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ANNA UNIVERSITY, CHENNAI

UNDERGRADUATE CURRICULUM (NON-AUTONOMOUS AFFILIATED INSTITUTIONS)

Programme: B.E., Civil Engineering (Environmental 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.

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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 (PSOs)

1. To design, and execute real-time civil and environmental engineering projects.
2. Utilize modern tools, software, and interdisciplinary knowledge to analyze environmental systems and provide sustainable solutions to emerging global environmental challenges
3. To demonstrate research capabilities, work collaboratively in teams, and uphold ethical standards.

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.	CE25C01	Introduction to Civil Engineering	T	3-0-0	3	3	ES (PC) – DIC
3.	PH25C01	Applied Physics – I	LIT	2-0-2	4	3	BS
4.	CY25C01	Applied Chemistry – I	LIT	2-0-2	4	3	BS
5.	ME25C01	Engineering Drawing	LIT	2-0-4	6	4	ES (G)
6.	UC25H01	தமிழர்மரபு/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**	

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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.	PH25C02	Applied Physics (CE) - II	T	2-1-0	3	3	BS
4.	EE25C01	Basic Electrical and Electronics Engineering	T	3-0-0	3	3	ES (G)
5.	CY25C02	Applied Chemistry (CE) – II	T	2-0-0	2	2	BS
6.	UC25H02	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
7.	CE25201	Construction Materials and Technology	T	3-0-0	3	3	ES (PC)
8.	EN25C02	English Essentials – II	LIT	1-0-2	3	2	HUM
9.	ME25C05	Re-Engineering for innovation	L	0-0-4	4	2	SD
10.	UC25A03	Life Skills for Engineers – II	---	1-0-2	3	1	HUM
11.	UC25A04	Physical Education – II	---	0-0-4	4	1	HUM
12.		Foreign Language^	LIT	1-0-2	3	1	HUM
				Total Credits	**37**	**27**	

^ 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.	CE25C02	Fluid Mechanics and Machinery	T	3-1-0	4	4	ES(PC)
3.	AG25C01	Engineering Geology	T	3-0-0	3	3	ES (PC)
4.	EO25C01	Environmental Chemistry	LIT	3-0-2	5	4	ES (PC)
5.	CE25C03	Surveying and Geomatics	T	3-0-0	3	3	ES (PC)
6.		Skill Development Course I	LIT	1-0-2	3	2	SD
7.	CE25C07	Fluid Mechanics and Machinery Laboratory	L	0-0-4	4	2	ES(PC)
8.	CE25C04	Surveying and Geomatics Laboratory	L	0-0-4	4	2	ES (PC)
9.	EN25C03	English Communication Skills Laboratory – I	L	0-0-2	2	1	HUM
				Total Credits	**32**	**25**	

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Semester – IV							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/ Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.	CE25C05	Water Supply Engineering	T	3-0-0	3	3	ES (PC)
2.	CE25C08	Strength of Materials	LIT	3-0-2	5	4	ES (PC)
3.	CE25C09	Air and Noise Pollution Control Engineering	T	3-0-0	3	3	ES (PC)
4.	EO25C02	Environmental Microbiology	LIT	3-0-2	5	4	ES (PC)
5.	ER25401	Soil Mechanics and Foundation Engineering	T	3-0-0	3	3	ES (PC)
6.	CE25C06	Concrete Technology	LIT	3-0-2	5	4	ES (PC)
7.		Skill Development Course II	LIT	1-0-2	3	2	SD
8.	CE25C10	Soil Mechanics Laboratory	L	0-0-4	4	2	ES (PC)
9.	EN25C04	English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
Total Credits					**33**	**26**	

Semester–V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/ Week**		**Credits**	**Category**
				L-T- P	**TCP**		
1.		Structural Analysis	T	3-0-0	3	3	ES (PC)
2.		Transportation Engineering	T	3-0-0	3	3	ES (PC)
3.		Design of Structural Elements (RCC & Steel)	T	3-1-0	4	4	ES (PC)
4.		Programme Elective I	T	3-0-0	3	3	ES (PE)
5.		Wastewater Engineering	T	3-0-0	3	3	ES (PC)
6.		Environmental Legislations and Policies	T	3-0-0	3	3	ES (PC)
7.		Skill Development Course-III	LIT	1-0-2	3	2	SD
8.		Industry Oriented Course - I	LIT	1-0-2	3	1	SD
9.		Water and Wastewater Engineering Laboratory	L	0-0-4	4	2	ES (PC)
Total Credits					**29**	**24**	
For Honours Degree							
1.		Capstone Design Project Level I	CDP	0-0-12	12	6	SD
OR							

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Semester–V							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/ Week**		**Credits**	**Category**
				L-T- P	**TCP**		
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.		Solid Waste Management	T	3-0-0	3	3	ES (PC)
2.		Hydrology and Water Resources Engineering	T	3-0-0	3	3	ES (PC)
3.		Engineering Entrepreneurship Development	LIT	2-0-2	4	3	HUM
4.		Programme Elective – II	T	3-0-0	3	3	ES (ET)
5.		Programme Elective III	T	3-0-0	3	3	ES (PE)
6.		Open Elective	T	3-0-0	3	3	---
7.		Building and Structural Drawing	L	0-0-4	4	2	ES (PC)
8.		Self-Learning Course	--	--	--	1	---
9.		Industry Oriented Course -II	LIT	1-0-2	3	1	SD
				Total Credits	**26**	**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	

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Semester– VII							
S. No.	**Course Code**	**Course Name**	**Course Type**	**Periods/ Week**		**Credits**	**Category**
				L-T-P	**TCP**		
1.		Environmental Impact Assessment	T	3-0-0	3	3	ES (PC)
2.		Climate Change and Sustainability	T	2-0-0	2	2	HUM
3.		Estimation, Costing and Valuation Engineering	T	3-1-0	4	4	ES (PC)
4.		Project Management	T	2-0-0	2	2	HUM
5.		Programme Elective - IV	T	3-0-0	3	3	ES (PE)
6.		Programme Elective - V	T	3-0-0	3	3	ES (PE)
7.		Summer Internship	---	---	---	1	SD
8.		Environmental Engineering Design and Drawing	L	0-0-4	4	2	ES (PC)
Total Credits					**21**	**20**	
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**	

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PROGRAMME ELECTIVE COURSES – STREAMS

Water and Wastewater Management	**Climate Resilience and Energy Systems**	**Circular Resource Recovery**	**Sustainable Habitat and Infrastructure Systems**	**Integrated Environmental Management and Smart Technologies**
Groundwater and Rain water Harvesting	Climate Change and Adaptation	Biochemical and Thermochemical Conversion of Biomass	Public Health Engineering Services in Buildings	Land reclamation management
Design, Operation and Maintenance, Monitoring of Water and Wastewater Treatment Plants	Carbon Sequestration, Utilization and Storage	Life Cycle Assessment	Environmental Health, Safety and Risk Assessment	Smart Disaster management
Sludge and Septage Management	Climatology and Meteorology	Landfill and Remediation Technology	Planning, Design and Management of Large Housing Complexes	Environmental Management System
Desalination and Marine Pollution Control	Energy Management in Industries	Plastic, C&D, biomedical and E- waste Management	Green Built Environment	Circular Economy
Reclamation and Reuse of wastewater	Renewable Energy	Environmental Sensitive Urban Design	Climate Resilient Buildings	Urban Stormwater Management
Surface and Groundwater Quality Modeling	Natural Resource Management and Accounting	Resource Recovery from Waste	Urban Water Infrastructure	Environmental Nanotechnology

Semester –I

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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%.

Methodology for Continuous Assessment : 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)

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CE25C01	Introduction to Civil Engineering	L	T	P	C
		3	0	0	3

Course Objective:

- To impart the significance of the Civil Engineering and provide insight to the essentials of components of infrastructure.

Overview of Civil Engineering: Role of civil engineers in society, Ethics in Civil Engineering Practice, outstanding accomplishments of the profession, future trends- Types of projects, stages of projects, specification and scope.

