	Thermal Engineering – I	T	3-0-0	3	3	ES (PC)
5.	ME25402	Manufacturing Processes– I	LIT	3-0-2	5	4	ES (PC)
6.	ME25C10	Standards in Mechanical Engineering	T	1-0-0	1	1	ES (PC)
7.	EN25C04	English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
8.		Skill Development Course – II	LIT	1-0-2	3	4	SD
Total Credits					27	24	

Semester-V							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
1.		Design of Machine Elements	T	3-0-0	3	3	ES (PC)
2.		Manufacturing Processes – II	LIT	3-0-2	5	4	ES (PC)
3.		Thermal Engineering – II	LIT	3-0-2	5	4	ES (PC)
4.		Measurements and Instrumentation	LIT	2-0-2	4	3	ES (PC)
5.		Programme Elective - I	T	3-0-0	3	3	ES (PE)
6.		Open Elective	T	3-0-0	3	3	---
7.		Skill Development Course – III	LIT	1-0-2	3	2	SD
8.		Industry Oriented Course– I	LIT	1-0-2	3	1	SD
Total Credits					29	23	

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

Semester-V							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T- P	TCP		
2.		Minor Elective – II	T	3-0-0	3	3	



Semester– VI							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.		Design of Transmission Systems	T	3-1-0	4	4	ES (PC)
2.		Heat and Mass Transfer	LIT	3-0-2	5	4	ES (PC)
3.		FEM applications in Mechanical Engineering	LIT	3-0-2	5	4	ES (PC)
4.		Power Generation Technologies	T	3-0-0	3	3	ES (PC)
5.		Programme Elective - II	T	3-0-0	3	3	ES (PE)
6.		Programme Elective - III	T	3-0-0	3	3	ES (PE)
7.		Computer Aided Modelling Laboratory	L	0-0-4	4	2	ES (PC)
8.		Self-Learning Course	---	---	0	1	---
9.		Industry Oriented Course - II	LIT	1-0-2	3	1	SD
Total Credits					30	25	
For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – III	T	3-0-0	3	3	
2.		Honours Elective – IV	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – III	T	3-0-0	3	3	
2.		Minor Elective – IV	T	3-0-0	3	3	

Semester– VII							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.		Engineering Entrepreneurship Development	LIT	2-0-2	4	3	HUM
2.		Climate Change and Sustainability	T	2-0-0	2	2	HUM
3.		Mechatronics and Automation	LIT	3-0-2	5	4	ES (PC)
4.		Programme Elective - IV	T	3-0-0	3	3	ES (PE)
5.		Programme Elective - V	T	3-0-0	3	3	ES (PE)
6.		Project Management	T	2-0-0	2	2	HUM
7.		Industrial Training	---	---	---	1	SD
Total Credits					19	18	
For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – V	T	3-0-0	3	3	
2.		Honours Elective – VI	T	3-0-0	3	3	
For Minor Degree							
1.		Minor Elective – V	T	3-0-0	3	3	
2.		Minor Elective – VI	T	3-0-0	3	3	

Semester– VIII							
S. No.	Course Code	Course Name	Course Type	Periods/Week		Credits	Category
				L-T-P	TCP		
1.		Project Work / Internship cum Project Work	PW / IPW	0-0-16	16	8	SD
Total Credits					16	8	

Total Number of Credits: 173

PROGRAMME ELECTIVE COURSES – STREAMS

Thermal	Manufacturing	Design	Materials	Industrial & Systems Engineering
Refrigeration & HVAC Systems	Digital Manufacturing	Computer-Aided Design and Prototyping	Composite Materials	Optimisation Techniques
Battery Technology	Robotic Systems	Tool Design	Fundamentals of Nanomaterials	Lean Manufacturing
Gas Dynamics and Jet Propulsion	Industrial IoT	Tribological Design	Nano Technology and Surface Engineering	Supply Chain Analytics
Vehicle Technology	Welding Engineering	Mechanical Vibrations	Materials for Electronics	Quality Engineering
Computational Fluid Dynamics	Design for Manufacturing and Assembly	Digital Twin	Materials Characterization	Life Cycle Assessment
Renewable Energy Systems	Additive Manufacturing	Electric Vehicle Design	Mechanical Behaviour of Materials	---
Energy Conservation and Management	-	Integrated Product Design and Development	Smart Materials	---



Semester I



MA25C01	Applied Calculus	L 3	T 1	P 0	C 4
Course Objectives: - To provide technical competence of modelling engineering problems using calculus. - To apply the calculus concepts in solving engineering problems using analytical methods and computational tools.					
UNIT-I Functions, Limits and Continuity: 12 Functions, graph of functions, New functions from old functions, Limit of a function, Continuity, Limits at infinity function. Activities: Visualization of functions and their transformations using open-source software, Solving application-oriented problems involving functions, limits and continuity.					
UNIT-II Differential Calculus and Applications: 12 Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem, Effect of derivatives on the shape of a graph. Activities: Graphical interpretation of derivatives as slopes of tangent lines using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
UNIT-III Functions of Several Variables: 12 Partial derivatives, Chain rule, Total derivative, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers, Application problems in engineering. Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
UNIT-IV Integral Calculus: 12 Fundamental theorem of Calculus, Indefinite integrals and the Net Change Theorem, Improper integrals, Arc Length, Area of Region, Area of surface of revolution. Activities: Definite and Indefinite Integrals, Determination of Area, Solving of Competitive Examination questions (Ex. GATE).					
UNIT-V Multiple Integrals: 12 Iterated integrals and Fubini's theorem, Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates. Activities: Double integrals and triple integrals using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving of GATE questions (20%), Internal Examinations (40%).					
References: - Anton, H., Bivens, I. C., & Davis, S. (2021). <i>Calculus: Early transcendentals</i>. John Wiley & Sons. - Ron Larson and David C. Falvo, (2013). <i>Calculus: an Applied Approach</i>. Cengage Learning. - Stewart, J., Clegg, D., & Watson, S. (2019). <i>Calculus: Early transcendentals</i>. - Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2018). <i>Thomas' calculus: Early transcendentals</i>. Pearson.					

5. Singh, K. (2019). *Engineering mathematics through applications*. Bloomsbury Publishing.

6. Grewal, B. S. (2012). *Higher engineering mathematics*. Khanna Publishers.

E-resources:

1. [https://math.libretexts.org/Bookshelves/Calculus/Map%3A_Calculus__Early_Transcendentals_\(Stewart\)/](https://math.libretexts.org/Bookshelves/Calculus/Map%3A_Calculus__Early_Transcendentals_(Stewart)/)
2. <https://openstax.org/books/calculus-volume-1/>
3. <https://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx>
4. SCILAB, <https://www.scilab.org/>

	Description of CO	PO	PSO
CO1	Explain the meaning of derivative, integral, and their geometric and physical interpretations.	---	---
CO2	Apply differentiation and integration techniques to compute maxima, minima, and area.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyze the behavior of single and multivariable functions using derivatives and partial derivatives.	PO2(3)	PSO1(2) PSO3(1)
CO4	Utilize modern computational software and online platforms to deepen understanding, perform complex calculations, and visualize mathematical concepts.	PO5(2) PO11(1)	PSO2(3) PSO3(1)
CO5	Apply multiple integration techniques and coordinate transformations to solve engineering problems involving area and volume.	PO1(3), PO2(2)	PSO1(2), PSO2(2)



ME25C03	Introduction to Mechanical Engineering	L 2	T 1	P 0	C 3
Course Objectives: To impart the fundamental concepts and principles of various fields such as Manufacturing, Materials, Mechanics, thermal engineering in Mechanical Engineering.					
UNIT-I Engineering: 9 History and evolution of mechanical engineering, Basic mechanical engineering principles (force, motion, energy, work, power), UNITS and dimensions, SI system, Ethics and professionalism in engineering. Activities: Interactive quiz, Conversion between SI and other UNIT systems.					
UNIT-II Mechanics of Materials and Structures: 9 Stress and strain, types of stresses (tensile, compressive, shear), Elasticity and plasticity, Mechanical properties of materials (strength, toughness, hardness), Introduction to bending, torsion, and axial loading, Simple structural analysis and design concepts. Activities: Demonstration of Simple truss or beam problems solved using software.					
UNIT-III Energy Interactions: 9 System, Energy Transfer, Conduction, convection, and radiation, Working principle of Heat Engines, Refrigeration and HVAC systems. Activities: Demonstration of working model of internal combustion engine & refrigerator, Virtual demonstration of Thermodynamic cycles.					
UNIT-IV Machine Elements: 9 Gears, bearings, shafts, fasteners, couplings, Selection of machine components, Quality control and safety in mechanical engineering. Activities: Demonstration of working of Gears, bearings, etc. in a mechanical system.					
UNIT-V Manufacturing Processes: 9 Casting, forming, machining & joining processes, CNC and additive manufacturing, overview of smart manufacturing. Activities: Demonstration of various machining processes, 3D printing of simple parts.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (10%), Assignments (40%) and Internal Examinations (50%)					
References: - Wickert, J., & Lewis, K. (2016). An Introduction to Mechanical Engineering. Cengage Learning. - Rajput, R. K., (2017). Fundamentals of Mechanical Engineering, Laxmi Publications.					
E-resources: - MIT OpenCourseWare – Mechanical Engineering https://ocw.mit.edu - PhET Simulations – University of Colorado Boulder https://phet.colorado.edu					

3. LibreTexts Engineering https://eng.libretexts.org

	CO Description	PO	PSO
CO1	Explain the evolution of mechanical engineering and apply basic engineering principles, UNITS, dimensions, and professional ethics.	---	---
CO2	Explain stress, strain, mechanical properties and basic concepts of loading, bending, torsion and structural analysis.	PO1(3)	PSO2(3)
CO3	Explain energy interactions, heat transfer modes, heat engines, refrigeration and HVAC systems.	PO2(2)	PSO1(2)
CO4	Describe the functions and applications of gears, bearings, shafts, fasteners and couplings, and understand the selection, quality and safety aspects of machine elements.	PO3(3)	PSO1(3)
CO5	Explain basic manufacturing processes including casting, forming, machining, joining, CNC, additive manufacturing and smart manufacturing.	PO5(3)	PSO1(3)



ME25C01	Engineering Drawing	L	T	P	C
		2	0	4	4
Course Objectives: - To impart knowledge on dimensions and drawing standards. - To explore the orthographic projection of lines and solids. - To provide the understanding of orthographic, isometric and perspective views.					
UNIT-I Fundamentals: 6+12 Drawing instruments, Drawing standards (BIS), Lettering in engineering, Sheet layout, elements of dimensioning, Systems of dimensioning. Free hand sketching of 2D & 3D objects, Conics – Ellipse, Parabola and Hyperbola. Activities: Virtual Demonstration of Conics and Cycloids.					
UNIT-II Orthographic Projection: 6+12 First angle projection, Projection of points, straight lines and planes.					
UNIT-III Projection of Solids: 6+12 Simple Solids, Section of Solids, Development of Surfaces Activities: Development of models of various solids and virtual demonstration of sectioning, CAD modelling of 2D objects.					
UNIT-IV Isometric Projection: 6+12 Isometric Scale, Projection of Simple solids. Activities: Conversion of 3D into 2D orthographic views, CAD modelling of 3D objects.					
UNIT-V Perspective Projection: 6+12 Simple solids projection Activities: Virtual demonstration of perspective views.					
Project: Development of 2D objects and 3D objects using CAD tools.					
Weightage: Continuous Assessment: 50% End Semester Examinations: 50%					
Assessment Methodology: Project – 10%, Models - 5%, Assignments - 35% and Internal Examinations - 50%					
References: - Natarajan, K. V. (2025). A Text Book of Engineering Graphics. Dhanalakshmi Publisher. - Venugopal, K., & Prabhu Raja, V. (2022). Engineering Drawing + AutoCAD. New Age International Publishers.					
E-Resources: - CAD Software – https://www.freecadweb.org/ - Engineering Drawing and Computer Graphics, Prof. Rajaram Lakkaraju (IIT Kharagpur) – https://onlinecourses.nptel.ac.in/noc22_me105/preview - MIT Design Handbook: Engineering Drawing and Sketching – https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/					

	CO Description	PO	PSO1
CO1	Explain the advantages of engineering drawing in engineering applications	---	
CO2	Apply the concepts of projections in formulating various solid parts in engineering systems.	PO1(3)	PSO1(2)
CO3	Analyse the various view and interpret the engineering drawings.	PO2(3)	PSO1(2)
CO4	Use CAD tools for creation of various models.	PO3(1)	PSO2(2)
CO5	Critically think and develop innovative models.	PO11(1)	PSO3(1)



PH25C01	Applied Physics – I	L	T	P	C
		2	0	2	3
Course Objective(s): To impart knowledge and expose the essentials of physics in various engineering applications.					
UNIT–I Properties of Matter 12					
Elasticity, Cantilever, Young's modulus (non-uniform bending), Girders: Bridges and buildings, Viscosity: Stokes method, Surface tension: drop weight method, Thermal expansion, Thermal stress, Bimetallic strips, Expansion joints					
Practical: Non-Uniform bending, Young's modulus of the material, Torsional pendulum, Rigidity modulus of the wire and moment of inertia of the disc.					
Activities: Virtual demonstration of thermal stress.					
UNIT–II Oscillations and Waves 12					
Oscillations: Simple Harmonic motion, Torsional pendulum, Couple per UNIT twist, Damped and Forced Oscillation					
Waves: Waves on a stretched string, Energy and Power, standing waves, Ultrasonics, piezo, electric method, Acoustic grating, Electromagnetic waves: Maxwell equation, Production of EM waves by dipole antenna, Propagation of EM waves in free space , wave equation, Cell phone reception					
Practical: Melde's string experiment – Frequency of an electrically vibrating metal tip.					
Activities: Virtual demonstration of propagation of EM waves					
UNIT–III Quantum Mechanics 12					
Black body radiation, Photoelectric effect, de Broglie hypothesis, Schrodinger Wave equation, Particle in a box (infinite potential well - three-dimensional box), Barrier penetration and quantum tunnelling.					
Practical: Photo-electric effect, Determination of Planck's constant.					
Activities: Virtual demonstration of Scanning Transmission Electron Microscope					
UNIT-IV Applied Optics 12					
Interference: Air wedge, Michelson's Interferometer, Fiber optics: Structure of a fiber, Fiber Optic Communication System, Fiber Sensors (Virtual demo), Displacement, pressure sensor and Temperature sensor					
Practical: Thickness of a thin sheet/wire using Air wedge Method.					
Activities: Demonstration of sensors					
UNIT-V Laser and its Application 12					
Einstein Co-efficient, Nd:YAG laser, CO2 laser (construction, functioning and applications), dye laser					
Practical: Ruling width of Compact disc using Laser					
Activities: Demonstration of applications of Lasers					
Weightage: Continuous Assessment: 50% and End Semester Examinations: 50%					
Assessment Methodology: Quiz (10%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)					

References:

1. Young, H. D., & Freedman, R. A. (2020). University physics with modern physics. Pearson.
2. Gaur, R. K., & Gupta, S. L. (2022). Engineering physics. Dhanpat Rai Publications.
3. Mathur, D. S. (2010). Elements of properties of matter. S. Chand Publishing.
4. Griffiths, D. J. (2018). Introduction to quantum mechanics. Cambridge University Press.
5. Silfvast, W. T. (2008). Laser fundamentals (2nd ed.). Cambridge University Press.

