

Branch Name:	CIVIL ENGINEERING
Program Code:	ET106
Course Title:	Structural Analysis – I
Course Code:	2ET1060405T
Pre-requisite Course:	Mechanics of Solids

Course Objectives:

1. The students will learn fundamental basics of Mechanics of solids.
2. To understand the concept of determinate and indeterminate structures, analyses of determinate and indeterminate structures.
3. The course runs through a number of techniques which are used for the analysis of civil engineering structures

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	3	1	-	4	24	60	16	40	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weight (%)
01	Fundamentals of Statically Determinate Structures: Types of statically determinate & indeterminate structures, static and kinematic indeterminacy, stability of structures, principle of superposition, Maxwell's reciprocal theorems. Computation of internal forces in statically determinate structures such as plane truss and plane frame.	06	15
02	Displacement of Determinate Beams and Plane Truss: Differential equation of elastic curve, relation between moment, slope and deflection, Macaulay's method, Moment Area Method, Conjugate Beam Method, Unit load method applied to beams. Displacement of determinate plane truss using unit load method.	10	20
03	Columns and Struts: Difference between Column and Strut, Buckling of columns, different end conditions, effective length, least radius of gyration, slenderness ratio, Euler's and Rankine's formulae.	06	15
04	Direct and Bending stresses: Members subjected to eccentric loads, middle third rule, kernel of section, chimney subjected to wind pressure, retaining walls, dams subjected to hydraulic pressure.	06	15
05	Influence lines: For statically determinate beams, I.L.D for support reaction, shear and moment for u.d.l, several point loads, criteria for maximum effects, influence lines for statically determinate trusses, forces in members for u.d.l and point loads, criteria for maximum effect.	06	15

06	Strain Energy Resilience, strain energy due to axial loads & flexure, proof resilience, modulus of resilience, impact loads, and sudden loads.	04	10
07	Arches, cables and suspension bridges: Three hinge arch - segmental and parabolic shapes. Forces and end actions in cables and suspension bridges	04	10

Reference Books:

1. Junarkar S.B. & Shah H.J.; Mechanics of Structures Vol-I; Charotar publishing house, Anand.
2. Wang C. K.; Intermediate Structural Analysis; Tata McGraw Hill book Company, New Delhi.
3. Popov E.P.; Engineering Mechanics of Solids; Prentice Hall of India, New Delhi.
4. Ryder G.H.; Strength of Materials; Mcmillan.
5. Gere & Timoshenko; Mechanics of Materials; CBS Publishers & Distributors, Delhi.
6. Hibbler R C; Mechanics of Materials; Pearson Education.
7. Hibbler R C; Structural Analysis; Pearson Education.

Course Outcome:

1. Ability to distinguish between determinate and indeterminate structures and analyze determinate structures
2. Ability to understand behavior of columns and applications of direct & bending stresses
3. Ability to compute the strain energy, and forces in arches and cables.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Ability to distinguish between determinate and indeterminate structures and analyze determinate structures	L-1 and L-2
CLO2	Ability to understand behavior of columns and applications of direct & bending stresses	L-2, L-4 and L-5
CLO3	Ability to compute the strain energy, and forces in arches and cables.	L-2, L-4 and L-5

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with POs & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CLO1	M	M		M		M	M		M				M		
CLO2	M	M	M	M		M			M				M		
CLO3	M	M	M	M	H	M		M	M			H	M	H	

H: High, M: Medium, L: Low