Fields of Civil Engineering: Overview of Structural, Construction, Geotechnical, Environmental, Transportation, Water Resources and Environmental Engineering – Introduction to Engineering Geology and seismology.

Civil Engineering Materials: Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel – Timber, Glass - Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building components.

Building Components: Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering- NBC.

Infrastructure:

Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management system- Introduction to Highways and Railways - Introduction to Green Buildings.

Activities:

An Industrial visit to a nearby Civil Engineering Projects.

Seminar / assignment on Emerging Civil Engineering fields.

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

Methodology for Continuous Assessment : Quiz (10%), Assignments (40%) and Internal Examinations (50%)

References:

1. Ramamrutham, S. (2013). Basic civil engineering. Dhanpat Rai Publishing Co. (P) Ltd.
2. Seetharaman, S. (2005). Basic civil engineering. Anuradha Agencies.
3. Kumar, S. (2001). Building construction. Standard Publishers.
4. Rangwala, S. C. (2009). Building materials (27th ed.). Charotar Publishing House Pvt. Ltd.
5. Palanichamy, M. S. (2000). Basic civil engineering. Tata McGraw Hill.

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	Description of CO	PO	PSO
CO1	Explain core Civil engineering concepts.	---	---
CO2	Apply basic engineering calculations in Civil Engineering systems.	PO1(3)	PSO1(3) PSO2(1)
CO3	Identify practices followed in infrastructure construction.	PO2(2)	PSO2(2) PSO3(1)

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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%

Methodology for Continuous Assessment : 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. 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)

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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%

Methodology for Continuous Assessment : Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)

References:

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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.KallolMondal, 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)

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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, Drawingstandards (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%

Methodology for Continuous Assessment :
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.RajaramLakkaraju (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/

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	CO Description	PO	PSO
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)

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

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

Language and Literature: Language Families in India, Dravidian Languages, Tamil as a Classical Language, Classical Literature in Tamil, Secular Nature of Sangam Literature, Distributive Justice in Sangam Literature, Management Principles in 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. கணினித்தமிழ், முனைவர்இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி, வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம் (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 C ivilization 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.

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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%

Methodology for Continuous Assessment : Quiz (10%), Assignments (20%), Speaking Task (10%), Reading Task (10%), Writing Task (10%), Internal Examinations (40%).

References:

1. Miller, K. Q., & Wahl, S. T. (2023). *Business and Professional Communication: KEYS for Workplace Excellence* (5th ed.). SAGE Publications.
2. Kumar, Sanjay &Pushpalatha. (2018). *English Language and Communication Skills for Engineers*. India: Oxford University Press.

3. 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)

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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: StringComparison, 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%

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

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References:

1. Matthes, E. (2019). Python crash course: A hands-on, project-based introduction to programming. No Starch Press.
2. Brown, M. C. (2018). Python: The complete reference. McGraw Hill Publishers.
3. Guttag, J. V. (2016). Introduction to computation and programming using Python: With applications to understanding data. 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)

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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%

Methodology for Continuous Assessment : 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.

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	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)

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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%

Methodology for Continuous Assessment : 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:

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%.

Methodology for Continuous Assessment : 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%

Methodology for Continuous Assessment : 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)

PH25C02	Applied Physics (CE) – II	L	T	P	C
		2	1	0	3

Course Objectives:

- To provide a comprehensive understanding of physics concepts in Civil engineering applications.

Mechanic: Elasticity – Types of supports and loads – free body diagrams - Equilibrium of rigid bodies – Types of structures: Beams, frames, trusses – Analysis of trusses – internal forces in members – Moment of inertia and bending- cantilever

Activities: Virtual Demonstration of deflection of beams and moment of inertia.

Acoustics: Reverberation – Loudness – Focusing – Echelon – Noise – Echo - Resonance – Interference – Sabine's formula (Derivation) – Absorption coefficient – Sonometer - Sound insulation.

Activities: Virtual Demonstration of sound insulation and resonance.

Lighting: Visual field glare, colour – day light calculations – day light design of windows, measurement of day light and use of models and artificial skies - artificial lighting – LED characteristics.

Activities: Virtual Demonstration of heat infiltration in glass, glass as building material, LED Characteristics.

Engineering Materials: Composites – Fibre Reinforced Plastics (FRP) – Fiber Reinforced Metals (FRM) – Fiber Reinforced Bricks (FRB) - Shape memory alloys – Ceramics – Thermal, Mechanical, Electrical and Chemical properties –3D printed construction materials - Nano materials.

Activities: Demonstration of 3D printing of materials, Composite fabrication.

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

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

References:

1. Balasubramaniam, R. (2014). Callister's materials science and engineering. Wiley India Pvt. Ltd.
2. Hibbeler, R. C. (2017). Engineering mechanics. Pearson.
3. Hibbeler, R. C. (2023). Structural analysis. Pearson.
4. Medved, S. (2021). Building physics. Springer.

E-resources:

1. Moment of Inertia: https://youtu.be/fDJeVR0o__w
2. Ceramics: https://www.youtube.com/watch?v=oeDANQrsnZ0

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3. Sound Insulation: https://youtu.be/nhE2a4GEOtA
4. Shape memory alloys: https://nescacademy.nasa.gov/video/00a31561480547248033a1c2df6f87831d
5. White LED: https://archive.nptel.ac.in/courses/108/108/108108122/
6. Daylighting and lighting design: https://youtu.be/vZO09qL-vZs
7. 3D Printed construction materials_ https://www.youtube.com/watch?v=UntRnpuWBtU

	Description of CO	**PO**	**PSO**
CO1	Explain the concepts of physics in civil 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 civil engineering.	PO2(2)	PSO1(2)

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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 ofV-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 ofa microcontroller and online simulation of microcontroller.

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

Methodology for Continuous Assessment : Quiz (5%), Assignments (25%), GATE Questions (20%), Internal Examinations (50%)

References:

1. Del Toro, V. (2022). Electrical Engineering Fundamentals, Pearson Education.
2. Hambley, A. R. (Year). Electrical Engineering: Principles and Applications (Edition if known). Publisher.(Note: Please provide the year and edition for complete citation)
3. Mehta, V. K., & Mehta, R. (2006). Principles of Electrical Engineering and Electronics. S. Chand Publishing.

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)

CY25C02	Applied Chemistry (CE) – II	L	T	P	C
		2	0	0	2

Course Objectives

- To provide comprehensive understanding of chemistry concepts in building materials.

Building Materials: Introduction, Bricks, Glass, Cement, Special Cement, Concrete, Reinforcement.

Activities: Virtual demonstration of properties of building materials.

Composites: Types, Matrix materials, Hybrids, Fiber Reinforcement, Characteristics, PMC, MMC, CM Applications.

Activities: Virtual demonstration of fabrication of composite materials.

Sustainable Materials: Bio-based materials, Product & Technology development, Admixtures, Environmental aspects, energy efficiency.

Activities: Calculation of carbon footprint in buildings.

Analytical Methods: Thermal conductivity, porosity, absorption and emission characteristics of building materials.

Activities: Analytical methods with virtual experiments, Hands-on demonstration of any one of the methods.

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

Methodology for Continuous Assessment : Quiz (5%), Assignments (20%), Flipped Class (5%), Virtual Practice (20%), Internal Examinations (50%)

References:

1. Jain, P. C., & Jain, M. (2022). Engineering chemistry. Dhanpat Rai Publishing Company (P) Ltd.
2. Eckold, G. (1994). Design and manufacture of composite structures. Woodhead Publishing Ltd.
3. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2022). Fundamentals of analytical chemistry. Cengage Learning India Pvt. Ltd.
4. Spitzer, W. G., & Simonson, K. (2011). Green building materials: A guide to product selection and specification. Wiley

E- resources:

1. https://archive.nptel.ac.in/courses/112/104/112104229/
2. https://nptel.ac.in/courses/103108100

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	Description of CO	PO	PSO
CO1	Explain the applications of chemistry in civil engineering stream.	---	---
CO2	Apply chemistry concepts to select appropriate materials.	PO1(3)	PSO1(2)
CO3	Analyse the systems and interpret data from the virtual studies in the field of civil engineering.	PO2(2)	PSO2(2) PSO3(1)

UC25H02	தமிழர்களும் தொழில்நுட்பமும்	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%

Methodology for Continuous Assessment : Quiz (20%), Assignments (30%), Internal Examinations (50%)

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.