E-Resources:

1. Barrier penetration problem and Quantum tunnelling:
<https://archive.nptel.ac.in/courses/115/104/115104096/>
2. EM waves and wireless channelling:
https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. CO2 Laser: https://onlinecourses.nptel.ac.in/noc25_ph03/preview
4. Bimetallic Strips _ <https://www.youtube.com/watch?v=WZQ8lvxdzDk>
5. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOwA
6. Dipole Antenna_ <https://www.youtube.com/watch?v=4xF1Fq2wB1I>
7. Optical Sensors_
<https://auece.digimat.in/nptel/courses/video/108106173/L02.html>
8. Scanning Tunnelling Electron Microscope_
<https://www.youtube.com/watch?v=XNYZYbXNWQA>

	Description of CO	PO	PSO
CO1	Explain the physics concepts in various applications.	PO1(2)	PSO1(2)
CO2	Apply the principles of wave optics and laser physics in practical systems.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the behaviour of materials under different conditions.	PO2(2)	PSO1(2) PSO3(1)
CO4	Conduct experiments in groups and interpret the data.	PO4(3) PO8(1)	PSO1(2) PSO2(2)
CO5	Apply the principle of laser physics in practical systems.	PO1(3)	PSO1(2)



CY25C01	Applied Chemistry – I	L	T	P	C
		2	0	2	3
Course Objectives: • To provide students with a solid understanding of the chemical principles for engineering applications. • To introduce the chemical properties of materials and how these properties influence the selection and use of materials in engineering systems. • To impart practical applications of chemistry in commonly used engineering devices					
UNIT - I Water Technology					12
Water quality parameters and standards. Industrial feed water, Remediation. Municipal water treatment. Desalination.					
Practical: Analysis of alkalinity, hardness and dissolved oxygen.					
Activity: Coagulation of water sample using Alum					
UNIT – II Nano-chemistry:					12
Classification, Size, dependent properties. Preparation of nanomaterials, Top-down and Bottom-Up approaches, Applications (Flipped classroom).					
Practical: Preparation of nanoparticles by Sol-Gel method.					
UNIT – III Electrochemistry					12
Electrochemical cell Electrode potential Redoxreaction. Conductivity of electrolytes, Factors.					
Practical: Conductometric titrations					
Activity: Electrochemical cell demonstration					
UNIT – IV Corrosion & Control					12
Chemical and electrochemical corrosions, galvanic series, factors influencing corrosion, Electrochemical protection. Organic and Inorganic coating.					
Practical: • Corrosion study by weight loss and salt spray method. • Potentiometry/UV-visible spectrophotometer.					
Activities: Case Study on Corrosion in Pipelines and Electronics, Control measures for a corroded metal					
UNIT – V Batteries:					12
Conventional, Contemporary and Emerging battery storage technologies, Primary & Secondary Batteries, Battery Pack, Battery Materials, Performance Parameters, Testing, Safety aspects.					
Practical: Measurement of EMF, Internal Resistance, Charge and Discharge Characteristics.					
Activities: Demonstration of battery pack in vehicles.					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					
Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)					

References:

1. Jain, P. C., & Jain, M. (2015). Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company (P) Ltd.
2. Dara, S. S. (2004). A Textbook of Engineering Chemistry. Chand Publications.
3. Sachdeva, M. V. (2011). Basics of Nano Chemistry. Anmol Publications Pvt Ltd.
4. Friedrich, E. (2014). Engineering Chemistry. Medtech.

E-Resources:

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

	Description of CO	PO	PSO
CO1	Understand the underlying mechanisms behind the applications of chemistry.	---	
CO2	Use chemistry concepts in widely used devices.	PO1(3)	PSO1(2) PSO2(2)
CO3	Evaluate how various chemical parameters affect the performance of engineering systems.	PO2(2)	PSO1(2) PSO2(1)
CO4	Conduct experiments in groups and interpret the results.	PO4(3) PO8(1)	PSO2(2) PSO3(2)
CO5	Report findings through case studies and written reports.	PO9(1)	PSO2(2) PSO3(3)



UC25H01	தமிழர் மரபு	L	T	P	C
		1	0	0	1

Course Objectives:

- பண்டைய தமிழர்களின் மரடப அறிமுகம் செய்தல்.
- பண்டைய தமிழர்களின் அறச்செய்தடைகடள புரிந்து சகொள்ளுதல்.
- பழங்கொலத் தமிழர்களின் பண்பொட்டுத் சதொதர்புகடள அறியச் செய்தல்.

அலகு-I 3

மொழி மற்றும் இலக்கியம்: இந்திய மொழிக் குடும்பங்கள், திராவிட மொழிகள், தமிழ் ஒரு செம்மொழி, தமிழ் செவ்விலக்கியங்கள், சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை, சங்க இலக்கியத்தில் பகிர்தல் அறம், திருக்குறளில் மேலாண்மைக் கருத்துக்கள், தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம், பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள், சிறுநிலக்கியங்கள், தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி, தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு-II 3

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

அலகு-III 3

நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம் தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி. புலியாட்டம் தமிழர்களின் விளையாட்டுகள்.

அலகு-IV 3

தமிழர்களின் திணைக் கோட்பாடுகள்: தமிழகத்தின் தாவரங்களும், விலங்குகளும், தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள். தமிழர்கள் போற்றிய அறக்கோட்பாடு, சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும், சங்ககால நகரங்களும் துறை முகங்களும், சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி, கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு-V 3

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு, இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள், தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

Total Hours:15

References:

1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ், முனைவர் இல. சுந்தரம், சென்னை பிரசுரம்).
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நுழைகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை, ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) Joint publication of TNTB & ESC and RMRL - (in print)

6. Social Life of the Tamils Institute of Tamil Studies. The Classical Period (Dr.S.Singaravelu) (Published by: International)
7. Historical Hentage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.

	Description of CO	PO	CO
CO1	மொழி மற்றும் இலக்கியம்	PO1	PSO1
CO2	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை	PO2	PSO1(2) PSO3(3)
CO3	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	PO3	PSO2(1)
CO4	தமிழர்களின் திணைக் கோட்பாடுகள்	PO4	PSO3(2)
CO5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	PO5	PSO3(3)



UC25H01	Heritage of Tamils	L	T	P	C
		1	0	0	1
UNIT I		3			
Language and Literature: Language Families in India, Dravidian Languages, Tamil as a Classical Language, Classical Literature in Tamil, Secular Nature of Sangam Literature, Distributive Justice in Sangam Literature, Management Principles in Thirukural, Tamil Epics and Impact of Buddhism & Jainism in Tamil Land, Bakthi Literature Azhwars and Nayanmars, Forms of minor Poetry - Development of Modern literature in Tamil Contribution of Bharathiyar and Bharathidhasan.					
UNIT II		3			
Heritage - Rock Art Paintings to Modern Art – Sculpture: Hero stone to modern sculpture, Bronze icons, Tribes and their handicrafts, Art of temple car making, Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments, Mridhangam, Parai, Veenai, Yazh and Nadhaswaram, Role of Temples in Social and Economic Life of Tamils.					
UNIT III		3			
Folk and Martial Arts: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyilattam, Leather puppetry, Silambattam, Valari, Tiger dance, Sports and Games of Tamils.					
UNIT IV		3			
Thinai Concept of Tamils: Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature, Aram Concept of Tamils, Education and Literacy during Sangam Age, Ancient Cities and Ports of Sangam Age, Export and Import during Sangam Age, Overseas Conquest of Cholas.					
UNIT V		3			
Contribution of Tamils to Indian National Movement and Indian Culture: Contribution of Tamils to Indian Freedom Struggle, The Cultural Influence of Tamils over the other parts of India, Self-Respect Movement, Role of Siddha Medicine in Indigenous Systems of Medicine, Inscriptions & Manuscripts, Print History of Tamil Books					
Total Hours:15					
References:					
1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).					
2. கணிணித் தமிழ், முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).					
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)					
4. பொருநை, ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)					
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)					
6. Social Life of the Tamils Institute of Tamil Studies. The Classical Period (Dr.S.Singaravelu) (Published by: International					
7. Historical Hentage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).					
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)					
9. Keeladi - 'Sangam City Civilization on the Banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)					

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



EN25C01	English Essentials – I	L	T	P	C
		2	0	0	2
Course Objectives: - Enhance learners' listening and speaking skills to understand and deliver speeches effectively - Equip students with the skills to write clear, coherent, and grammatically correct texts for various purposes. - Strengthen the ability to comprehend, interpret, and analyse written English across diverse contexts.					
UNIT-I Listening Skills 9 Listening to Simple Conversations, Understanding tone and intent, Short Speeches / Stories, Extracting information, Pronunciation, Listening to Various Accents. Suggested Activities: Listening and Repeating, Note-taking					
UNIT-II Speaking Skills 9 Self-Introduction, Expressing opinions, Participating in Conversations, Speech Acts - agreeing & disagreeing. Suggested Activities: Just a Minute (JAM) Video recording, Situational role plays, Usage of Apps.					
UNIT-III Reading Skills 9 Reading Strategies – Skimming, Scanning, Predicting, Intensive reading - short passages and long passages on suggested themes. Suggested Activities: Reading - newspaper and digital articles, Reading comprehension, note making and summarizing.					
UNIT-IV Writing Skills 9 Hints Development, Guided Writing, Writing Different Types of Paragraphs, Sentence Structure, Sentence Formation, Letter Writing, Emails (Formal & Informal). Suggested Activities: Picture and poster description, Brainstorming and Mind Mapping.					
UNIT-V Grammar and Vocabulary 9 Tenses, Adjectives, Subject-Verb Agreement, Sentence Patterns, Synonyms and Antonyms, Word Substitution, Prefixes and suffixes, Idioms and Phrases. Suggested Activities: Gap fills exercises, Cloze Test, Error Detection and Spell Bee.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (10%), Assignments (20%), Speaking Task (10%), Reading Task (10%), Writing Task (10%), Internal Examinations (40%).					
Total Hours:45					
References: - Miller, K. Q., & Wahl, S. T. (2023). <i>Business and Professional Communication: KEYS for Workplace Excellence</i> (5th ed.). SAGE Publications. - Kumar, Sanjay & Pushpalatha. (2018). <i>English Language and Communication Skills for Engineers</i>. India: Oxford University Press. - Sharma, S., & Mishra, B. (2024). <i>Communication Skills for Engineers and Scientists</i> (2nd ed.). PHI Learning					
E-resources: Cambridge English – https://www.cambridgeenglish.org/learning-english/grammar-and-vocabulary/					

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

	Description of CO	PO	PSO
CO1	Listen and comprehend spoken English, take and draft notes.	---	---
CO2	Develop communication skills relevant to engineering and technology.	PO1(3)	PSO1(2) PSO3(3)
CO3	Analyze texts in different contexts using appropriate reading strategies.	PO2(2)	PSO2(1)
CO4	Communicate thoughts and ideas in real life situations.	PO9(2)	PSO3(2)
CO5	Apply vocabulary and grammar appropriately to communicate in written and spoken forms.	PO11(1)	PSO3(3)



CS25C02	Computer Programming: Python	L 2	T 0	P 2	C 3
Course Objectives: - To equip engineering students with the foundational knowledge and practical skills in Python programming to analyse and solve computational problems effectively. - To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.					
UNIT-I Introduction to Python: 9 Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, Interactive and Script Mode, Indentation, Comments, Error messages, Variables, Reserved Words, Data Types, Arithmetic operators and expressions, Built-in Functions, Importing from Packages. Practical (Minimum Three Programs) Problem Analysis Charts, Algorithms, Flowcharts, Pseudocode for Simple Python Programs					
UNIT-II Control Structures and Functions 9 Control Structures: if, if-else, Nested if, Multi-way if-elif Statements, while Loop, for Loop, Nested Loops, pass Statement. Functions: Hiding Redundancy and Complexity, Parameters, Arguments and Return Values, Formal and Actual Arguments, Named Arguments, Recursive Functions, Lambda Functions. Practical (Minimum Three Programs) Programs using Conditional Statements, Programs using Looping Statements, Programs using User-defined Functions, Recursive and Lambda Function Programs					
UNIT-III Strings & Collections: 9 Strings: String Comparison, Formatting, Slicing, Splitting, Stripping. Collections: Lists, Tuples, Dictionaries, Basic List Operators, Searching and Sorting Lists, Dictionary Literals, Adding and Removing Keys, Accessing and Replacing Values. Practical (Minimum Three Programs) String Manipulation Programs, Programs using Lists, Programs using Tuples, Programs using Dictionaries					
UNIT-IV File Handling nad Modules: 9 File Operations: Create, Open, Read, Write, Append and Close Files, Manipulating Directories, OS and Sys Modules, Reading and Writing Text and Numbers, Creating and Reading Formatted Files (CSV, Tab-separated Files). Practical (Minimum Three Programs) Reading and Writing Text Files, Reading and Writing CSV Files, Directory Manipulation, Sorting Data from Files					
UNIT-V Packages and Mini Project: 9 Packages: Built-in Modules, User-defined Modules, NumPy, SciPy, Pandas, Scikit-learn. Practical (Minimum Three Programs)					

- Programs using Built-in Modules, User-defined Modules, NumPy Programs, Pandas Programs, SciPy and Scikit-learn Applications

Mini Project

Development of **Minimum Two** Python-based projects integrating problem-solving, functions, collections, file handling, and Python packages.

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

Assessment Methodology: Quiz (5%), Project (15%), Assignment Programs (25%), Practical (25%), Internal Examinations (30%)

References:

1. Matthes, E. (2019). *Python crash course: A hands-on, project-based introduction to programming* (2nd ed.). No Starch Press.
2. Brown, M. C. (2018). *Python: The complete reference* (4th ed.). McGraw Hill Publishers.
3. Guttag, J. V. (2016). *Introduction to computation and programming using Python: With applications to understanding data* (2nd ed.). MIT Press.
4. McKinney, W. (2017). *Python for data analysis: Data wrangling with pandas, NumPy, and IPython*. Shroff/O'Reilly.

E-Resources:

1. Official Python Documentation – <https://docs.python.org/3/>
2. Python Tutorials – <https://www.w3schools.com/python/>
3. NumPy – <https://numpy.org/doc/>
4. SciPy – <https://scipy.org/>
5. Google's Python class – <https://developers.google.com/edu/python/>

	Description of CO	PO	PSO
CO1	Apply problem-solving techniques to develop algorithms, flowcharts, and Python programs using fundamental programming concepts.	---	---
CO2	Develop Python programs using control structures, functions, recursion, and modular programming techniques.	PO1 (2) PO2 (3) PO5 (2)	PSO2(2) PSO3(1)
CO3	Implement Python applications using strings, lists, tuples, dictionaries, and other collection data types.	PO2 (3) PO8 (1) PO9 (1)	PSO3(1) PSO3(2)
CO4	Develop programs for file handling and utilize Python modules to perform data processing tasks.	PO11 (1)	PSO2(2)
CO5	Apply Python packages such as NumPy, Pandas, SciPy, and Scikit-learn to solve engineering and data analysis problems through mini projects.	PO11 (1)	PSO2(2)



ME25C04	Makerspace	L	T	P	C
		0	0	4	2
Course Objectives:					
1. To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques. 2. To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators.					
List of Activities					
(A). Dis-assembly & Assembly Practices i. Tools and its handling techniques. ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine. iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators. iv. Dis-assembly and assembly of a Bicycle. (B). Welding Practices i. Welding Procedure, Selection & Safety Measures. ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes. iii. Hands-on session of preparing base material & Joint groove for welding. iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Steel plates / pipes, for fabrication of a simple part. (C). Electrical Wiring Practices i. Electrical Installation tools, equipment & safety measures. ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box. iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells. iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply. (D). Electronics Components / Equipment Practices i. Electronic components, equipment & safety measures. ii. Dis-assembly and assembly of Computers. iii. Hands-on session of Soldering Practices in a Printed Circuit Board. iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier. v. Hands-on session of integration of sensors and actuators with a Microcontroller. vi. Demonstration of Programmable Logic Control Circuit.					



(E). Contemporary Systems

- i. Demonstration of Solid Modelling of components.
- ii. Demonstration of Assembly Modelling of components.
- iii. Fabrication of simple components / parts using 3D Printers.
- iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

References:

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

	Description of CO	PO	PSO
CO1	Demonstrate proper use and handling of basic hand and power tools.	---	---
CO2	Carry out electrical wiring installations and repairs, applying safety measures in domestic applications.	PO1(3)	PSO2(1)
CO3	Develop solid innovative models through software.	PO5(2)	PSO2(2)
CO4	Adapt and follow safety protocols in the work environment.	PO11(2)	PSO3(2)



UC25A01	Life Skills for Engineers – I	L	T	P	C
		1	0	2	1
Course Objectives • To equip engineering students with essential life skills encompassing personal and emotional development, effective management of time and stress, financial literacy, digital safety, and civic responsibility. • To enhance self-awareness, interpersonal skills, and resilience to prepare students for the professional and personal challenges of engineering careers and life beyond academics.					
Personal and Emotional Development: Self-Awareness & Personality, Emotional Intelligence & Empathy, Positive thinking, Right attitude, Stress & Anger Management, Goal-Setting & Time Management, Growth Mindset & Resilience. Activities: Personality tests (MBTI, DISC), reflection journals, Empathy circle, role-playing difficult conversations, Guided mindfulness sessions, stress relief toolkit creation, Vision board creation, weekly time audit and planner, Group challenge scenarios, resilience journal.					
Management Skills: Financial Literacy: Budgeting & Saving, Nutrition, Health, and Hygiene, Digital Literacy & Online Safety, Civic Responsibility & Ethics Activities: Create a monthly budget, financial simulation game, Meal planning workshop, physical wellness challenge, Social media audit, privacy and safety scenarios, CommUNITy service, values debate.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)					
References: 1. Khera, S. (2003). <i>You can win</i>. Macmillan. 2. Levesque, H. (n.d.). <i>Life skills 101: A practical guide to leaving home and living on your own</i>. (Publication year not specified) 3. Mitra, B. K. (2017). <i>Personality development & soft skills</i> (3rd impression). Oxford University Press. 4. ICT Academy of Kerala. (2016). <i>Life skills for engineers</i>. McGraw Hill Education (India) Private Ltd.					

