St. Thomas College of Engineering & Technology
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CIVIL ENGINEERING

SYLLABUS- SEMESTER III

Semester 3												
Sl No	**Slot**	**Course Code**	**Course Title**	**Category**	**Credit Structure**				**SS**	**Total Marks**		**Total Credits**
					L	**T**	**P**	**R**		**CIA**	**ESE**	
1	A	**25UMGT301**	Fourier Transforms and Complex Analysis	BSC	3	0	0	0	4.5	40	60	3
2	B	**25UCET301**	Fluid Mechanics	PCC	3	1	0	0	5	40	60	4
3	C	**25UCET302**	Structural Analysis I	PCC	3	1	0	0	5	40	60	4
4	D	**25UCET303**	Surveying and Geomatics	PBL	3	0	0	1	5.5	60	40	4
5	E	**25UAMT304**	Fundamentals of Artificial Intelligence and Data Science	ESC	3	1	0	0	5	40	60	4
6	F	**25UHUT001**	Economics for Engineering Practices	HMC	2	0	0	0	3	40	60	2
		25UHUT002	Sustainability and Ethics in Engineering	HMC	2	0	0	0	3	40	60	
7	K	**25UCEL305**	Survey Lab	PCL	0	0	3	0	1.5	50	50	2
8	L	**25UCEL306**	Fluid Mechanics Lab	PCL	0	0	3	0	1.5	50	50	2
9	M		Remedial/Minor/Course	VAC	4	0	0	0	6	40	60	4
				Total Credit								**25/29**

25UMGT301	FOURIER TRANSFORMS AND COMPLEX ANALYSIS	Category	L	T	P	R	Credit	Year of Introduction
		BSC	3	0	0	0	3	2025

Preamble: This course introduces basic ideas of Fourier transforms which are widely used in the modelling and analysis of a wide range of physical phenomena and has got application across all branches of engineering. To understand the basic theory of functions of a complex variable, residue integration and conformal transformation.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering.	K3 Apply
CO2	Explain the analyticity of complex functions and apply it in Conformal mapping.	K3 Apply
CO3	Compute complex integrals using Cauchy's integral theorem and Cauchy's integral formula.	K3 Apply
CO4	Explain the series expansion of complex function about a singularity and apply residue theorem to compute real integrals.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	1
CO4	3	3	2	2	-	-	-	-	-	-	1
Avg	3	3	2	2	-	-	-	-	-	-	1

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*			*	
CO4	*	*	*	*	*			*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*			*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (10hrs)

Fourier integral, from Fourier series to Fourier integral Fourier cosine and and Sine integrals, Fourier Cosine and Sine Transform, Linearity, Transforms of Derivatives, Fourier Transform and its inverse, Linearity, Transforms of Derivative.

Module 2 (10hrs)

Complex Function, Limit, Continuity, Derivative, Analytic functions, Cauchy-Riemann Equations (without proof), Laplace's Equations, Harmonic functions, Finding harmonic conjugate, Conformal mapping, Mappings of $w=z^2$, $w=e^z$, $w=\frac{1}{z}$, $w=sinz$.

Module 3 (11hrs)

Complex Integration: Line integrals in the complex plane (Definition & Basic properties),

First evaluation method, Second evaluation method, Cauchy's integral theorem (without proof) on simply connected domain, Independence of path, Cauchy integral theorem on multiply connected domain (without proof), Cauchy Integral formula (without proof).

Module 4 (11hrs)

Taylor series and Maclaurin series, Laurent series (without proof), Singularities and Zeros – Isolated Singularity, Poles, Essential Singularities, Removable singularities, Zeros of Analytic functions – Poles and Zeros, Formulas for Residues, Residue theorem (without proof), Residue Integration- Integral of Rational Functions of $cos\theta$ and $sin\theta$.

Textbook

1.Kreyszig, E. (2016). *Advanced engineering mathematics* (10th ed.). John Wiley & Sons.

Reference Books

1. Zill, D. G., & Shanahan, P. D. (2015). *Complex analysis: A first course with applications* (3rd ed.). Jones & Bartlett Learning.
2. Ramana, B. V. (2023). *Higher engineering mathematics* (39th ed.). McGraw-Hill Education.
3. Grewal, B. S. (2018). *Higher engineering mathematics* (44th ed.). Khanna Publishers.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER

Course Code	**25UMGT301**
Course Name	**FOURIER TRANSFORMS AND COMPLEX ANALYSIS**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	Find the Fourier cosine integral of f(x)=$\begin{cases} 1\ , & if\ \|x\| < 1 \\ 0\ , & otherwise \end{cases}$	3	1	L2
2	Find the Fourier transform of f(x)=$\begin{cases} x, & if\ \|x\| < 1 \\ 0\ , & otherwise \end{cases}$	3	1	L2
3	Show that the function f(z)= $\frac{\bar{z}}{z}$ does not have a limit as z=0	3	2	L3
4	Check whether the function u(x ,y) = xy^2 is the real art of an analytic function.	3	2	L3
5	Evaluate $\int_c \ \|z\|dz$ where c is the line segment joining -i and i	3	3	L3
6	Evaluate $\int_c \ \frac{z^2}{z^2-1}dz$ where c is the unit circle	3	3	L3
7	Find the Taylor series expansion of f(z)= sin z about z= $\frac{\pi}{4}$	3	4	L2
8	Find pole and residue of $\tan z$	3	4	L2
Part B (*Answer any one full question from each Module. Each carries 9 marks*)				
Module 1				
Qn No.	Question	Marks	CO	BL
7(a)	Find the Fourier cosine integral of the function f(x)= e^{-ax} ,x>0 and hence show that $\int_0^\infty \frac{cos\omega x}{1+\omega^2}d\omega = \frac{\pi}{2}$	5	1	L3
(b)	Find the Fourier sine transform of the function f(x)= $\begin{cases} 1\ , & 0 < x < 1 \\ -1, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$	4	1	L2
OR				
8(a)		5	1	L3

	Find the Fourier transform of f(x)= $e^{-\alpha\|x\|}, \alpha > 0$			
(b)	Find the Fourier sine integral of f(x)= $\begin{cases} \sin x, 0 \le x \le \pi \\ 0, x > \pi \end{cases}$	4	1	L2
	MODULE-2			
9(a)	Show that f(z)= $\sin z$ is differentiable everywhere. and find its derivative	5	2	L2
(b)	Show that u= $y^2 - 3x^2y$ is harmonic. and hence find the analytic function and harmonic conjugate	4	2	L3
	OR			
10(a)	Find the analytic function whose imaginary part is $\frac{x-y}{x^2+y^2}$	5	2	L2
(b)	Find the image of the infinite strip $\frac{1}{4} < y < \frac{1}{2}$	4	2	L3
	MODULE-3			
11(a)	Solve f(z)= $x^2 + ixy$ from A(1,1) to B(2,4) along the curve x=t and y=t	5	3	L3
(b)	Solve $\int_c \frac{z+4}{z^2+2z+5} dz$ where c is |z+1-i| = 2	4	3	L3
	OR			
12(a)	Solve $\int_c \frac{e^z}{z^2+4} dz$ where c is |z- i|= 2	5	3	L3
(b)	Solve $\int_c Re(z)dz$ where c is a straight line from 0 to (1+2i)	4	3	L3
	MODULE-4			
13(a)	Expand f(z)= $\frac{z+1}{z-1}$ as a Taylor series about z= -1	5	4	L3
(b)	Find poles and residue of f(z)= $\frac{ze^{2iz}}{z^2+9}$	4	4	L2
	OR			
14(a)	Solve $\int_c \frac{sin\pi z^2+cos\pi z^2}{(z-1)(z-2)} dz$ where c is |z|=3	5	4	L3
(b)	Expand f(z)= $\frac{1}{z^2}$ as Taylor series about z= 2	4	4	L2

25UCET301	FLUID MECHANICS	Category	L	T	P	R	Credit	Year of Introduction
		PCC	3	1	0	0	4	2025

Preamble: This course introduces learners to the essential principles governing fluid behaviour in static and dynamic conditions. The subject develops conceptual clarity on fluid properties, pressure measurement, kinematics, and energy relationships, while extending applications to pipe flow and open channel flow systems.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Describe the physical properties of fluids and pressure characteristics using principles of fluid statics and pressure measurement devices.	K2 Understand
CO2	Determine hydrostatic forces on submerged surfaces and apply buoyancy principles to assess the stability of floating and submerged bodies.	K3 Apply
CO3	Apply continuity, energy, and momentum principles to determine fluid flow behaviour and solve related engineering problems.	K3 Apply
CO4	Determine flow characteristics in pipes, orifices, notches, and open channel systems, considering energy losses and discharge relationships.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	1	-	-	-	-	-	-	-	3	1	-
CO2	3	3	2	2	-	-	-	-	-	-	-	3	2	-
CO3	3	3	2	1	-	-	-	-	-	-	-	3	1	1
CO4	3	3	3	2	-	-	-	-	-	-	-	3	2	1
Avg	3	2.5	2	1.5	-	-	-	-	-	-	-	3	1.5	1

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9

CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*			*	
CO4	*	*	*	*	*			*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*			*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment /Field study/Industrial Visit: 15 marks

SYLLABUS

Module 1 (14 hrs)

Introduction to fluids and their physical properties - Newton's law of viscosity and classification of fluids - Introduction to Non-Newtonian fluids and examples from engineering and industrial applications - Fluid pressure concepts, Pascal's law and Hydrostatic law - Measurement of pressure using manometers: piezometer, U tube manometer, differential manometers and inverted differential manometers - Brief overview of mechanical pressure gauges - Numerical problems on pressure measurement and hydrostatics.