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%

Methodology for Continuous Assessment : Quiz (20%), Assignments (30%), Internal Examinations (50%)

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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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 Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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CE25201	Construction Materials and Technology	L	T	P	C
		3	0	0	3

Course Objectives:

- To impart fundamental knowledge of traditional and modern building materials used in construction.
- To introduce methods of construction such as masonry, formwork, scaffolding, plastering, and joints.

Stones, Bricks and Concrete Blocks: Stone as building material, Criteria for selection, Tests on stones, Deterioration and preservation of stonework. Bricks, Classification, Manufacturing of clay bricks, Tests on bricks, Compressive strength, Water absorption, Efflorescence, Bricks for special uses, Refractory bricks. Concrete blocks, Types, Hollow and solid blocks, Lightweight concrete blocks, Applications.

Activities: Visit to brick / block manufacturing plant.

Lime, Cement, Aggregates and Mortar: Types, Preparation of lime mortar, Applications. Cement, Ingredients, Manufacturing process, Types and grades, Properties: hydration, compressive and tensile strength, soundness, consistency, setting time. Fine aggregates, River sand, crushed stone sand (M and P-Sand), Properties. Coarse aggregates, Crushing strength, impact strength, flakiness and elongation index, abrasion resistance, Grading. Mortar, Cement and lime mortars, Uses and proportions.

Activities: Virtual Demonstration of Cement Manufacturing.

Timber, Metals and Other Materials: Timber, Market forms, Industrial timber, Plywood, Laminated panels. Metals, Steel, Aluminum, Composition, properties, Market forms, Mechanical treatment, Aluminum composite panels. Surface finishes, Paints, Varnishes, Distempers, Bituminous products. Sealants for joints, Insulating materials, Acoustic and thermal insulation, Fire protection, Damp proofing, Ventilation, Air conditioning.

Construction Technology and Construction Practices: Masonry construction, Brick and stone masonry. Formwork, Centering, shuttering, Scaffolding, Shoring, Underpinning. Construction joints, Contraction, construction and expansion joints. Plastering, Pointing, Cavity and diaphragm walls.

Activities: Virtual Demonstration of different types of masonry works.

Advanced Materials: Advanced materials, Glass, Solar Panels - Ceramics, Clay products, Refractories, Fibre reinforced plastics, Fibre textiles, Geomembranes, Geotextiles. Composite materials, Types, Laminar composites, Applications in construction.

Activities: Visit to Construction sites, virtual demonstration of FRP.

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Construction Equipment and Planning: Construction equipment, Selection for earthwork, concreting, material handling, dewatering and pumping. Construction planning. **Activities:** Case Study in Concrete Mixing Plan.
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%
Methodology for Continuous Assessment : Quiz (10%), Assignments (40%) and Internal Examinations (50%)
References: 1. Varghese, P. C. (2015). Building materials. PHI Learning Pvt. Ltd. 2. Arora, S. P., &Bindra, S. P. (2013). Building construction. Dhanpat Rai Publications. 3. Punmia, B. C. (2008). Building construction. Laxmi Publications Pvt. Ltd. 4. Peurifoy, R. L., Schexnayder, C. J., Shapira, A., & Schmitt, R. (2011). Construction planning, equipment and methods. Tata McGraw-Hill. 5. Srinath, L. S. (2001). PERT and CPM*:* Principles and applications. Affiliated East-West Press. 6. Rangwala, S. C. (2017). Building materials. Charotar Publishing House Pvt. Ltd.

CO	CO Description	PO Mapping	PSO
CO1	Explain the properties, classifications, and applications of conventional and advanced building materials.	---	---
CO2	Evaluate the quality and suitability of stones, bricks, cement, lime, aggregates, and mortar using standard tests.	PO1(3) PO2(2)	PSO1(2)
CO3	Apply knowledge of construction practices such as masonry, formwork, scaffolding, joints, and finishes in building works.	PO2(2) PO4(2)	PSO2(2)
CO4	Utilize construction planning techniques (CPM, PERT, network models) and equipment selection for effective project execution.	PO2(2) PO4(2)	PSO2(3) PSO3(1)

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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%

Methodology for Continuous Assessment : 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/

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	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)

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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.

Boot camp 1: Introduction to Product Development, Reverse Engineering, Overview of the product lifecycle, Hands-on disassembly of simple products, Practice of basic measurements and sketching, Introduction to CAD modeling of disassembled parts, Virtual assembly of parts.

Boot camp 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%

Methodology for Continuous Assessment : 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. 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) PSO3(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%

Methodology for Continuous Assessment : 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.

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	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)

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UC25A04	Physical Education - ll	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%

Methodology for Continuous Assessment : 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:

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 (Ichheiße…, Werbist 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%

Methodology for Continuous Assessment : Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. Funk, H., Kuhn, C., &Demme, S. (2015). Menschen A1: Deutsch alsFremdspracheKursbuch. HueberVerlag.

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	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)

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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%

Methodology for Continuous Assessment : 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)

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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%

Methodology for Continuous Assessment : Assignments (30%), Quiz (10%) and Internal Examinations 60%

References:

1. King, R., Yeon, J., & Brown, A. (2015). Elementary Korean. 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.

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	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 4^{th} 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

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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)

CE25C02	Fluid Mechanics and Machinery	L	T	P	C
		3	1	0	4

Course objective:

To introduce fundamental principles of fluid mechanics and apply them to analyze and solve practical civil engineering problems.

Fluid Properties: Fluid properties - methods of analysis - system and control volume - pressure measurement

Fluid Statics: Forces on plane and curved surfaces - buoyancy, flotation, and metacentric height.

Activity: Construct simple floating models to study buoyancy, metacentric height, and hydrostatic forces.

Fluid Flows: Flow classification, streamline concepts, stream function, flow nets; conservation laws (mass, energy, momentum), continuity equation, Euler's and Bernoulli's equations, and applications to flow measurement and pipe bends. Laminar flow, Reynolds experiment, Hagen–Poiseuille equation, Darcy–Weisbach equation, Moody diagram, pipe losses, and pipes in series and parallel.

Activity:
Review of Competitive Exam questions on pipe flow, discharge/velocity calculations, and pipe losses.

Dimensional Analysis: Fundamental dimensions, dimensional homogeneity, Rayleigh's method, Buckingham Pi theorem, dimensionless parameters, similitude, model studies, and applications

Activity:
Quiz on dimensional analysis.

Boundary Layers: Boundary layer concepts, laminar and turbulent flow, momentum integral equation, drag, lift, separation, and control measures.

Turbines: Impact of jets, velocity triangles, rotodynamic machine theory, turbine classification, working principles of Pelton, Francis, and Kaplan turbines, work done, efficiencies, draft tube, specific speed, performance curves, and governing.

Activity:
Prepare a poster on turbine working principles, performance, and efficiency.

Pumps: Pump classification, centrifugal pumps, solar pumps - working principle, heads and efficiencies, velocity triangles, impeller work, performance curves; reciprocating pumps, indicator diagram, air vessels, and rotary pumps.

Activity:
Visit a pump installation or water treatment plant and prepare a report.

