GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3144002
Semester – IV
Subject Name: Fundamentals of Structural Analysis

Type of course: Core Subject in Civil and infrastructure engineering

Prerequisite: Mechanics of Solids

Rationale: This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Analysis of Trusses:** Internal forces in members of statically determinate pin jointed trusses.	04	10
2	**Analysis of Statically Determinate Beams:** Static and Kinematic indeterminacy of a system, concept stability and redundancy, principle of superposition, principle of virtual work, Method of Strain energy for analysis of beams, Minimum complementary energy, Castigliano's theorems, determination of deflection.	08	20
3	**Displacement of Determinate Beams:** Differential equation of elastic curve, relation between moment, slope and deflection, Macaulay's method, Moment Area Method.	08	10
4	**Moment Distribution Method:** Analysis of determinate and indeterminate beams, settlement of supports. Analysis of determinate portal frames.	06	15
5	**Slope Deflection Method:** Analysis of determinate and indeterminate beams for various loading including settlement/rotation of support.	06	15
6	**Arches, Cables and Suspension Bridges:** Analysis of three hinge arches with circular and parabolic shapes subjected to various types of loading, Analysis of two hinged arches. Analysis of forces in cables.	06	15

7	**Influence Lines for Determinate Beams:** Influence lines under a train of concentrated loads, and under moving uniformly distributed loads.	06	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

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; Mc Millan
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 Outcomes:

S. No.	Course Outcome Statement	Marks % weightage
CO-1	Apply principles of statics (equilibrium, compatibility and constitutive relationships) to determine response of statically determinate members/beams.	20 %
CO-2	Determine displacements of statically determinate structures, using the principle of virtual work and strain energy stored in the system.	20 %
CO-3	Use classical and iterative methods for determination of internal forces and displacements in determinate and indeterminate beams.	20 %
CO-4	Draw influence lines for statically determinate beams under moving loads (concentrated and uniformly distributed)	20 %
CO-5	Determine the forces in three hinged and two hinged arches, and to determine the forces in cables.	20%

Term-Work:

1. The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial. Practical examinations shall consist of oral based on term work and above course.

List of Open Source Software/learning website:

www.nptel.iitm.ac.in/courses/