Module 2 (14 hrs)

Hydrostatic forces on submerged surfaces: vertical, horizontal, inclined, and curved surfaces - Determination of total pressure and centre of pressure with numerical applications - Buoyancy and floatation: centre of buoyancy, meta centre, and meta centric height - Stability analysis of floating and submerged bodies - Analytical determination of meta centric height and conceptual description of experimental methods - Discussion on engineering significance of stability, including applications in floating structures, storage vessels, marine systems, and submerged bodies - Numerical problems on buoyancy and stability.

Module 3 (14 hrs)

Description of fluid motion: Lagrangian and Eulerian approaches - Classification of fluid flow - Continuity equation in one, two, and three dimensions -Velocity and acceleration in fluid flow - Streamlines, pathlines, streaklines, velocity potential, stream function, and flow nets - Concept of dimensionless numbers and Reynolds number in fluid flow analysis and similarity - Fluid dynamics: Euler's equation of motion - Bernoulli's equation with assumptions and limitations - Applications of Bernoulli's equation: Venturimeter, Orifice meter and Pitot tube - Momentum equation and forces on pipe bends. Numerical problems.

Module 4 (14 hrs)

Flow through orifices, hydraulic coefficients and discharge relationships - Discharge through large orifices and time of emptying (numerical problems) - Flow measurement using notches and weirs: rectangular, triangular, and trapezoidal notches/weirs, including velocity of approach and end contraction effects - Numerical problems - Pipe flow: major and minor losses, Darcy Weisbach equation, hydraulic gradient line, total energy line, pipes in series and parallel, equivalent pipes - Open channel flow: comparison with pipe flow and classification. (Concept only).

Field study/Industrial Visit :

Visit to a pumping station / water treatment plant / irrigation structure to observe flow measurement devices, pipe systems, and energy loss phenomena. Submission of a brief technical observation report is mandatory as a part of assessment.

Text Books:

P. N. Modi & S. M. Seth(2019). *Hydraulics and Fluid Mechanics including Hydraulic Machines.* 22nd Edition. Rajsons Publications.Standard Book House.

R. K. Bansal (2023). *Fluid Mechanics and Hydraulic Machines.*11th Edition. Laxmi, Publications.

K. Subramanya(2019).*Flow in Open Channels.*5th Edition. Mc Graw Hill Publishers.

Reference Books:

Arora.K.R(2005). Fluid Mechanics, Hydraulics and Hydraulic Machines.Standard Publishers.

Victor Streeter, E. Benjamin Wylie, K.W. Bedford (2017). Fluid Mechanics. Mc Graw Hill Publishers.

Bruce R. Munson, Donald F. Young, Theodore H. Okiishi(2005). Fundamentals of Fluid Mechanics. 9th Edition. John Wiley & Sons Inc.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	**25UCET301**
Course Name	**FLUID MECHANICS**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	Classify fluids based on their rheological behaviour with suitable examples.	3	1	L2
2	Explain Pascal's law and its engineering applications.	3	1	L2
3	Explain the concepts of centre of buoyancy and metacentre.	3	2	L2
4	Distinguish stable, unstable and neutral equilibrium of floating bodies.	3	2	L2
5	Differentiate Eulerian and Lagrangian descriptions of fluid motion.	3	3	L2
6	Explain the significance of Reynolds number in fluid flow analysis.	3	3	L2
7	Explain the hydraulic coefficients of an orifice.	3	4	L2
8	Distinguish hydraulic gradient line and total energy line.	3	4	L2
Part B (*Answer any one full question from each Module. Each carry 9 marks*)				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9.a	Explain the working principle of a differential manometer.	3	1	L2
9.b	Compare Newtonian and Non-Newtonian fluids with suitable engineering applications.	6	1	L2
OR				
10.a	Explain Newton's law of viscosity.	3	1	L2
10.b	Describe various pressure measuring devices used in fluid mechanics and their applications.	6	1	L2
Module II				

Qn No.	Question	Marks	CO	BL
11.a	Explain the procedure to determine the metacentric height of a floating body.	3	2	L2
11.b	A rectangular plate 2 m wide and 3 m high is immersed vertically in water with its top edge 1 m below the free surface. Determine: (i) Total hydrostatic force (ii) Position of centre of pressure	6	2	L3
OR				
12.a	Explain the significance of centre of pressure in engineering applications.	3	2	L2
12.b	A wooden block measuring 2 m × 1 m × 0.8 m and having specific gravity 0.7 floats in water. Determine the metacentric height and comment on its stability.	6	2	L3
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13. a	Explain the impulse-momentum principle.	3	3	L2
13. b	An orifice meter consisting of an 80 mm diameter orifice fitted in a 200 mm diameter pipe has Cd = 0.65. The pipe carries oil of specific gravity 0.8. If the differential manometer reading is 700 mm of mercury, determine the discharge through the pipe.	6	3	L3
OR				
14. a	Explain the assumptions made in deriving Bernoulli's equation.	3	3	L2
14. b	Water flows through a horizontal pipe bend reducing from 300 mm diameter to 150 mm diameter. The discharge is 0.12 m^3/s and inlet pressure is 250 kPa. Determine the force exerted on the bend using the momentum equation.	6	3	L3
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15. a	Explain major and minor losses in pipe flow.	3	4	L2
15. b	A circular tank of diameter 2 m contains water up to a height of 3 m. If an orifice of diameter 150 mm is provided at the bottom, determine the time required to empty the tank. Take Cd = 0.62.	6	4	L3
OR				

16. a	Distinguish rapidly varied flow and gradually varied flow.	3	4	L2
16. b	A 40 m long rectangular weir is divided into 12 equal bays by vertical posts each 0.6 m wide. Taking Cd = 0.623, determine the discharge over the weir if the head over the crest is 1.2 m and the velocity of approach is 2 m/s.	6	4	L3

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25UCET302	STRUCTURAL ANALYSIS I	Category	L	T	P	R	Credit	Year of Introduction
		PCC	4	0	0	0	4	2025

Preamble: This course provides a thorough understanding of the fundamental theory of structural analysis and to develop the student's ability to both model and analyse statically determinate and indeterminate structures and to provide realistic applications encountered in professional practice.

Prerequisite: MOS205 Mechanics of Solids

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Compute the forces and deflection in truss,cable,suspension bridge and beams.	K3 Apply
CO2	Apply energy and deformation methods to calculate deflections and internal forces in statically indeterminate structures.	K3 Apply
CO3	Apply slope deflection and moment distribution methods for analysis of continuous beams and portal frames.	K3 Apply
CO4	Apply concepts of three-hinged arches and influence lines to determine reactions and internal forces in statically determinate structures.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	-	-	-	-	-	-	3	2	-
CO2	3	3	2	1	2	-	-	-	-	-	-	3	2	-
CO3	3	3	2	1	2	-	-	-	-	-	-	3	1	-
CO4	3	3	2	1	2	-	-	-	-	-	-	3	1	-
Avg	**3**	**3**	**2**	**1**	**2**	-	-	-	-	-	-	**3**	**1.5**	-

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*	*		*	

CO2	*	*	*	*	*	*		*	
CO3	*	*	*	*	*	*		*	
CO4	*	*	*	*	*	*		*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*		*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (15 hrs)

Statically determinate trusses: Method of joints and method of sections.

Cables: Analysis of forces in cables under concentrated and uniformly distributed loads;Anchor Cable supports.

Suspension Bridges: Un-stiffened suspension bridges, maximum tension in the suspension cable and backstays, pressure on towers.

Deflection of statically determinate structures: Introduction and simple illustrative examples of simple beams and cantilever beams :Moment area method and Castigliano's theorem Part I.

Module 2 (15 hrs)

Principle of virtual work, Betti's theorem, Maxwell's law of reciprocal deflections; Unit load method for determination of deflection of statically determinate beams and trusses (simple illustrative numerical problems only)

Analysis of Statically Indeterminate Structures:Degree of static and kinematic indeterminacies; Introduction to force and displacement methods.

Method of consistent deformations: Analysis of beams, frames and trusses. (simple problems with one redundant, illustration only for two redundant problems). Concepts of effect of pre-strain, lack of fit, temperature changes and support settlement. (Illustration only).

Castigliano's theorem Part II, theorem of least work. Minimum strain energy method for

analysing statically indeterminate structures (Illustrative simple examples only).

Module 3 (13 hrs)

Slope Deflection Method: Analysis of continuous beams and portal frames without sway;

Frames with sway (illustration only); Settlement effects (illustration only) .

Moment Distribution Method: Analysis of continuous beams and portal frames without sway; Frames with sway (illustration only).

Module 4 (13 hrs)

Arches: Theory of arches – Eddy's theorem;Analysis of three-hinged arches; Normal thrust and radial shear due to simple cases of loading.

Moving Loads and influence lines:Introduction to moving loads - concept of influence lines -influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams – analysis for single concentrated load, several concentrated loads, uniformly distributed load shorter and longer than the span – conditions for maximum bending moment and shear force

Text Books

Gere, J. M., & Timoshenko, S. P. (2004). Mechanics of Materials (5th ed.). CBS Publishers.

Leet, K. M., Uang, C.-M., & Gilbert, A. M. (2011). Fundamentals of Structural Analysis (4th ed.). McGraw Hill Education.