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

Methodology for Continuous Assessment: Quiz - 10%, Poster presentation - 15%; Report preparation from Site visit – 10%, Assignment – 15%, Internal Examinations – 50%

References

1. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2021.
2. Modi P.N and Seth S.M. Hydraulics and Fluid Mechanics including Hydraulic Machines, 23rd Ed., Standard Book House, New Delhi, 2022.
3. Subramanya K. Theory and Applications of Fluid Mechanics, Tata McGraw Hill Education, New Delhi, 2019.
4. Som S.K., Gautam Biswas and Chakraborty S. Introduction to Fluid Mechanics and Fluid Machines,3rd Ed., Tata McGraw Hill Education Pvt. Ltd., 2019
5. Pani B.S. Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016.
6. Ojha C.S.P., Berndtsson R. and Chandramouli P.N. Fluid Mechanics and Machinery, Oxford University Press, 2010.
7. IS 5120:1969: Code of practice for hydraulic turbines — Testing

E-Resources:

1. NPTEL Course: Fluid Mechanics https://nptel.ac.in/courses/112/105/112105093/
2. NPTEL Course: Hydraulic Machines- https://nptel.ac.in/courses/112/106/112106121/
3. Interactive Tools: Fluid Flow Demo (Sim Scale/Flow Lab) – https://www.simscale.com/

CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain fundamental concepts of fluid properties, statics, and hydrostatics, including pressure measurement, buoyancy, and metacentric height.	-	-	-	-
CO2	Apply fluid flow principles, Bernoulli's and momentum equations, and pipe flow calculations to solve engineering problems	PO1 (3) PO2 (3)	3	2	1
CO3	Analyze dimensional analysis, boundary layers, and fluid flow behavior to evaluate drag, lift, and similitude in model studies.	PO1 (2) PO2 (3)	2	-	-
CO4	Design and evaluate turbines, pumps, and rotodynamic machines considering efficiency, performance curves, and operational parameters.	PO1 (2) PO2 (2) PO3 (3)	3	-	1

AG25C01	Engineering Geology	L	T	P	C
		3	0	0	3

Course objective:

To impart knowledge on Earth's structure, minerals, and rocks; geological processes; geophysical investigations; and landslide mitigation.

Physical Geology: Role of geology in civil engineering, branches of geology, Earth structure and composition, weathering and soil formation, geomorphic processes (river, wind, groundwater, sea), plate tectonics, earthquakes, and seismic zones in India.
Activity: Seminar using photographs, satellite images, or field observations to study weathering and landforms.

Mineralogy: Physical properties of minerals; study of major minerals (quartz, feldspar, pyroxene, amphibole, mica, calcite, gypsum, clay minerals); Performance and decay of rock minerals.

Petrology: Rock classification; igneous, sedimentary, and metamorphic rocks; engineering properties and uses of common rocks (granite, basalt/dolerite, sandstone, limestone, laterite, shale, quartzite, marble, gneiss, schist), quality testing of rocks.

Activity: Site visit to nearby quarry/mine

Structural Geology: Geological maps, attitude of beds, structural features (folds, faults, joints) and their engineering significance.

Geophysical methods: Seismic and electrical techniques for subsurface investigations.

Activity: Quiz on geophysical methods

Geological Applications: Remote sensing in civil engineering; geological considerations in dams, reservoirs, tunnels, road cuttings, buildings and coastal structures; landslides—causes and mitigation.

Activity: Case study on a dam/tunnel/road cutting/coastal structure/buildings focusing on geological issues and investigation.

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

Methodology for Continuous Assessment: Quiz - 10%, Site visit report - 15%; Report preparation from Case study – 10%, Seminar report – 15%, Internal Examinations – 50%

References

1. Varghese, P.C., Engineering Geology for Civil Engineering, Prentice Hall of India Learning Private Limited, New Delhi, 2012.
2. Venkat Reddy. D., Engineering Geology, Vikas Publishing House Private Limited, 2024.

3. Chenna Kesavulu N., Textbook of Engineering Geology, Macmillan India Limited, India, 2009.
4. Parbin Singh. A., Text book of Engineering and General Geology, Katson Publishing house, Ludhiana, 2023.

E-Resources:

1. NPTEL Course: *Geology for Engineers* https://nptel.ac.in/courses/113/101/113101053/
2. Virtual Rock Lab: Rock Identification Guide – https://geology.com/rocks/

CO – PO Mapping

	CO Description	PO Mapping	PSO	PSO2	PSO3
CO1	Explain fundamental geological processes, landforms, and plate tectonics with relevance to civil engineering.	-	-	-	-
CO2	Identify minerals and rocks and evaluate their engineering properties.	PO1 (3), PO2 (2)	3	2	-
CO3	Analyze geological structures and apply geophysical methods for subsurface investigation.	PO1 (2), PO2 (3)	2	3	-
CO4	Apply geological knowledge in the design of civil engineering projects and mitigation of natural hazards.	PO1 (2), PO2 (3)	3	1	1

EO25C01	Environmental Chemistry	L	T	P	C
		3	0	2	4

Course objective:

To provide students with fundamental and applied knowledge of chemical processes occurring in air, water, and soil environments, with emphasis on pollution control, emerging contaminants, and sustainable chemical practices.

Chemical Fundamentals: Stoichiometry, mass balance, equilibria, acid–base reactions, solubility product, carbonate system, ocean acidification, kinetics, and green chemistry principles.

Practical:

1. Estimation of total hardness and chloride in water using volumetric titration.

Aquatic Chemistry: Water quality parameters and fate of chemicals through volatilization, partitioning, and degradation. Metal speciation, redox reactions, pE–pH diagrams, sorption, colloids, coagulation, and bioavailability.

Practical:

2. Determination of sulphate and phosphate concentrations;
3. Analysis of total, dissolved, and suspended solids.

Atmospheric Chemistry: Atmospheric structure and reactions, photochemical smog, ozone depletion, greenhouse gases, global warming, carbon capture, acid rain, particulates, and air quality parameters.

Practical:

4. Determination of Chemical Oxygen Demand (COD).

Soil Chemistry: Soil composition, clay minerals, cation/anion exchange capacity, acid–base and ion-exchange reactions. Soil contamination, heavy metals, POPs, endocrine disruptors, and nanomaterials.

Practical:

5. Determination of Biochemical Oxygen Demand (BOD)

Tasks:

Task 1: Collect and analyze a water sample for hardness, chloride, sulphate, phosphate, and solids (TS, TDS, TSS). Interpret results using chemical principles (equilibria, solubility, speciation) and evaluate suitability for drinking or environmental use.

Task 2: Determine COD and BOD of a wastewater sample and assess pollution levels. Relate findings to aquatic chemistry, biodegradation, and environmental impact, and suggest appropriate treatment methods.

Task 3: Investigate a real-world issue involving air or soil pollution (e.g., heavy metals, POPs, or greenhouse gases) and propose mitigation strategies.

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

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

References:

1. Sawyer, C.N., Mac Carty, P.L. and Parkin, G.F., "Chemistry for Environmental Engineering and Science", Tata McGraw – Hill, Fifth edition, New Delhi 2017.
2. Colin Baird„ Environmental Chemistry, Freeman and company, New York, 5th Edition, 2012.
3. Manahan, S.E., "Environmental Chemistry", Eleventh Edition, CRC press, 2022.
4. Ronald A. Hites,"Elements of Environmental Chemistry", Wiley, 2nd Edition, 2020.

E-Resources

1. NPTEL – Environmental Chemistry / Environmental Engineering https://nptel.ac.in
2. US EPA – Environmental Chemistry & Pollutant Fate https://www.epa.gov
3. WHO – Air and Water Quality Guidelines https://www.who.int

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain chemical principles governing air, water, and soil systems.	-	-	-	-
CO2	Analyze chemical processes influencing pollutant behavior and environmental quality.	PO2 (2) PO4 (3) PO6 (2) PO7 (2)	3	2	1
CO3	Evaluate pollution control methods and sustainable chemical practices.	PO3 (2) PO4 (2) PO6 (3)	2	2	2
CO4	Apply environmental chemistry concepts to real-world problems and emerging contaminants.	PO2 (2) PO6 (3) PO7 (2)	2	1	2

CE25C03	Surveying and Geomatics	L	T	P	C
		3	0	0	3

Course objective:

To study the various methods of surveying and understand the concept of control, control and modern surveying and also to use various survey instruments

Levelling: Chain Surveying, Datum, benchmarks, levelling methods (fly and check), booking and reduction, contouring

Theodolite Surveying: Horizontal and vertical angle measurements - Temporary and permanent adjustments - Trigonometric levelling - Single and double plane methods – Stadia tacheometry - Subtense method - Tangential tacheometry.