	Description of CO	PO	PSO
CO1	Understand personality traits and emotional intelligence, in interpersonal interactions.	---	---
CO2	To work and execute as a team through successful implementation of set goals.	PO7 (1) PO8 (2) PO9 (2)	PSO3(2)
CO3	Develop and implement best practices in day-to-day life, in terms of planning and execution.	PO11 (3)	PSO3(2)

UC25A02	Physical Education - I	L 0	T 0	P 4	C 1
Course Objectives: • To impart the fundamentals of physical education for development of students' physical, mental, and social well-being. • To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship.					
Introduction to physical education: Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid practices.					
Participation of athletic events: Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles.					
Skill development in any one of the following outdoor games: Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.					
Skill development in any one of the following indoor games: Shuttle Badminton, Chess and Table Tennis.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)					
References: 1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers. 2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co. 3. Mangal, S. K. (2009). <i>Psychology of sports performance</i>. Sports Publication.					
E-resources: 1. https://www.who.int/health-topics/physical-activity					

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	---
CO2	Apply basic principles of exercise science in the routine life.	PO1(3)	PSO1(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8(3)	PSO3(2)
CO4	Demonstrate independent learning in health, nutrition, and fitness-related topics.	PO11(2)	PSO3(2)



Semester II



MA25C02	Linear Algebra	L	T	P	C
		3	1	0	4
Course Objectives: - To impart foundational knowledge in linear algebra essential for analysing and solving problems in engineering applications. - To provide the knowledge on computation using software and interpret key linear algebra concepts using software.					
UNIT-I Vector Spaces:		12			
Introduction to Vector Spaces, Examples, Subspaces, Linear Combinations, Span, Generating Sets, Linear Dependence and Independence, Basis and Dimension, Dimension of Subspaces.					
Activities: Open-Source software, exercises to test linear dependence and independence using rank, compute span and basis of a set of vectors, determine the dimension of subspaces, and illustrate the concept of subspace and basis in R^2/R^3 with visualization.					
UNIT-II Linear Transformations and Diagonalization:		12			
Null space, Range, Dimension Theorem (statement only), Matrix representation of a linear transformation.					
Activities: Open-Source software, exercises to compute the matrix representation of a linear transformation, find the null space and range of a matrix.					
UNIT-III Eigen Value Analysis:		12			
Eigenvalues & Eigenvectors- Linear Independence of Eigenvectors – Diagonalization of Matrices – Conditions for Diagonalizability – Construction of Modal Matrix – Applications of Diagonalization – Simple problems (up to 3×3 matrices).					
Activities: Open-source software, exercises to compute eigenvalues and eigenvectors of matrices, determine Eigen spaces, verify linear independence of eigenvectors, test the diagonalizability of matrices, construct the modal matrix, and verify diagonalization using computational tools.					
UNIT-IV Inner Product Spaces:		12			
Inner product, Norms, Cauchy, Schwarz inequality, Gram, Schmidt orthogonalization, Simple problems (up to R^3).					
Activities: Open-Source software, exercises to compute inner products and vector norms.					
UNIT-V Matrix Decomposition:		12			
Orthogonal transformation of a symmetric matrix to diagonal form - Positive definite matrices, QR decomposition, Singular Value Decomposition (SVD), Least squares solutions- simple problems (up to 3×3 matrices).					
Activities: Open-Source software, exercises to check if a matrix is positive definite, perform QR decomposition and SVD using built-in functions.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignment (20%), Software activity (20%), Quiz (20%), Internal Examinations (40%).					

References:

1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). *Linear algebra*. Pearson.
2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). *Linear algebra and its applications with MATLAB*. Pearson.
3. Bronson, R. (2011). *Schaum's outline of matrix operations*. McGraw-Hill Education.
4. Strang, G., & Thomson, R. (2005). *Linear algebra and its applications*. Brooks/Cole.
5. Lipschutz, S., & Lipson, M. (2009). *Schaum's outline of linear algebra*. McGraw-Hill.
6. Kreyszig, E. (2018). *Advanced engineering mathematics*. Wiley India.

	Description of CO	PO	PSO
CO1	Explain the fundamental concepts of Linear Algebra.	---	---
CO2	Compute and interpret eigenvalues and eigenvectors.	PO1(3)	PSO1(2)
CO3	Apply inner product concepts and perform orthogonalization.	PO1 (3)	PSO1(1)
CO4	Compute least squares solutions of linear system of equations.	PO1 (2) PO2 (2)	PSO3(1)
CO5	Use MATLAB to implement and validate key linear algebra concepts	PO5 (1) PO11 (1)	PSO2(2)



ME25C02	Engineering Mechanics	L	T	P	C
		3	1	0	4
Course Objectives: • To introduce the fundamental concepts and principles of statics related to forces acting on particles and rigid bodies. • To develop the ability to formulate and apply equilibrium equations for particles and rigid bodies in two and three dimensions. • To enable students to analyse force systems through vector resolution and calculation of moments and couples.					
UNIT-I Forces and Equilibrium of Particles					12
Resultant of forces in a plane, Equilibrium of a particle in a plane, Addition of concurrent forces in space, Equilibrium of a particle in space.					
UNIT-II Equilibrium of Rigid Bodies					12
Free Body Diagram, Equivalent force systems, Transmissibility, Moment of force about a point and axis, Couples and force-couple systems, Equilibrium of rigid bodies in two and three dimensions, Principle of virtual work					
UNIT-III Centroids and First Moment of Areas					12
First moments of areas and lines, Centroids of composite areas and lines, Pappus–Guldinus theorems.					
UNIT-IV Moment of Inertia of Areas and Masses					12
Second moment of area, Parallel axis theorem, Rectangular and Polar Moments of Inertia, Radius of gyration, Product of inertia, Principal axes and principal moments of inertia, Mass moments of inertia of thin plates.					
UNIT-V Friction					12
Laws of friction, Coefficient of friction, Angle of friction, Friction problems, Wedges, Ladder friction, Belt friction.					
Weightage: Continuous Assessment: 40% End Semester Examinations: 60%					
Assessment Methodology: Quiz - 10%, Assignments - 20%, Solving of GATE questions (20%) and Internal Examinations - 50%					
References: 1. Beer, F. P., Johnston Jr., E. R., DeWolf, J. T., & Mazurek, D. F. (2015). Mechanics of Materials. McGraw-Hill Education. 2. Meriam, J. L., & Kraige, L. G. (2018). <i>Engineering Mechanics: Statics and Dynamics</i> . Wiley. 3. Pytel, A., & Kiusalaas, J. (2014). Engineering Mechanics (Indian Edition). Cengage Learning India.					
E-resources: 1. Moment of Inertia Calculator – https://skyciv.com/free-moment-of-inertia-calculator/ 2. OpenStax – University Physics Volume 1 – https://openstax.org/books/university-physics-volume-1/pages/10-4-moment-of-inertia-and-rotational-kinetic-energy 3. Engineering Mechanics, Dr. Dwarakish G. S. – https://onlinecourses.swayam2.ac.in/course24_ed75/preview					

	CO Description	PO	PSO
CO1	Explain the fundamental concepts of forces and apply equilibrium conditions to particles in two- and three-dimensional force systems.	PO1(3)	PSO1(3)
CO2	Analyze rigid bodies using free body diagrams, equivalent force systems, moments, couples, and the principle of virtual work.	PO1(3)	PSO1(3)
CO3	Determine centroids and first moments of simple and composite areas using appropriate engineering principles.	PO2(2)	PSO1(3)
CO4	Calculate area and mass moments of inertia, principal axes, principal moments, and radius of gyration for engineering applications.	PO3(2)	PSO2(3)
CO5	Solve engineering problems involving dry friction, wedges, ladders, and belt friction.	PO3(2)	PSO3(1)



EE25C01	Basic Electrical and Electronics Engineering	L	T	P	C
		3	0	0	3
Course Objectives: To impart foundational knowledge in principles and applications of electrical and electronics engineering.					
UNIT-I DC Fundamentals		9			
Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Kirchhoff's law, Series parallel combination of R, L and C components, Voltage Divider and Current Divider Rules.					
Activities: Virtual Demonstration of electrical laws & circuits, Hands-on Breadboarding, Solving GATE questions.					
UNIT-II AC Fundamentals		9			
Faraday's Laws of Electro-magnetic Induction, Definition of Self and Mutual Inductances, Generation of sinusoidal voltage, Instantaneous & RMS values of sinusoidal signals, Introduction to 3-phase systems, Electrical Safety, Fuses and Earthing.					
Activities: Virtual Demonstration of electromagnetic induction, Measurement of instantaneous and RMS values of AC signals, Solving GATE questions.					
UNIT-III Electric Machines		9			
DC Machines, Transformers, Star and delta Connections, Three phase Induction motors, Synchronous Generators, Single Phase Induction Motors, Stepper Motor, Universal Motor and BLDC motor.					
Activities: Virtual demonstration of step-up and step-down transformers, Virtual working models of Universal and BLDC motors, Solving GATE questions.					
UNIT-IV Analog and Digital Electronics		9			
Semiconductor Devices : PN junction diodes, Zener Diode, Voltage regulator, BJT & FET Transistors, Timers, Operational Amplifiers.					
Digital Electronics: Boolean algebra, Basic and Universal Gates, adders, multiplexers, demultiplexers and flip-flops.					
Activities: Virtual demonstration of V-I characteristics of PN junction and Zener diodes using simulation, inverting/non-inverting amplifiers, Online logic gate simulators, Solving GATE questions.					
UNIT-V Microcontrollers		9			
Microcontrollers: Introduction, Architecture, Potential Applications.					
Activities: Physical demonstration of a microcontroller and online simulation of microcontroller.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (5%), Assignments (25%), GATE Questions (20%), Internal Examinations (50%)					
E-resources:  https://archive.nptel.ac.in/courses/08/106/108106172/ - Circuit Simulator – https://www.falstad.com/circuit/					



	Description of CO	PO	PSO
CO1	Learnt the fundamentals of DC Circuits	---	---
CO2	Apply basic and AC circuits calculations in electrical systems.	PO2(3)	PSO1(1)
CO3	Understand the concepts of electrical machines.	PO1(3)	PSO1(2)
CO4	Explain the basic electronics engineering concepts.	PO3(3)	PSO2(2)
CO5	Understand the underlying mechanisms behind the microcontrollers	PO3(2)	PSO1(3)



PH25C05	Applied Physics (ME) – II	L	T	P	C
		2	1	0	3
Course Objective(s): To provide a comprehensive understanding of physics concepts in Civil engineering applications.					
UNIT-I Mechanic		9			
Elasticity -Types of supports and loads - free body diagrams - Equilibrium of rigid bodies - Types of structures: Beams, frames, trusses -Analysis of trusses - internal forces in members - Moment of inertia and bending- cantilever					
Activities: Virtual Demonstration of deflection of beams and moment of inertia.					
UNIT-II Acoustics		9			
Reverberation - Loudness -Focusing - Echelon - Noise -Echo - Resonance - Interference -Sabine's formula (Derivation) - Absorption coefficient-Sonometer - Sound insulation.					
Activities: Virtual Demonstration of sound insulation and resonance.					
UNIT-III Light		9			
Visual field glare, colour - day light calculations -day light design of windows, measurement of day light and use of models and artificial skies - artificial lighting - LED characteristics.					
Activities: Virtual Demonstration of heat infiltration in glass, glass as building material, LED Characteristics.					
UNIT -IV Engineering materials		9			
Composites - Fibre Reinforced Plastics (FRP) -Fiber Reinforced Metals (FRM) - Fiber Reinforced Bricks (FRB) - Shape memory alloys Activities: Demonstration of Shape memory alloys equipment					
UNIT-V Ceramic materials		9			
Ceramics - Thermal, Mechanical, Electrical and Chemical properties -3D printed construction materials - Nano materials. Activities: Demonstration of 3D printing of materials, Composite fabrication.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (10%), Assignments (30%), Flipped Class (10%), Internal Examinations (50%)					
References: 1. Balasubramaniam, R. (201 4). Callister's materials science and engineering. Wiley India Pvt. Ltd. 2. Hibbeler, R. C. (201 7). Engineering mechanics. Pearson. 3. Hibbeler, R. C. (2023). Structural analysis. Pearson. 4. Medved, S. (2021). Building physics. Springer.					
E-resources: 1. Moment of Inertia: https://youtu.be/fDJJeVR0ow 2. Ceramics: https://www.youtube.com/watch?v=oeDANQrsnZ0 3. Sound Insulation: https://youtu.be/nhE2a4GEOtA 4. Shape memory alloys : https://nescacademy.nasa.gov/video/00a31561480547248033a1c2df6f87831d 5. White LED: https://archive.nptel.edu/courses/108/108/108108122/ 6. Day lighting and lighting design https://youtu.be/vZO09qL-vZs 7. 3D Printed construction materials https://www.youtube.com/watch?v=UntRnpuWBtU					

	Description of CO	PO	PSO
CO1	Understand elasticity beam and trusses and analyze structures.	PO1(3), PO2(2)	PSO1(3)
CO2	Explain acoustics and control techniques.	PO1(2), PO2(2)	PSO1(3) PSO2(2)
CO3	Apply lighting principle and understand LED Characteristics	PO1(3), PO5(2)	PSO1(3) PSO2(2)
CO4	Understand engineering material, composites and shape memory alloys	PO1(3), PO2(2)	PSO1(3) PSO2(3)
CO5	Explain ceramics, nanomaterials and 3D Printing materials	PO1(3), PO5(2)	PSO1(3) PSO3(2)



CY25C03	Applied Chemistry (ME) – II	L 2	T 0	P 0	C 2
Course Objective(s): - To impart knowledge and expose to applications of chemistry in mechanical engineering stream. - To explore the mechanisms and working principles of smart materials and coatings with real-world applications.					
UNIT – I Functional Materials: 6 Types, Smart coatings, Mechanisms, Sustainable energy materials. Activities: Seminar on recent development in functional materials (e.g., smart coatings, self-cleaning surfaces), Infographic Design of functional nanomaterials.					
UNIT – II Fuels: 6 Classification, Chemical Composition, natural resources, Calorific Value - Alternative Fuels - Natural gas benefits. Activities: Comparison of efficiency and emissions in fuels.					
UNIT - III Composites: 6 Matrix materials – Reinforcements, Hybrid composites, Engineering applications. Activities: Design of a simple composite structure for a real engineering application (e.g., lightweight bike frame).					
UNIT - IV Lubricants and Adhesives: 6 Types, Functions. Key properties, Synthetic lubricants, Mechanisms, Emerging lubricants. Adhesion Mechanisms, Classification, Bond strength, Industrial adhesives. Activities: Collection of lubricants used in real-world engineering systems (e.g., gears, engines, bearings), Virtual demonstration of lubricant viscosity testing. Adhesion of thermal pads on different Integrated circuits, Industrial adhesives.					
UNIT - V Combustion: 6 Reaction Kinetics, Stoichiometric combustion and air-fuel ratio calculations, Knocking and Anti-knocking agents, Hydrogen combustion, Flue Gas analysis. Activities: Virtual simulation of flue gas analysis and gas composition, Calculation of air-fuel ratio.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (5%), Seminar (5%), Assignments (30%), Flipped Class (10%), Internal Examinations (50%)					
References: - Palanna, O. G. (2009). <i>Engineering chemistry</i>. McGraw-Hill Education (India) Pvt. Ltd. - Cheong, K. Y., Impellizzeri, G., & Fraga, M. A. (2018). <i>Emerging materials for energy conversion and storage</i>. Elsevier. - Jain, P. C., & Jain, M. (2013). <i>Engineering chemistry</i>. Dhanpat Rai Publishing Company (P) Ltd. - Sharma, S. C. (2000). <i>Composite materials</i>. Narosa Publishing House					