Vaidyanathan, R., & Perumal, P. (2003). Comprehensive Structural Analysis, Volume I & II (1st ed.). Laxmi Publications (P) Ltd.

Reference Books

Kassimali, A. (2011). Structural Analysis (4th ed.). Cengage Learning.

Chandramouli, P. N. (2010). Structural Analysis I: Analysis of Statically Determinate Structures (1st ed.). Yes Dee Publishing Pvt. Ltd.

Menon, D. (2008). Structural Analysis (1st ed.). Narosa Publishing House.

Hibbeler, R. C. (2012). Structural Analysis (8th ed.). Pearson Education.

Reddy, C. S. (2009). Indeterminate Structural Analysis (3rd ed.). Tata McGraw Hill Education.

Schodek, D. L. (2014). Structures (7th ed.). Pearson Education.

Negi, L. S., & Jangid, R. S. (1997). Structural Analysis (1st ed.). Tata McGraw Hill.

Bhavikatti, S. S. (2016). Structural Analysis II (4th ed.). Vikas Publishing House Pvt. Ltd.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

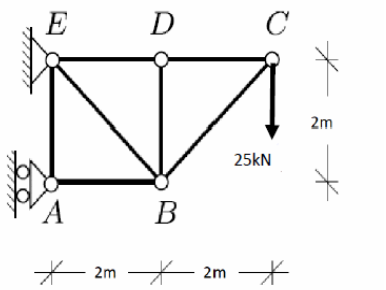
Course Code	**25UCET302**
Course Name	**STRUCTURAL ANALYSIS I**
Max. Marks: 60	**Duration: 2.5 Hours**

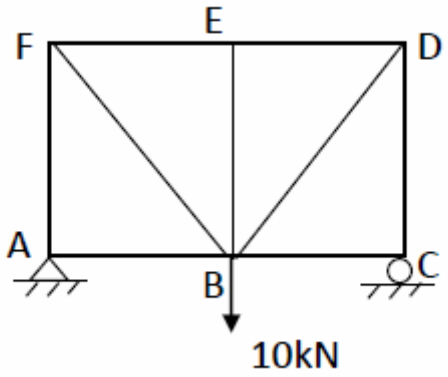
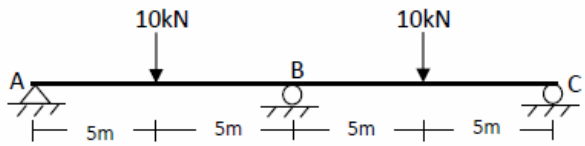
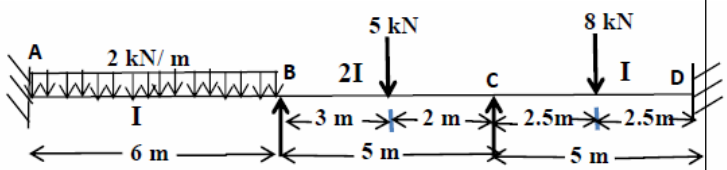
Part A

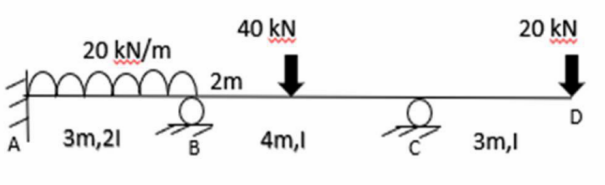
(Answer all questions. Each question carries 3 marks)

Qn No.	Question	Marks	CO	BL
1	Describe Moment- Area theorems.	3	1	L2
2	Differentiate method of joints and method of sections.	3	1	L2
3	Explain Maxwell's law of reciprocal deflections.	3	2	L2
4	Describe Castigliano's first theorem for deflection.	3	2	L2
5	Explain Distribution Factor used in Moment-Distribution method.	3	3	L2
6	Explain the basic equation used for Slope- Deflection method of analysis and explain each term.	3	3	L2
7	Summarise the types of arches.	3	4	L2
8	Describe the significance of influence line diagram.	3	4	L2

Module I

Qn No.	Question	Marks	CO	BL
9	Calculate the forces in the given truss using method of joints. 	9	1	L3
	OR			
10	Cable of a suspension bridge supports a uniformly distributed load of 10kN/m of horizontal span.	9	1	L3

	Supporting piers are 20m high and 120m apart and dip of the cable is 18m. If the cable passes over frictionless pulley on top of the pier, determine the vertical and horizontal force transmitted to the pier and the maximum bending moment in the pier. Anchor cable is at 30º to the horizontal.			
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Determine the vertical deflection at E of the pin jointed plane truss shown in Fig. using unit load method. All members have cross sectional area 1200mm^2 and E= 200GPa. AB = BC= 3m, AF = 4m. 	9	2	L3
OR				
12	Calculate the vertical force in B in the beam shown using consistent deformation method. 	9	2	L3
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13	Calculate the final forces in the beam and draw SFD and BMD using slope deflection method . 	9	3	L3

OR				
14	Calculate the final forces in the continuous beam shown in Figure using moment distribution method. Draw bending moment diagram. 	9	3	L3
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	A three hinged parabolic arch of span 40m and central rise 12m supports uniformly distributed load of 3.5kN/m over the left half span. Determine the normal thrust and radial shear at point 3m from left support.	9	4	L3
OR				
16	A uniformly distributed load 40kN/m and 5m long traverses a simply supported beam AB of span 15m from left to right. Draw the influence line diagram for shear force and bending moment at a section 6m from A. Calculate the maximum shear force and bending moment at this section using these diagrams.	9	4	L3

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25UCET303	SURVEYING AND GEOMATICS	Category	L	T	P	R	Credit	Year of Introduction
		PBL	3	0	0	1	4	2025

Preamble: The course covers fundamental surveying techniques such as linear and angular measurements, levelling and contouring, along with modern geospatial tools like Total Station, GPS,Remote Sensing, and GIS. It equips students with practical skills in field data collection, analysis, and spatial data interpretation for engineering applications.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

Mapping

CO	Course Outcomes	Knowledge Level
CO1	Apply surveying principles, instruments, and leveling methods for accurate field data collection.	K3 Apply
CO2	Compute contours, area, volume, and triangulation for land features and earthwork.	K3 Apply
CO3	Apply EDM, Total station and GPS techniques for accurate surveying measurements and positioning.	K3 Apply
CO4	Apply the principles of remote sensing and GIS for geospatial analysis.	K3 Apply

of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	-	-	-	-	-	3	2	1
CO2	3	3	2	2	2	1	-	-	-	-	-	3	2	1
CO3	3	3	1	2	3	1	-	-	-	-	-	3	2	2
CO4	3	3	2	2	3	2	-	-	-	-	-	3	2	3
Avg	3	3	1.75	2	2.5	1.25	-	-	-	-	-	3	2	1.75

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*	*	*	*	

CO2	*	*	*	*	*	*	*	*	
CO3	*	*	*	*	*	*	*	*	
CO4	*	*	*	*	*	*	*	*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**60**	**40**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 25 marks
Project : 30 marks

SYLLABUS

Module 1 (14 hrs)

Definition – Classifications – Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Principles of leveling - Temporary and permanent adjustments – Methods of leveling – Procedure in leveling – Booking.

Module 2 (14 hrs)

Contouring - Characteristics, methods, uses - Areas enclosed by straight lines - Irregular figures - Volumes - Earth work calculations. Triangulation: Triangulation figures, Triangulation stations, Inter visibility of stations, Satellite Stations and reduction to centre.

Module 3 (14 hrs)

Electromagnetic Distance Measurement, principle, classification - Electronic Theodolite, Characteristics, Measurement of horizontal and vertical angle measurement - Total station, features, working principle, uses - Global Positioning Systems, components and principles, satellite constellation, operating procedure, GPS Receivers, classification, GPS surveying methods.

Module 4 (14 hrs)

Remote Sensing - Definition - Electromagnetic spectrum – Elements – Electromagnetic energy - Electromagnetic radiation - Energy interactions with atmosphere and earth surface features - platforms - Digital image processing - Resolution of images - advantages and applications of remote sensing - Geographical Information System - Components of GIS, Subsystem of GIS -- Data structures - Database management - Applications of GIS - Sources of error in GIS.

Text Books:

Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain(2016).Surveying Vol. I & II. Sixteenth Edition.Lakshmi Publications Pvt Ltd.New Delhi.

T. P. Kanetkar and S. V. Kulkarni(2008). Surveying and Levelling, Parts 1 & 2.Pune Vidyarthi Griha Prakashan. Pune.

M. Anji Reddy(2012). Textbook of Remote Sensing And Geographical Information Systems.Fourth Edition. B.S Publications .

Reference Books:

R. Subramanian(2012). Surveying and Levelling.Second Edition. Oxford University Press.

K. Roy(2010). Fundamentals of Surveying. Second Edition. Prenticeˆ Hall of India.

K. R. Arora(2013). Surveying Vol I & II.Twelfth Edition . Standard Book house.

C. Venkatramaiah(2011). Textbook of Surveying.Second Edition.Universities Press.

Burrough P(1998). Principles of Geographical Information Systems. Oxford University Press.

Suggested Project Topics

Conduct the land surveying using linear measurements (tape or distomat).

Determine the errors in traverse and apply corrections.

Prepare the survey sketch.

Determine the reduced levels and prepare the contour maps using conventional (level or theodolite) methods.

Conduct the total station survey and prepare the contour maps.

Prepare sketch for profile leveling and cross sectioning.

Determine the earthwork quantity.

Conduct GIS survey.