Activity: Review of Competitive Exam Questions related to levelling and theodolite surveying.

Modern Surveying: Total station - components, working, errors, applications; Bathymetry, GPS - components, data acquisition, errors, applications; Introduction to drone surveying and LiDAR.

Activity: Case study report on GPS applications.

Control Surveying, Adjustment: Horizontal and vertical control, triangulation, traversing, trilateration, coordinate computation; errors, weights, and adjustment of observations.

Activity: Seminar on control surveying.

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

Methodology for Continuous Assessment: Quiz - 10%, Case study report – 20%; Seminar report – 20%, Internal Examinations – 50%

References

1. Kanetkar.T. P and Kulkarni.S. V, Surveying and Levelling, Parts1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2010
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, Surveying Vol.I & Lakshmi Publications Pvt Ltd, New Delhi, 2016.
3. Subramanian.R., Surveying and Levelling, Second Edition, Oxford Univers Press, 2012.
4. Bannister and Raymond.S, Surveying, Seventh Edition, Longman 2004
5. Roy.S. K, Fundamentals of Surveying, Second Edition, Prentice' Hall of India, 2011
6. Arora.K. R, Surveying Vol I & II, Standard Book house, Twelfth Edition, 2013.
7. IS 12843:1989: Specification for electronic total stations for surveying
8. IS 12762:1994: Specification for global positioning system (GPS) receivers for surveying
9. IS 4880 (Part 1-4):1975: Code of practice for design of control surveys for civil engineering projects

E-Resources:

1. https://nptel.ac.in/courses/105/104/105104101/
2. https://www.britannica.com/technology/surveying
3. http://egyankosh.ac.in/handle/123456789/39480
4. https://www.isro.gov.in/spacecraft/satellite-navigation

CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain principles of levelling, theodolite surveying, and contouring.	-	-	-	-
CO2	Apply surveying techniques to determine heights, distances, and field measurements.	PO1 (3) PO2 (2) PO4 (3)	3	2	1
CO3	Analyze modern surveying methods such as Total Station, GPS, and remote sensing tools.	PO1 (2) PO2 (3) PO5 (3)	2	3	-
CO4	Apply control surveying methods and adjust observations for accurate surveying results.	PO1 (3) PO2 (2)	3	2	-

CE25C07	Fluid Mechanics and Machinery Laboratory	L	T	P	C
		0	0	4	2

Course Objective:

To provide hands on experience in calibration of flow meters, performance characteristics of pumps and turbines.

List of Experiments:

1. **Flow Measurement Devices**
   Calibration of rotameter and flow measurement using venturimeter/orifice meter/notches.
2. **Bernoulli's Theorem -** Verification of Bernoulli's equation.
3. **Losses in Pipes -** Determination of friction factor and minor losses.
4. **Pumps -** Performance characteristics of centrifugal and reciprocating pump.
5. **Turbines -**Performance characteristics of Pelton and Francis turbine.
6. **Metacentric Height -** Determination of metacentric height of floating bodies.

Tasks: (Perform any 2 tasks)

Task 1: Compare discharge values obtained from different devices and analyze errors.

Task 2: Evaluate major and minor losses in the system and Compare experimental results with theoretical/Moody chart values.

Task 3: Plot performance curves and determine the specific speed of a centrifugal pump

Task 4: Plot characteristic curves (H–Q, η–Q) and determine efficiency of a reciprocating pump.

Task 5: Assess stability conditions and compare with theoretical values.

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

Methodology for Continuous Assessment: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

References:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2022.
3. Subramanya.K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd. 2019.

E-Resources

1. https://vlab.co.in
2. https://fmvlab.iitkgp.ac.in

CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Perform fluid mechanics experiments and obtain relevant measurements.	PO4 (3) PO5 (2) PO8 (2) PO9 (2)	2	2	1
CO2	Analyze experimental data to evaluate flow behavior, losses, and energy principles.	PO2 (2) PO4 (3) PO5 (2) PO9 (2)	3	2	1
CO3	Evaluate the performance of hydraulic machines and interpret results for practical applications.	PO2 (2) PO4 (3) PO6 (2) PO9 (2)	3	3	1

CE25C04	Surveying and Geomatics Laboratory	L	T	P	C
		0	0	4	2

Course Objective:

To provide hands on experience in calibration of flow meters, performance characteristics of pumps and turbines.

List of Experiments:

1. **Levelling Operations:** Fly levelling, check levelling, and benchmark transfer.
2. **Contouring and Mapping:** Grid levelling, contour mapping, and cut & fill volume estimation.
3. **Theodolite Surveying:** Measurement of horizontal angles by repetition and reiteration methods.
4. **Total Station Surveying:** Angle, distance, coordinate measurement, orientation, and resection methods.
5. **Height and Distance Measurement:** Determination of height using REM/trigonometric methods.
6. **GPS Surveying:** Navigation and feature collection using handheld GPS.

Tasks: (Perform any 2 tasks)

Task 1: Site Levelling and Earthwork Estimation: Perform levelling and contour mapping to estimate cut and fill volumes for a construction site.
Task 2: Precision Survey and Layout: Measure horizontal angles using theodolite methods and apply them for setting out a simple structure.
Task 3: Total Station Mapping: Conduct a topographic survey using Total Station and prepare contour and feature maps for planning.
Task 4: Height and GPS Survey: Determine heights using REM method and integrate GPS data for mapping infrastructure features.

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

Methodology for Continuous Assessment: Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

References:

1. Subramanian. R., Surveying and Levelling, Oxford University Press, Second Edition, 2013.
2. Bannister and Raymond. S., Surveying, Seventh Edition, Longman 2004.
3. Roy.S. K, Fundamentals of Surveying, Second Edition, Prentice' Hall of India 2011.
4. Arora.K.R., Surveying Vol I & II, Standard Book house, Twelfth Edition.2018.

E-Resources

1. Surveying Virtual Lab - https://vlab.co.in
2. MIT Open Course Ware - https://ocw.mit.edu

CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Perform levelling and angular measurements using conventional surveying instruments.	PO1 (2) PO4 (3) PO5 (3) PO8 (2)	2	1	-
CO2	Apply modern surveying tools (Total Station and GPS) for field data collection and mapping.	PO1 (3) PO4 (2) PO5 (3) PO8 (2)	3	3	1
CO3	Analyze survey data to prepare maps, contours, and compute elevations and distances.	PO1 (2) PO2 (2) PO4 (3) PO5 (3)	3	2	1

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

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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

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	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)

Semester IV

CE25C05	Water Supply Engineering	L	T	P	C
		3	0	0	3

Course objective:

To enable students to understand the planning, design, treatment, and distribution of safe and sustainable water supply systems, including source selection, water quality assessment, treatment technologies, and distribution networks in accordance with codal provisions.

Sources, Quality of Water: Planning of water supply, population forecasting, water demand, sources (surface & groundwater), water quality and standards.

Activity: Poster on water sources and quality comparison for a town.

Collection, Conveyance: Intake structures, pipe materials, hydraulics of pipe flow, Transmission main design – Laying, jointing and testing of pipes, pumps and appurtenances.

Activity: Model Making of an intake and conveyance system.

Conventional Water Treatment: Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators, flash mixers, Coagulation and flocculation –Design of Clarifloccuator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management – Operation and Maintenance aspects.