	Description of CO	PO	PSO
CO1	Explain the major concepts of chemistry with regard to applications in mechanical systems.	---	PSO1(2)
CO2	Apply the chemistry principles and evaluate the engineering materials in mechanical systems.	PO1(3)	PSO1(2)
CO3	Analyse and evaluate the performance and efficiency of mechanical systems.	PO2(3) PO3(1)	PSO2(2) PSO3(1)
CO4	Propose innovative solutions for real-world applications and challenges.	PO9(1)	PSO2(2) PSO3(1)
CO5	Propose sustainable and innovative chemical solutions for corrosion control, energy conversion and	PO9(1) PO11(1)	PSO2(2) PSO3(1)



UC25H02	தமிழர்களும் தொழில்நுட்பமும்/ Tamils and Technology	L	T	P	C
		1	0	0	1

அலகு-I 3 நெசவு மற்றும் பாணைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில், பாணைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள், பாண்டங்களில் கீறல் குறியீடுகள்.
அலகு-II 3 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு, சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள், மாமல்லபுரச் சிற்பங்களும், கோவில்களும், சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள். மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ, சாரோசெனிக் கட்டிடக் கலை.
அலகு-III 3 உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை, உலோகவியல், இரும்புத் தொழிற்சாலை, இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள், நாணயங்கள் அச்சடித்தல், மணி உருவாக்கும் தொழிற்சாலைகள், கல்மணிகள், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள், எலும்புத்துண்டுகள், தொல்லியல் சான்றுகள். சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.
அலகு-IV 3 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் : அணை, ஏரி, குளங்கள், மதகு. சோழர்காலக் குழுமித் தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள், வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள், கடல்சார் அறிவு. மீன்வளம், முத்து மற்றும் முத்துக்குளித்தல், பெருங்கடல் குறித்த பண்டைய அறிவு, அறிவுசார் சமூகம்.
அலகு-IV 3 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி. கணித்தமிழ் வளர்ச்சி. தமிழ் நூல்களை மின்பதிப்பு செய்தல், தமிழ் மென்பொருட்கள் உருவாக்கம், தமிழ் இணையக் கல்விக்கழகம், தமிழ் மின் நூலகம், இணையத்தில் தமிழ் அகராதிகள், சொற்குவைத் திட்டம்.
Total Hours:15
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%
Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)
Text-Cum-Reference Books
1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2. கணினித் தமிழ், முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்). 3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) 4. பொருநரை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print) 6. Social Life of the Tamils, The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies. 7. Historical Heritage of the Tamils (Dr.S.V. Subramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies) 8. The Contributions of the Tamils to Indian Culture. (Dr. M.Valarmathi) (Published by: International Institute of Tamil Studies.) 9. Keeladi, 'Sangam City Civilization on the banks of River Vaigai' (Jointly Published by:

Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)

(Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.



C25H02	Tamils and Technology	L	T	P	C
		1	0	0	1
UNIT-I		3			
Weaving and Ceramic Technology: Weaving Industry during Sangam Age, Ceramic technology, Black and Red Ware Potteries (BRW), Graffiti on Potteries.					
UNIT-II		3			
Design and Construction Technology: Designing and Structural construction House & Designs in household materials during Sangam Age, Building materials and Hero stones of Sangam age, Details of Stage Constructions in Silappathikaram, Sculptures and Temples of Mamallapuram, Great Temples of Cholas and other worship places,Temples of Nayaka Period, Type study (Madurai Meenakshi Temple), Thirumalai Nayaka rMahal, Chetti Nadu Houses, Indo, Saracenic architecture at Madras during British Period.					
UNIT-III		3			
Manufacturing Technology: Art of Ship Building , Metallurgical studies, Iron industry, Iron smelting, steel, Copper and gold Coins as source of history - Minting of Coins, Beads making, industries Stonebeads, Glass beads, Terracotta beads, Shell beads / bone beats, Archeological evidences, Gem stone types described in Silappathikaram.					
UNIT-IV		3			
Agriculture and Irrigation Technology: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompuof Chola Period, Animal Husbandry - Wells designed for cattle use , Agriculture and Agro Processing -Knowledge of Sea -Fisheries, Pearl, Conche diving, Ancient Knowledge of Ocean -Knowledge Specific Society.					
UNIT-V		3			
Scientific Tamil & Tamil Computing: Development of Scientific Tamil, Tamil computing, Digitalization of Tamil Books, Development of Tamil Software, Tamil Virtual Academy, Tamil Digital Library, Online Tamil Dictionaries, Sorkuvai Project.					
Total Hours:15					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (20%), Assignments (30%), Internal Examinations (50%)					
Text-Cum-Reference Books					
1. தமிழக வரலாறு, மக்களும் பண்பாடும், கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).					
2. கணினித் தமிழ், முனைவர் இல சுந்தரம் (விகடன் பிரசுரம்).					
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)					
4. பொருநை, ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)					
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)					
6. Social Life of the Tamils, The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.					
7. Historical Heritage of the Tamils (Dr.S.V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).					
8. The Contributions of the Tamils to Indian Culture (M.Valarmathi) (Published by: International Institute of Tamil Studies.)					
9. Keeladi, 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,					

Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)

(Published by: The Author)

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.



ME25C05	Re-Engineering for Innovation	L	T	P	C
		0	0	4	2
Course Objectives: - To cultivate foundational skills in prototyping, and automation for development of prototypes with real-world applications. - To provide a comprehensive, hands-on exposure to product development through reverse engineering concepts.					
Bootcamp 1: Introduction to Product Development, Reverse Engineering, Overview of the product lifecycle, Hands-on disassembly of simple products, Practice of basic measurements and sketching, Introduction to CAD modeling of disassembled parts, Virtual assembly of parts.					
Bootcamp 2: Embedded System Programming (Open-source platforms), Practice of interfacing sensors, reading data, automation in home, healthcare and agriculture.					
Reverse Engineering: Sketch and prototype alternative designs, Group brainstorming sessions, Manufacture prototype parts using 3D printing and / or workshop tools, Assemble prototype product.					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)					
References: - Wang, W. (2010). Reverse engineering: Mechanisms, structures, systems & materials. CRC Press. - Margolis, M. (2020). Arduino cookbook: Recipes to begin, expand, and enhance your projects (3rd ed.). O'Reilly Media.					
E-resources: - GrabCAD – https://grabcad.com/ - GitHub – https://github.com/					

	Description of CO	PO	PSO
CO1	Understand the product development lifecycle, including stages such as concept generation, design, prototyping, and testing.	---	
CO2	Apply reverse engineering techniques to analyze and document existing products.	PO1 (3) PO2 (2)	PSO1(2)
CO3	Collaborate in teams to fabricate prototypes using appropriate tools.	PO5 (2) PO8 (1) PO9 (1)	PSO3(3)
CO4	Engage in independent learning and continuously adapt to emerging technologies in product design	PO11(2)	PSO2(2) PSO3(2)



EN25C02	English Essentials – II	L	T	P	C
		1	0	2	2
Course Objectives: • Enable learners to improve fluency and accuracy in spoken and written communication. • Develop learners’ ability to articulate ideas clearly and effectively in formal and informal spoken interactions. • Help learners construct well-organised written documents relevant to academic and workplace contexts.					
UNIT-I Oral Communication		9			
Types - Verbal and Nonverbal, Interpersonal and Group communication, Telephonic conversation.					
Suggested Activities: Short presentations, Listen and respond to short podcasts.					
UNIT-II Conversational Skills		9			
Formal Speeches, Welcome Address, Vote of Thanks and Introducing Chief guests, Brainstorming and Group discussions.					
Suggested Activities: Debates, Role Play.					
UNIT-III Business Correspondence		9			
Email Communication, Formal Letters & Types - Complaint, Request and Permission Letters, Business Meeting.					
Suggested Activities: Agenda, Minutes of the Meeting.					
UNIT-IV Academic Writing		9			
Paraphrasing, Summarizing, Essay Writing - Cause and Effect, Argumentative, Persuasive, Instructions and Recommendations.					
Suggested Activities: User guides/ manuals, Policy document.					
UNIT-V Team Work		9			
Leadership Skills - Team building, Team Leader, Team player, Negotiation and Problem solving skills.					
Suggested Activities: SWOT Analysis.					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					
Assessment Methodology: Worksheets (10%), Group Activity (20%), Report Writing (20%), Internal Examinations (50%)					
References: 1. Koneru Aruna. (2020). <i>English Language Skills for Engineers</i>. McGraw Hill Education. 2. Taylor, Shirley & Chandra .V. (2010). <i>Communication for Business A Practical Approach</i>. India: Pearson Longman. 3. Ian Badger, et al., (2014). <i>Listening: B2 (Collins English for Life: Skills)</i>, Collins. 4. Raymond Murphy (2019), <i>Grammar in Use</i>, Cambridge University Press.					
E-Resources: 1. Communication for Business Success - https://open.umn.edu/opentextbooks/textbooks/8 2. TED Talks – https://www.ted.com/					



	Description of CO	PO	PSO
CO1	Understand the importance of communication and drafting skills in engineering and technology.	---	
CO2	Apply listening strategies to comprehend spoken English in various contexts.	PO1(3)	PSO3(2)
CO3	Participate actively in group discussions by analysing critically from different views.	PO2(2) PO8(1)	PSO3(3)
CO4	Create written reports coherently for various purposes.	PO9(2)	PSO3(2)
CO5	Adapt communication styles to global, multicultural environments.	PO11(1)	PSO2(2)



UC25A03	Life Skills for Engineers – II	L	T	P	C
		1	0	2	1
Course Objectives: To impart and cultivate analytical reasoning, innovative thinking, effective collaboration, and ethical leadership to prepare students for complex challenges in professional and personal environments.					
Critical Thinking: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.					
Activities: Two-Brainstorm Method, “30 Circles” Challenge, “Desert Survival” Simulation, Lateral thinking riddles and puzzles, "What If?" Scenario Writing, Fast vs. Slow Thinking Game, Creativity Myth Busters					
Problem Solving: Techniques, Six Thinking Hats, Mind Mapping, Forced Connections. Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking.					
Activities: Case study analysis, Escape Room challenge.					
Leadership: Leadership Styles & Self-Assessment, Communication & Active Listening, Decision-Making & Responsibility, Teamwork & Delegation, Empathy, Integrity & Conflict Management, Vision, Motivation & Goal-Setting.					
Activities: Crisis Leadership Simulation, Tower Challenge, Leadership Dilemmas Role-Play, Team Vision Board					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)					
References: - De Bono, E. (2017). <i>Six thinking hats</i>, Little, Brown Book Group. - Facione, P. A. (2015). <i>Critical thinking: What it is and why it counts</i>. Insight Assessment. - Kahneman, D. (2011). <i>Thinking, fast and slow</i>. Farrar, Straus and Giroux. - Whetten, D. A., & Cameron, K. S. (2016). <i>Developing management skills</i>. Pearson.					

	Description of CO	PO	PSO
CO1	Explain the importance of leadership and management skills in life.	---	
CO2	Apply and demonstrate creative thinking techniques to generate innovative solutions.	PO7 (3)	PSO1(1) PSO2(1)
CO3	Exhibit effective collaboration and communication skills through teamwork, active listening, and conflict resolution strategies.	PO8 (2)	PSO3(3)
CO4	Integrate scientific temperament and logical reasoning into problem solving in engineering and real-world contexts.	PO11 (2)	PSO2(1) PSO3(2)

UC25A04	Physical Education - II	L 0	T 0	P 4	C 1
Course Objectives: To impart knowledge on gymnastic exercises and pressing needs for upskilling in a particular game.					
Basic gymnastics exercises: Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.					
Upskilling in any one of the athletics: Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discuss Throw, Shot Put, Short and Long-distance Running.					
Advance skills in any one of the indoor/outdoor games, which has been opted by the student in the I semester.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)					
References: - Singh, A. (2008). Essentials of physical education. Kalyani Publishers. - Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co. - Mangal, S. K. (2009). <i>Psychology of sports performance</i>. Sports Publication. - Kandappan, K. (2004). <i>Foundations of physical education</i>. Friends Publications.					
E-resources: https://www.who.int/health-topics/physical-activity					

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	
CO2	Apply safety principles and methods during sports activities.	PO1(3)	PSO3(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8 (3)	PSO3(2)
CO4	Demonstrate the advanced technical skills and strategic understanding in the game of their interest.	PO11(1)	PSO3(2)



Foreign Language^

UC25F01	Deutsch – I	L 1	T 0	P 2	C 1
Course Objectives: To impart fundamentals of the Deutsch language, including reading, writing systems, pronunciation, and speaking.					
Basics & Introduction: German alphabet and pronunciation, Basic greetings and farewells, Introducing yourself and others (Ich heiße..., Wer bist du?), Numbers 1–100 and days of the week, Personal pronouns (ich, du, er, sie...), Sentence structure (SVO word order). Activities: Alphabet spelling game, short skits, Use color-coded cards for SVO sentences.					
Grammar Essentials & Everyday Vocabulary: Present tense of regular verbs (spielen, arbeiten, machen...), Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Articles and gender (der, die, das; ein, eine), Simple questions and negation (nicht, kein), Describing people and things: adjectives and colors, Family, school, food, and common objects vocabulary. Activities: Conjugate regular and irregular verbs, “Question Chain” game, Create a simple family tree.					
Everyday Communication in German: Asking for and giving directions, Telling the time and talking about schedules, Ordering food and drinks at a café or restaurant, Talking about hobbies, weather, and daily routines, Listening to short conversations and responding appropriately, Introduction to German culture and formal/informal language use (du vs Sie). Activities: Ordering food and drinks, Give directions, Formal / Informal greetings, Do's and Don'ts.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%					
References: Funk, H., Kuhn, C., & Demme, S. (2015). Menschen A1: Deutsch als Fremdsprache Kursbuch. Hueber Verlag.					



	CO Description	PO	PSO
CO1	Understand simple spoken Deutsch in everyday contexts.	---	
CO2	Communicate with widely used Deutsch words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Deutsch language.	PO11 (1)	PSO3(2)



UC25F02	Japanese – I	L	T	P	C
		1	0	2	1
Course Objectives: To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation, and speaking.					
Writing Systems & Basic Communication: Introduction to Hiragana: vowels, basic characters, reading & writing, Introduction to Katakana: basic characters and usage, Basic greetings and farewells (こんにちは, おはようございます, さようなら), Introducing yourself (名前、出身、年齢), Basic sentence structure: Subject–Object–Verb, Numbers 1–100, days of the week, classroom expressions.					
Activities: Flashcard games and writing drills, Self-introduction, Numbers & date-matching, Greeting expressions, Listening to audio.					
Grammar & Everyday Vocabulary: Particles: は (wa), を (wo), の (no), へ (e), に (ni), Present tense verbs: です, ます-form conjugation (たべます、のみます). Negative forms: ではありません, ません, Describing people and objects using adjectives (い and な), Question formation: なに、どこ、だれ、いつ, Vocabulary for family, food, colors, and basic actions.					
Activities: Verb conjugation drills, Guessing game, Picture description, “Shopping” with food vocab and counters					
Conversation & Cultural Etiquette: Talking about routines and schedules (daily verbs, time expressions), Asking and giving simple directions (～はどこですか?). Ordering food and making polite requests (～をください、～をおねがいします). Expressing likes and dislikes (すき・きらい), Listening to short conversations and identifying key phrases, Introduction to formal/informal speech and Japanese etiquette.					
Activities: Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.					
Activities: Practice worksheets and flashcards for hiragana, Writing drills and reading simple katakana words, Dialogue practice for greetings and self-introduction, Sentence construction exercises with basic SOV structure, Particle usage exercises and short dialogues, Role-play scheduling, shopping, and telling time, Verb conjugation drills for common verbs, Descriptive sentence exercises using adjectives, Practice Q&A dialogues forming questions and negations, Kanji writing practice and quizzes for basic characters, Vocabulary tests and conversational practice on daily topics, Oral presentations and listening comprehension quizzes.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%					
References: - Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K. (2011). Genki I: An integrated course in elementary Japanese. The Japan Times. - The Japan Foundation. (2017). Marugoto Japanese language and culture starter (A1) course book for communicative language activities. Goyal Publishers.					



