ANNA UNIVERSITY, CHENNAI

UNDER GRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: B.E., Marine 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.

Program Specific Outcomes:

PSO1 Design and develop proficiency in the design, operation, and maintenance of ship machinery and marine propulsion systems.

PSO2 Equip students with skills in using advanced simulation software and marine engineering tools for diagnostics and troubleshooting.

PSO3 Demonstrate research aptitude, teamwork, ethical practices for continuous self-learning and professional growth throughout their careers.

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/ YRC	---	---	---	---	---
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.	MA25C09	Computational Differential Equations	T	3-1-0	4	4	BS
2.	MV25301	Marine Engines – I	LIT	3-0-2	5	4	ES (PC)
3.	ME25C11	Applied Thermodynamics	T	3-1-0	4	4	ES (PC)
4.	CE25C11	Strength of Materials	LIT	3-0-2	5	4	ES (PC)
5.	MV25302	Seamanship, Elementary Navigation and Survival at Sea	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	**29**	**25**	

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.	MV25401	Marine Engines – II	LIT	3-0-2	5	4	ES (PC)
3.	MV25402	Hydraulics and Fluid Machinery	LIT	3-0-2	5	4	ES (PC)
4.	MV25403	Ship Construction	T	3-0-0	3	3	ES (PC)
5.	MV25404	Marine Electrical Machines – I	T	3-0-0	3	3	ES (PC)
6.	MV25405	Marine Auxiliary Machines – I	LIT	2-0-2	4	3	ES (PC)
7.	MV25406	Standards in Marine Engineering	T	1-0-0	1	1	ES (PC)
8.	EN25C04	English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
9.		Skill Development Course – II	LIT	1-0-2	3	2	SD
10.	MV25407	Thermal Engineering and Boiler Chemistry Laboratory	L	0-0-4	4	2	ES (PC)
			Total Credits		**33**	**26**	

Semester – V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods / Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Marine Auxiliary Machines – II	T	3-0-0	3	3	ES (PC)
2.		Fire Prevention and Control in Ships	LIT	3-0-2	5	4	ES (PC)
3.		Marine Electrical Machines – II	LIT	3-0-2	5	4	ES (PC)
4.		Measurements and Instrumentation	LIT	2-0-2	4	3	ES (PC)
5.		Open Elective	T	3-0-0	3	3	---
6.		Programme Elective – I	T	3-0-0	3	3	ES (PE)
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	
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.		Marine Electronics	T	3-1-0	4	4	ES (PC)
2.		Stability of Ships	LIT	3-0-2	5	4	ES (PC)
3.		Marine Vehicle Performance	LIT	3-0-2	5	4	ES (PC)
4.		Programme Elective – II	T	3-0-0	3	3	ES (PE)
5.		Programme Elective – III	T	3-0-0	3	3	ES (PE)
6.		Marine Workshop Practices and Afloat Training Laboratory	L	0-0-4	4	2	ES (PC)
7.		Self-Learning Course	---	---	0	1	---
8.		Industry Oriented Course - II	LIT	1-0-2	3	1	SD
				Total Credits	**27**	**22**	
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.		Marine Management and IMO Requirements	LIT	2-0-2	4	3	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	**18**	**17**	

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

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

TOTAL NUMBER OF CREDITS: 172

PROGRAMME ELECTIVE COURSES – STREAMS

Naval Architecture	Marine Propulsion & Control Systems	Manufacturing	Materials	Management & Maintenance
Ship Structure	Renewable Energy in Marine Systems	Digital Manufacturing	Composite Materials	Ship Operations and Management
Ship Design and Construction	Advanced Marine Propulsion Systems	Industrial IoT	Marine Coatings and Corrosion Control	Dry Docking and Ship Repair
Stability of Ships and Offshore Structures	Marine Control Engineering	Welding Engineering	Non-Destructive Testing (NDT) Methods	Hull and Machinery Maintenance
Marine Hydrodynamics	Shipboard Automation Systems	Design for Manufacturability	Materials Selection for Seawater Environments	Marine Surveying and Inspection
Design of Marine Vehicles	IoT Applications in Marine Systems	Composite Materials and Processes	Materials Characterization	Maritime Economics and Port Operations

Semester I

MA25C01	Applied Calculus	L	T	P	C
		3	1	0	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.

Differential Calculus: Functions, graph of functions, New functions from old functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem, Effect of derivatives on the shape of a graph.

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

Functions of Several Variables: Partial derivatives, 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).

Integral Calculus: 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).

Multiple Integrals: 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:

1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals. John Wiley & Sons.

2. Ron Larson and David C. Falvo,(2013), Calculus: an Applied Approach. Cengage Learning.
3. Stewart, J., Clegg, D., & Watson, S. (2019). *Calculus: Early transcendentals*.
4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2018). *Thomas' calculus: Early transcendentals*. 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)/
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)

ME25C03	Introduction to Mechanical Engineering	L	T	P	C
		2	1	0	3

Course Objectives:

- To impart the fundamental concepts and principles of various fields such as Manufacturing, Materials, Mechanics, thermal engineering in Mechanical Engineering.

Engineering: 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.

Mechanics of Materials and Structures: 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.

Energy Interactions: 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.

Machine Elements: 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.

Manufacturing Processes: 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:

1. Wickert, J., & Lewis, K. (2016). An Introduction to Mechanical Engineering. Cengage Learning.
2. Rajput, R. K., (2017). Fundamentals of Mechanical Engineering, Laxmi Publications.

E-resources:

1. MIT OpenCourseWare – Mechanical Engineering https://ocw.mit.edu
2. PhET Simulations – University of Colorado Boulder https://phet.colorado.edu
3. LibreTexts Engineering https://eng.libretexts.org

	CO Description	PO	PSO
CO1	Explain core mechanical engineering concepts.	---	---
CO2	Apply basic engineering calculations in mechanical systems.	PO1(3)	PSO1(3) PSO2(2)
CO3	Identify common manufacturing processes for engineering applications.	PO2(2)	PSO3(2)

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.

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

Activities: Virtual Demonstration of Conics and Cycloids.

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

Projection of Solids: 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.

Isometric Projection: Isometric Scale, Projection of Simple solids.

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

Perspective Projection: Simple solids projection

Activities: Virtual demonstration of perspective views.

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

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

Assessment Methodology:
Project – 10%, Models - 5%, Assignments - 35% and Internal Examinations - 50%

References:

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

E-Resources:

1. CAD Software – https://www.freecadweb.org/
2. Engineering Drawing and Computer Graphics, Prof. Rajaram Lakkaraju (IIT Kharagpur) – https://onlinecourses.nptel.ac.in/noc22_me105/preview
3. 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.

Properties of Matter: 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.

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

Quantum Mechanics: 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

Applied Optics: Interference: Air wedge, Michelson's Interferometer, Fiber optics: Structure of a fiber, Fiber Optic Communication System, Fiber Sensors (Virtual demo), Displacement, pressure sensor and Temperature sensor, Einstein Co-efficient, Nd:YAG laser, CO_2 laser (construction, functioning and applications), dye laser

Practical: Ruling width of Compact disc using Laser, Thickness of a thin sheet/wire using Air wedge Method.

Activities: Demonstration of sensors and applications of Lasers

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

Assessment Methodology: Quiz (5%), 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.	---	---
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)

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

Water Technology: 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

Nano-chemistry: Classification, Size, dependent properties. Preparation of nanomaterials, Top-down and Bottom-Up approaches, Applications (Flipped classroom).

Practical: Preparation of nanoparticles by Sol-Gel method.

Electrochemistry: Electrochemical cell, Electrode potential., Redox reaction. Conductivity of electrolytes, Factors.

Practical: Conductometric titrations

Activity: Electrochemical cell demonstration

Corrosion & Control: 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

Batteries: 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 e-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 importance of chemistry applications with underlying mechanisms.	---	
CO2	Apply the chemistry concepts in widely used devices.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the effect of various chemical parameters on performance of engineering systems.	PO2(2)	PSO1(2) PSO2(1)
CO4	Perform experimentations as a group and interpret the results.	PO4(3) PO8(1)	PSO2(2) PSO3(2)
CO5	Communicate findings through case studies and reports	PO9(1)	PSO2(2) PSO3(3)

UC25H01	தமிழர் மரபு	L	T	P	C
		1	0	0	1

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, சிற்றிலக்கியங்கள், தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி, தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

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.

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

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.

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 அச்சு வரலாறு.

References:

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 (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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 Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC25H01	Heritage of Tamils	L	T	P	C
		1	0	0	1

Language and Literature: Language Families in India, Dravidian Languages, Tamil as aClassical 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.