Assessment and Evaluation for Project Activity

Sl. No	Evaluation for	Allotted Marks

1	Project Planning and Proposal	5
2	Contribution in Progress Presentations and Question Answer Sessions	4
3	Involvement in the project work and Team Work	3
4	Execution and Implementation	10
5	Final Presentations	5
6	Project Quality, Innovation and Creativity	3
Total		30

Project Planning and Proposal (5 Marks)
Clarity and feasibility of the project plan
Research and background understanding
Defined objectives and methodology
Contribution in Progress Presentation and Question Answer Sessions (4 Marks)
Individual contribution to the presentation
Effectiveness in answering questions and handling feedback
Involvement in the Project Work and Team Work (3 Marks)
Active participation and individual contribution
Teamwork and collaboration
Execution and Implementation (10 Marks)
Adherence to the project timeline and milestones
Application of theoretical knowledge and problem-solving
Final Result
Final Presentation (5 Marks)
Quality and clarity of the overall presentation
Individual contribution to the presentation
Effectiveness in answering questions
Project Quality, Innovation, and Creativity (3 Marks)
Overall quality and technical excellence of the project
Innovation and originality in the project
Creativity in solutions and approaches

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	**25UCET303**
Course Name	**SURVEYING AND GEOMATICS**
Max. Marks: 40	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 2 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	The length of a line measured with a 20 m chain was found to be 250 m. Calculate the true length of the line, if the chain was 10 cm too long.	2	1	L3
2	Describe the Reversible level.	2	1	L2
3	Summarise the methods of determining areas.	2	2	L2
4	Distinguish between survey station and tie station.	2	2	L2
5	Describe the weight of an observation.	2	3	L2
6	Explain the Global Positioning Systems.	2	3	L2
7	Outline the disadvantages of using remotely sensed data.	2	4	L2
8	Summarise the purposes of GIS.	2	4	L2
Part B (*Answer any one full question from each Module. Each carry 6 marks*)				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	The following consecutive readings were taken with a level and a 4 m levelling staff on a continuously sloping ground at a common interval of 30 m. 0.780, 1.535, 1.955, 2.430, 2.985, 3.480, 1.155, 1.960, 2.365, 3.640, 0.935, 1.045, 1.630 and 2.545. The RL of first point A was 180.750 m. Estimate the RL of points and the gradient of line joining first and last points.	6	1	L3
OR				
10	The following consecutive readings were taken with a dumpy level and a 4 m level staff on a continuous sloping ground at common interval of 30m. 0.585 on A, 0.930, 1.955, 2.840, 3.645, 3.930, 0.960, 1.035, 1.680, 2.535, 3.845, 0.950, 1.575, 3.015 on B. The elevation at A was 520.15m. (i) Rule out a page of level book and	6	1	L3

	enter above readings. (ii) Determine the RL of B (iii) Determine the gradient of line AB. Adopt the rise and fall method.			
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	The offsets taken from a chain line to an irregular boundary is shown below. Estimate the area between the chain line, the irregular boundary and the first and last offset by Simpson's rule. Distance (m): 0, 15, 30, 45, 60, 75, 90, 105, 120 Offsets (m): 3.18, 4.62, 6.06, 5.61, 4.92, 6.24, 6.72, 5.79, 5.28	6	2	L3
OR				
12	An observer standing on the deck of a ship just sees the top of a lighthouse with his eyes at a height of 11 m. The top of the light house is 58 m above mean sea level. Evaluate the distance of the observer from the lighthouse.	6	2	L3
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13	A survey team is tasked with establishing control points over a large area using GPS. Apply the principles of GPS surveying to for obtaining accurate coordinates.	6	3	L3
OR				
14	Demonstrate the working principle of a Total Station to measure horizontal and vertical angles and compute field observations.	6	3	L3
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Use the principles of remote sensing and platform characteristics to select an appropriate platform for environmental monitoring of a large area.	6	4	L3
OR				
16	Illustrate the application of GIS in solving real-world problems such as urban planning or transportation network analysis.	6	4	L3

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25UAMT304	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE	Category	L	T	P	R	Credit	Year of Introduction
		ESC	3	1	0	0	4	2025

Preamble: Artificial Intelligence (AI) and Data Science are transformative technologies that are reshaping industries, economies, and everyday life across the globe. From intelligent virtual assistants and recommendation systems to autonomous vehicles and predictive healthcare analytics, AI and Data Science are driving innovation and enabling data-driven decision-making in unprecedented ways. The course provide students with a foundational understanding of the principles, methodologies, and applications of intelligent systems and data analytics.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain the concept of machine learning including neural networks and different learning techniques for engineering applications.	**K2** Understand
CO2	Apply mathematical concepts such as matrix operations, probability And regression to solve engineering problems.	**K3** Apply
CO3	Demonstrate knowledge of essential skills and tools required for Data Science, including data storage techniques and dataset creation.	**K3** Apply
CO4	Apply appropriate data pre-processing techniques to prepare datasets for analysis and modeling.	**K3** Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-
CO3	2	3	3	2	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-
Avg	2.2	2.5	2.5	2	-	-	-	-	-	-	-

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*				
CO2	*	*	*	*					

CO3		*	*	*	*				
CO4	*	*		*	*				

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*				

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (14 hrs)

Basics of Machine Learning -types of Machine Learning systems-challenges in ML- Supervised learning model example- regression models- Classification model example- Logistic regression-unsupervised model example- K-means clustering. Artificial Neural Network- Perceptron- Universal Approximation Theorem.

Module 2 (14 hrs)

Role of linear algebra in Data representation and analysis – Matrix decomposition- Singular Value Decomposition (SVD)- Spectral decomposition. Basics of probability- random variables and statistical measures - rules in probability-Bayes theorem and its applications-Correlation analysis-linear correlation - regression analysis- linear regression.

Module 3 (14 hrs)

Data Science: Steps in doing Data Science - Data Science relation to other fields- Data Science and Information Science- Computational Thinking - Skills and tools needed to do Data Science - Storing data - Combining bytes into larger structures - Creating data sets - Identifying data problem - Understanding data sources - Exploring data models- Introduction to Big Data.

Module 4 (14 hrs)

Structured and unstructured data - Challenges with unstructured data - Data collection: Open data - multimodal data - Data Pre-processing: Data Cleaning - Data Integration, Data Transformation - Data Reduction - Data Discretization. Applications of Machine Learning in Data Science- modelling process- demonstration of ML. Benefits of data science-use of statistics and Machine Learning in Data Science- data science process applications in data science.

Text Books:

1. Gilbert Strang(2023), Introduction to Linear Algebra, Wellesley-Cambridge Press, 6th edition.

2. Gupta.S.C and V.K.Kapoor(2020) Fundamentals of mathematical statistics, Sultan Chand & Sons ,9th edition

3. Cielen, Davy and Arno Meysman(2016), Introducing data science: bigdata, machine learning, and more, using Python tools, Simon and Schuster, 1st edition

Reference Books:

Avrim Blum, John Hopcroft, and Ravi Kannan(2020) , Foundations of Data Science, Cambridge University Press, 1st edition

Carlos Fernandez(2017), Probability and Statistics for Data Science , Center for Data Science in NYU, 1st edition.

Kotu Vijay, and Bala Deshpande(2018) ,Data science: concepts and practice, Morgan 2nd edition

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code: 25UAMT304	**Course Name: Fundamentals of Artificial Intelligence & Data Science**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A (Answer all questions. Each question carries 3 marks)				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	Define machine learning and explain the difference between supervised and unsupervised learning with suitable examples.	3	CO1	L2
2	Explain the concept of Logistic Regression and state how it differs from Linear Regression.	3	CO1	L2
3	Define Singular Value Decomposition (SVD) and state its significance in data representation.	3	CO2	L2
4	State Bayes' theorem and explain its role in probability-based classification.	3	CO2	L2
5	List the essential skills and tools required to perform Data Science and explain any two in brief.	3	CO3	L2
6	Explain the concept of Computational Thinking and its relevance to Data Science.	3	CO3	L2
7	Define data pre-processing and explain the need for data cleaning in the data analysis pipeline.	3	CO4	L2
8	Distinguish between structured and unstructured data with suitable examples.	3	CO4	L2

Part B (Answer any one full question from each Module. Each carries 9 marks)				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Explain the different types of Machine Learning systems in detail. Discuss the challenges involved in Machine Learning and illustrate how a supervised learning regression model works with an example.	9	CO1	L2
OR				
10	Describe the architecture and working principle of an	9	CO1	L2