	CO Description	PO	PSO
CO1	Understand simple spoken Japanese in everyday contexts.	---	
CO2	Communicate with widely used Japanese words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.	PO11 (1)	PSO3(2)



UC25F03	Korean – I	L 1	T 0	P 2	C 1
Course Objectives: To impart fundamentals of the Korean language, including reading, writing systems, pronunciation, and speaking.					
Fundamentals of Korean: Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (Subject-Object-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요).					
Activities: Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.					
Essential Grammar and Vocabulary: Particles (은/는, 이/가, 을/를) and usage, Basic verbs and present tense conjugation, Sentence patterns: affirmative, negative, interrogative, Common adjectives and descriptive sentences, Expressing possession and location, Asking simple questions (어디, 뭐, 누구).					
Activities: Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.					
Everyday Korean Communication: Polite speech levels and honorifics introduction, Talking about time, dates, and schedules, Ordering food, shopping phrases, counting objects, Simple directions and transportation vocabulary, Listening practice with short dialogues, Cultural notes on etiquette and communication.					
Activities: Role-play ordering at a restaurant or buying items, Listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Assignments (30%), Quiz (10%) and Internal Examinations 60%					
References: - King, R., Yeon, J., & Brown, A. (2015). Elementary Korean (2nd ed.). Tuttle Publishing. - Cho, Y., Lee, H., Schulz, C., Sohn, H.-M., & Sohn, S.-O. (2001). Integrated Korean: Beginning 1. University of Hawai'i Press.					

	CO Description	PO	PSO
CO1	Understand simple spoken Korean in everyday contexts.	---	
CO2	Communicate with widely used Korean words effectively.	PO9 (2)	PSO3(2)
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Korean language.	PO11 (1)	PSO3(2)



Semester III



MA25C03	Computational Differential Equations	L	T	P	C
		3	1	0	4
Course Objectives: The Objectives of the course are to equip students with the ability to formulate and solve various types of Ordinary and Partial Differential Equations (ODEs & PDEs) and to develop proficiency in applying numerical methods and computational tools for solving differential equations encountered in engineering problems.					
UNIT-I First Order Ordinary Differential Equations					12
Basic concepts of ordinary differential equations–Formation of first order differential equations from physical problems–First order and first-degree ODE: Variables separable–Exact equations–Leibnitz’s equation – Bernoulli’s equation – Activities: Application and Visualization of the first order ODE using open-source software and solving Competitive Examination questions					
UNIT-II Numerical Methods for Solving Ordinary and Partial Differential Equations					12
Solving first order ODE by Euler's formula, Taylor series and Runge-Kutta method of 4 th order - Solving second order ODE by Runge Kutta method of 4 th order and finite difference method - Numerical Methods for first order PDE by Method of lines with Runge-Kutta method of order fourth. Activities: solving ordinary differential equations using open-source software and solving of Competitive Examination questions					
UNIT-III Higher Order Ordinary Differential Equations					12
Formation of second order differential equations from physical problems–Linear equations of second and higher order with constant coefficients – Euler’s linear equations – Method of variation of parameters - Activities: solving ordinary differential equations using open-source software and solving of Competitive Examination questions					
UNIT-IV First Order Partial Differential Equations					12
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of PDE by variable separable method – Solution of standard types of first order partial differential equations (excluding reducible to standard types) – Lagrange’s linear equation Activities: Application and Visualization of the Partial Differential Equations using open-source software and solving Competitive Examination questions					
UNIT-V Higher Order Partial Differential Equations					12
Linear homogeneous partial differential equations of second and higher order with constant coefficients. Numerical Methods: Finite difference techniques for the solution of two-dimensional Laplace’s and Poisson’s equations on rectangular domain—Solution of one-dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes—Solution of one-dimensional wave equation by explicit scheme.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving Competitive Examination questions (20%), Internal Examinations (40%).					

References:

- Erwin Kreyszig, Advanced Engineering Mathematics, (11th ed.), John Wiley & Sons, USA, 2025.
2. Joe D. Hoffman, Numerical *Methods for Engineers and Scientists* (3rd ed.). CRC Press (Taylor & Francis Group), 2001.
3. Steven C. Chapra and Raymond P. Canale. *Numerical Methods for Engineers* (8th ed.). McGraw-Hill Education, 2021.
4. William E. Boyce and Richard C. DiPrima. Elementary Differential Equations and Boundary Value Problems, (11th ed.). John Wiley & Sons, USA, 2017.
5. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2026.
6. Randall J. LeVeque, Finite Difference Methods for Ordinary and Partial Differential Equations, SIAM, 2007.

E-resources:

1. <https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/>
2. https://archive.nptel.ac.in/content/syllabus_pdf/111107063.pdf
3. <https://github.com/patrickwalls/mathematicalpython>

	Description of CO	PO	PSO
CO1	Explain first and higher-order ODEs using appropriate analytical and numerical	-	-
CO2	Explain first order and 4th order ODE Numerical techniques.	PO1(3) PO5(3)	PSO2(1)
CO3	Solve c PDEs using classical and finite difference methods.	PO1(3) PO5(3)	PSO1(2)
CO4	Apply various solution methods to differential equations arising in engineering contexts.	PO1(3) PO5(3)	PSO2(1)
CO5	Interpretation of numerical solutions for partial differential equations and using open-source software.	PO2(3) PO5(3) PO11(2)	PSO2(1)

(1) = Low; (2) = Medium; (3) = High



ME25C07	Applied Engineering Mechanics	L	T	P	C
		3	0	0	3
Course Objectives: To provide a comprehensive understanding of applied engineering mechanics principles for analyzing structures, machines, and mechanical systems. It develops the ability to solve engineering problems using analytical, energy, and momentum methods.					
UNIT-I Analysis of Plane Trusses and Simple Machines					9
Planar trusses - Assumptions - Static determinacy - Method of joints - Method of sections - Simple Machines, Mechanical advantage, Velocity ratio, Efficiency					
Activities Simulation of plane trusses using FEM software. Physical modeling of 2D trusses using wooden sticks.					
UNIT-II Space Trusses, Plane Frames and Virtual Work					9
Introduction to 3D trusses - Plane frames - Analysis of member forces - Principle of virtual work - Analysis of planar machines/mechanisms					
Activities Case studies of collapse of 3D trusses. Problem-solving assignments using computational tools/programming environments.					
UNIT-III Mechanical Systems and Equilibrium					9
Mechanical efficiency of real machines - Potential energy and equilibrium - Stability of equilibrium of mechanical systems					
Activities Problem-solving assignments using computational tools/programming environments.					
UNIT-IV Kinetics of Particles					9
Energy and Momentum Methods: Work-Energy principle - Conservation of Energy principle - Impulse-Momentum principle - Direct impacts - Oblique impacts					
Activities Assignments using programming tools to calculate the motion parameters of particles and present the results in graphical form.					
UNIT-V Plane Motion of Rigid Bodies					9
Energy and Momentum Methods: Kinetic energy of rigid bodies - Linear momentum principle - Angular momentum principle - Eccentric impacts of rigid bodies					
Activities Problem-solving assignments using computational tools/programming environments. Case studies of rigid body motion in engineering systems.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (5%), Assignments (25%), Review of GATE/ESE Questions (20%), Internal Examinations (50%)					
References: 1. Ferdinand P. Beer, E. Russell Johnston, David Mazurek, Phillip J. Cornwell and Brian Self, Vector Mechanics for Engineers: Statics and Dynamics, 13th					

Edition, McGraw-Hill Education, 2025.

2. R. C. Hibbeler, Engineering Mechanics: Statics & Dynamics, 16th Edition, Pearson Education, 2026.

3. James L. Meriam, L. G. Kraige and J. N. Bolton, Engineering Mechanics: Statics and Dynamics (An Indian Adaptation), 9th Edition, Wiley India, 2021.

E-resources:

1. <https://nptel.ac.in/courses/112106180>

2. <https://nptel.ac.in/courses/112106286>

	CO Description	PO	PSO
CO1	Analyze planar trusses and simple machines using the methods of joints, sections, and principles of static equilibrium.	PO1(3), PO2(3)	PSO1(3), PSO2(2)
CO2	Analyze space trusses, plane frames, and planar mechanisms using the principle of virtual work and computational tools.	PO1(3), PO2(3)	PSO1(3), PSO2(3)
CO3	Evaluate the performance, efficiency, and equilibrium of mechanical systems using principles of mechanics.	PO1(3), PO2(3), PO4(2)	PSO1(2), PSO2(3)
CO4	Apply work-energy and impulse-momentum principles to analyze the kinetics of particles and engineering systems.	PO2(3), PO3(2), PO4(2)	PSO1(2), PSO2(3)
CO5	Analyze the plane motion of rigid bodies using energy, linear momentum, angular momentum, and impact principles for engineering applications.	PO2(3), PO3(3), PO4(3)	PSO1(3), PSO2(3)

(1) = Low; (2) = Medium; (3) = High



ME25301	Engineering Thermodynamics	L	T	P	C
		4	0	0	4
Course Objectives: This course introduces the fundamental principles and laws of thermodynamics related to energy, heat, work, and properties of pure substances. It develops the ability to analyze thermodynamic systems using the First and Second Laws, and to evaluate system performance using entropy, exergy, and property relations. The course also emphasizes solving engineering problems through analytical approaches.					
UNIT-I Basic Concepts		12			
Continuum and macroscopic approach; thermodynamic systems (closed and open); thermodynamic properties and equilibrium; state of a system, state postulate for simple compressible substances, state diagrams, paths and processes on state diagrams, ideal gas equation of state; concept of temperature, zeroth law of thermodynamics, thermodynamic temperature scale.					
Activities: - Identify and report closed and open thermodynamic systems from daily life. Fabricate a transparent plunger–cylinder setup to demonstrate an adiabatic process. - Demonstrate Boyle’s law and Charles’s law.					
UNIT-II First Law of Thermodynamics		12			
Concept of energy and its various forms, concepts of heat, work and different modes of work; reversible and irreversible processes, concept of moving boundary work; first law applied to elementary processes, closed systems and control volumes, steady and unsteady flow analysis.					
Activities: Develop a program to compute moving boundary work for different polytropic processes and plot P–V diagrams.					
UNIT-III Second Law of Thermodynamics		12			
Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; perpetual motion machines, Carnot cycle and Carnot principles/theorems; Clausius inequality and concept of entropy; microscopic interpretation of entropy, the principle of increase of entropy, T-s diagrams; second law analysis of control volume; exergy analysis of closed and open systems; basics of third law of thermodynamics.					
Activities: Develop a program to generate P–v and T–s diagrams for a Carnot cycle and evaluate heat transfer, work, and efficiency. Develop a program to analyze energy balance, exergy balance, exergy destruction, and second-law efficiency of steady-flow systems.					
UNIT-IV Properties of Pure Substances		12			
Pure substances and their phases; Phase-change processes of pure substances, property diagrams for phase-change processes; Gibbs phase rule, thermodynamic property tables and charts; real gases and van der Waals equation of state; compressibility factor, principle of corresponding states, generalized compressibility chart.					
Activities: Develop a program to generate T–v, P–v, and P–T diagrams for water using thermodynamic property correlations.					

Develop a program to evaluate the ideal-gas approximation error for water vapour under varying conditions.

UNIT-V Thermodynamic Relations

12

Reciprocity and cyclic relation, Helmholtz and Gibbs functions, Maxwell relations; Clapeyron and Clapeyron–Clausius equations; volume expansivity, isothermal and adiabatic compressibility, Mayer relation; Joule- Thomson coefficient.

Activities:

Develop a program to numerically verify a Maxwell relation using thermodynamic property data.

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

Assessment Methodology: Quiz (5%), Assignments (25%), Review of GATE/ESE Questions, Internal Examinations (50%)

References:

1. Cengel. Y. A. and Boles. M. A., "Thermodynamics: An Engineering Approach", 10th Edition, McGraw-Hill, 2025.
2. Moran. M. J., Shapiro. H. N., Boettner. D. D. and Bailey. M. B., "Fundamentals of Engineering Thermodynamics", 9th Edition, Wiley, 2018.
3. Nag. P. K., "Engineering Thermodynamics", 7th Edition, McGraw-Hill Education, 2025.

E-resources:

1. <https://nptel.ac.in/courses/112105220>
2. <https://nptel.ac.in/courses/112105123>
3. <https://nptel.ac.in/courses/112106310>
4. <https://nptel.ac.in/courses/112106320>

CO	CO Description	PO	PSO
CO1	Explain the fundamental concepts of thermodynamic systems, properties, equilibrium, state principles, and apply the zeroth law of thermodynamics to engineering problems.	—	—
CO2	Apply the first law of thermodynamics to closed and open systems for the analysis of energy transfer, work interactions, and engineering processes.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze thermodynamic systems using the second law, entropy, exergy, and thermodynamic cycles to evaluate system performance and efficiency.	PO1 (2), PO2 (2), PO4 (2)	PSO1 (3), PSO2 (2)
CO4	Evaluate the thermodynamic properties of pure substances and real gases using property tables, charts, equations of state, and computational methods.	PO2 (2), PO3 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO5	Apply thermodynamic relations, Maxwell relations, Clapeyron equations, and thermodynamic property relations to solve engineering problems using computational tools	PO2 (2), PO3 (2), PO4 (2)	PSO1 (2), PSO2 (2)

(1) = Low; (2) = Medium; (3) = High



CE25C11	Strength of Materials	L	T	P	C
		3	0	2	4
Course Objective: To understand the behaviour of materials under different loading conditions and analyze stresses, strains, bending, torsion, deflection, columns, and pressure vessels.					
UNIT-I Stress, Strain and Deformation of Solids 15 Rigid bodies and deformable solids - Tension, Compression and Shear stresses - Deformation of simple and compound bars - Thermal stresses - Elastic constants - Volumetric strains - Stresses on inclined planes - Principal stresses and principal planes - Mohr's circle of stress Activity Assignments and quiz problems on stress, strain and deformation of solids. Practical Tensile test on mild steel rod. Hardness test on metals (Rockwell and Brinell Hardness Tests).					
UNIT-II Beam Loading and Bending Stresses 15 Beams and types of beams - Transverse loading on beams - Shear force and bending moment in beams - Cantilever, simply supported and overhanging beams - Theory of simple bending - Bending stress distribution - Load carrying capacity - Proportioning of sections - Flitched beams - Shear stress distribution Activity Demonstration of practical applications of transverse loading on beams. Simulation of Shear Force and Bending Moment Diagrams using web-based analysis tools. Practical Double shear test on metal rod. Impact test on metal specimen (Izod and Charpy).					
UNIT-III Torsion and Deflection of Beams 15 Torsion: Theory of torsion - Stresses and deformations in solid and hollow circular shafts - Combined bending moment and torsion of shafts - Power transmitted to shaft - Shafts in series and parallel Deflection of Beams: Elastic curve - Governing differential equation - Double integration method - Macaulay's method - Area moment method - Conjugate beam method for computation of slope and deflection of determinate beams Activity Assignments on torsion of solid and hollow circular shafts. Practical Torsion test on mild steel rod. Deflection test on metal beam and verification of Maxwell's reciprocal theorem.					



UNIT-IV Springs and Columns 15 Springs: Closed and open coiled helical springs - Springs in series and parallel - Strain energy method for determinate beams - Maxwell's reciprocal theorem - Leaf springs Columns and Struts: Introduction - Classification of columns - Axially loaded compression members - Euler's crippling load theory - Derivation of Euler's critical load formulae for various end conditions - Equivalent length - Slenderness ratio - Euler's critical stress - Limitations of Euler's theory - Rankine–Gordon formula - Eccentric loading and Secant formula - Prof. Perry's formula Activity Model making of lightweight bridge. Practical Deflection test on carriage spring. Compression test on wood and brick.	UNIT-V Thin, Thick and Spherical Pressure Vessels 15 Thin cylindrical shells subjected to internal pressure - Circumferential and longitudinal stresses - Deformation in thin cylinders - Spherical shells subjected to internal pressure - Deformation in spherical shells - Thick cylinders - Lamé's theory Activity Assignments and quiz problems on thin cylinders, spherical shells and thick cylinders. Tasks: T1. Design a crane beam used in construction to safely carry heavy loads, considering bending stress and shear force. T2. Design a transmission shaft for an automobile to transmit required power without failure under torsion and combined loading. T3. Design a vehicle suspension spring (helical spring) to absorb shocks and provide required comfort based on load and deflection criteria. T4. Design a building column (steel or concrete) to safely support axial loads, considering buckling and stability conditions.
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%	
Assessment Methodology: Written Test (40%), Practical (30%), Activity (30%). Practical: Lab Experiments (50%), Tasks (50%) (Each student must complete a minimum of two tasks). Activity: Review of GATE/ESE Questions (10%), Mini Project/ Quiz/ Assignment Programs/ Flipped Class /Seminar Presentation (20%)	
References: 1. R. K. Bansal, A Textbook of Strength of Materials, 7th Edition, Laxmi Publications, New Delhi, 2024. 2. R. K. Rajput, Strength of Materials: Mechanics of Solids, Revised Edition, S. Chand Publishing, New Delhi, 2022. 3. S. Ramamrutham and R. Narayanan, Strength of Materials, Revised Enlarged Edition, Dhanpat Rai Publishing Company, New Delhi, 2025. R. Subramanian, Strength of Materials, 3rd Edition, Oxford University Press, New Delhi, 2017.	