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.

Folk and Martial Arts: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance, Sports and Games of Tamils.

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.

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

References:

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.
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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.

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.

Speaking Skills: Self-Introduction (Tenses, Adjectives) Expressing opinions (Subject-Verb Agreement), Participating in Conversations (Speech Acts - agreeing & disagreeing – synonyms and antonyms**)**

Suggested Activities: Self-Introduction, Just a Minute (JAM) Video recording, Situational role plays, Spell Bee, Word Substitution, Usage of Apps.

Listening Skills: Listening to Simple Conversations (Understanding tone and intent), Short Speeches / Stories, Extracting information, Pronunciation, Listening to Various Accents.

Suggested Activities: Listening and Repeating, Gap fill exercises, Note-taking

Reading Skills: Reading Strategies – (Skimming, scanning, predicting) intensive reading - short passages and long passages on suggested themes (Sentence Patterns, Prefixes and suffixes, idioms and phrases).

Activities: Reading - newspaper and digital articles, Cloze, Reading comprehension, note making and summarising,

Writing Skills: Word Substitution, Sentence Formation, Hints Development (Guided Writing), Writing Different Types of Paragraphs - (Sentence Structure) – Letter Writing / Emails (Informal)

Activities: Error Detection, Picture and poster description, Descriptive, Narrative and Comparative paragraphs, Brainstorming and Mind Mapping - Informal letters/ Emails

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%).

References:

3. Miller, K. Q., & Wahl, S. T. (2023). *Business and Professional Communication: KEYS for Workplace Excellence* (5th ed.). SAGE Publications.
4. Kumar, Sanjay & Pushpalatha. (2018). *English Language and Communication Skills for Engineers*. India: Oxford University Press.
5. Sharma, S., & Mishra, B. (2024). *Communication Skills for Engineers and Scientists* (2nd ed.). PHI Learning.

E-resources:

1. Cambridge English – https://www.cambridgeenglish.org/learning-english/grammar-and-vocabulary/

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

	Description of CO	**PO**	**PSO**
CO1	Listen and comprehend spoken English, take and draft notes.	---	---
CO2	Apply vocabulary and grammar appropriately to communicate in written and spoken forms.	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	Develop communication skills relevant to engineering and technology.	PO11(1)	PSO3(3)

CS25C02	**Computer Programming: Python**	L	T	P	C
		2	0	2	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.

Introduction to Python: 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: Problem Analysis Chart, Flowchart and Pseudocode Practices. (Minimum three)

Control Structures: if, if-else, nested if, multi-way if-elif statements, while loop, for loop, nested loops, pass statements.

Practical: Usage of conditional logics in programs. (Minimum three)

Functions: Hiding redundancy, complexity; Parameters, arguments and return values; formal vs actual arguments, named arguments, Recursive & Lambda Functions.

Practical: Usage of functions in programs. (Minimum three)

Strings & Collections: String Comparison, Formatting, Slicing, Splitting, Stripping, Lists, tuples, and dictionaries, basic list operators, searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values.

Practical: String manipulations and operations on lists, tuples, sets, and dictionaries. (Minimum three)

File Operations: Create, Open, Read, Write, Append and Close files. Manipulating directories, OS and Sys modules, reading/writing text and numbers, from/to a file; creating and reading a formatted file (csv, tab-separated, etc.).

Practical: Opening, closing, reading and writing in formatted file format and sort data. (Minimum three)

Packages: Built-in modules, User-Defined modules, Numpy, SciPy, Pandas, Scikit-learn**.**

Practical: Usage of modules and packages to solve problems. (Minimum three), Project (Minimum Two)

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	Explain the potential usage of Python in engineering applications	---	---
CO2	To apply the concepts of Python in solving engineering problems and formulate new projects.	PO1 (2) PO5 (2)	PSO2(2) PSO3(1)
CO3	To interpret the data and effectively communicate in groups.	PO2 (3) PO8 (1) PO9 (1)	PSO3(1) PSO3(2)
CO4	Adapt new programming concepts and technologies in the profession.	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 Stell 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). *You can win*. Macmillan.
2. Levesque, H. (n.d.). *Life skills 101: A practical guide to leaving home and living on your own*. (Publication year not specified)
3. Mitra, B. K. (2017). *Personality development & soft skills* (3rd impression). Oxford University Press.
4. ICT Academy of Kerala. (2016). *Life skills for engineers*. 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	T	P	C
		0	0	4	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). *Psychology of sports performance*. 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.

Vector Spaces 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 $\boldsymbol{R^2}/\boldsymbol{R^3}$ with visualization.

Linear Transformations and Diagonalization: Null space, Range, Dimension Theorem (statement only), Matrix representation of a linear transformation, Eigenvalues & Eigenvectors, Diagonalizability.

Activities: Open-Source software, exercises to compute the matrix representation of a linear transformation, find the null space and range of a matrix, and compute eigenvalues and eigenvectors of a matrix.

Inner Product Spaces: Inner product, Norms, Cauchy, Schwarz inequality, Gram, Schmidt orthogonalization, Simple problems (up to $\boldsymbol{R^3}$).

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

Matrix Decomposition: 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 $3 \times 3\ matrices$).

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.

Statics of Particles: 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.

Activities: Assignments and Quiz on resultant forces, Solving of GATE questions.

Statics of Rigid Bodies: Concept of Free Body Diagram, Equivalent systems of forces, Transmissibility, Moment of a force about a point and an axis, Couples and force-couple systems, Equilibrium of rigid bodies in two and three dimensions, Principle of virtual work.

Activities: Virtual demonstration of rigid bodies, Solving of GATE questions.

Moments of Inertia: First moments of areas and lines, Centroids of composite areas and lines, Theorems of Pappus-Guldinus, Second moment of area, Parallel axis theorem, Rectangular and Polar Moments of inertia of composite areas, Radius of Gyration, Product of Inertia, Principal Axes and Principal Moments of Inertia, Mass moments of inertia of thin plates.

Activities: Virtual Simulation of Moment of Inertia, Principal Axes Determination, Solving of GATE questions.

Friction: Laws of friction, Coefficients of Friction, Angles of Friction, Types of Friction Problems, Wedges and Ladder friction, Belt friction.

Activities: Virtual Demonstration of Friction in belts and pulleys, Solving of GATE questions

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). *Engineering Mechanics: Statics and Dynamics*. 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/ntr24_ed75/preview

	CO Description	PO	PSO
CO1	Explain the principles of statics in determination of forces acting on particles and rigid bodies.	---	---
CO2	Apply equilibrium conditions to predict the behaviour of particles and rigid bodies under various force configurations	PO1(3)	PSO1(3)
CO3	Analyse various systems through resolution of forces and moments.	PO2(2)	PSO1(2)
CO4	Demonstrate the ability to engage in adapting new techniques in the analysis of force and moments in a system.	PO11(1)	PSO2(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.

DC Fundamentals: 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.

AC Fundamentals: 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.

Electric Machines: 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.

Semiconductor Devices: PN junction diodes, Zener Diode, Voltage regulator, BJT & FET Transistors, Timers, Operational Amplifiers.

Activities: Virtual demonstration of V-I characteristics of PN junction and Zener diodes using simulation, inverting/non-inverting amplifiers, Solving GATE questions.

Digital Electronics: Boolean algebra, Basic and Universal Gates, adders, multiplexers, demultiplexers and flip-flops.

Activity: Online logic gate simulators, Solving GATE questions.

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:

1. https://archive.nptel.ac.in/courses/108/106/108106172/
2. Circuit Simulator – https://www.falstad.com/circuit/

	Description of CO	PO	PSO
CO1	Understand and explain basic electrical and electronic concepts.	---	
CO2	Apply and analyse electrical circuits in real-time applications.	PO1 (3) PO2 (1)	PSO1(2)
CO3	Identify and utilise key electronic devices used in engineering applications	PO2 (2)	PSO1(2)

PH25C05	Applied Physics (ME) – II	L	T	P	C
		2	1	0	3

Course Objective(s):

- To impart fundamental knowledge of rigid body dynamics, thermal physics, phase transitions, and functional materials.
- To provide analytical abilities for evaluating physical phenomena in mechanical engineering applications.

Rigid Body Dynamics: Centre of mass – Moment of inertia (circular disc, solid cylinder, hollow cylinder, solid sphere, hollow sphere), Gear, shaft, gyroscope

Activities: Demonstration of moment of inertia of Gear, shafts and Gyroscopes.