	Artificial Neural Network. Explain the Perceptron model and state the Universal Approximation Theorem with its significance in neural network design.			
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	A retail company has collected customer data represented as a matrix A consisting of 4 customers (rows) and 3 features: monthly spend, number of visits, and loyalty score (columns). The company wants to reduce the dimensionality of this data for visualization while preserving maximum variance. (a) Explain how Singular Value Decomposition (SVD) of matrix A can be used to achieve this dimensionality reduction. Outline the steps involved, including how the singular values indicate which components to retain. (b) A discrete random variable X represents the number of visits per month by a customer, with the following probability distribution: X = 1, 2, 3, 4 with P(X) = 0.1, 0.3, 0.4, 0.2 respectively. Calculate the mean (expected value) and variance of X, and interpret what these values tell the company about customer visiting behaviour.	9	CO2	L3
OR				
12	A medical testing centre uses a screening test for a disease that is present in 2% of the population. The test correctly identifies the disease in 95% of people who actually have it (true positive rate), and incorrectly indicates the disease in 4% of people who do not have it (false positive rate). A randomly selected person tests positive. (a) Apply Bayes' theorem to calculate the probability that this person actually has the disease. Comment on what this result implies about the reliability of the test in practice. (b) The centre also recorded the age (X, in years) and blood pressure (Y, in mmHg) of 6 patients: X: 25, 32, 40, 48, 55, 60 Y: 118, 122, 130, 138, 145, 150 Calculate Pearson's correlation coefficient between age and blood pressure, and use simple linear regression to predict the blood pressure of a 50-year-old patient.	9	CO2	L3
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13.a	A retail startup wants to build a system that predicts which products a customer will buy next, using past purchase records, website browsing logs, and social	5	CO3	L3

	media reviews. Apply the steps involved in doing Data Science to outline how the team should proceed from problem identification to deployment, and justify how this process relates Data Science to other fields such as Information Science.			
13.b	A hospital wants to create a single dataset by combining numeric patient vitals, text-based doctor's notes, and X-ray images for analysis. Apply appropriate data storage techniques to combine these different types of bytes into larger structures, and identify the skills and tools the data science team would need to create this dataset.	4	CO3	L3
OR				
14.a	A telecom company is experiencing high customer churn but does not know the underlying cause. Apply the process of identifying the data problem and understanding the relevant data sources, such as call records, billing history, and complaint logs, that the company should investigate. Demonstrate with a suitable example how exploring different data models could help uncover patterns behind the churn.	5	CO3	L3
14.b	A social media platform generates millions of posts every day and wants to identify trending topics in real time. Apply the concept of Computational Thinking to decompose this problem into manageable parts, and demonstrate the skills and tools needed to handle the Big Data characteristics, namely volume, velocity, and variety, involved in solving it.	4	CO3	L3
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15.a	Apply data pre-processing techniques—including Data Cleaning, Data Integration, Data Transformation, and Data Reduction—to prepare a given dataset for machine learning modeling. Explain Data Discretization with examples.	6	CO4	L3
15.b	Analyse how Machine Learning is applied in Data Science by describing the modelling process and the benefits of using statistics and Machine Learning in Data Science applications.	3	CO4	L3
OR				
16.a	Analyse the challenges involved in handling unstructured data. with the methods of data collection including open data and multimodal data, and apply appropriate pre-processing strategies for such data.	6	CO4	L3

16.b	Apply the data science process with real-world applications. Demonstrate how the use of statistics and Machine Learning contributes to data science process outcomes.	3	CO4	L3

25UHUT001	ECONOMICS FOR ENGINEERING PRACTICES	Category	L	T	P	R	Credit	Year of Introduction
		HMC	2	0	0	0	2	2025

Preamble: This syllabus covers the fundamentals of Microeconomics, Macroeconomics, and Engineering Economics. It bridges economic theory with practical engineering and management, teaching students to apply analytical tools to scarcity, market dynamics, and financial decision-making.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Understand the fundamentals of various economic issues using laws and learn the concepts of demand, supply, elasticity and production function.	K2 Understand
CO2	Develop decision making capability by applying concepts relating to costs and revenue, and acquire knowledge regarding the functioning of firms in different market situations.	K3 Apply
CO3	Outline the macroeconomic principles of monetary and fiscal systems and national income.	K2 Understand
CO4	Make use of the possibilities of value analysis and engineering, and take investment decisions through capital budgeting techniques.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	0	0	-	2	2	-	-	-	-
CO2	3	3	2	0	1	2	-	-	1	1	3
CO3	2	2	0	0	-	3	3	1	-	-	2
CO4	3	3	3	2	2	-	2	1	1	1	3
Avg	2.75	2.5	2.5	2	1.5	2.3	2.3	1	1	1	2.6

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9

CO1	*	*	*	*	*		*		*
CO2	*	*	*	*	*	*	*	*	
CO3	*	*	*	*	*		*	*	*
CO4	*	*	*	*	*	*		*	*

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (7 hrs)

Nature and significance of economics, Basic economic problems – Production Possibility Curve – Utility – Law of diminishing marginal utility –Demand: Factors determining demand – Law of Demand – Demand curve- Price elasticity of demand- measurement of price elasticity and its applications – Supply: factors determining supply - Law of supply – Supply curve- Equilibrium price determination- Changes in demand and supply and its effects on equilibrium price and quantity. Production: Production function, Factors of Production- Cobb-Douglas Production Function

Module 2 (7 hrs)

Cost: Cost concepts – Private cost and social cost – Sunk cost – Opportunity cost -Explicit and implicit cost –Short run cost curves –Long run average cost curve -Revenue concepts – Break-even point. Taxation-Direct and indirect taxes-principles of Taxation, GST.Market: Market: different market structures and market equilibrium – Kinked demand model- E-commerce, Stock market-SENSEX, NIFTY, Mutual Funds & ETFs (Concepts Only)

Module 3 (7 hrs)

National income: Concepts (GDP, GNP and NNP-Basic problems)– Final goods and Intermediate goods - Methods of Estimation –output method – expenditure method-- Difficulties in the measurement of national income. International trade, terms of Trade,

Gain from International Trade, Free Trade vs. Protection**.** Dumping, and Balance of Payment. Inflation: Causes and Effects – Measures to Control Inflation - Monetary and Fiscal policies – Repo and reverse repo rate. Role of Science, Engineering and Technology In economic Development

Module 4 (7 hrs)

Value Analysis and value Engineering: Cost Value, Exchange Value, Use Value, Esteem Value - Aims, Advantages and Application areas of Value Engineering - Value Engineering Procedure.Capital Budgeting: Time value of money - Net Present Value Method - Benefit Cost Ratio – Internal Rate of Return -– Payback – Accounting Rate of Return.

Text Books:

1. Geetika, Piyali Ghosh and Chodhury, Managerial Economics, Tata McGraw Hill,2015
2. H. G. Thuesen, W. J. Fabrycky, Engineering Economy, PHI, 1966.
3. R. Paneerselvam: Engineering Economics, PHI, 2012.
4. I M Pandey, Financial Management, Vikas Publishing House ,2015

Reference Books:

1 Leland Blank P.E, Anthony Tarquin P. E., Engineering Economy Mc Graw Hill, 7th edition.
2. Khan M. Y, Indian Financial System, Tata McGraw Hill, 2011.
3. Donald G. Newman, Jerome P. Lavelle, Engineering Economics and analysis, Engg. Press, Texas, 2002.
4. Chan S. Park, Contemporary Engineering Economics, Prentice Hall of India Ltd, 2001.
5. Prasanna Chandra, Financial Management: Theory and Practice, Mc Graw Hill, 2007.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER

Course Code	**25UHUT001**
Course Name	**ECONOMICS FOR ENGINEERING PRACTICES**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	Explain is the Opportunity Cost principle	3	1	L2
2	Briefly explain the Cobb-Douglas Production Function	3	1	L2
3	Distinguish between Sunk Cost and Incremental Cost.	3	2	L2
4	Interpret the law of diminishing marginal utility using a real-world consumer scenario.	3	2	L3
5	Define Reverse Repo Rate and its impact on money supply.	3	3	L2
6	Define Exchange Value in Value Engineering?	3	3	L2
7	Explain the concept of Payback Period in project evaluation.	3	4	L2
8	Describe the financial meaning of the Internal Rate of Return (IRR) in capital budgeting decisions.	3	4	L3
Part B (*Answer any one full question from each Module. Each carries 9 marks*)				
Module 1				
Qn No.	Question	Marks	CO	
7(a)	Illustrate the Law of Diminishing Marginal Utility with a schedule and diagram.	5	1	L2
(b)	Explain the effect of an increase in Consumer Income on the equilibrium price and quantity of a normal good.	4	1	L2
OR				
8(a)	When the price of a machine part is ₹500, the supply is 100 units. When the price increases to ₹600, the supply rises to 150 units. Calculate the Price Elasticity of Supply and interpret the result.	5	1	L2
(b)	Discuss the three stages of the Law of Variable Proportions.	4	1	L2
MODULE-2				
9(a)	Compare the features of Perfect Competition and Monopoly markets.	5	2	L2
(b)	A firm has a Fixed Cost of ₹20,000 and a Variable Cost of ₹50 per unit. If the selling price is ₹100 per unit, calculate the Break-even Point in units.	4	2	L3

OR				
10(a)	Explain the Kinked Demand Curve model and why it leads to price rigidity in an Oligopoly.	5	2	L2
(b)	Differentiate between Private Cost and Social Cost using the example of industrial pollution.	4	2	L3
MODULE-3				
11(a)	Discuss the Difficulties in the Measurement of National Income in a developing economy.	5	3	L2
(b)	From the data given below estimate GNPmp, GNPfc and NNPmp and National income. GDPmp 5000(in 100 billion), NFIA = -50, indirect tax =70, subsidy =30, depreciation=30.	4	3	L2
OR				
12(a)	Explain Demand-Pull Inflation? Suggest two Fiscal Policy measures to control it.	5	3	L2
(b)	Explain the difference between Final Goods and Intermediate Goods with examples.	4	3	L2
MODULE-4				
13(a)	Describe the Aims and Advantages of applying Value Engineering in a construction project.	5	4	L3
(b)	Explain Use Value? How does it differ from Esteem Value?	4	4	L2
OR				
14(a)	An engineering project requires an initial investment of ₹5,000. The estimated annual cash inflows for 4 years are ₹2,000, ₹1,800, ₹1,600, and ₹1,400. If the discount rate is 8%, calculate the Net Present Value (NPV).	5	4	L3
(b)	State the decision rule for the Benefit-Cost Ratio (BCR) method.	4	4	L2