5. S. S. Rattan, Strength of Materials, 4th Edition, McGraw Hill Education, New Delhi, 2021.
6. B. S. Basavarajaiah and P. Mahadevappa, Strength of Materials in SI UNITS, 3rd Edition, Universities Press, New Delhi, 2010.
7. S. P. Timoshenko and D. H. Young, Elements of Strength of Materials, 5th Edition, East-West Press, New Delhi, 2017.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc25_ce25/preview
2. <https://nptel.ac.in/courses/112107147>
3. <https://archive.nptel.ac.in/courses/105/105/105105108/>
4. <https://ocw.mit.edu/courses/3-11-mechanics-of-materials-fall-1999/>
5. <https://ocw.mit.edu/courses/3-11-mechanics-of-materials-fall-1999/pages/lecture-notes/>
6. <https://www.vlab.co.in/ba-nptel-labs-mechanical-engineering>
7. <https://solidmechanics.org/>
8. https://www.engineeringtoolbox.com/stress-strain-d_950.html
9. https://www.engineeringtoolbox.com/beam-stress-deflection-d_1312.html

CO	CO Description	PO	PSO
CO1	Apply the concepts of stress, strain, elastic constants, principal stresses and thermal stresses to analyze deformation in engineering components.	PO1(3) PO2(3) PO3(2)	PSO1
CO2	Analyze beams under different loading conditions and determine shear force, bending moment, bending and shear stresses for safe structural design.	PO1(3) PO2(3) PO3(3) PO5(2)	PSO1
CO3	Evaluate torsional behavior of shafts and determine slope and deflection of beams using appropriate analytical methods.	PO1(3) PO2(3) PO4(3) PO5(2)	PSO1 PSO2
CO4	Analyze the behavior of springs and columns under different loading conditions and evaluate their load carrying capacity and stability.	PO1(3) PO2(3) PO3(3) PO6(2)	PO10 PSO1 PSO3
CO5	Analyze thin and thick pressure vessels subjected to internal pressure and determine stresses and deformation using suitable theories.	PO1(3) PO2(3) PO3(2) PO6 (2) PO5(2)	PSO1 PSO2

(1) = Low; (2) = Medium; (3) = High



ME25C08	Metallurgy and Materials Science	L	T	P	C
		3	0	0	3
Course Objective: This course provides knowledge on phase diagrams, ferrous and non-ferrous materials, heat treatment processes, polymers, ceramics, composites, and mechanical behavior of engineering materials. It enables students to understand material selection, microstructure-property relationships, testing methods, and modern materials used in engineering applications.					
UNIT-I Constitution of Alloys and Phase Diagrams					9
Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast-Iron microstructure, properties and application.					
Activity: Study of phase diagrams and microstructures.					
UNIT-II Heat Treatment					9
Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalizing, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram – continuous cooling Transformation (CCT) diagram – Austempering, Martempering – Hardenability, Jominy end quench test -case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening – Thermo-mechanical treatments- elementary ideas on sintering.					
Activity: Demonstration of heat treatment and hardenability test.					
UNIT-III Ferrous and Non-Ferrous Metals					9
Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V,Ti& W) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupronickel – Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys –shape memory alloys- Properties and Applications- overview of materials standards.					
Activity: Alloy identification and material selection exercise.					
UNIT-IV Non-Metallic Materials					9
Polymers – types of polymers, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PAI, PPO, PPS, PEEK, PTFE, Thermoset polymers – Urea and Phenol formaldehydes – Nylon, Engineering Ceramics – Properties and applications of Al ₂ O ₃ , SiC, Si ₃ N ₄ , PSZ and SIALON – intermetallics- Composites- Matrix and reinforcement Materials- applications of Composites - Nano composites.					
Activity: Classification of polymers, ceramics, and composites.					
UNIT-V Mechanical Properties and Deformation Mechanisms					9
Mechanisms of plastic deformation, slip and twinning – Types of fracture – fracture mechanics- Griffith's theory- Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test Izod and Charpy, fatigue and creep failure mechanisms.					
Activity: Demonstration of tensile, hardness, and impact tests.					

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%
Assessment Methodology: Quiz (5%), Assignments (25%), Review of GATE/ESE Questions, Internal Examinations (50%)
References: 1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th edition, 2018. 2. Sydney H. Avner, Introduction to Physical Metallurgy, McGraw Hill Education, 2nd Edition, Reprint 2017. 3. Alavudeen N., Venkateshwaran N., and Winowlin Jappes J.T., A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, Revised Edition, 2016. 4. Amandeep Singh Wadhwa and Harvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Science Press, Revised Edition, 2018. 5. G.S. Upadhyay and Anish Upadhyay, Materials Science and Engineering, Viva Books Pvt. Ltd., 2020. 6. Raghavan V., Materials Science and Engineering, Prentice Hall of India Pvt. Ltd., 7th Edition, 2023. 7. William D. Callister Jr. and David G. Rethwisch, Materials Science and Engineering: An Introduction, Wiley India Pvt. Ltd., 10th Edition, 2020.

CO	CO Description	PO	PSO
CO1	Explain the constitution of alloys, phase diagrams, iron-iron carbide equilibrium diagram, and classify steels and cast irons based on their microstructure, properties, and applications.	PO1(3) PO2(2) PO4(2)	PSO1 PSO2
CO2	Apply heat treatment processes and interpret TTT/CCT diagrams to enhance the mechanical properties and performance of engineering materials.	PO1(3) PO2(3) PO3(2) PO5(2)	PSO1 PSO2
CO3	Select suitable ferrous and non-ferrous metals based on composition, properties, standards, and engineering applications.	PO1(3) PO2(3) PO3(3) PO5(2) PO6(2)	PSO1 PSO2
CO4	Classify and evaluate polymers, ceramics, composites, nanocomposites, and other advanced materials for engineering applications.	PO1(3) PO3(3) PO4(2) PO6(2) PO7(2)	PSO1 PSO2 PSO3
CO5	Analyze mechanical properties, deformation mechanisms, fracture behavior, and material testing techniques for engineering design and material selection.	PO1(3) PO2(3) PO4(3) PO5(2)	PSO1 PSO2 PSO3

(1) = Low; (2) = Medium; (3) = High



EC25C17	Embedded Systems	L	T	P	C
		3	0	0	3
Course Objective: This course introduces students to embedded system architecture, microcontrollers, and real-time operating systems. Students learn programming in C and Python, peripheral interfacing, and communication protocols to design and implement embedded applications for real-world automation systems.					
UNIT-I Embedded Hardware Architectures 9 CISC Architecture: Introduction to MCS51 Family - 8051 Microcontroller, Architecture, Timers, Interrupts, Serial Data Communication RISC Architecture: Overview of PIC16F487x Family - PIC16F877A – Architecture, Timers, Interrupts, Serial Ports Activity Simulate and compare basic programs (timers/interrupts) on 8051 and PIC microcontrollers.					
UNIT-II ARM Architecture and Embedded Software Development Tools 9 ARM Architecture: Introduction to ARM - LPC4088 Architecture Software Development Tools: IDE Tools - ISP Tools - ARM Development Tools Activity Develop and debug a simple embedded application using an ARM-based IDE and development tools.					
UNIT-III Embedded Communication Interfaces 9 Wired Communication Interfaces: Serial Communication Protocols - RS232, RS485, I ² C, SPI, USB - Parallel Communication Protocol - IEEE 488 Wireless Communication Interfaces: Bluetooth Classic, Bluetooth Low Energy (BLE), IEEE 802.15.4, Zigbee, IEEE 802.11, LoRaWAN Activities Implement serial communication (UART/I ² C/SPI) between a microcontroller and an external device. Demonstrate wireless data transmission using a module (e.g., Bluetooth/Zigbee/Wi-Fi).					
UNIT-IV Real-Time Operating Systems 9 Operating System Basics: The Kernel and its subsystems - Kernel Space and User Space Types and Functions of RTOS: Task, Process and Threads, Interrupt Handling, Multiprocessing and Multitasking, Task Scheduling, Comparative study of various RTOSs Activity Simulate task scheduling and interrupt handling using an RTOS environment.					
UNIT-V Embedded Programming and Peripheral Interfacing 9 Embedded Programming: Embedded C Programming - Python Programming for Embedded Applications Peripheral Interfacing: Input Devices, Output Devices, ADC, DAC, PWM Generation, Sensor Interface Activity Develop an embedded application interfacing sensors/actuators using an open-source tool.					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					



Assessment Methodology: Quiz (5%), Assignments (25%), Review of GATE/ESE Questions, Internal Examinations (50%)

References

1. Raj Kamal, Embedded Systems: Architecture, Programming and Design, 3rd Edition, McGraw Hill Education, 2017.
2. James K. Peckol, Embedded Systems: A Contemporary Design Tool, 2nd Edition, Wiley, 2019.
3. Tammy Noergaard, Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers, 2nd Edition, Elsevier, 2012.
4. Han-Way Huang, Embedded System Design Using C8051, 1st Edition, Cengage Learning, 2009.
5. Rajib Mall, Real-Time Systems: Theory and Practice, 2nd Edition, Pearson Education, 2017.
6. Shibu K. V., Introduction to Embedded Systems, 3rd Edition, McGraw Hill Education, 2017.

E-Resources:

1. <https://nptel.ac.in/courses/108105057>
2. <https://nptel.ac.in/courses/106105193>
3. <https://nptel.ac.in/courses/106105172>
4. <https://nptel.ac.in/courses/106105193>
5. <https://nptel.ac.in/courses/106105159>

	CO Description	PO	PSO
CO1	Explain the architecture and operation of CISC- and RISC-based embedded systems, including 8051 and PIC microcontrollers, and develop basic embedded applications.	PO1(3) PO5(3)	PSO1 PSO2
CO2	Analyze ARM processor architecture and utilize embedded software development tools for designing and debugging embedded applications.	PO1(3) PO2(3) PO5(3)	PSO1 PSO2
CO3	Apply wired and wireless communication protocols for reliable data exchange in embedded systems.	PO1(3) PO2(3) PO3(3) PO6(2)	PSO1 PSO2
CO4	Analyze the concepts of Real-Time Operating Systems (RTOS), including task scheduling, interrupt handling, and multitasking for embedded applications.	PO1(3) PO2(3) PO4(3) PO8(1)	PSO2 PSO3
CO5	Develop embedded applications using Embedded C/Python and interface sensors, actuators, and peripherals for real-time control systems	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1 PSO2 PSO3

(1) = Low; (2) = Medium; (3) = High



EN25C03	English Communication Skills Laboratory– I	L	T	P	C
		0	0	2	1
Course Objectives: The objectives of the course are to foster students' confidence and fluency in professional and social communication and to bridge the gap between academic English and industry expectations.					
List of Activities					
A. Elements of Effective Speaking and Listening					5
(i) Sharing life experience/ turning point in their life – SATORI					
(ii) Situational Conversation – eg. Talking to a Senior about Internship Tips					
(iii) Welcoming a Guest Speaker at a Seminar					
(iv) Pictography to represent data using images or symbols					
(v) B2-C1 Listening exercises include lectures, interviews, and discussions.					
B. Mastering Presentations					5
(i) Presentation Skills – Non-verbal communication					
(ii) Mini-Presentations: Topics like “My Dream Project,” “Engineering in 2050,” 3-minute technical pitches with logical flow					
(iii) Technical Presentations with PPT					
C. Group Discussion Strategies:					5
(i) Introduction to Group Discussions - Key skills for effective participation					
(ii) Phases in a GD and Conversational Phrases in GD.					
(iii) Group Discussions – Abstract and Factual topics					
D. Resume & LinkedIn Optimization					5
(i) Building LinkedIn Profile – Drafting headlines and summaries					
(ii) Social Media Optimisation					
(iii) Preparing Video Resume					
E. Podcast-Based Language Learning:					5
(i) Listening to podcast (motivational, career oriented, success stories)					
(ii) Podcast Preparation – Purpose – Topic – Structure – Recording Tips - Publication of the Podcast					
F. Mock Interviews and Communication Strategies:					5
(i) Listening – Job interview					
(ii) Speaking – Mock interviews					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.					
Internal Assessment: 1. Listening (20 marks)					
2. Video Resume (20 marks)					
3. Creating a Podcast (30 marks)					
4. Mock interview (30 marks)					
End Semester Assessment: 1. Presentation with PPT (50 marks)					
2. Group Discussion (50 marks)					



References:

1. Floyd Kory, "Interpersonal Communication", McGraw Hill Publication, 2023.
2. Bharadwaj Apoorva, "Leadership Communication Skills for Intercultural Management: Strategies for Effective Intercultural Management (Contemporary Themes in Business and Management)", Routledge India; 1st edition, 2024.
3. Helen Spencer-Oatey and Domna Lazidou, "Making Working Relationships Work: The TRIPS Toolkit for Handling Relationship Challenges and Promoting Rapport", Castledown Publishers, 2023.
4. Presentations - Cambridge
5. Speaking Extra
6. Listening Extra – Miles Craven by Cambridge University Press
7. CVs, Resumes, and LinkedIn: A Guide to Professional English – Springer International Publishing

E-resources:

1. Train your mind to perform under pressure- Simon Sinek
<https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/>
2. Brilliant way one CEO rallied his team in the middle of layoffs
<https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html>
3. Will Smith's Top Ten rules for success
<https://www.youtube.com/watch?v=bBsT9omTeh0>

	Description of CO	PO	PSO1
CO1	Communicate effectively in everyday professional situations with confidence	---	---
CO2	Deliver well-organised and effective presentations	PO9(3)	PSO1(1) PSO3(2)
CO3	Participate in group discussions and express ideas clearly and confidently.	PO8(2) PO9(3)	PSO3(2)
CO4	Create professional video resumes and participate in interviews effectively.	PO9(2)	PSO3(3)
CO5	Create, record and publish motivational podcasts.	PO9(2) PO11(1)	PSO2(2) PSO3(3)

(1) = Low; (2) = Medium; (3) = High



Semester IV



CS25C16	Applied Data Science	L	T	P	C
		3	0	0	3
Course Objectives This course introduces the core concepts of data science, including data preprocessing, exploratory analysis, and machine learning techniques. It aims to develop the ability to analyze and interpret data using modern tools for real-world problem solving while emphasizing ethical and responsible use of data.					
UNIT-I Foundations and Mathematical Concepts for Data Science 9 Introduction to Data Science: Data Science definition - Data Science lifecycle - Types of data (structured, unstructured, semi-structured) - Data sources and data collection methods - Role of Data Scientist - Applications in healthcare, banking and e-commerce Mathematical Foundations: Linear equations and solutions - Matrices and their properties - Eigenvalues and eigenvectors - Matrix factorizations - Inner products - Distance measures - Projections - Notion of hyperplanes and halfplanes Activity Perform statistical analysis and regression on a dataset using a programming language to understand data distribution and relationships.					
UNIT-II Statistical Methods and Data Preprocessing 9 Statistical Methods: Descriptive statistics - Inferential statistics - Hypothesis testing - Regression analysis - Statistical modelling Data Preprocessing and Wrangling: Data cleaning (missing values, noise handling) - Data transformation and normalization - Feature engineering - Data integration - Handling outliers - Data pipelines - Tools: Python (Pandas, NumPy) Activity Clean and preprocess a real dataset by handling missing values, outliers and applying normalization using Pandas.					
UNIT-III Exploratory Data Analysis and Visualization 9 Exploratory Data Analysis: Descriptive statistics - Data visualization techniques - Bar charts - Histograms - Box plots - Scatter plots - Heatmaps - Correlation and covariance - Identifying patterns and trends Tools: Matplotlib - Seaborn Activity Analyze and visualize a dataset using plots (histogram, scatter plot and heatmap) to identify patterns and correlations.					
UNIT-IV Machine Learning Techniques 9 Supervised Learning: Linear Regression - Logistic Regression - Decision Trees - k-Nearest Neighbour (k-NN) Unsupervised Learning: K-Means Clustering - Hierarchical Clustering Model Evaluation: Accuracy - Precision - Recall - F1-score - Confusion Matrix - Overfitting - Underfitting Activity Build and evaluate a machine learning model (e.g., regression or classification) using Scikit-learn.					