Thermal Physics: Thermal conductivity –Transient plane source method, Transient Line Source method- Forbe's method – conduction through compound media, Laws of Thermodynamics .

Activities: Demonstration of thermal conductivity of insulators

Phase Transitions: Solid solutions – single component system, binary phase diagrams – iron-carbon equilibrium diagram, T-T-T-diagram – heat treatment of steels – hardening techniques

Activities: Demonstration of Hardening of steels

Functional Materials: Ceramics – Composites, Fiber Reinforced Plastics, Metallic Glasses, LED Characteristics

Activities: Demonstration of LED working and its characteristics.

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

Assessment Methodology: Quiz (10%), Assignments (30%), Flipped Class (10%), Internal Examinations (50%)

References:

1) Mathur, D. S. (2008). *Elements of properties of matter*. S. Chand.
2) Brij Lal, & Subramaniyan, N. (2018). *Heat, thermodynamics and statistical physics*. S. Chand.
3) Raghavan, V. (2009). *Physical metallurgy: Principles and practice*. PHI Learning.
4) Askeland, D. (2010). *Materials science and engineering*. Brooks/Cole.

E-resources:

1. Moment of Inertia: https://youtu.be/fDJeVR0o__w
2. Conduction: http://kcl.digimat.in/nptel/courses/video/112106155/L32.html
3. Iron –Carbon phase diagram –

   https://archive.nptel.ac.in/courses/113/104/113104068/

4. Gyroscope_ https://www.youtube.com/watch?v=FydJu1A1oeM
   gyroscope-131127011945-phpapp02.pdf
5. Hardening Techniques_
   https://www.youtube.com/watch?v=ckCN9jGsdUY
6. LED Characteristics – https://youtu.be/IgapvczVyXs

	Description of CO	**PO**	**PSO**
CO1	Explain the concepts of physics in mechanical engineering stream.	---	
CO2	Apply appropriate techniques in physics to solve engineering problems.	PO1(3)	PSO1(3)
CO3	Analyse physical systems and interpret data from the virtual studies in the core branches in mechanical engineering.	PO2(2)	PSO1(2)

CY25C03	Applied Chemistry (ME) – II	L	T	P	C
		2	0	0	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.

Functional Materials: 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.

Fuels: Classification, Chemical Composition, natural resources, Calorific Value – Alternative Fuels – Natural gas benefits.
Activities: Comparison of efficiency and emissions in fuels.

Composites: Matrix materials – Reinforcements, Hybrid composites, Engineering applications.

Activities: Design of a simple composite structure for a real engineering application (e.g., lightweight bike frame).

Lubricants: Types, Functions. Key properties, Synthetic lubricants, Mechanisms, Emerging lubricants.

Activities: Collection of lubricants used in real-world engineering systems (e.g., gears, engines, bearings), Virtual demonstration of lubricant viscosity testing.

Combustion: 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.

Adhesives: Adhesion Mechanisms, Classification, Bond strength, Industrial adhesives.

Activities: Adhesion of thermal pads on different Integrated circuits, Industrial adhesives.

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

Assessment Methodology: Quiz (5%), Seminar (5%), Assignments (30%), Flipped Class (10%), Internal Examinations (50%)

References:

1. Palanna, O. G. (2009). *Engineering chemistry*. McGraw-Hill Education (India) Pvt. Ltd.
2. Cheong, K. Y., Impellizzeri, G., & Fraga, M. A. (2018). *Emerging materials for energy conversion and storage*. Elsevier.
3. Jain, P. C., & Jain, M. (2013). *Engineering chemistry*. Dhanpat Rai Publishing Company (P) Ltd.

Sharma, S. C. (2000). *Composite materials*. Narosa Publishing House

	Description of CO	**PO**	**PSO**
CO1	Explain the major concepts of chemistry with regard to applications in mechanical systems.	---	
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)	

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

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில், பானைத் தொழில்நுட்பம், கருப்பு சிவப்பு பாண்டங்கள், பாண்டங்களில் கீறல் குறியீடுகள்.

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.

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.

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு, சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள், வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள், கடல்சார் அறிவு, மீன்வளம், முத்து மற்றும் முத்துக்குளித்தல், பெருங்கடல் குறித்த பண்டைய அறிவு, அறிவுசார் சமூகம்.

அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி, கணித்தமிழ் வளர்ச்சி, தமிழ் நூல்களை மின்பதிப்பு செய்தல், தமிழ் மென்பொருட்கள் உருவாக்கம், தமிழ் இணையக் கல்விக்கழகம், தமிழ் மின் நூலகம், இணையத்தில் தமிழ் அகராதிகள், சொற்குவைத் திட்டம்.

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 (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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 Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

UC25H02	Tamils and Technology	L	T	P	C
		1	0	0	1

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

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.

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.

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.

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.

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 (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi , 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & 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 Bookand 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:

1. Wang, W. (2010). Reverse engineering: Mechanisms, structures, systems & materials. CRC Press.
2. Margolis, M. (2020). Arduino cookbook: Recipes to begin, expand, and enhance your projects (3rd ed.). O'Reilly Media.

E-resources:

1. GrabCAD – https://grabcad.com/
2. 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)

	Description of CO	PO	PSO
			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.

Oral Communication: Types (Verbal and Nonverbal), Interpersonal and group communication, Telephonic conversation.

Suggested Activities: Short presentations, Debates, Formal Speeches (Welcome, Vote of Thanks and introducing guests), Listen and respond to short podcasts.

Business Correspondence: Email Communication, Formal Letters (Types), Business Meeting.

Suggested Activities: Email and letter writing (Complaint, request, permission), Agenda, minutes of the meeting.

Academic Writing: Paraphrasing, Summarizing, Essay Writing, Instructions and Recommendations.

Suggested Activities: Essay writing (Cause and effect, argumentative, persuasive), User guides/ manuals, policy document.

Team Work: Leadership Skills (Team building, Team Leader, Team player), Negotiation and Problem solving skills

Suggested Activities: SWOT Analysis, Brainstorming and Group discussions.

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*). English Language Skills for Engineers*. McGraw Hill Education.
2. Taylor, Shirley & Chandra .V. (2010). *Communication for Business A Practical Approach*. India: Pearson Longman.
3. Ian Badger, et al., (2014). *Listening: B2 (Collins English for Life: Skills)*, Collins.
4. Raymond Murphy (2019), *Grammar in Use*, 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:

1. De Bono, E. (2017). *Six thinking hats*, Little, Brown Book Group.
2. Facione, P. A. (2015). *Critical thinking: What it is and why it counts*. Insight Assessment.
3. Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.
4. Whetten, D. A., & Cameron, K. S. (2016). *Developing management skills*. 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 c problem solving in engineering and real-world contexts.	PO11 (2)	PSO2(1) PSO3(2)

UC25A04	Physical Education - II	L	T	P	C
		0	0	4	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:

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). *Psychology of sports performance*. Sports Publication.
4. Kandappan, K. (2004). *Foundations of physical education*. Friends Publications.

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 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	T	P	C
		1	0	2	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:

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

	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	T	P	C
		1	0	2	1

Course Objectives:

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

Fundamentals of Korean: Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (Subject-Object-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요).

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:

1. King, R., Yeon, J., & Brown, A. (2015). Elementary Korean (2nd ed.). Tuttle Publishing.
2. 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

MA25C09	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.

First Order Ordinary Differential Equations: 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 – Numerical Methods: Solving first order ODE by Euler's formula, Taylor series and Runge Kutta method of 4th order.

Activities: Application and Visualization of the first order ODE using open-source software and solving Competitive Examination questions

Higher Order Ordinary Differential Equations: 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– Numerical Methods: Solving second order ODE by Runge-Kutta method of 4th order and finite difference method.

Activities: solving ordinary differential equations using open-source software and solving of Competitive Examination questions

First Order Partial Differential Equations: 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 – Numerical Methods for first order PDE by Method of lines with Runge-Kutta method of order fourth.

Activities: Application and Visualization of the Partial Differential Equations using open-source software and solving Competitive Examination questions

Higher Order Partial Differential Equations: 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.

Activities: Application of the second order PDE using open-source software of 1-D wave, 1-D heat equations, Laplace and Poisson equations and Solving Competitive Examination questions

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:

1. 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,* (11thed.). 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 techniques.	-	-
CO2	Solve higher-order PDEs using classical and finite difference methods.	PO1(3) PO5(3)	PSO1(2)
CO3	Apply various solution methods to differential equations arising in engineering contexts.	PO1 (3) PO5(3)	PSO2(1)
CO4	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

MV25301	Marine Engines– I	L	T	P	C
		3	0	2	4

Course Objectives:

This course provides knowledge of marine diesel engines, including design, construction, combustion, and fuel systems. It enables students to analyze engine performance, apply operational principles, and understand modern marine propulsion and auxiliary systems.