25UHUT002	SUSTAINABILITY AND ETHICS IN ENGINEERING	Category	L	T	P	R	Credit	Year of Introduction
		HMC	2	0	0	0	2	2025

Preamble: This course is designed to cultivate a holistic perspective in engineering students by integrating professional integrity**,** social equity**,** and environmental stewardship. In an era of rapid technological advancement and climate volatility, technical expertise alone is insufficient; the modern engineer must be a morally conscious decision-maker.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain fundamental ethical theories to resolve moral dilemmas in personal and professional contexts.	K2 (Understand)
CO2	Outline philosophical perspectives of environmental ethics to protect biodiversity and manage urban environmental impacts.	K2 (Understand)
CO3	Develop strategies for Zero Waste and Circular Economy to mitigate disruptions in the hydrological cycle and resource depletion.	K3 (Apply)
CO4	Illustrate the importance of Renewable Energy technologies in combating the climate crisis in relation to Environmental Regulations and the Sustainable Development Goals (SDGs)**.**	K3 (Apply)

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	2	-	3	2	2	-
CO2	-	-	-	-	-	3	-	2	3	2	-
CO3	1	1	2	-	-	2	3	-	-	-	-
CO4	2	2	3	2	2	2	3	1	-	2	2
Avg	**1.5**	**1.5**	**2.5**	**2**	**2**	**2.25**	**3**	**2**	**2.5**	**2**	**2**

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*				*		*		

CO2	*				*		*		
CO3	*	*	*	*	*		*		*
CO4	*	*	*	*	*	*	*	*	*

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment : 15 marks

SYLLABUS

Module 1 (7 hrs)

Fundamentals of ethics -Moral Relativism vs. Objectivity. Consequentialism. Deontology Metaethics. Personal vs. professional ethics, Civic Virtue, Respect for others, Profession and Professionalism, Plagiarism, case studies, Technology and digital revolution, Cybertrust and cybersecurity, High technologies: connecting people and places- Managing conflict, Confidentiality, Codes of Ethics. Basic concepts in Gender Studies, gender, gender spectrum: gender stereotypes, Gender disparity and discrimination in education, Ethical values and practices in connection with gender Gender policy and women/transgender empowerment initiatives.

Module 2 (7 hrs)

Introduction to Environmental Ethics: key philosophical theories (anthropocentrism, biocentrism, ecocentrism).Deep Ecology.Intrinsic value.Sustainable Engineering Principles: Definition and scope, triple bottom line, life cycle analysis and sustainability metrics. Ecosystems and Biodiversity: An overview of various ecosystems in Kerala/India, and its significance. Landscape and Urban Ecology: Principles of landscape ecology, Urbanization and its environmental impact, Moral Extensionism

Module 3 (7 hrs)

Hydrology and Water Management: water cycle, Environmental flow, disruptions and disasters. Zero Waste Concepts and Practices: Definition of zero waste and its principles, Strategies for waste reduction, Case studies of successful zero waste initiatives. Circular Economy and Degrowth: Differences between linear and circular economies, AI-Driven Energy Optimization**,** Digital Twins**,** Bio-Engineering & Biomimicry**,** Carbon Capture and Storage (CCS)**,** Mobility and Sustainable Transportation: Basic tenets of a Sustainable Transportation design, Integrated mobility systems, E-Mobility.

Module 4 (7 hrs)

Renewable Energy and Sustainable Technologies: (solar, wind, hydro, biomass), Challenges and opportunities in renewable energy adoption. Climate Change and Engineering Solutions: Kerala/India and the Climate crisis, Engineering solutions to mitigate, adapt and build resilience to climate change. Environmental Policies and Regulations: Ethical considerations in environmental policy-making. Case Studies and Future Directions: Analysis of real-world case studies, Emerging trends and future directions in environmental ethics and sustainability, Discussion on the role of engineers in promoting a sustainable future. The Sustainable Development Goal 17.

Text Books:

Whitbeck, C. (2011). Ethics in engineering practice and research (2nd ed.). Cambridge University Press.

Oakley, J. (2006). Virtue ethics and professional roles. Cambridge University Press.

Bakshi, B. R. (2019). Sustainable engineering: Principles and practice. Cambridge University Press.

Martin, M. W., & Schinzinger, R. (2014). Ethics in engineering (4th ed.). Tata McGraw-Hill Education.

Ahlawat, A. (2019). Sustainable development goals: Directive principles for sustainable India by 2030. Notion Press.

Reference Books:

Parmar, R. K. (2025). Green technology and sustainable development (1st ed.). ISBN-13 publication.

Kosanam, N. (2023). Beyond carbon: Responsible ways to restore ecological balance. ISBN-13 publication.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER

Course Code	**25UHUT002**
Course Name	**SUSTAINABILITY AND ETHICS IN ENGINEERING**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1.	Differentiate between Moral Relativism and Objectivity in the context of professional decision-making.	3	1	L2
2.	Outline the key differences between personal ethics and professional ethics for a practicing engineer.	3	1	L2
3.	Explain the concept of 'Intrinsic Value' within environmental philosophy frameworks.	3	2	L2
4.	Summarise the three core pillars that constitute the 'Triple Bottom Line' of sustainability	3	2	L2
5.	Describe the engineering definition and operational importance of maintaining 'Environmental Flow' in river systems.	3	3	L2
6.	Differentiate between a Linear Economy and a Circular Economy using a conceptual pipeline breakdown.	3	3	L2
7.	Describe the challenges faced by coastal infrastructure in Kerala due to the ongoing climate crisis.	3	4	L2
8.	Outline the overarching objective of Sustainable Development Goal 17 regarding global partnerships.	3	4	L2
	Part B (*Answer any one full question from each Module. Each carry 9 marks*)			
	Module I			
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Describe the key principles of Consequentialism and Deontology. Explain their relevance in assessing a workplace confidentiality conflict in engineering practice.	9	1	L2
	OR			
10	Explain the role of gender policies and empowerment initiatives in addressing structural discrimination within educational institutions.	9	1	L2
	Module II			
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Describe the key environmental philosophical theories of Anthropocentrism, Biocentrism, and Ecocentrism and their	9	2	L2

	influence on modern industrial development policies.			
	OR			
12	Explain the key phases of Life Cycle Analysis (LCA) and the sustainability indicators used to evaluate the environmental performance of engineering products.	9	2	L2
	Module III			
Qn No.	**Question**	**Marks**	**CO**	**BL**
13.a	A town experiences frequent water shortages during summer. Apply the concepts of the water cycle and environmental flow to suggest suitable water management measures.	5	3	L3
13.b	Describe the concept of Carbon Capture and Storage (CCS) as a climate mitigation strategy. .	4	3	L2
	OR			
14.a	A residential colony generates a large amount of household waste. Apply the principles of Zero Waste to recommend two strategies for reducing waste generation.	5	3	L3
14.b	Explain the concept of AI-driven energy optimization and its significance in sustainable development.	4	3	L2
	Module IV			
Qn No.	**Question**	**Marks**	**CO**	**BL**
15.a	A coastal community is vulnerable to sea-level rise and flooding. Apply engineering solutions to improve its climate resilience.	5	4	L3
15.b	Summarize the opportunities and challenges associated with renewable energy adoption in India.	4	4	L2
	OR			
16.a	A proposed industrial project is located near a sensitive ecosystem. Apply environmental policy and ethical principles to identify key considerations before project approval.	5	4	L3
16.b	Explain the importance of emerging sustainable technologies in achieving environmental sustainability.	4	4	L2

25UCEL305	SURVEY LAB	Category	L	T	P	R	Credit	Year of Introduction
		PCL	0	0	3	0	2	2025

Preamble: This course imparts practical experience to students by exposing them to various techniques of field surveying. The course is designed to make student familiar with conventional and advanced surveying instruments.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Use conventional surveying tools such as chain/tape and compass for plotting and area determination.	K3 Apply
CO2	Apply levelling principles in field to determine reduced levels.	K3 Apply
CO3	Determine distances, heights and level differences using theodolite and tacheometric surveys.	K3 Apply
CO4	Compute height, distance and contouring using total station and demonstrate the use of modern surveying instruments.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS03
CO1	3	2	-	2	1	-	-	2	-	-	-	2	1	-
CO2	2	2	-	2	1	-	-	2	-	-	-	1	1	-
CO3	2	3	-	2	1	-	-	2	-	-	-	2	1	-
CO4	1	2	-	2	2	-	-	2	-	-	-	1	1	-
Avg	2	2.25	-	2	1.25	-	-	2	-	-	-	1.5	1	-

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*		*		*	

CO2	*	*	*	*		*		*	
CO3	*	*	*	*		*		*	
CO4	*	*	*	*		*		*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*		*		*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**50**	**50**	**3hrs**

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Examination	Total
5	**25**	**20**	**50**

Preparation and Pre-Lab Work (7 Marks)
Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

Conduct of Experiments (7 Marks)
Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and trouble-shooting skills during the experiments.
Teamwork: Collaboration and participation in group experiments.

Lab Reports and Record Keeping (6 Marks)
Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

Viva Voce (5 Marks)
Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Submission of Record: *Students shall be allowed to attend the end semester examination only upon submitting the duly certified record. The external examiner shall endorse the record*

Procedure/Preliminary Work/Design/Algorithm (10 Marks)

Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.

Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.

Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.