UNIT-V Applied Data Science and Case Studies	9
Applied Data Science: Real-world applications - Recommendation systems - Fraud detection - Traffic Route Optimisation - Customer segmentation - Introduction to Big Data concepts - Ethics in Data Science - Data privacy and security basics	
Activity Develop a mini project (e.g., house price prediction or customer segmentation) and present insights with ethical considerations.	
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%	
Assessment Methodology: Quiz (5%), Assignments (25%), Review of GATE/ESE Questions (20%), Internal Examinations (50%)	
References 1. Provost, F., & Fawcett, T. (2013). Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking. O'Reilly Media. 2. Wes McKinney, <i>Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter</i> , 3rd Edition, O'Reilly Media, 2022. 3. Aurélien Géron, <i>Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems</i> , 3rd Edition, O'Reilly Media, 2022. 4. Joel Grus, <i>Data Science from Scratch: First Principles with Python</i> , 2nd Edition, O'Reilly Media, 2019.	
E-resources: 1. https://onlinecourses.nptel.ac.in/noc25_cs120/preview 2. https://nptel.ac.in/courses/106106212 3. https://ocw.mit.edu/courses/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/ 4. https://ocw.mit.edu/courses/18-650-statistics-for-applications-fall-2016/ 5. https://www.coursera.org/learn/what-is-datascience 6. https://www.coursera.org/specializations/data-science-python 7. https://pandas.pydata.org/docs/ 8. https://numpy.org/doc/ 9. https://scikit-learn.org/stable/user_guide.html	

	CO Description	PO	PSO
CO1	Explain the fundamentals of Data Science, mathematical concepts, and data collection methods for solving engineering problems.	PO1 (3) PO2 (2)	PSO2(3)
CO2	Apply statistical methods and data preprocessing techniques to clean, transform, and prepare datasets for analysis.	PO1 (3) PO5 (3)	PSO2(2)
CO3	Perform exploratory data analysis and visualize data using appropriate tools to identify patterns and relationships.	PO2 (3) PO5 (3)	PSO2(2)
CO4	Develop and evaluate supervised and unsupervised machine learning models using suitable algorithms and performance metrics.	PO2 (3) PO4 (2)	PSO2(2), PSO3(2)
CO5	Apply Data Science techniques to real-world engineering applications while considering ethical, privacy, and security aspects.	PO2 (3) PO4 (2)	PSO2(3) PSO5(3)

(1) = Low; (2) = Medium; (3) = High



ME25C09	Kinematics and Dynamics of Machines	L	T	P	C
		3	0	2	4
Course Objectives: The course introduces the fundamental concepts of mechanical linkages and mechanisms used in machines, including higher pairs such as cams and gear transmissions. It develops an understanding of force analysis in mechanisms, the effects of unbalanced forces, and the basic principles governing vibrations in mechanical systems.					
UNIT-I Kinematic Analysis of Mechanisms 15 Mechanisms: Mechanisms - Terminology and definitions - Kinematic inversions of four-bar chain and slider-crank chain - Kinematic analysis in simple mechanisms - Velocity polygons - Acceleration polygons Cams: Cam terminology - Different types of cams and followers Practical Analysis of Four-Bar Chain and Slider-Crank Mechanisms.					
UNIT-II Cam Design and Gear Trains 15 Cams: Cam design for different follower motion curves - Graphical construction of cam profiles for different types of followers Gears and Gear Trains: Gear terminology - Law of toothed gearing - Involute gearing - Gear tooth action - Interference and undercutting - Gear trains - Parallel-axis gear trains - Epicyclic gear trains Practical - Cam displacement curves. - Experimental study of velocity ratios of simple, compound, epicyclic and differential gear trains.					
UNIT-III Static and Dynamic Force Analysis 15 Applied and constrained forces - Free body diagrams - Static equilibrium conditions - Static force analysis in simple mechanisms - Dynamic force analysis in simple machine members - Inertia forces - Inertia torque - D'Alembert's principle					
UNIT-IV Balancing of Rotating Masses and Gyroscope 15 Static balancing - Dynamic balancing - Balancing of revolving masses - Balancing machines - Gyroscopes - Gyroscopic couple - Gyroscopic stabilization - Gyroscopic effects in automobiles, ships and airplanes Practical - Motorized gyroscope. - Study of gyroscopic effect and gyroscopic couple.					
UNIT-V Mechanical Vibrations 15 Vibrations - Single degree of freedom system - Equations of motion - Undamped free vibration of single degree of freedom system - Damped free vibration of single degree of freedom system - Logarithmic decrement - Forced vibration of single degree of freedom system - Magnification factor - Rotating unbalance - Support harmonic excitation - Critical speed of shafts Practical - Undamped free vibrations of a single degree of freedom spring-mass system. - Torsional vibration (undamped) of single rotor shaft system. - Determination of critical speed of shafts.					

Tasks:

T1. Design a four-bar mechanism for an application such as a windshield wiper or robotic arm to achieve a desired motion path.

T2. Design a cam and follower system for an IC engine valve mechanism to achieve specified motion (displacement, velocity, acceleration).

T3. Design a gear train system (simple or epicyclic) for an automobile gearbox or industrial machine to obtain required speed reduction and torque transmission.

T4. Analyze and design a rotating system (shaft with masses) for proper balancing and determine the critical speed to avoid excessive vibration in machines (e.g., turbine shaft or motor rotor).

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

Assessment Methodology:

Written Test (40%), Practical (30%), Activity (30%).

Practical: Lab Experiments (50%), Tasks (50%) (Each student must complete a minimum of two tasks).

Activity: Review of GATE/ESE Questions (10%), Mini Project/ Quiz/ Assignment Programs/ Flipped Class /Seminar Presentation (20%)

References:

1. S. S. Rattan, Theory of Machines, 5th Edition, McGraw Hill, 2019.
2. J. J. Uicker Jr., G. R. Pennock & J. E. Shigley, Theory of Machines and Mechanisms, 6th Edition, Cambridge University Press, 2023.
3. P. L. Ballaney, Theory of Machines and Mechanisms, 26th Edition, Khanna Publishers, 2024.
4. R. L. Norton, Kinematics and Dynamics of Machinery, 3rd Edition (SI UNITS), McGraw Hill Education, 2020.

E-resources:

1. <https://nptel.ac.in/courses/112105268>
2. <https://nptel.ac.in/courses/112104114>
3. <https://nptel.ac.in/courses/112107212>
4. <https://nptel.ac.in/courses/112104121>

	CO Description	PO	PSO
CO1	Analyze the kinematics of mechanisms and determine velocity and acceleration of machine elements using graphical methods.	PO1 (3) PO5 (2)	PSO1 (3)
CO2	Design cam profiles and analyze gear trains for motion transmission in mechanical systems.	PO1 (3) PO2 (3)	PSO1 (3)
CO3	Perform static and dynamic force analysis of mechanisms using free body diagrams and D'Alembert's principle.	PO2 (3) PO3 (3)	PSO1 (3)
CO4	Analyze balancing of rotating masses and evaluate gyroscopic effects in engineering applications.	PO4 (2), PO8 (1)	PSO1 (3), PSO2 (2)
CO5	Analyze free and forced vibrations of single degree-of-freedom systems and determine critical speed of rotating shafts for safe machine design.	PO4 (3), PO5 (3)	PSO1 (3), PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



CE25C12	Fluid Mechanics and Machinery	L	T	P	C
		3	0	2	4
Course Objective: To introduce the students about properties of the fluids, behaviour of the fluids under statics, kinematics and dynamic conditions. To expose to the applications of the conservation laws to flow measurements, flow through pipes and forces on pipe bends. To impart basic knowledge to the students about the working principles and performance characteristics of hydraulic machineries.					
UNIT-I Fluid Properties and Fluid Statics					15
Fluid Properties: Types and properties of fluids - Viscosity - Surface tension - Compressibility - Basics of compressible flow Fluid Statics: Fluid pressure - Manometers - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Metacentric height and its determination Activity • Mini case study on buoyancy applications in ships and submarines. • Problem-solving using simulation tools for pressure distribution. Practical • Determination of metacentric height.					
UNIT-II Fluid Kinematics and Fluid Dynamics					15
Fluid Kinematics: Classification of fluid flows - Eulerian and Lagrangian - approach - Concept of control volume and system - Velocity and acceleration - Stream function and velocity potential - Flow nets Fluid Dynamics: Application of control volume to continuity, energy and momentum - Euler's equation of motion along a streamline - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation Activity Group activity on Bernoulli-based engineering applications (aircraft wing, carburetor, atomizer, etc.). Software demonstration for flow patterns. Practical Determination of coefficient of discharge of a Venturimeter.					
UNIT-III Flow Through Pipes and Dimensional Analysis					15
Flow Through Pipes: Reynolds experiment - Laminar flow through circular conduits - Hagen–Poiseuille equation - Darcy–Weisbach equation - Moody diagram - Major and minor losses in pipes - Hydraulic gradient and total energy gradient - Pipes in series and parallel - Equivalent pipes - Boundary layer concepts - Types of boundary layer thickness Dimensional Analysis: Fundamental dimensions - Dimensional homogeneity - Rayleigh's method - Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models Activities Pipe network design exercise using campus/building water supply layout. Industrial case study on pipeline losses and leakage reduction. Model-making activity demonstrating similitude concepts. Group exercise on identifying dimensionless numbers in engineering systems. Practical Determination of friction factor for flow through pipes.					

UNIT-IV Hydraulic Turbines 15 Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Pelton wheel - Francis turbine - Kaplan turbine - Working principles - Work done by water on the runner - Efficiencies - Draft tube - Specific speed - Performance curves for turbines Activity Virtual demonstration of turbines. Practical Characteristics of Pelton wheel turbine	UNIT-V Hydraulic Pumps 15 Centrifugal Pumps: Classification of pumps - Working principle - Heads and efficiencies - Work done by the impeller - NPSH - Minimum speed to start the pump - Pumps connected in series and parallel - Performance curves Reciprocating Pumps: Working principle - Indicator diagram and its variations - Air vessels - Work saved by air vessels Activity Virtual demonstration of pumps. Practical Characteristics of centrifugal pumps. Characteristics of reciprocating pump.
Tasks: T1. Design a water supply pipeline system for a residential building, considering flow rate, head loss, and pipe sizing. T2. Design a flow measurement system using a venturimeter or orifice meter for an industrial application to determine discharge accurately. T3. Select and design a hydraulic turbine system (Pelton/Francis/Kaplan) for a small hydroelectric power plant based on site conditions. T4. Design a pumping system (centrifugal or reciprocating) for irrigation or water transfer, considering head, discharge, and efficiency.	
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%	
Assessment Methodology: Written Test (40%), Practical (30%), Activity (30%). Practical: Lab Experiments (50%), Tasks (50%) (Each student must complete a minimum of two tasks). Activity: Review of GATE/ESE Questions (10%), Mini Project/ Quiz/ Assignment Programs/ Flipped Class /Seminar Presentation (20%)	
References: 1. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, 23rd Edition, Standard Book House, New Delhi, 2022. 2. A. K. Jain, Fluid Mechanics including Hydraulic Machines, 12th Edition, Khanna Publishers, New Delhi, 2022. 3. S. K. Som, Gautam Biswas, and S. Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, 3rd Edition, McGraw Hill Education, Chennai, 2024. 4. B. S. Pani, Fluid Mechanics: A Concise Introduction, 2nd Edition, PHI	

Learning Private Limited, 2021.

5. A. K. Jain, Fluid Mechanics including Hydraulic Machines, 12th Edition, Khanna Publishers, New Delhi, 2022.

6. V. L. Streeter, E. B. Wylie and K. W. Bedford, Fluid Mechanics, 9th Edition, McGraw Hill Education, New Delhi, 2017.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc25_ce107/preview
2. <https://elearn.nptel.ac.in/shop/nptel/introduction-to-fluid-mechanics/>
3. <https://opencw.aprende.org/courses/mechanical-engineering/2-06-fluid-dynamics-spring-2013/>
4. <https://www.digimat.in/nptel/courses/video/112105171/112105171.html>
5. <https://fm-hfs-iitb.vlabs.ac.in/>
https://archive.nptel.ac.in/content/syllabus_pdf/105101082.pdf

	CO Description	PO	PSO
CO1	Explain the properties of fluids and apply the principles of fluid statics to analyze pressure distribution, buoyancy, and stability of floating bodies.	PO1 (3) PO2 (3)	PSO1 (3) PSO2 (2)
CO2	Apply the principles of fluid kinematics and fluid dynamics to analyze fluid flow and solve engineering problems involving continuity, energy, and momentum equations.	PO1 (3) PO2 (3)	PSO1 (3) PSO2 (3)
CO3	Analyze fluid flow through pipes using dimensional analysis, similitude, and empirical relations to evaluate flow characteristics and head losses.	PO2 (3) PO4 (3)	PSO1 (3) PSO2 (3)
CO4	Analyze the performance characteristics of hydraulic turbines and evaluate their suitability for different hydraulic power applications.	PO3 (3) PO5 (2)	PSO1 (3) PSO2 (2)
CO5	Evaluate the performance of centrifugal and reciprocating pumps and select appropriate pumping systems for engineering applications.	PO1 (3) PO5 (3)	PSO1 (3) PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



ME25401	Thermal Engineering – I	L 3	T 0	P 0	C 3
Course Objectives: The course focuses on applying thermodynamic laws to analyze thermodynamic and steam power cycles, while also providing an understanding of IC engines, their systems, and aircraft propulsion cycles.					
UNIT-I Air Standard Cycles and Vapour Power Cycles 9 Air Standard Cycles: Carnot cycle - Otto cycle - Diesel cycle - Dual cycle – Cycle analysis - Comparison of Otto, Diesel and Dual cycles - Atkinson cycle Vapour Power Cycles: Carnot cycle - Basic Rankine cycle - Comparison of Carnot and Rankine cycles - Rankine cycle improvements, Reheat cycle, Regenerative cycle - Combined cycle power generation Activities Write a program to analyze Otto, Diesel and Dual cycles for given inputs (compression ratio, heat addition, etc.) and compute efficiency, work output and mean effective pressure. Generate P–V and T–S diagrams for different air standard cycles and compare their performance. Develop a program to analyze the Rankine cycle with and without reheat/regeneration, and compute efficiency, turbine work and pump work. Plot T–S diagrams for basic and modified Rankine cycles and compare performance improvements.					
UNIT-II Internal Combustion Engines 9 Internal Combustion Engines: Classification - Working - Components and their functions - Ideal and actual valve timing diagrams - Ideal and actual port timing diagrams - Ideal and actual P–V diagrams - Two-stroke and four-stroke engines - SI and CI engines – comparison - Combustion in SI and CI engines - Abnormal combustion - Knocking and detonation Engine Testing: Measurement of performance parameters and characteristics - Performance calculations - Morse test - Heat balance test Activities Prepare a comparative performance report of petrol and diesel vehicles. Develop a simple program or spreadsheet to estimate engine performance parameters (thermal efficiency, BSFC, etc.) for given input conditions.					
UNIT-III IC Engine Auxiliary Systems 9 Fuel Supply Systems: Simple carburettor - Fuel injector - Multi-Point Fuel - Injection (MPFI) - Gasoline Direct Injection (GDI) - Common Rail Direct Injection (CRDI) - Electronic Fuel Injection (EFI) Supporting Systems: Ignition system - Lubrication system - Cooling system - Concepts of supercharging - Concepts of turbocharging Activity Prepare a case study report on modern fuel injection systems (MPFI, GDI and CRDI) used in automobiles.					



UNIT-IV Gas Turbine Cycles**9**

Gas Turbine Cycles: Gas turbine cycle analysis - Open cycle - Closed cycle - Performance and its improvement - Regenerative cycle, Intercooled cycle, Reheated cycle, Combination of regenerative, intercooling and reheating

Activities

Write a program to analyze Brayton cycle and its modifications (intercooling, reheating and regeneration) and compute efficiency and work output.