Marine Diesel Engine Fundamentals: Design Features of marine diesel Engine 2-stroke and 4-stroke cycles, deviation from ideal condition in actual engines. Timing diagrams of 2-stroke timing diagrams of 4-stroke. Marine diesel engine of MAN/B&W/Sulzer make etc, Comparative study of Cross head type, trunk type, slow speed, medium speed and high-speed diesel engines.

Practical: Study of Construction and Working of 2-Stroke Slow Speed Marine Diesel Engine

Construction and Components: Constructional Details of IC Engines Principal components, Bed plates, A frames, Welded construction of bed plates and frames, Foundation Bolts, Tie rods, Crank Shaft , connecting rods, cross heads, Bearings, Piston assembly, Jackets and liners, cylinder heads, Exhaust Valves, etc.

Practical: Study of Liner, Piston, Cylinder Head, Exhaust Valve, Cross head Assembly, Main Bearing, Stuffing Box and Tie Rod of 2-Stroke Slow Speed Marine Diesel Engine.

Scavenging and Turbocharging: Scavenging and Supercharging System Scavenging arrangements in 2-stroke engines, Various types of scavenging, their merits and demerits, Turbocharger and its details, Pulse type and constant pressure type turbo charging, air cooled - water cooled turbocharger casing. Centrally supported and end supported shaft bearings and types, sealing arrangements and lubrication arrangement.

Practical: Demonstration of Turbocharger Construction and Working Principle

Combustion and Fuel Injection Systems: Combustion of fuels in IC engines. Preparation of fuels for efficient combustion, Fuel atomization, Requirements for fuel injectors, high pressure pipes and jacketing arrangement, provision of fuel leak off alarms. Design aspect for combustion chambers. Recirculation type and slide type fuel injector, Design aspect of modern injectors, Ignition delay, Injection delay etc. Fuel injection system, Jerk type fuel pump, (Fuel pumps in Sulzer RTA & MAN B&W MC engines), Pump timing of different marine diesel engines. common rail system- Sulzer RT Flex.

Practical:

- Study of Fuel Pump Construction and Operation,
- Calibration of Fuel Injection Timing in Diesel Engines
- Fuel Injector Testing

Tasks:

T1. A marine diesel engine shows poor fuel efficiency at sea – analyze combustion and fuel injection system.

T2. A ship engine experiences scavenging inefficiency – evaluate system type and suggest improvements.

T3. A turbocharged engine shows low power output **–** diagnose turbocharger and air supply issues.

T4. A marine engine faces frequent injector failures – analyze fuel system and recommend solutions.

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. D.A. Taylor, “Introduction to Marine Engineering”, 2nd Edition, Butter worth – Heinemann, London, 1999
2. Wood yard, Doug, “Pounder’s Marine Diesel Engines”, 7th Edition, Butter Worth Heinemann Publishing, London, 2001
3. Leslie Jackson, Thomas D Morton, Paul A Russe **l**, “Motor Engineering Knowledge For Marine Engineers”, 3rd Ed. Reeds Vol 12, Adlard Coles Nautical, London, 1994
4. Marine Diesel Engines Vol I &Vol II. Notes by Prof K Venkatrara
5. M.E.P., “Low Speed Diesel Engines New”, Marine Engineering Practice, Vol-2 Part-17,, IMarEST, London, 2004 2. S. H. Henshall, “Medium and High Speed Diesel Engines for Marine Use”, 1st Edition, Institute of Marine Engineers, Mumbai, 1996.
6. D.K. Sanyal, “Principle & Practice of Marine Diesel Engines”, 2nd Edition, Bhandarkar Publication, Mumbai, 1998.
7. Mathur, M.L., Sharma, R.P., “ Internal Combustion Engines”, 7th Ed. Dhanpat rai Publications, REPRINT 2002.

CO	CO Description	PO	PSO
CO1	Explain design, construction, scavenging, combustion, and fuel systems of marine diesel engines.	PO1 (2), PO2 (2)	PSO1 (2)

CO2	Apply IC engine principles to determine engine operation, timing, and fuel injection parameters.	PO1 (2), PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze engine systems including scavenging, combustion, and fuel systems for performance evaluation.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate engine configurations and supercharging systems for efficiency and reliability.	PO2 (2), PO3 (2), PO4 (2)	PSO1 (2), PSO2 (2), PSO3 (1)

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

ME25C11	Applied Thermodynamics	L	T	P	C
		3	1	0	4

Course Objectives:
The course focuses on understanding and applying thermodynamic principles in engineering systems, with emphasis on the analysis, evaluation, and comparison of air standard cycles, steam power cycles, refrigeration systems, and heat transfer processes.

Basic Thermodynamics: Systems, closed, open and isolated. Property, state, path and process, quasi-static process, Zeroth Law.

Activities:
Observe and document thermodynamic systems in daily life (e.g., pressure cooker, air compressor, refrigerator) and classify them as open/closed systems with justification.

First and Second Law of Thermodynamics: Heat and work transfer in flow and non-flow processes, Steady flow energy equation - Engineering Applications, Second law, Kelvin-Planck statement, Clausius statement, Concept of Entropy, Clausius inequality, Entropy changes in non- flow processes. Available and Unavailable Energy.

Activities:
- Conduct an energy audit of a simple thermal device such as an electric kettle or water heater using the First Law of Thermodynamics.
- Study entropy generation in daily-life irreversible processes such as mixing hot and cold water or ice melting.
- Analyze a steam turbine/compressor/pump using the Steady Flow Energy Equation and prepare a performance report.

Air Standard Cycles: Carnot cycle, Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Comparison of cycles
Activities:
- Plot P–V and T–S diagrams for Otto, Diesel, Dual, and Brayton cycles using simulation software or graph sheets.
- Compare thermal efficiencies of different air standard cycles for varying compression ratios.

Properties Steam and Vapour Power Cycle: Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagram. p-v-T surface Properties of steam, Dryness fraction, Quality of steam-by-steam tables and Mollier chart –Rankine cycle, Rankine cycle Improvements- Reheat, Regenerative Cycle

Activities:
- Compare the efficiency improvement obtained using reheating and regeneration in Rankine cycles.
- Visit a thermal power plant (virtual/physical) and identify major Rankine cycle components.

Refrigeration: Principles of refrigeration, Vapour compression refrigeration, Performance Calculations, Working principle of Vapour absorption cycle, comparison, sustainable refrigerants.

Activities:

- Study of the working of domestic refrigerators and air conditioners and identify major VCR system components.
- Analyze eco-friendly refrigerants and prepare a report on environmental impacts (ODP/GWP).

Heat Transfer: Modes of heat transfer, Heat conduction - composite wall, Heat conduction through hollow and composite cylinders, spheres. Basics of Convective heat transfer. Fundamentals of Radiative heat transfer, heat-exchangers. LMTD for parallel and counter flow configuration.

Activities:

- Measure temperature variation across composite walls using simple experimental setups.
- Analyze cooling mechanisms in automobile radiators or electronic devices.
- Perform a case study on heat exchangers and calculate LMTD for parallel and counter flow systems.

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. Yunus A. Çengel, Michael A. Boles & Mehmet Kanoğlu, Thermodynamics: An Engineering Approach, 10th Edition, McGraw Hill Education, 2023.
2. P.K. Nag & Sudipta De, Engineering Thermodynamics, 7th Edition, McGraw Hill Education, 2025.
3. Mahesh M. Rathore, Thermal Engineering, Latest available edition: 1st Edition, Tata McGraw Hill, 2010.
4. P. Ballaney, Thermal Engineering, 25th Edition, Khanna Publishers, 2017.
5. R.K. Rajput, Thermal Engineering, 10th Edition, Laxmi Publications (P) Ltd., 2017.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc25_me148/preview
2. https://onlinecourses.nptel.ac.in/noc24_me03/preview
3. https://nptel.ac.in/courses/112103307
4. https://www.nptelprep.in/courses/112103307
5. https://nptel.ac.in/courses/112106133
6. https://nptel.ac.in/courses/112106419

CO	CO Description	PO	PSO
CO1	Explain the basic principles of thermodynamics and energy interactions in engineering systems.	-	-
CO2	Apply thermodynamic laws to analyze air standard cycles and steam power cycles.	PO1(2), PO2(2), PO3(2)	PSO1(2)
CO3	Analyse refrigeration, air-conditioning systems, and heat transfer processes including conduction, convection, and radiation.	PO2(2), PO3(2), PO4(2)	PSO2(2)
CO4	Demonstrate problem-solving skills in real-world thermodynamic and heat transfer applications, including performance evaluation and design calculations.	PO4(2), PO5(1), PO12(1)	PSO2(2), PSO3(1)

(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.