Advanced Water Treatment: Sequencing Batch Reactor - Moving bed biofilm Reactor - Membrane Bioreactor - UASB - Biogas recovery - Reclamation and Reuse of sewage - Constructed Wetland - Nutrient removal systems - Desalination.

Activity: Site Visit to a municipal water treatment plant.

Distribution Systems: Components – Selection of pipe material – Service reservoirs Functions – Network design – Analysis of distribution networks – Appurtenances - Leak detection.

Building Water Supply: House service connection – Fixtures and fittings, systems of plumbing and types of plumbing- relevant NBC provisions.

Activity: Case-based exercise on building water supply design.

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

Methodology for Continuous Assessment: Quiz - 10%, Poster presentation - 15%; Site visit report – 10%; Model making – 15%; Internal Examinations – 50%

References

1. Garg, S.K. Environmental Engineering, Khanna Publishers, New Delhi, 2018.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2021.
3. Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2012.

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4. Manual on Water Supply and Treatment Systems, CPHEEO, Ministry of Housing and Urban Affairs, Government of India, New Delhi, 2023.
5. IS 10500:2012 Drinking Water – Specification.
6. IS 2065:1983 Code of Practice for Water Supply in Buildings.

E-Resources

1. https://mohua.gov.in/publication/manual-on-water-supply-and-treatment-systems
2. CPHEEO Manual on Operation & Maintenance of Water Supply Systems
3. https://gwe-nitk.vlabs.ac.in/

CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain water sources, quality parameters, and planning aspects of water supply systems as per standards.	-	-	-	-
CO2	Apply principles of intake design, conveyance, and pipe flow to design water transmission systems.	PO1 (3), PO2 (3), PO3 (2)	3	1	1
CO3	Analyze conventional and advanced water treatment processes and evaluate their performance.	PO1 (3), PO2 (3), PO3 (2)	3	2	1
CO4	Evaluate water distribution systems and design components ensuring safe and sustainable supply.	PO1 (3), PO2 (3), PO3 (2)	3	2	2

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CE25C08	Strength of Materials	L	T	P	C
		3	0	2	4

Course Objective:

This course provides a foundational understanding of stress, strain, and deformation in solids, while developing analytical skills to evaluate internal forces, deflections, and torsional behaviour in structural members, springs, and pin-jointed plane trusses.

Simple Stresses and Strains

Stress–strain concepts, Hooke's law, elastic constants, stress–strain behavior of materials, axial deformation.

Practical:

1. Tension Test on Mild Steel / HYSD Steel
2. Determination of Elastic Constants (E, G, v) using bar / torsion tests.
3. Hardness testing of metals using: – Brinell hardness test and Rockwell hardness test

Shear Force and Bending Moment: Beam types - loads (point load, UDL, UVL, effects of applied moments (concentrated and distributed) - SFD and BMD for cantilever, simply supported, and overhanging beams.

Activity: Review of Competitive Exam questions on SFD and BMD

Shear Force and Bending Moment: Beam types - loads (point load, UDL, UVL, effects of applied moments (concentrated and distributed) - SFD and BMD for cantilever, simply supported, and overhanging beams.

Bending and Shear Stresses: Bending theory, bending equation, stress distribution in beams and sections.

Practical:

4. Determination of ultimate shear stress of a mild steel rod by conducting a double shear test.
5. Determination of Young's modulus of a beam with rectangular cross section (metal and wooden specimens) by conducting deflection tests.

Deflection Analysis of Beams

Elastic curve and beam deflection, governing differential equation for beam deflection, double integration method, Macaulay's method, moment area method, conjugate beam method, application of these methods to compute slope and deflection of statically determinate beams.

Activity: Seminar on a beam deflection method

Torsion, Springs, and Trusses: Torsion equation and assumptions, analysis of solid and hollow circular shafts, torsional rigidity, combined torsion and bending, shafts in series and parallel; helical springs (open and closed-coiled); analysis of determinate

and indeterminate pin-jointed plane trusses using method of joints, sections, and tension coefficient method.

Practical:

6. Open and Closed Coiled Helical Springs – Determine stiffness and deflection under load.

Tasks:

1. Plot SFD and BMD for different beam configurations using MS-EXCEL or equivalent open-source simulation tools.
2. Conduct/compile results from key lab tests (tension, torsion, beam deflection, spring test) and interpret material properties and structural behavior.
3. Design a simple structural/mechanical system (e.g., shaft, spring, or truss) considering strength, stiffness, and safety, and justify the design with calculations.

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

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

References

1. Rajput. R. K., Strength of Materials, S. Chand and Co, New Delhi, 2025.
2. Bansal. R.K, Strength of Materials, Laxmi Publications, New Delhi, 2024.
3. Punmia. B. C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2018.
4. Timoshenko S.P. and Gere.J.M, Mechanics of Materials, Van Nos Reinbhold, New Delhi 2018.
5. Singh. D.K., Strength of Materials, Ane Books Pvt. Ltd., New Delhi, 2021.
6. Kazimi S.M.A, Solid Mechanics, Tata McGraw-Hill Publishing Co., New Delhi, 2017.
7. IS 1608 (Part 1):2022: Metallic Materials – Tensile Testing – Method of Test at Room Temperature.
8. IS 1586 (Part 1):2018: Metallic Materials – Rockwell Hardness Test – Test Method.
   (2012 version is superseded by 2018.)

E-Resources:

1. NPTEL material https://archive.nptel.ac.in/courses/105/105/105105108/
2. https://sm-nitk.vlabs.ac.in/

CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain stress, strain, material properties, and elastic behavior of solids.	-	-	-	-
CO2	Analyze complex stress conditions, thermal stresses, and stress transformation using Mohr's circle.	PO1 (3), PO2 (3), PO4 (3)	3	2	1
CO3	Evaluate shear force, bending moment, and stress distribution in beams.	PO2 (2), PO4 (3), PO5 (3)	3	2	1
CO4	Apply concepts of torsion, springs, and trusses for structural analysis and design.	PO1 (3), PO3 (3), PO4 (2)	3	2	2

CE25C09	Air and Noise Pollution Control Engineering	L	T	P	C
		3	0	0	3

Course objective:

To provide knowledge on sources, impacts, monitoring, and control of air and noise pollution.

Air Pollution Fundamentals: Atmosphere as a sink, air quality standards (NAAQS, AQI), and regulatory framework in India.

Sources and classification of pollutants, health and environmental impacts, and linkages with climate change and national programs.

Activity: Case study on air pollution episodes in Indian cities

Sampling, Meteorology, Modelling: Sampling and measurement of particulate and gaseous pollutants, ambient and stack monitoring techniques – Online monitoring techniques- Meteorological influences, plume dispersion, wind patterns, inversions, and basics of air quality modelling.

Activity: Assignment on AQI interpretation, wind rose, and dispersion

Particulate Pollution Control Technologies: Gravity separator, cyclone separator, filters, scrubbers, and electrostatic devices - cleaner production - policy measures.

Gaseous Pollution Control Technologies: Absorption, adsorption, incineration, biofiltration – SOx, NOx, COx pollutant control methods - policy measures - Emerging concepts like decarbonization and emission trading.

Activity: Poster presentation on air pollution control equipment used in industries

Noise Pollution: Sources, measurement, and impacts of noise pollution with relevant standards - Noise control methods at source, path, receiver, and applications in occupational and environmental health.

Activity: Noise level survey and mitigation proposal

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

Methodology for Continuous Assessment: Quiz - 10%, Poster presentation - 15%; Site visit report – 10%; Model making – 15%; Internal Examinations – 50%

References:

1. C. S. Rao, Environmental Pollution Control Engineering, 4th Edition, New Age International Publishers, 2022.
2. M. N. Rao and H. V. N. Rao, Air Pollution, Tata McGraw Hill Education, Reprint Edition, 2022.
3. Y. Anjaneyulu, Air Pollution and Control Technologies, Allied Publishers Pvt. Ltd., 2019.