Plot T–S diagrams for different gas turbine cycles and compare their performance.

UNIT-V Jet Propulsion**9**

Jet Propulsion: Principle of jet propulsion - IC engine driven propulsion - Gas turbine propulsion - Turbojet engine - Turboprop engine - Turbofan engine

Activities

Develop a basic computational model to calculate thrust, specific fuel consumption and efficiency for turbojet or turbofan engines.

Prepare a comparative analysis report on turbojet, turbofan and turboprop engines based on real aircraft applications.

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

Assessment Methodology: Quiz - 10%, Assignments - 20%, Review of GATE/ESE Questions - 20% and Internal Examinations - 50%

References:

1. Mahesh M. Rathore, "Thermal Engineering", 1st Edition (Latest Reprint), McGraw Hill Education, 2024.
2. Ganesan. V, "Internal Combustion Engines", 4th Edition (Latest Reprint), McGraw Hill Education, 2024.
3. Ballaney. P. L, "Thermal Engineering", 27th Edition, Khanna Publishers, 2024.
4. Rajput R.K., "Thermal Engineering", 11th Edition, Laxmi Publications (P) Ltd., 2022.
5. Onkar Singh, "Applied Thermodynamics", 5th Edition, New Age International Publishers, 2021.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc25_me36/preview?utm_source=chatgpt.com
2. https://onlinecourses.nptel.ac.in/noc24_me03/preview?utm_source=chatgpt.com
3. https://online.vtu.ac.in/course-details/Applied-Thermodynamics?utm_source=chatgpt.com



CO	CO Description	PO	PSO
CO1	Analyze air standard and vapour power cycles, evaluate their performance, and compare cycle efficiencies using thermodynamic principles.	PO1 (3), PO2 (2)	PSO1 (3)
CO2	Analyze the operation, combustion processes, and performance characteristics of internal combustion engines through testing and performance evaluation	PO1 (3), PO2 (3)	PSO2 (2)
CO3	Explain the working principles and performance of IC engine auxiliary systems, including fuel supply, ignition, lubrication, cooling, and boosting systems.	PO2 (2), PO3 (2)	PSO2 (2)
CO4	Analyze gas turbine cycles and evaluate the effect of intercooling, reheating, and regeneration on cycle performance.	PO4 (2) PO5 (1)	PSO2 (2) PSO3 (1)
CO5	Analyze the principles of jet propulsion systems and evaluate the performance of various aircraft propulsion engines for engineering applications.	PO1 (3) PO5 (3)	PSO2 (3) PSO3 (2)

(1) = Low; (2) = Medium; (3) = High



ME25402	Manufacturing Processes – I	L 3	T 0	P 2	C 4
Course Objectives: Appreciate and determine the appropriate manufacturing pathways for producing specific products.					
UNIT-I Digital Geometrical Models and Shape Representation 15 Digital Storage of Geometrical Shapes: Geometrical shape types - 2.5D (constant cross section), 2.75D (offsetting a surface), General 3D shapes - Storage of shape information in digital geometrical models - Wireframe model - Surface models - Solid models - File formats - STL file - Slicing into layers Practical Create wireframe, surface and solid models of a given geometrical shape using any CAD software.					
UNIT-II Subtractive Manufacturing Processes 15 Mechanics of Cutting: Orthogonal and oblique cutting - Chip formation - Types of chips - Nomenclature of single-point cutting tool - Shear plane theory - Shear stress - Shear strain - Forces in machining - Merchant's circle - Cutting tool materials - Tool wear and wear mechanisms - Cutting fluids - Temperature in machining - Surface roughness - Tool life - Machinability Turning, Drilling and Milling: Lathe operations - Need for drilling - Geometry of twist drill - Types of drilling machines - Drilling and related operations - Up milling and down milling - Types of milling machines and cutters - Milling operations - Indexing - Work holding and tool holding devices - Machining time and power estimation Practical Taper turning on a cylindrical workpiece using different methods. Evaluation of machinability of two work materials based on tool wear, chip morphology and cutting force. Drilling and milling practicals.					
UNIT-III Abrasive Processes and Additive Manufacturing 15 Abrasive Processes: Grinding - Specification of grinding wheel - Mechanism of metal removal in grinding - Grindability and its improvement - Dressing – Truing - Surface grinding - Cylindrical grinding - Centerless grinding - Honing - Lapping - Super finishing methods Additive Manufacturing: ISO nomenclature of AM processes - Directed Energy Deposition (DED) - Material Extrusion (MEX) - Material Jetting (MJT) - Powder Bed Fusion (PBF) - Vat Photopolymerization (VPP) - Binder Jetting (BJT) Practical Evaluation of the grindability of two materials by determining the G-ratio and measuring surface finish. Use of any open-source CAM software to simulate milling. Simulation of 3D printing processes using any open-source software.					



UNIT-IV Programmable Positioning Systems 15 CNC and Motion Control: Need for spatial positioning of cutting tools and additive manufacturing heads - Tool paths as containing shape information - Coordinate systems - Motion control systems: Point-to-point control, Continuous path control - Interpolation methods - Absolute positioning - Incremental positioning - CNC software - DNC - Advantages of CNC Practical Manual part programming for CNC turning centre (facing, turning and threading). Manual part programming for CNC machining centre (drilling, pocketing and contouring).
UNIT-V Pattern, Mold and Mask Making 15 Pattern, Mold and Mask Making: Physical storage of surface information on molds, patterns and masks - Patterns and their types - Molds and their various features - Mold types - Flow-through molds, Open molds, Closed molds - Making of masks for chemical machining - Silicon electronics fabrication Practical Make a 3D CAD model of any mold.
Tasks: T1. Design and manufacture a precision shaft component using lathe operations (turning, threading, knurling), ensuring dimensional accuracy and surface finish. T2. Develop a machining process plan for producing a gear (spur/helical) using milling, shaping, or hobbing, including tool selection and machining parameters. T3. Design and optimize a grinding process to achieve required surface finish and dimensional tolerance for a mechanical component (e.g., bearing shaft). T4. Develop a CNC part program for a turning or machining center to manufacture a component (e.g., flange or bracket) using appropriate tool paths and cycles.
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%
Assessment Methodology: Written Test (40%), Practical (30%), Activity (30%). Practical: Lab Experiments (50%), Tasks (50%) (Each student must complete a minimum of two tasks). Activity: Review of GATE/ESE Questions(10%), Mini Project/ Quiz/ Assignment Programs/ Flipped Class /Seminar Presentation (20%)
References: 1. Serope Kalpakjian and Steven Schmid, Manufacturing Engineering and Technology, 9th edition, Pearson, 2025 2. Groover, Mikell P. Fundamentals of modern manufacturing: materials, processes, and systems. 7th Edition, John Wiley & Sons, 2019. 3. Knight, Winston A., and Geoffrey Boothroyd. Fundamentals of metal machining and machine tools. CRC Press, 2019. 4. A. B. Chattopadhyay, Machining and Machine Tools, 2nd Edition, Wiley, 2017. 5. Juneja, B. L. Fundamentals of metal cutting and machine tools. New Age International, 2017. 6. P N Rao, Manufacturing Technology: Metal cutting and machine tools. Tata McGraw-Hill, 2013.

E-resources:

1. <https://nptel.ac.in/courses/112103245>
2. <https://nptel.ac.in/courses/112105233>
3. <https://nptel.ac.in/courses/112103250>
4. <https://nptel.ac.in/courses/112104290>
5. <https://fab-coep.vlabs.ac.in/exp/3d-machining/theory.html>
6. <http://vlabs.iitkgp.ac.in/vmp/exp1/index.html#>
7. <http://vlabs.iitkgp.ac.in/vmp/exp1/Webpage/index.html>

	Description of CO	PO	PSO
CO1	Develop and interpret digital geometric models using wireframe, surface, solid modelling techniques, and standard CAD file formats for manufacturing applications.	PO1 (3)	PSO1 (3)
CO2	Analyze conventional machining processes, cutting mechanics, tool wear, machining parameters, and evaluate machinability for efficient manufacturing.	PO2 (3)	PSO2 (2)
CO3	Evaluate abrasive machining and additive manufacturing processes for producing engineering components with improved quality and productivity	PO3 (3)	PSO2 (3)
CO4	Apply CNC programming, motion control principles, and CAM tools to develop machining programs for manufacturing operations.	PO4 (3)	PSO1 (3)
CO5	Design and develop patterns, molds, and masks for manufacturing processes using CAD tools and appropriate manufacturing techniques.	PO3 (3)	PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



ME25C10	Standards in Mechanical Engineering	L	T	P	C
		1	0	0	1
Course Objectives: The course introduces standardization, conformity assessment, and the roles of BIS and ISO, while familiarizing students with key standards in engineering drawings, testing, management systems, and machinery safety for practical application.					
UNIT-I Fundamentals of Standardization and Conformity Assessment 3 Introduction: Aims of standardization - Types of standards - Importance of standards to industry Conformity Assessment: Objects of conformity assessment - First-party assessment - Second-party assessment - Third-party assessment - Certifications and markings Activities Study and present the importance and types of standards used in mechanical engineering industries. Analyze different types of conformity assessment and identify certification markings on products.					
UNIT-II Bureau of Indian Standards (BIS) 3 Bureau of Indian Standards (BIS): Objectives of BIS - Roles of BIS - Functions of BIS - Application of any one BIS standard Activity Study BIS functions and identify BIS standards applied to common engineering components.					
UNIT-III International Organization for Standardization (ISO) 3 ISO Standards: Key principles for ISO standards development - ISO Directives - Stages in ISO standard development - Application of any one ISO standard Activity Analyze the ISO standard development process and study key ISO standards.					
UNIT-IV Standards for Engineering Drawing 3 SP 46:2003 Sizes and layout of drawing sheets - Scales - Lines - Sections - Screw threads and threaded parts - Springs Gears - Dimensioning - Surface texture - Linear and angular tolerances - Geometrical tolerances Activity Interpret engineering drawings using SP 46 standards and identify symbols, tolerances and dimensions.					
UNIT-V International Engineering Standards 3 ASTM Standards: Objectives of ASTM standards - Scope of ASTM standards - Application of any one ASTM standard ASME Standards: Objectives of ASME standards - Scope of ASME standards					
Weightage: Continuous Assessment: 100%.					
Assessment Methodology: Quiz - 10%, Assignments - 20%, and Internal Examinations - 70%					
References: 1. Bureau of Indian Standards, Engineering Drawing Practice for Schools & Colleges, SP 46:2003, Bureau of Indian Standards, New Delhi, India, 2003, ISBN: 81-7061-019-2. 2. W. Hesser, A. Inklaar, and J. Weigand, Standardization Essentials: Principles and					

Practice, Wiley-VCH, Weinheim, Germany, 2010.

3. C. D. Sullivan, Standards and Standardization: Basic Principles and Applications, Marcel Dekker Archive Information, New York, USA, 1983, ISBN: 0-8247-1919-0.

4. ASTM International Standards Catalog, ASTM International, West Conshohocken, Pennsylvania, USA.

5. James D. McCabe, Introduction to the Practice of Mechanical Engineering, including ASME standards and codes, Pearson Education.

E-resources:

1. <https://standardsbis.bsbedge.com/>
2. <https://www.iso.org/sites/edumaterials/trbsaunders.pdf>
3. https://www.ds.dk/media/px5jhney/a-world-built-on-standards.pdf?srsId=AfmBOoqD36gwxLHthllwtvrlqVtSnLaQFL7N8vSJcNfrxSF_qUstL8ia
4. <https://www.bis.gov.in/?lang=en>
5. <https://www.iso.org/home.html>

CO	CO Description	PO	PSO
CO1	Explain the concepts of standardization, conformity assessment, and certification systems used in engineering industries.	PO1 (2)	PSO2 (2)
CO2	Describe the objectives, functions, and applications of Bureau of Indian Standards (BIS) in engineering practice.	PO1 (2)	PSO2 (2)
CO3	Explain the development, principles, and applications of International Organization for Standardization (ISO) standards.	PO2 (2), PO3 (2)	PSO1 (2), PSO2 (2)
CO4	Interpret engineering drawings using SP 46:2003 standards, including dimensioning, tolerances, symbols, and surface texture specifications.	PO1 (3), PO5 (2)	PSO1 (3), PSO2 (2)
CO5	Explain the objectives, scope, and engineering applications of ASTM and ASME standards in mechanical engineering.	PO2 (2), PO3 (2)	PSO1 (2), PSO2 (2)

(1) = Low; (2) = Medium; (3) = High



EN25C04	English Communication Skills Laboratory– II	L	T	P	C
		0	0	2	1
Course Objectives: The objectives of the course are to build students' advanced communication skills for workplace readiness and develop intercultural competence for effective collaboration in global and virtual teams. Prepare students for competitive exams with focused skill-building and test-oriented practice.					
List of Activities					
Stage Ready – Impactful Public Speaking					6
(i) Simulate a formal event such as an academic conference, convocation, or awards ceremony, where students roles including Master of Ceremonies (MC), Role as a dignitary, and a Commentator					
(ii) Visual Prompt Storytelling: Use random images to create spontaneous stories, focusing on plot, setting, and character,					
(iii) Digital Presentation - Record a short video explaining a project or technical concept, using slides, voiceover, and visual aids (to be uploaded using google classroom or drive link)					
Professional and Application-Oriented Writing					6
(i) Résumé Preparation: Design ATS-friendly résumés tailored to various job descriptions, using action verbs and quantifiable impact. ·					
(ii) Design engaging content for poster presentation relevant to their domain.					
Receptive Skills in Workplace Communication					6
(i) Reading articles related to their domain and discuss in groups					
(ii) Visit company websites, make inferences and present in the class					
(iii) Listen to recorded mock interviews and take detailed notes. Summarise key points and action items in a professional format and make a presentation.					
Intercultural Communication					6
(i) Assertive vs Aggressive communication					
(ii) Role play activities – workplace communication in intercultural/cross cultural contexts					
From Campus to Career: Industry Skills and Global Exam Preparation					6
(i) Participate in HR interviews using AI tools or peer interviewers, responding to behavioural questions using methods like STAR (Situation, Task, Action, Result)					
(ii) Practice Verbal Ability in competitive exams like UPSC, SSC, CDS, TNPSC, etc.					
Weightage: Continuous Assessment: 60%, End Semester Lab Examinations: 40%.					
Internal Assessment Methodology: 1. Oral story telling using visual prompts (30 marks)					
2. Poster presentation (40 marks)					
3. ATS resume writing (30 marks)					
End Semester Assessment:					
1. Interview (50 marks)					
2. Verbal Ability test (50 marks)					
(students must bring the resume but evaluation must be done based on the performance in the interview)					



References:

1. Lucas, Stephen, and Paul Stob. The Art of Public Speaking. Thirteenth edition, McGraw- Hill Education, 2020.
2. Abrahams, Matt. Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot. Simon & Schuster, 2023.
3. Beshara, Tony. Powerful Phrases for Successful Interviews, Rev. ed., McGraw- Hill, 2023.
4. Papalia, Anna. Interviewology: The New Science of Interviewing. Harper Business, 2024.
5. Verbal Ability and Reading Comprehension by Ajay Singh McGraw Hill Education 2020

E-resources:

1. Purdue OWL – Online Writing Lab (Academic and professional writing help) <https://owl.purdue.edu/>
2. Canva Resume Builder (Creative, ATS-friendly resume design) <https://www.canva.com/resumes/>
3. BBC Learning English – Pronunciation <https://www.bbc.co.uk/learningenglish/english/features/pronunciation>
4. India Bix website

	Description of CO	PO	PSO1
CO1	Understand basic industry-related reading materials.	-	-
CO2	Design and present a domain specific poster	PO9(3)	PSO1(2) PSO3(3)
CO3	Deliver effective digital presentations	PO9(3)	PSO2(1)
CO4	Communicate appropriately in intercultural/cross cultural contexts	PO9(3) & PO11(1)	PSO3(3)
CO5	Perform in interviews and competitive exams successfully	PO9(3)	PSO3(1)

(1) = Low; (2) = Medium; (3) = High



K. J. J.
Dr. K. ANANDAVELU, B.E., M.E., Ph.D.,
D.I.S., I.G.C.O.H.S., M.I.S.T.E., M.S.E.A (T),
PRINCIPAL
MRK Institute of Technology
Kattumannarkoil - 608 301.