Stress, Strain and Deformation of Solids: 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
1. Tensile test on mild steel rod.
2. Hardness test on metals (Rockwell and Brinell Hardness Tests)

Transverse Loading on Beams and Stresses In Beam: Beams, Types, Transverse loading on beams, Shear force and Bending moment in beams, Cantilever, Simply-supported and over-hanging 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
1. Double shear tests on metal rod
2. Impact test on metal specimen (Izod and Charpy)

Torsion: Theory of Torsion, Stresses and Deformations in Solid and Hollow Circular Shafts, Combined bending moment and torsion of shafts, Power transmitted to shaft, Shaft in series and parallel, Closed and Open Coiled helical springs – springs in series and parallel.

Activity: Assignments on torsion of solid and hollow circular shafts.

Practical: Torsion test on mild steel rod.

Deflection of Beams and Springs: Elastic curve, Governing differential equation, Double integration method, Macaulay's method, Area moment method, Conjugate beam method for computation of slope and deflection of determinant beams, Strain energy method for determinate beams, Maxwell's reciprocal theorem, Leaf springs.

Practical
1. Deflection test on metal beam. Verification of Maxwell's reciprocal theorem.
2. Deflection test on carriage spring.

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 light weight bridge.

Practical: Compression test on wood and brick.

Thin Cylinders, Spheres and Thick Cylinders: Stresses in thin cylindrical shell due to internal pressure, circumferential and longitudinal stresses, Deformation in thin cylinders, Spherical shells subjected to internal pressure, Deformation in spherical shells, Thick cylinders, Lame's theory.

Activity: Assignments and Quiz problems on Thin Cylinders, Sphere 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.
4. 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	Describe fundamental concepts of stress, strain, deformation, bending, torsion, deflection, columns, and pressure vessels to demonstrate overall understanding of strength of materials.	—	—
CO2	Calculate stresses, strains, deformation, shear force, bending moment, and load-carrying capacity of structural members using relevant theories.	PO1 (2), PO2 (2)	PSO1 (2)
CO3	Analyze beams, shafts, springs, and columns under various loading conditions to determine stress distribution and structural response.	PO1 (2), PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate strength, stability, and performance of structural components and develop suitable solutions for engineering applications involving deformation and failure analysis.	PO2 (2), PO3 (2), PO5 (2)	PSO1 (2), PSO2 (2), PSO3 (1)

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

MV25302	Seamanship, Elementary Navigation and Survival at Sea	L	T	P	C
		3	0	0	3

Course Objective:

This course provides fundamental knowledge of seamanship, navigation, mooring operations, and survival techniques at sea. It enables students to apply navigational methods, handle shipboard operations, and respond effectively to emergencies for safe maritime practices.

Seamanship, Basics of Ship Handling, Rope Work and Deck Work: General organization of a ship, various types of ships, important parts of a ship, maritime terminology, various types of knots, basic knots and bends in the rope work, uses of rudder and propeller, various commands on steering and main propulsion equipment, deck equipment, safe working practices to be followed while working on the deck.

Activity: Demonstrate basic knots and simulate ship handling commands and deck safety practices.

Mooring Operations: Mooring winch and windlass constructional detail. Different types of anchors and their constructional details, various terminology associated with anchoring- drooping and weighing of anchor, cable stopper, purpose of cable locker. Anchor chain ranging and calibration. Various methods of mooring a ship. Safe working practices on mooring winches and windlass operation.

Activity: Study anchoring and mooring procedures and illustrate safe operation of mooring equipment.

Navigation of Ships: Types of navigation- coastal navigation, celestial navigation and electronic navigation. Latitudes and longitude, time zones, standard time. Plotting ship's position in Navigational charts, true and magnetic compass. Sextant, GPS, log and echo sounder. Route planning and simple passage planning.

Activity: Plot a ship's position on a navigational chart using coordinates and basic instruments.

Survival Equipment: Various emergencies, lifesaving appliances- life raft, life boat and rescue boats, EPIRB, SART, TPA. Survival pack, Stowage and securing arrangement, Abandon ship: Manning of lifeboat and life raft. Muster list. Radio and alarm signals, Distress signals (S.O.S) Distress Calls time and Radio frequency. Pyrotechnics. Survival factors and challenges, equipment available, duties of crew members, Initial action on boarding survival craft, maintaining the craft.

Activity: Analyze lifesaving appliances and demonstrate emergency procedures like abandon ship.

Challenges for Survival at Sea: Launching procedure for life raft and lifebuoys. Embarkation into lifeboat and life raft Actions to be taken immediately on barding the life raft or life buoy. Hypothermia, hyperthermia, drinks of death. Manning a life raft. Finding food and water at sea. Importance of group survival strategies.

Activity: Evaluate survival strategies and actions required in emergency situations at sea.

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. Graham Danton, “The theory and practice of seamanship”, 11th Edition, Routledge, NewYork, USA Reprint 2005.
2. Capt. J. Dinger, “Seamanship Primer”, 8th Edition, Bhandarkar Publications, Mumbai 2017.
3. Capt T K Joseph, “Principles of Navigation” 2nd edition, Applied research International, 2006
4. Admiralty Manual of Seamanship, Published by Stationary Office Books, revised edition, 1982
5. Seamanship Techniques Shipboard and marine operations. Routledge publisher’s 3rd edition 2004
6. D.J House “Seamanship Techniques” 3 rd Edition, Butterworth Heinemann, 2009

CO	CO Description	PO	PSO
CO1	Explain seamanship, navigation, mooring, and survival concepts.	PO1 (2)	–
CO2	Apply seamanship, navigation, and mooring procedures for ship operations.	PO1 (2), PO2 (2)	PSO1 (2)
CO3	Analyze ship handling, navigation methods, and survival challenges.	PO2 (2), PO4 (1)	PSO1 (2), PSO3 (2)
CO4	Evaluate navigational tools, mooring systems, and survival strategies.	PO2 (2), PO3 (2), PO5 (1)	PSO2 (2), PSO3 (2)

(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.

Embedded Hardware Architecture: 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.

Arm And Embedded Software Development Tools: 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.

Wired Communication Interfaces: Wired Communication Protocols: Serial – RS232, RS485, I2C, SPI, USB; Parallel – IEEE 488.

Activity: Implement serial communication (UART/I2C/SPI) between a microcontroller and an external device.

Wireless Communication Interfaces: Wireless Communication Protocols: Bluetooth Classic, BLE, IEEE 802.15.4, Zigbee, IEEE 802.11, LoRaWAN.

Activity: Demonstrate wireless data transmission using a module (e.g., Bluetooth/Zigbee/Wi-Fi).

Real-Time Operating System: 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.

Embedded Programming and Peripheral Interfacing: Embedded C and Python Programming for Embedded Applications. Peripheral Interfacing: Input and Output Devices, ADC, DAC, PWM Generation, Sensor Interface.

Activity: Develop an embedded application interfacing sensors/actuators using 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	CO Description	PO	PSO
CO1	Explain the architecture, components, programming, and communication protocols of embedded systems.	—	—
CO2	Apply embedded C/Python programming and peripheral interfacing techniques to implement embedded applications.	PO1 (2), PO5 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze embedded systems for performance, task scheduling, and peripheral communication using real-time operating systems.	PO1 (2), PO3 (2), PO5 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate efficiency, reliability, and suitability of embedded systems, communication protocols, and RTOS-based solutions.	PO1 (2), PO2 (2), PO5 (2)	PSO1 (2), PSO2 (2), PSO3 (2)

(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

(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

(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:

(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

(i) Building LinkedIn Profile – Drafting headlines and summaries

(ii) Social Media Optimisation

(iii) Preparing Video Resume

E. Podcast-Based Language Learning:

(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:

(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 DomnaLazidou**, “**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.

Introduction and Mathematics for Data Science: Linear equations and solutions, Matrices and their Properties; Eigenvalues and eigenvectors; Matrix Factorizations, Inner products, Distance measures; Projections; Notion of hyperplanes; halfplanes. Descriptive statistics, Inferential statistics, Hypothesis testing, Regression analysis Statistical modelling.

Activity: Perform statistical analysis and regression on a dataset using programming language to understand data distribution and relationships.