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4. National Ambient Air Quality Standards (NAAQS), 2009 – Central Pollution Control Board (CPCB), Government of India.
5. Air (Prevention and Control of Pollution) Act, 1981 – Government of India.
6. CPCB Air Quality Index (AQI) Guidelines, 2014 – Central Pollution Control Board.
7. IS 5182 (Part 1):2006 – Methods for Measurement of Air Pollution – Sampling of Gaseous Pollutants, Bureau of Indian Standards.

E-Resources

CPCB – Air Quality & Standards
https://cpcb.nic.in
MoEFCC – Air & Noise Pollution Rules
https://moef.gov.in

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain sources, characteristics, and impacts of air and noise pollution.	-	-	-	-
CO2	Analyze air quality using sampling, monitoring, meteorological data, and basic dispersion models.	PO2 (3) PO5 (2)	2	2	1
CO3	Select appropriate air and noise pollution control technologies for industrial and urban environments.	PO2 (3) PO6 (2)	2	2	1
CO4	Propose effective measures for air and noise pollution mitigation.	PO2 (2) PO6 (3)	2	2	2

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EO25C02	Environmental Microbiology	L	T	P	C
		3	0	2	4

Course objective:

To provide fundamental understanding of microorganisms, their role in environmental systems, wastewater treatment, nutrient cycling, and environmental toxicology for assessing ecological and human health impacts.

Microbial Fundamentals: Classification of microorganisms, cell structure, and importance of microbes. Pathogens in water, soil, and air, their transmission and health impacts. Basics of DNA, RNA, recombinant DNA technology, biosafety, and bioethics.

Practical:

1. Microscopic observation and staining (Gram staining) of microorganisms.
2. Basic DNA extraction from microbial or plant samples.

Microbial Diversity: Microbial diversity in aquatic and terrestrial environments, including extreme conditions. Occurrence in water, soil, and air, and microbial roles in biogeochemical cycles.

Practical:

3. Determination of microorganisms in water/soil using plate count method.

Microbial Metabolism: Microbial nutrition, growth phases, metabolism, aerobic and anaerobic respiration, and bioenergetics. Biodegradation of pollutants and bioremediation processes.

Practical:

4. Determination of microbial growth curve combined with biochemical tests for metabolic activity.

Wastewater Microbiology: Microbiology of wastewater treatment, aerobic and anaerobic processes, nutrient removal, and indicator organisms. Environmental toxicology concepts including toxicity and biomagnification.

Practical:

5. Determination of coliform bacteria (MPN method)

Tasks:

Task 1: Analyze a given water sample for basic quality parameters (e.g., BOD) and microbial contamination (MPN method), interpret results, and assess public health risks with suitable treatment recommendations.

Task 2: Conduct microbial enumeration of soil/water samples, evaluate the influence of environmental conditions on microbial growth, and relate findings to nutrient cycling and ecosystem functions.

Task 3: Investigate microbial growth and metabolic activity through growth curve

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and biochemical tests, and evaluate their role in biodegradation of organic pollutants and bioremediation strategies.
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%
Methodology for Continuous Assessment: Quiz (5%), Project (15%), Assignment Programs (25%), Practical (25%), Internal Examinations (30%)
References: 1. Maier, R.M., Pepper, I.L. and Gerba, C.P., *Environmental Microbiology*, 3rd Edition, Academic Press, Elsevier. 2. Rittmann, B.E. and McCarty, P.L., *Environmental Biotechnology: Principles and Applications*, McGraw Hill Education. 3. Baird, C. and Cann, M., *Environmental Chemistry*, W.H. Freeman and Company. 4. Bhatia S.C. , "Hand Book of Environmental Microbiology", Part 1 and 2, Atlantic Publisher, 2008 5. Gabriel Bitton, Wastewater Microbiology, 3rd Edition, 2005.
E-Resources 1. NPTEL – Environmental Microbiology / Biotechnology https://nptel.ac.in 2. WHO – Water Quality & Pathogens https://www.who.int 3. US EPA – Microbial & Toxicological Risk Assessment https://www.epa.gov

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Explain fundamentals of microorganisms, pathogens, and their environmental significance.	-	-	-	-
CO2	Analyze microbial diversity, nutrient cycling, and environmental interactions.	PO2 (2) PO4 (3) PO6 (2) PO7 (2)	3	2	1
CO3	Evaluate microbial metabolism, biodegradation, and bioremediation processes.	PO3 (2) PO4 (2) PO6 (3)	2	3	-
CO4	Apply wastewater microbiology and environmental toxicology concepts to assess environmental and health impacts.	PO2 (2) PO6 (3) PO7 (2)	2	2	2

ER25401	Soil Mechanics and Foundation Engineering	L	T	P	C
		3	0	0	3

Course objective:

To enable the students to acquire the essential knowledge about the soil exploration, index, and engineering properties of soils, types of foundations, and their carrying capacity.

Soil Exploration and Classification: Methods of exploration - Auguring and boring - Wash boring and rotary drilling - Sampling methods - Split spoon sampler, thin wall sampler, Stationary piston sampler - Penetration tests (SPT and SCPT) - Index properties and phase relations - BIS classification system.

Activity: Visit to a nearby soil exploration site/virtual demonstration

Stresses and Settlement: Effective stress concepts in soils – Total, neutral and effective stresses – Stresses due to applied loads - Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point load and udl) - Computation of total settlement and time rate of settlement using Terzaghi's one dimensional consolidation theory.

Activity: Review of GATE questions on stress distribution and consolidation settlement

Effective Stress, Permeability: Soil water -Effective stress, capillarity, Darcy's law, hydraulic conductivity, laboratory and field permeability tests, seepage, and flow nets.

Activity: Flow Net Drawing Exercise

Foundations: Types - Functions and requisites – Contact pressure distribution of Footings and Rafts - Piers and Caissons – Classification - Functions – Carrying capacity of piles - Static formula – Selection Factors – Choice of foundation based on soil condition.

Activity: Model making on types of foundations

Shear Strength and Bearing Capacity: Shear strength of cohesive and cohesionless soils – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Evaluation of Bearing capacity of shallow foundation using BIS formula.

Activity: Quiz on shear strength of soil.

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

Methodology for Continuous Assessment : Quiz-10%, Poster presentation-15%; Case Study report -15%; Assignment – 10%, Internal Examinations – 50%

References

1. Murthy V.N.S., Soil Mechanics and Foundation Engineering, CBS Publishers Distribution Ltd., New Delhi. 2020.
2. Gopal Ranjan and Rao, A.S.R., Basic and Applied Soil Mechanics, New Age Ltd. International Publisher New Delhi (India) 2020.
3. Coduto, D.P., Geotechnical Engineering – Principles and Practices, Prentice Hall of India Pvt. Ltd. New Delhi, 2015.

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4. Das, B.M., Principles of Geotechnical Engineering, Cengage Learning India Private Limited,8th Edition, 2017.
5. Punmia, B. C. Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundations*, 18th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2024.

Relevant Indian Standards

- IS 2720, Indian Standards on methods of test for soils, Bureau of Indian Standards.

E-Resources

1. NPTEL web courses on Geotechnical Engineering – 1 and 2 byDr.D. N. Singh, IIT Bombay
2. https://archive.nptel.ac.in/courses/105/101/105101201/

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Describe soil exploration methods, sampling techniques, and classify soils using the BIS system.	-	-	-	-
CO2	Analyze stress distribution in soils and evaluate settlement using consolidation theory.	PO1 (3) PO2 (3)	3	3	-
CO3	Assess permeability characteristics and seepage behavior in soils using laboratory and analytical methods.	PO1 (3) PO2 (3)	2	2	-
CO4	Evaluate shear strength and bearing capacity of soils and select appropriate foundation systems based on soil conditions.	PO1 (3) PO2 (3) PO3 (2)	3	2	1

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CE25C06	Concrete Technology	L	T	P	C
		3	0	2	4

Course objective:

To impart fundamental knowledge of concrete materials, mix proportioning, and testing as per IS codes, and to develop the ability to design, evaluate, and apply conventional and special concretes for safe, durable, and sustainable construction practices.