Creativity and logic in algorithm or experimental design.

Conduct of Experiment/Execution of Work/Programming (15 Marks)

Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

Result with Valid Inference/Quality of Output (10 Marks)

Accuracy of Results: Precision and correctness of the obtained results.

Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

Viva Voce (10 Marks)

Ability to explain the experiment, procedure results and answer related questions

Proficiency in answering questions related to theoretical and practical aspects of the subject.

Record (5 Marks)

Completeness, clarity, and accuracy of the lab record submitted

SYLLABUS

Expt. No	List of Experiments
1	**Introduction to Conventional Surveying** a. Chain surveying b. Compass surveying

	Levelling
2	Simple leveling
3	Differential levelling
4	Fly levelling
5	Profile levelling and cross sectioning
	Theodolite surveying
6	Distance between accessible points
7	Distance between inaccessible points
8	Level difference between points
9	Tangential tacheometry
10	Height of building
11	Traversing – Balancing the traverse using Bowditch rule, Transit rule and graphical method.
	Total station survey
12	Remote height measurement
13	Distance between two points
14	Computation of area of a plot
15	Contouring
16	**Land survey using DGPS**
17	**Study of instruments** Automatic level , Digital level ,Handheld GPS

*** A minimum of 12 experiments is mandatory**

Text Books:

1. Dr. B.C. Punmia,Ashok Kumar Jain &Arun Kumar Jain(2005). Surveying. Laxmi publications (P) Ltd.
2. C. Venkatramaiah(2011). Textbook of Surveying.Universities Press (India) Private Limited.
3. Prof. T.P. Kenetkar &Prof.S.V. Kulkarni(2004). Surveying and Levelling. Pune Vidyarthi Griha Prakashan.

Reference Books:

1. R.Agor(2005) . A Text book of Surveying and Levelling.Khanna Publishers.
2. S.K.Duggal(2015).Surveying Vol. I.Reprint . Tata McGraw Hill Ltd.
3. S.K. Duggal (2015). Surveying Vol. II,Reprint . Tata McGraw Hill Ltd.

25UCEL306	FLUID MECHANICS LAB	Category	L	T	P	R	Credit	Year of Introduction
		PCC	0	0	3	0	2	2025

Preamble: This laboratory course complements the theoretical Mechanics of Fluids course by providing practical exposure to fluid flow behaviour, measurement techniques, hydraulic devices, and energy relationships. The course develops essential experimental skills, data interpretation abilities, and technical documentation practices through hands on experimentation.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Perform calibration and measurement experiments using standard fluid flow instruments and devices.	K3 Apply
CO2	Determine flow parameters and hydraulic coefficients through experimental verification of fundamental fluid mechanics principles.	K3 Apply
CO3	Examine fluid flow behaviour in pipes and open channels through controlled laboratory experiments.	K4 Analyse
CO4	Analyse the performance characteristics of pumps and turbines .	K4 Analyse

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	3	3	-	-	2	-	-	-	3	2	-
CO2	3	3	-	3	2	-	-	2	-	-	-	3	2	1
CO3	2	1	-	3	1	-	-	2	-	-	-	2	3	-
CO4	3	3	-	2	2	-	-	2	-	-	-	3	2	1
Avg	2.5	2.25	-	2.75	2	-	-	2	-	-	-	3	2.25	1

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*		*		*	
CO2	*	*	*	*		*		*	

CO3	*	*	*	*		*		*	
CO4	*	*	*	*		*		*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*		*		*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**50**	**50**	**3 hrs**

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Examination	Total
5	**25**	**20**	**50**

Preparation and Pre-Lab Work (7 Marks)
Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

Conduct of Experiments (7 Marks)
Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and trouble-shooting skills during the experiments.
Teamwork: Collaboration and participation in group experiments.

Lab Reports and Record Keeping (6 Marks)
Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

Viva Voce (5 Marks)
Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments,

viva, and record are the average of all the specified experiments in the syllabus.

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Submission of Record: *Students shall be allowed to attend the end semester examination only upon submitting the duly certified record. The external examiner shall endorse the record*

Procedure/Preliminary Work/Design/Algorithm (10 Marks)

Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.

Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.

Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.

Creativity and logic in algorithm or experimental design.

Conduct of Experiment/Execution of Work/Programming (15 Marks)

Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

Result with Valid Inference/Quality of Output (10 Marks)

Accuracy of Results: Precision and correctness of the obtained results.

Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

Viva Voce (10 Marks)

Ability to explain the experiment, procedure results and answer related questions

Proficiency in answering questions related to theoretical and practical aspects of the subject.

Record (5 Marks)

Completeness, clarity, and accuracy of the lab record submitted

SYLLABUS

Exp. No.	Experiments
1	Study of taps, valves, pipe fittings, gauges, Pitot tubes, water meters, and current meters
2	Calibration of pressure gauges

3	Determination of meta centric height and radius of gyration of floating bodies
4	Verification of Bernoulli's theorem
5	Determination of hydraulic coefficients of orifices and mouthpieces under constant head and time of emptying methods
6	Calibration of Venturi meter
7	Calibration of Orifice meter
8	Calibration of water meter
9	Calibration of rectangular notch
10	Calibration of triangular notch
11	Determination of coefficient of discharge using time of emptying method
12	Plotting of Specific Energy Curves in open channel flow
13	Study of hydraulic jump characteristics in open channel flow
14	Determination of friction coefficient in pipes
15	Determination of loss coefficients for pipe fittings
16	Performance test on turbines (impulse / reaction turbines)
17	Performance test on pumps (positive displacement and rotodynamic pumps)

Note: *A minimum of* ***12 experiments*** *shall be completed.*

Text Books:

P. N. Modi & S. M. Seth(2019). *Hydraulics and Fluid Mechanics including Hydraulic Machines.* 22nd Edition. Rajsons Publications.Standard Book House.

R. K. Bansal (2023). *Fluid Mechanics and Hydraulic Machines.*11th Edition. Laxmi, Publications.

K. Subramanya(2019).*Flow in Open Channels.*5th Edition. Mc Graw Hill Publishers.

Reference Books:

Arora.K.R(2005). Fluid Mechanics, Hydraulics and Hydraulic Machines.Standard Publishers.

Victor Streeter, E. Benjamin Wylie, K.W. Bedford (2017). Fluid Mechanics. Mc Graw Hill Publishers.

Bruce R. Munson, Donald F. Young, Theodore H. Okiishi(2005). Fundamentals of Fluid Mechanics. 9th Edition. John Wiley & Sons Inc.

Minor Basket I
(*Construction Technology*)

25UMCET301	BUILDING MATERIALS	Category	L	T	P	R	Credit	Year of Introduction
		VAC	4	0	0	0	4	2025

Preamble: This course introduces the properties, behavior, and applications of conventional and modern building materials used in construction. It emphasizes material selection, durability, and quality aspects for safe and economical structures. The course also highlights sustainable and innovative materials for environmentally responsible construction.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

Mapping of

CO	Course Outcomes	Knowledge Level
CO1	Explain manufacturing, properties, and applications of conventional building materials.	K2 Understand
CO2	Describe properties, behavior, and applications of concrete, steel, and special concretes.	K2 Understand
CO3	Explain finishing materials and their performance in building applications.	K2 Understand
CO4	Describe modern, smart, and sustainable building materials and their applications.	K2 Understand

course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	1	–	–	–	–	–	–	–
CO2	3	2	2	1	–	–	–	–	–	–	–
CO3	2	1	1	–	–	1	–	–	–	–	–
CO4	2	1	2	–	–	2	–	–	–	–	1
Avg	2.5	1.25	1.75	1	-	1.5	-	-	-	-	1

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	

CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*		*		
CO4	*	*	*	*	*		*	*	

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*		*	*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment/Activity : 15 marks

SYLLABUS

Module 1 (14 hrs)

Stone: Classification, quarrying, dressing, and properties,Uses and selection criteria -Brick: Brick manufacturing, types, properties, and defects - Lime: types, properties, and applications-Cement: Manufacturing process, types of cement, and properties.Setting and hardening of cement-Aggregates and Mortar: Classification, grading, and properties of aggregates.Types and properties of mortar-Timber: Structure of timber, seasoning methods, defects, preservation, and engineered wood.

Module 2 (14 hrs)

Concrete: Ingredients, water-cement ratio, workability, and strength-Mix design basics and durability of concrete-Special Concretes:High-strength concrete,Fibre reinforced concrete,Self-compacting concrete,Geopolymer concrete-Steel:Types of reinforcing steel and manufacturing process,Mechanical properties and corrosion of steel-Admixtures and durability improvement techniques.

Module 3 (14 hrs)

Glass and Plastics: Types, properties, and applications in buildings- Flooring and Tiles:Ceramic tiles, vitrified tiles, stone flooring, and wooden flooring- Paints and Surface Finishes:Constituents, types, defects, and application methods,Varnishes, distempers, and coatings-Insulating and Waterproofing Materials:Thermal and acoustic insulation materials - Waterproofing compounds and sealants

Module 4 (14 hrs)

Composite Materials: Fibre reinforced polymers and sandwich panels- Applications in strengthening and retrofitting- Geosynthetics:Types, functions, and applications in civil engineering-Smart and Advanced Materials:Shape memory alloys, self-healing concrete, and nano materials- Sustainable Materials:Recycled aggregates and green concrete,Fly ash, GGBS, and alternative eco-friendly materials

Recommended Activity(Suggested topics)

Visit to a construction site,observe material storage, batching, mixing, and quality control practices.Document different materials used and sustainability measures adopted.