Introduction and Mathematics for 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, e-commerce.

Data Preprocessing & 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.

Exploratory Data Analysis (EDA) & Visualisation: Descriptive statistics, Data visualisation 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, heatmap) to identify patterns and correlations.

Machine Learning Techniques: Supervised Learning: Linear Regression, Logistic Regression, Decision Trees, 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.

Applied Data Science & Case Studies: 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, *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter, 3rd Edition, O'Reilly Media*, 2022.
3. *Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*, 3rd Edition, O'Reilly Media, 2022.
4. Joel Grus, Data Science from Scratch: First Principles with Python, 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	CO Description	PO	PSO
CO1	Explain the concepts of data science lifecycle, mathematics, preprocessing, EDA, and ML techniques.	–	–
CO2	Describe data preprocessing, feature engineering, and visualization techniques.	PO1 (2), PO5 (2)	PSO2 (2)
CO3	Apply data preprocessing, visualization, and machine learning algorithms using tools.	PO2 (2), PO5 (2)	PSO2 (2)
CO4	Analyze datasets using statistical and analytical methods to derive insights.	PO2 (2), PO4 (2)	PSO2 (2), PSO3 (2)

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

MV25401	Marine Engines – II	L	T	P	C
		3	0	2	4

Course Objectives:

The course aims to provide an understanding of marine engine starting, reversing, and safe operating practices, along with the analysis of engine performance, lubrication, and maintenance procedures. It also covers the functioning of governors, crankcase inspection, and safety systems, and introduces the construction and operation of modern smart marine engines.

Marine Diesel Engine Maneuvering System: Starting and reversing system of different marine diesel engines with safety provisions.

Practical:

- Study of Starting Air Distribution System in 2-Stroke Marine Engines
- Study of Marine Engine Reversing Mechanism
- Demonstration of Turning Gear Engagement and Safety Arrangement

Auxiliary Diesel Engines, Medium Speed Engine, Gearing Systems, Clutches And Exhaust Valve: Auxiliary diesel Engines, medium Speed engine, Gearing systems and Clutches: Types, couplings, and reduction gears used in conjunction with medium speed engines. Development in exhaust valve design, V- type engine details

Practical:

- Demonstration of Speed Control in Medium Speed Diesel Engines
- Study of V-Type Engine Arrangement and Working Principle

Performance Characteristics of Diesel Engine and Indicator Cards & Lubricating System: Performance Characteristics of diesel Engine and indicator Cards & Lubricating System Constructional details of indicator instruments, Indicator diagrams and power calculations. significance of power diagram calculations and fault detection, simple draw card, light spring cards and out of phase diagram, power balancing, Load diagrams, performance characteristics curve, test bed and sea trails of diesel engines. Lubrication arrangement in diesel engines including Cooling System, Merits and demerits of different cooling mediums, cylinder lubrication, liner wear and preventive measures.

Practical:

- Study and Measurement of Indicator Diagrams using Indicator Instrument
- Demonstration of Hans Jensen Mechanical Lubricator
- Study of Alpha Lubrication System
- Calculation of Indicated Power Using Power Cards

Governors and Crankcase Inspection: Governors and their Operation with PID Controller, Over speed arrangement and over speed safety. Electronic Governors with constant speed arrangement. Marine diesel engine Crank Case Inspection, depth gauge and crankshaft deflection and alignment.

Practical:

- Study of Electronic Governor and Constant Speed Operation
- Crankshaft Deflection Measurement

Basic Construction and Operation of Smart Engines: Difference between convention and smart engines. Introduction to engine control system, Engine Hydraulic Oil Loop, Hydraulic cylinder unit, Fuel Oil Pressure Booster, Fuel Oil Injection working principle, Exhaust valve, Fiva Valve, ME Tacho-system

Practical:

- Study of Fuel Oil Injection Working Principle in Smart Engines
- Study of Hydraulic and Fuel Booster Arrangements in Smart Engines

Tasks:

T1. A marine engine fails to start or reverse properly – analyze starting system and safety mechanisms.

T2. A ship engine shows abnormal vibration and power imbalance – evaluate performance using indicator diagrams.

T3. A marine engine experiences excessive liner wear and lubrication failure – diagnose causes and suggest improvements.

T4. A vessel faces engine overspeed or governor malfunction – analyze control system and propose corrective measures.

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. D.K. Sanyal, “Principle & Practice of Marine Diesel Engines”, 2nd Edition, Bhandarkar Publication, Mumbai, 1998.
2. FSS Code, 2015 Edition, IMO Publication.
3. International Safety Guide for Oil Tanker and Terminals (ISGOTT), 6th edition, Witherby Seamanship International Ltd. ISBN-10 1856099180

CO	CO Description	PO	PSO
CO1	Explain safe practices in marine engine starting and reversing operation	PO1(2)	PSO1(2)
CO2	Explain safe practices in marine engine operation	PO2 (2)	PSO1 (2)
CO3	Analyze marine engine performance and lubrication system.	PO2 (2), PO3 (2) PO4(2)	PSO2 (2)
CO4	Explain the inspection and maintenance procedure for marine diesel engine crank case and governor.	PO4 (2), PO5 (1), PO9(1)	PSO2 (2), PSO3 (1)

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

MV25402	Hydraulics and Fluid Machinery	L	T	P	C
		3	0	2	4

Course Objectives:
The course provides an understanding of fluid properties, statics, and flow behavior, and their application in analyzing pipe flow, energy losses, and stability of floating bodies. It also enables evaluation of the performance and characteristics of pumps and hydraulic turbines.

Properties of Fluids & Fluid Statics: Properties of fluids, Pascal's Law, Absolute pressure and gauge pressure, Manometers - Single column manometer, U-tube manometer and Differential manometer. Variation of fluid pressure with depth, Total force due to liquid pressure on immersed plane surfaces - Horizontal surface and Vertical surface. Centre of pressure, Rectangular vertical plane surface and Triangular plane surface with one edge parallel to liquid surface

Practical: Flow Measurement Using Venturi and Orifice Meter

Buoyancy and Floatation: Buoyancy, Floatation, Metacentric height, Stability of floating bodies and Stability of submerged bodies

Practical: Metacentric Height-War, Cargo Ship Model.

Fluid Kinematics & Fluid Dynamics: Types of fluid flow, Types of flow lines, Rate of flow, Continuity equation, Circulation and vorticity and Types of motion of fluid particles. Euler's equation of motion, Bernoulli's equation and applications - Venturi meter, Orifice meter and Pitot tube - Impulse momentum equation, Flow through an orifice, Torricelli's theorem, Coefficient of velocity, contraction and discharge.

Practical: Calibration of Rotameter.

Flow Through Pipes and Boundary Layer: Reynolds experiment, Rotating viscometer, Navier–Stokes equations of motion, Flow of viscous fluid in circular pipes, Hagen–Poiseuille equation, Darcy–Weisbach equation, Major and minor energy losses, Pipes in series and parallel and Power transmission through pipes. Boundary layer characteristics, Boundary layer thickness, Total drag due to laminar and turbulent layers and Boundary layer separation and its control

Practical: Study of Losses in Pipe Flow - Major Losses

Pumps: Dimensional analysis, Buckingham π theorem, Dimensionless numbers in fluid mechanics, Impact of jets on flat plates, curved plates, and pipe bends, Surge pressure and control, Centrifugal pumps - Constructional details,Pump output and efficiencies, Blade diagram, Effect of vane angle, Cavitation, Pump characteristics, Multistage pumps, Vibration and noise in hydraulic pumps and Reciprocating pumps – working principle

Practical:
1. Performance Test on Reciprocating Pump
2. Performance Test on Centrifugal Pump

Turbines: Classification of hydraulic turbines, Pelton turbine, Francis turbine, Kaplan turbine – working principle, velocity triangles, efficiencies, Draft tube efficiencies, Hydraulic turbine characteristics

Practical:

1. Performance Test on Pelton Wheel Turbine
2. Performance Test on Francis Turbine

Tasks:

T1. A ship shows instability during loading – analyze buoyancy and metacentric height to improve stability.

T2. A pipeline system experiences high energy losses – evaluate flow conditions and reduce losses.

T3. A centrifugal pump shows low efficiency and cavitation – analyze operating conditions and suggest improvements.

T4. A hydraulic turbine produces reduced power output **–** evaluate performance and optimize operating parameters.