Concrete Materials: Cement types, composition, properties, tests as per IS codes; aggregates (fine and coarse), properties, grading, and tests; quality of water for concrete.

Practical:

1. Tests on Cement (fineness, consistency, setting time, specific gravity);
2. Tests on aggregate (grading, specific gravity, bulk density, impact, crushing, flakiness, elongation).

Admixtures and Fibres: Chemical admixtures (accelerators, retarders, plasticizers, super plasticizers, water proofers); mineral admixtures (fly ash, silica fume, GGBS, metakaolin); fibres and their effects on concrete properties.

Activity: Flipped classroom on mineral admixtures

Concrete Mix Design: Principles of mix proportioning, nominal and design mix (with and without admixtures), BIS method, material properties for mix design, quality control and assurance.

Activity: Concrete mix proportioning and fresh concrete testing (IS 516).

Fresh and Hardened Concrete: Workability tests (slump, compaction factor), segregation, bleeding, NDT tests (rebound hammer, UPV), compressive and flexural strength, modulus of elasticity, durability studies.

Practical:

3. Determination of slump of concrete
4. Determination of compressive strength of concrete

Special Concretes: High strength concrete, HPC, SCC, fiber reinforced concrete, ferrocement, ready mix concrete, shotcrete, polymer concrete, geopolymer concrete, sustainable concrete, 3D printing.

Activity: Poster presentation on special concretes.

Tasks:

1. Evaluate the properties of cement, aggregates, and water through laboratory testing and compare the results with IS code requirements.
2. Design and prepare a concrete mix for a specified grade using BIS guidelines and assess its fresh concrete properties.
3. Cast concrete specimens, determine compressive strength, and interpret the quality and durability characteristics of concrete.
4. Study a special concrete technology and present its materials, properties, applications, and sustainability benefits in construction.

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

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

References

1. Gupta.B.L., Amit Gupta, Concrete Technology, Jain Book Agency, 2010.
2. Shetty, M. S, Concrete Technology, Chand.S and Company Ltd, New Delhi, 2026
3. Neville, A.M; Properties of Concrete, Pitman Publishing Limited, London,2011
4. Gambhir.M.L., Concrete Technology, Fifth Edition, McGraw Hill Education,2017.
5. Job Thomas., Concrete Technology, Cencage learning India Private Ltd, New Delhi, 2018.
6. IS 456:2000 Plain and Reinforced Concrete – Code of Practice.
7. IS 10262:2019 Concrete Mix Proportioning – Guidelines.
8. IS 2386 (Part 4):1963 Methods of Test for Aggregates for Concrete – Mechanical Properties**.**
9. IS 516 (Part 1/Sec 1):2021 Methods of Tests for Strength of Concrete.
10. SP 23:1982 Handbook on Concrete Mixes.

E-Resources

1. NPETL-Concrete Technology https://nptel.ac.in/courses/105106186
2. Bureau of Indian Standards (BIS) – IS codes related to cement, aggregates, concrete and testing - https://www.bis.gov.in
3. https://ct-dei.vlabs.ac.in/

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CO – PO Mapping

	CO Description	PO Mapping	PSO1	PSO2	PSO3
CO1	Evaluate the properties of cement, aggregates, and water through standard laboratory tests as per relevant IS codes.	PO2 (2) PO4 (3) PO5 (2) PO7 (3) PO8 (2)	2	2	1
CO2	Analyze the influence of chemical admixtures, mineral admixtures, and fibres on the fresh and hardened properties of concrete.	PO2 (2) PO4 (3) PO5 (2) PO8 (2)	3	2	1
CO3	Design and proportion concrete mixes using BIS methods and assess workability and quality control parameters.	PO1 (3) PO3 (3) PO7 (2) PO8 (2)	3	3	2
CO4	Determine the strength, durability, and performance of concrete, including special concretes, using standard and non-destructive testing methods.	PO1 (3) PO4 (3) PO5 (2) PO8 (3)	3	3	1

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CE25C10	Soil Mechanics Laboratory	L	T	P	C
		0	0	4	2

Course objective:

To develop students' skills to test the soils for their index and engineering properties, and to characterize the soil based on its properties.

List of Experiments:

1. Determination of Index Properties
    a) Specific gravity of soil solids
    b) Grain size distribution – Sieve analysis and Hydrometer analysis
    c) Liquid limit and Plastic limit tests
2. Determination of In-situ Density and Compaction Characteristics
    a) Field density Test (Core cutter and Sand replacement method)
    b) Determination of moisture–density relationship using standard proctor compaction test.
3. Determination of Engineering Properties
    a) Permeability determination (constant head and falling head methods)
    b) Direct shear test in cohesion less soil
    c) Unconfined compression test in cohesive soil
    d) Vane Shear test
    e) Tri-axial compression test in cohesion less soil (Demonstration only)

Tasks:

1. Prepare a bore log report by performing index and engineering tests for the samples obtained from a nearby site location.
2. Develop a compaction and permeability assessment report and interpret the suitability of soil for backfill.
3. Evaluate shear strength characteristics and estimate bearing capacity of shallow foundations using obtained parameters.

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

Methodology for Continuous Assessment : Project (30%), Assignment (10%), Practical (30%), Internal Examinations (30%)

References

1. Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", New age International (P) limited publishers, New Delhi, 2008.
2. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008.
3. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.
4. BrajaM.Das., "Soil Mechanics: Laboratory Manual", Oxford University Press, Eighth edition, 2012.

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Relevant Indian Standards

1. IS 2720 (Part 3):1980 (Reaffirmed 2020) – Methods of Test for Soils – Determination of Specific Gravity, Bureau of Indian Standards.
2. IS 2720 (Part 4):1985 (Reaffirmed 2020) – Methods of Test for Soils – Grain Size Analysis, Bureau of Indian Standards.
3. IS 2720 (Part 5):1985 (Reaffirmed 2021) – Methods of Test for Soils – Determination of Liquid and Plastic Limit, Bureau of Indian Standards.
4. IS 2720 (Part 7):1980 (Reaffirmed 2021) – Methods of Test for Soils – Determination of Water Content-Dry Density Relation Using Light Compaction, Bureau of Indian Standards.
5. IS 2720 (Part 10):1991 (Reaffirmed 2021) – Methods of Test for Soils – Unconfined Compression Test, Bureau of Indian Standards.
6. IS 2720 (Part 11):1993 (Reaffirmed 2021) – Methods of Test for Soils – Triaxial Compression Test, Bureau of Indian Standards.
7. IS 2720 (Part 13):1986 (Reaffirmed 2021) – Methods of Test for Soils – Direct Shear Test, Bureau of Indian Standards.
8. IS 2720 (Part 17):1986 (Reaffirmed 2021) – Methods of Test for Soils – Laboratory Determination of Permeability, Bureau of Indian Standards.
9. IS 2720 (Part 28):1974 (Reaffirmed 2021) – Methods of Test for Soils – Determination of Dry Density of Soils in Place, Bureau of Indian Standards.
10. IS 2720 (Part 30):1980 (Reaffirmed 2021) – Methods of Test for Soils – Laboratory Vane Shear Test, Bureau of Indian Standards.

E-resources

https://archive.nptel.ac.in/courses/105/101/105101160/ - Geotechnical Engineering Laboratory by Prof. J. N. Mandal, IIT Bombay

	CO Description	**PO Mapping**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic principles and procedures of soil laboratory tests for determining index and engineering properties.	**-**	**-**	**-**	**-**
CO2	Perform soil laboratory tests and analyze results to evaluate compaction, permeability, and consolidation characteristics.	PO4 (3) PO5 (2) PO8 (2) PO9 (2)	2	2	1
CO3	Interpret shear strength parameters and assess their implications for bearing capacity and foundation performance.	PO2 (2) PO4 (3) PO5 (2) PO9 (2)	2	2	1

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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%.

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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)