Study green building materials (fly ash bricks, geopolymer concrete, recycled aggregates, bamboo). Evaluate environmental benefits and propose applications in local construction.

Text Books:

Duggal, S. K. (2020). *Building materials* (5th ed.). McGraw Hill Education.

Mishra, A. K. (2018). *Building materials and construction* (1st ed.). S. Chand Publishers.

Punmia, B. C. (2020). *Building materials and construction* (10th ed.). Laxmi Publications.

Shetty, M. S. (2019). *Concrete technology* (8th ed.). S. Chand Publishers.

Reference Books:

Neville, A. M. (2012). *Properties of concrete* (5th ed.). Pearson Education.

Gambhir, M. L. (2017). *Concrete technology: Theory and practice* (5th ed.). Tata McGraw-Hill Education.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	**25UMCET301**
Course Name	**BUILDING MATERIALS**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	Outline the desirable properties of a good building stone.	3	1	L2
2	Explain the common defects found in bricks.	3	1	L2
3	Outline the advantages of fibre reinforced concrete.	3	2	L2
4	Explain the causes of corrosion in steel.	3	2	L2
5	Differentiate between ceramic tiles and vitrified tiles.	3	3	L2
6	Explain the purpose of thermal insulation materials.	3	3	L2
7	Outline the functions of geosynthetics.	3	4	L2
8	Explain the role of nanomaterials in construction.	3	4	L2
Part B (*Answer any one full question from each Module. Each carry 9 marks*)				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9.a	Explain the manufacturing process of cement and discuss its important properties.	6	1	L2
9.b	Summarize the common defects found in bricks.	3	1	L2
OR				
10.a	Explain the types and properties of mortar used in construction.	6	1	L2
10.b	Describe the methods of seasoning of timber.	3	1	L2
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Explain the types of admixtures and their role in improving concrete durability.	9	2	L2
OR				

12	Describe the basics of concrete mix design and durability requirements.	9	2	L2
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13. a	Explain the properties and uses of plastics in construction.	5	3	L2
13. b	Summarize the constituents of paint.	4	3	L2
OR				
14. a	Compare ceramic tiles, vitrified tiles, stone flooring, and wooden flooring.	5	3	L2
14. b	Differentiate between varnish and distemper.	4	3	L2
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Explain the role of composite materials in strengthening and retrofitting structures.	9	4	L2
OR				
16	Describe the concept of sustainable materials and their importance in construction.	9	4	L2

Minor Basket II

(Environmental Sustainability and Management)

25UMCET302	ENVIRONMENTAL POLLUTION AND ABATEMENT	Category	L	T	P	R	Credit	Year of Introduction
		VAC	4	0	0	0	4	2025

Preamble:

This course introduces the fundamental concepts of environmental pollution, its sources, impacts, and control strategies. It covers pollution control technologies for air and water, along with solid and hazardous waste management practices. Emphasis is given to sustainable approaches such as cleaner production, circular economy, and emerging environmental issues.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

Mapping of course

CO	Course Outcomes	Knowledge Level
CO1	Explain sources, types, impacts, and monitoring approaches of environmental pollution.	K2 Understand
CO2	Describe air and water pollution sources, monitoring techniques, and control technologies.	K2 Understand
CO3	Explain solid and hazardous waste management methods and treatment approaches.	K2 Understand
CO4	Explain emerging pollution challenges and sustainable pollution control strategies.	K2 Understand

outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	–	–	–	2	–	–	–	–	–
CO2	1	2	2	-	–	3	–	–	–	–	–
CO3	1	1	2	–	–	3	1	–	–	–	–
CO4	–	2	1	–	–	3	1	–	–	–	2
Avg	1.33	1.75	1.66	-	-	2.75	1	-	-	-	2

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*			*		

CO2	*	*	*	*	*		*		
CO3	*	*	*	*	*		*		*
CO4	*	*	*	*	*		*	*	*

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*		*	*	*

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment/Activity : 15 marks

SYLLABUS

Module 1 (14 hrs)

Introduction to Environmental Engineering: scope and importance -Components of environment: air, water, and soil systems - Basic concepts: mass balance, material flow, and environmental cycles-Definition, classification, and sources of environmental pollution-Types of pollutants and their transport and transformation in air, water, and soil-Environmental quality standards and indicators - Overview of environmental legislation and regulatory framework.

Module 2 (14 hrs)

Air Pollution Control: Sources, effects, and dispersion of air pollutants- Air quality monitoring and standards-Control equipment: cyclone separator, scrubber, electrostatic precipitator, bag filter.

Water Pollution Control: Sources and characteristics of water pollutants- Wastewater treatment: primary, secondary, and tertiary processes- Industrial wastewater treatment and reuse-Water quality standards and monitoring- Effluent standards and zero liquid discharge (ZLD) concepts- Role of CPCB and SPCBs.

Module 3 (14 hrs)

Sources, classification, and characteristics of solid waste- Functional elements of solid waste management-Waste processing: composting, biomethanation, incineration, sanitary landfills-

Hazardous waste: definition, sources, treatment, storage, and disposal- Hazardous waste handling and management rules- industrial waste management principles- Case studies on solid waste management practices.

Module 4 (14 hrs)

Emerging pollution issues:Plastic pollution and microplastics - e-waste management - Biomedical and construction waste concerns- Sustainable solutions & management: Waste minimization and cleaner production -3R principles and circular economy -Extended Producer Responsibility (EPR) -Green technologies for pollution prevention - Role of IT and AI in pollution monitoring - Public awareness, environmental ethics, and stakeholder participation

Recommended Activity(Suggested topics)

Visit a wastewater treatment plant, solid waste management facility, or recycling unit. Observe treatment processes and prepare a brief technical report.

Conduct waste characterization of campus/household.Propose segregation, recycling, and reduction strategies based on 3R principles.

Text Books:

Dutt, N. H. G. (2014). *Environmental pollution and control* (16th ed.). Neelkamal Publications Pvt. Ltd.

Bhatia, H. S. (2003). *A text book of environmental pollution and control* (19th ed.). Galgotia Publications.

Trivedi, P. R. (2004). *Environmental pollution and control*. A.P.H. Publishing Corporation.

Davis, M. L., & Masten, S. J. (2013). *Principles of environmental engineering and science*. McGraw-Hill Education.

Bhatia, S. C. (2013). *Environmental pollution and control in chemical process industries* (3rd ed.). Khanna Publications.

Reference Books:

Peavy, H. S., Row, D. R., & Tchobanoglous, G. (1985). *Environmental engineering*. McGraw-Hill.

Rao, C. S. (2006). *Environmental pollution control engineering* (2nd ed.). New Age International Publishers.

Masters, G. M., & Ela, W. P. (2013). *Introduction to environmental engineering and science* (3rd ed.). Pearson Education.

Michelle, J. R., & Zimmerman, J. B. (2014). *Environmental engineering: Fundamentals, sustainability, design* (2nd ed.). Wiley.

END SEMESTER EXAMINATION – MODEL QUESTION PAPER

Course Code	**25UMCET302**
Course Name	**ENVIRONMENTAL POLLUTION AND ABATEMENT**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1	Explain the scope and importance of Environmental Engineering.	3	1	L2
2	Differentiate between point source and non-point source pollution.	3	1	L2
3	Explain the major sources of air pollution.	3	2	L2
4	Explain the purpose of air quality monitoring.	3	2	L2
5	Classify the various types of solid waste.	3	3	L2
6	Describe hazardous waste with suitable examples.	3	3	L2
7	Explain the need for e-waste management.	3	4	L2
8	Describe the role of AI in pollution monitoring.	3	4	L2
Part B (*Answer any one full question from each Module. Each carry 9 marks*)				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9.a	Explain the components of environment	6	1	L2
9.b	Describe the significance of environmental quality standards.	3	1	L2
OR				
10.a	Explain the concept of material flow and environmental cycles.	6	1	L2
10.b	Describe the importance of environmental legislation and regulatory frameworks in environmental protection.	3	1	L2
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11.a	Describe the dispersion of air pollutants.	5	2	L2
11.b	Explain the working principles of cyclone separators and bag filters.	4	2	L2
OR				
12.a	Explain the stages involved in wastewater treatment.	5	2	L2
12.b	Describe the importance of water quality standards.	4	2	L2

Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13. a	Explain the functional elements involved in an integrated solid waste management system.	5	3	L2
13. b	Describe the processes of composting and biomethanation for waste treatment.	4	3	L2
OR				
14. a	Explain the major provisions of hazardous waste handling and management rules.	5	3	L2
14. b	Describe the operation and environmental benefits of sanitary landfills.	4	3	L2
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Explain the principles of the circular economy and Extended Producer Responsibility (EPR)	9	4	L2
OR				
16	Describe the role of green technologies, Information Technology (IT), and Artificial Intelligence (AI) in pollution prevention and environmental monitoring.	9	4	L2

SUSTAINABLE DEVELOPMENT GOALS MAPPING - SEMESTER III

SEMESTER III	SUSTAINABLE DEVELOPMENT GOALS																
Course Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25UMGT301				✓					✓		✓						

25UCET301				✓		✓			✓		✓		✓				
25UCET302				✓					✓		✓						
25UCET303				✓					✓		✓		✓		✓		
25UAMT304				✓					✓								
25UHUT001	✓			✓				✓									
25UHUT002				✓		✓					✓	✓	✓				
25UCEL305				✓					✓		✓				✓		
25UCEL306				✓		✓			✓		✓		✓				