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, Fluid Mechanics and Hydraulic Machines, 9th Revised Edition, Laxmi Publications, 2010.
2. R. K. Rajput, Fluid Mechanics and Hydraulic Machines, 6th Edition, S. Chand Publishing, New Delhi, 2015.
3. S. C. Gupta, Fluid Mechanics and Hydraulic Machines, 1st Edition, Pearson, 2011.
4. Bruce R. Munson, Donald F. Young, and Theodore H. Okiishi, Fundamentals of Fluid Mechanics, 6th Edition, John Wiley & Sons (Asia) Pvt. Ltd., India, 2010.
5. John A. Roberson and Clayton T. Crowe, Engineering Fluid Mechanics, 6th Edition, John Wiley & Sons, 1999.
6. Yunus A. Çengel, Fluid Mechanics: Fundamentals and Applications, 2nd Edition, McGraw-Hill Education, 2006.
7. Joy, Hydraulic Power Transmission in Marine Machinery, Marine Engineering Practice, Vol. 1, Part 07, Institute of Marine Engineering, Science and Technology (IMarEST), London, 2002.

CO	CO Description	PO	PSO
CO1	Explain properties of fluids, fluid statics, buoyancy, and stability of floating and submerged bodies.	–	–
CO2	Apply fluid mechanics principles to analyze fluid flow, pressure, and metacentric height.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze flow through pipes, boundary layer behavior, and energy losses in fluid systems.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate performance and characteristics of pumps and hydraulic turbines using engineering principles.	PO3 (2), PO5 (2)	PSO1 (2), PSO2 (2), PSO3 (1)

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

MV25403	Ship Construction	L	T	P	C
		3	0	0	3

Course Objectives

This course aims to provide students with fundamental knowledge of ship structural components, shipbuilding materials, and construction methods used in modern shipyards. It enables students to understand ship structural design, safety considerations, and classification requirements relevant to marine engineering practice.

Introduction to Ship Construction: Types of ships and their general arrangement Basic ship terminology, Ship dimensions and principal particulars, Structural members of ships, Shipbuilding materials and properties, Shipyard layout and shipbuilding process.

Activity: Ship types identification, Diagram labeling (parts of ship) & Short report on materials.

Hull Structure and Framing Systems: Longitudinal and transverse framing systems Bottom structure and double bottom construction, Keel, floors, girders and brackets Side shell plating and framing, Deck structure and deck beams, Bulkheads and watertight compartments

Activity: Model/drawing of framing systems, Sketch double bottom & bulkheads and Comparison discussion

Structural Components of Ships: Bow and stern construction, Fore peak and aft peak structures, Engine room structure and foundations, Shaft tunnel and propeller shaft, Superstructures and deck houses, Hatch openings and hatch covers

Activity: Component mapping on diagram, Video-based identification & Short assignment**.**

Ship Construction Techniques: Welding in ship construction, Riveted and welded joints, Prefabrication and modular construction, Block construction method Ship launching methods, Dry docking and ship repair

Activity: Welding process study, Flowchart of block construction & Field/virtual shipyard visit

Ship Structural Strength and Classification: Longitudinal strength of ships Stresses in hull girder, Load distribution on ship structures, Corrosion and protection methods, Role of classification societies, Ship structural inspection and maintenance.

Activity: Case study on failures, Basics of stress/load discussion & Corrosion & inspection activity.

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. Eyres, D.J., Ship Construction, Butterworth-Heinemann.
2. Lamb, T., Ship Design and Construction, SNAME.
3. Rawson, K.J. & Tupper, E.C., Basic Ship Theory, Butterworth-Heinemann.
4. Barrass, C.B., Ship Design and Performance for Masters and Mates, Elsevier.
5. Watson, D.G.M., Practical Ship Design, Elsevier.
6. Classification Society Rules (DNV / ABS / Lloyd's Register).
7. NPTEL Marine Engineering resources.

CO	CO Description	PO Mapping	PSO
CO1	Explain basic ship types, terminology, structural components, and shipbuilding materials.	–	–
CO2	Apply knowledge of hull structure, framing systems, and ship components in design and analysis.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze ship structural components, construction methods, and fabrication techniques.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate ship structural strength, load distribution, corrosion protection, and classification requirements.	PO3 (2), PO5 (2)	PSO1 (2), PSO2 (2), PSO3 (1)

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

MV25404	Marine Electrical Machines – I	L	T	P	C
		3	0	0	3

Course Objectives:

This course introduces the principles of electro-mechanical energy conversion and the construction, operation, and performance of marine electrical machines such as DC generators, motors, and transformers. It also covers motor characteristics and their application in efficient marine propulsion and shipboard electrical systems.

Electromechanical Energy Conversion: Fundamentals of Magnetic circuits – Statically and dynamically induced EMF – Principle of electromechanical energy conversion forces and torque in magnetic field systems – co-energy in singly excited and multi excited magnetic field system – Winding Inductances – magnetic fields in rotating machines- magnetic saturation and leakage fluxes.

Activity: Students learn the fundamentals of magnetic circuits, EMF generation, and energy conversion through simple problem-solving, demonstrations, and short assignments on inductance and co-energy.

DC Generators: Principle of operation, constructional details, armature windings and its types, EMF equation – armature reaction – demagnetizing and cross magnetizing ampere turns – compensating winding – commutation – inter poles – OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections- applications of DC Generators.

Activity: Activities include diagram labeling, plotting characteristics, and solving numerical problems to understand construction, operation, and performance of DC generators.

DC Motors: Principle of operation – significance of back e.m.f – torque equations and power developed by armature – speed control of DC motors – starting methods of DC motors – load characteristics –losses and efficiency – condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne’s test, Hopkinson's test, Field test, Retardation test, Separation of core losses-applications of DC motors.

Activity: Students study motor operation, speed control, and performance through demonstrations, graph plotting, and basic testing methods with problem-solving exercises.

Transformers: Construction and principle of operation – equivalent circuit – phasor diagrams – voltage regulation –losses and efficiency – all day efficiency – applications of single-phase transformer. Construction and working of auto transformer – comparison with two winding transformers – applications of autotransformer. Three Phase Transformer – Construction – types of connections and their comparative features–Scott connection, applications of Scott connection.

Activity: Learning involves drawing equivalent circuits and phasor diagrams, solving numerical problems, and comparing different types of transformers and their applications.

Fault Finding Techniques for Generator: Types of fault in main generator, Emergency generator, Fault finding techniques of main generator, Essential requirements for fault prevention and fault location in Generators Fault Rectification and actions to be taken on detection of fault in Main Generator and Emergency Generator.

Activity: Students analyze common generator faults, perform fault identification exercises, and develop flowcharts for troubleshooting and preventive maintenance.

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. Theraja A. K, A Textbook of Electrical Technology: - AC and DC Machines (Volume - 2) Publisher S. Chand
2. Edmund GR Kraal, Stanley Buyers, Christopher Lavers, “Basic electro technology for marine engineers”, 4th Ed. Reeds Vol 06
3. I.J Nagrath and D.P Kothari, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill Publishing Co., Ltd., New Delhi, 2002
4. Hughes Edward, “Electrical technology”, 2nd edition, “ELBS with DP Publications”, USA, 1996.

CO	CO Description	PO	PSO
CO1	Explain the principles, construction, operation, characteristics, and fault-finding methods of marine electrical machines and transformers.		
CO2	Apply the concepts of electromechanical energy conversion, DC machines, transformers, and generator fault diagnosis in marine electrical systems.	PO1(2), PO2 (2)	PSO1 (2), PSO2 (1)
CO3	Analyze the performance characteristics, testing methods, efficiency, speed control, and operational behavior of electrical machines and transformers.	PO2(2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate machine performance, transformer operation, generator faults, and maintenance practices for reliable marine electrical applications.	PO3(2), PO5 (2)	PSO2 (2), PSO3 (2)

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

MV25405	Marine Auxiliary Machines – I	L	T	P	C
		2	0	2	3

Course Objectives:
The course provides knowledge of marine auxiliary systems including piping, valves, air compressors, purifiers, and heat exchangers, with emphasis on their operation, performance, and troubleshooting.

Engine Room Various Piping Arrangements: Piping arrangement of steam, fuel oil, lubricating oil cooling water, starting and service air systems, with fittings in the system. Pipeline materials and pipeline standards. Domestic fresh water and sea water hydrophore systems. Layout of machines in engine room. Location of stores and workshop, water tight doors, emergency escapes.

Practical:

- Identification and tracing of steam, fuel oil, lubricating oil, cooling water, and compressed air pipelines in engine room layout.
- Preparation and study of schematic piping diagrams for marine auxiliary systems.

Valves, Cocks & Filters: Understand construction and basic maintenance of valves and cocks. Globe valves, gate valves, Butterfly valves, Non return valves, Quick closing valves and pressure reducing valves, Solenoid control spool valves, Remote operation for shutting down low sea and high sea suction valves. Construction & operation of Simplex & Duplex Filters, auto clean filters

Practical:

- Dismantling, assembly, and maintenance of globe valve and gate valve.
- Study and operation of quick closing valves and pressure reducing valves. Dismantling and operational study of simplex and duplex filters.

Air Compressors: Design consideration, construction & operation of multistage reciprocating air compressors, rotary and screw air compressors, use of inter coolers and aftercoolers, emergency air compressor on ships, uses of compressed air, requirements of control air. Mountings of main and emergency air reservoirs, dehumidifiers, filters, pressure reducing valve.

Practical:

- Study and operation of multistage reciprocating air compressor.

Purifier and Clarifier: Principle of separation in gravity and centrifuge, purifier and clarifier operation, Factors affecting purification, selection of gravity disc, Basic components of purifier and clarifier, Working of purifier and clarifier, Operation problems and their remedies.

Practical:

- Demonstration and study of purifier operation and sludge discharge process.
- Dismantling, cleaning, and maintenance of purifier bowl assembly.

Heat Exchangers: Construction & operation of Tubular Heat Exchangers, Plate type heat exchangers. Materials used in their construction. Expansion arrangement provided and their purpose. Maintenance works to be carried out. Fault finding and conditional assessment of heat exchangers.

Practical:

- Study and operation of shell and tube heat exchanger.
- Dismantling, cleaning, and maintenance of plate type heat exchanger.
- Fault diagnosis and performance assessment of marine heat exchangers.

Tasks:

T1. A ship faces fuel leakage in piping system – analyze pipeline layout, valves, and suggest corrective measures.

T2. An air compressor shows low pressure output – diagnose faults and improve performance.

T3. A purifier fails to separate impurities effectively – evaluate operating conditions and suggest remedies.

T4. A heat exchanger shows reduced heat transfer efficiency – identify fouling issues and recommend maintenance actions.

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. Marine auxiliary machinery - H.D GEORGE, 7th edition, Butterworth-Heinemann Ltd, ISBN-10 0750643986
2. Reeds Marine Engineering Series Vol 8, General Engineering Knowledge – Thomas D Morton, Leslie Jackson. Thomas Reed Publication.

CO	CO Description	PO	PSO
CO1	Explain the construction, operation, and layout of marine auxiliary systems including piping systems, valves, compressors, purifiers, and heat exchangers.	PO1 (2), PO2 (1)	PSO1 (2)
CO2	Apply the principles of marine auxiliary machinery in piping arrangements, compressed air systems, purification systems, and heat exchanger operations.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (1)
CO3	Analyze the performance, operating conditions, faults, and maintenance requirements of marine auxiliary machines and systems.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate troubleshooting methods, operational efficiency, and maintenance practices for reliable operation of marine auxiliary systems onboard ships.	PO3 (2), PO5 (2)	PSO2 (2), PSO3 (2)

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

MV25406	Standards in Marine Engineering	L	T	P	C
		1	0	0	1

Course Objectives:
This course aims to familiarize students with international standards, regulations, and classification requirements applicable to marine engineering systems and ship operations. It enables students to understand safety, quality, environmental, and operational standards followed in the maritime industry.

Introduction to Maritime Standards: Importance of standards in marine engineering, International maritime organizations and regulatory framework, Overview of International Maritime Organization conventions, Role of maritime safety and environmental protection standards, Introduction to AI in maritime regulation and compliance monitoring

Activity: Students learn maritime regulations and IMO standards through discussions and short presentations.

Classification Societies and Ship Certification: Role of classification societies in ship design and construction (e.g., DNV, Lloyd's Register), Rules and regulations of classification societies, Ship surveys and certification procedures, Statutory and class certificates, AI-based predictive maintenance and smart survey techniques in ship certification

Activity: Activities include case studies and reports on classification societies and certification procedures.

Marine Engineering Codes and Standards: Standards related to marine machinery and equipment, International Safety Management (ISM) standards, Quality standards in shipbuilding and maintenance, Environmental regulations for ships, Application of AI in machinery monitoring, fault detection, and energy efficiency optimization

Activity: Students study machinery, safety, and environmental standards through assignments and comparisons.

Safety, Environmental and Operational Standards: Safety management and operational standards on ships, Pollution prevention regulations (e.g., MARPOL)
Marine engineering safety practices, Case studies on maritime accidents and regulatory compliance, AI applications in accident prediction, risk assessment, and autonomous ship operations

Activity: Activities focus on safety practices and pollution control using case studies and discussions.

Weightage: Continuous Assessment: 100%.

Assessment Methodology: Quiz - 10%, Assignments - 20%, and Internal Examinations - 70%

References:

1. Taylor, D.A., Introduction to Marine Engineering, Butterworth-Heinemann.
2. Eyres, D.J., Ship Construction, Butterworth-Heinemann.
International Maritime Organization (IMO) Conventions and Codes.
Classification Society Rules (DNV, ABS, Lloyd's Register).
SOLAS – Safety of Life at Sea Convention.
4. MARPOL – International Convention for the Prevention of Pollution from Ships.
5. NPTEL Marine Engineering Resources.

CO	CO Description	PO Mapping	PSO
CO1	Explain the importance of maritime standards, international regulations, and the role of regulatory bodies in marine engineering.	–	–
CO2	Apply knowledge of classification societies, certification procedures, and survey requirements in ship operations.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze marine engineering codes, safety standards, and environmental regulations for ship systems.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate safety, environmental, and operational standards, including risk assessment and compliance in maritime practices.	PO3 (2), PO5 (2)	PSO1 (2), PSO2 (2), PSO3 (1)

(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

(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

(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·

(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

(i) Assertive vs Aggressive communication

(ii) Role play activities – workplace communication in intercultural/crosscultural contexts

From Campus to Career: Industry Skills and Global Exam Preparation

(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

MV25407	Thermal Engineering and Boiler Chemistry Laboratory	L	T	P	C
		0	0	4	2

Course Objectives:

1. To study the performance of an internal combustion engine
2. To study the characteristics of fuels and lubricants used in marine engines.
3. To study the performance of steam generator and steam turbine
4. To perform the tests on boiler feed water and fresh water used for engine cooling.

Thermal Engineering Laboratory

List of Experiments

1. To conduct Performance test on steam turbine
2. To determine dryness fraction of steam using steam calorimeter
3. To determine Flash point of given fuel oil
4. To determine Fire point of given fuel oil
5. To determine viscosity of oil using redwoods viscometer
6. To conduct performance test on Diesel engine with AVL setup
7. To conduct heat balance test on Diesel engine setup.
8. Test on Reciprocating compressor.
9. C.O.P. of a Refrigeration plant.
10. Performance test on A/C plant.

Boiler Chemistry Laboratory

List of Experiments

1. To determine the hardness content of the sample of boiler water in ppm in terms of CaCO3.
2. To determine the chloride content of the sample of water in ppm in terms of CaCO3.
3. To determine the alkalinity due to Phenolphthalein, total alkalinity and Caustic alkalinity of the sample of water (in ppm).
4. To determine the phosphate content of the sample of water.
5. To determine the dissolved Oxygen content of the sample of water.
6. To determine the sulphate content of given sample of water.
7. To determine the pH-value of the given sample of water.
8. Testing of boiler water - Dissolved oxygen, total-dissolved solids, turbidity.

References:

1. Flanagan, G.T.H, ‘Marine Boilers”, 3rd Edition, Elsevier, 2015
2. Kothandaraman & Domkundwar, A Course In Thermal Engineering, Dhanpat Rai & Co, 2013
3. Ganesan V, Internal Combustion Engines, McGraw-Hill, New York, 1996

CO	CO Description	PO Mapping	PSO
CO1	Explain the performance characteristics of steam turbines and diesel engines through experimental analysis.	–	–
CO2	Apply experimental methods to determine properties of fuels and lubricants such as flash point, fire point, and viscosity.	PO1 (2), PO2 (2)	PSO1 (2), PSO2 (2)
CO3	Analyze steam properties and engine performance using calorimeter tests and heat balance methods.	PO2 (2), PO4 (2)	PSO1 (2), PSO2 (2)
CO4	Evaluate boiler water quality parameters such as hardness, alkalinity, pH, and dissolved oxygen using standard test procedures.	PO3 (2), PO5 (2)	PSO1 (2), PSO2 (2), PSO3 (1)