GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL AND INFRASTRUCTURE ENGINEERING
FUNDAMENTALS OF STRUCTURAL ANALYSIS
SUBJECT CODE: 2144002
B.E. 4th Semester

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
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	30	0	20	150

Content:

Sr. No.	Topics	Hours	% Weightage
1	Fundamentals of Statically Determinate Structures: Types of statically determinate & indeterminate structures, static and kinematic indeterminacy, stability of structures, principle of superposition, Computation of internal forces in statically determinate structures such as plane truss, plane frame, grids.	**06**	**14**
2	Displacement of Determinate Beams and Plane Truss: Differential equation of elastic curve, relation between moment, slope and deflection, Macaulay's method, Moment Area Method	**08**	**20**
3	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**	**14**
4	Fixed Beams & Consistent Deformation Method: Computation of fixed-end actions for various types of loads, beams of varying moment of inertia.	**06**	**14**
5	Slope Deflection Method: Analysis of continuous beams for various loading including settlement/rotation of support	**06**	**14**
6	Arches, Cables and Suspension Bridges: Calculation internal forces in three hinge arches with circular and parabolic shapes subjected to various types of Loading.	**06**	**14**
7	Thin cylinder: Analysis of thin cylinder and spherical vessels under pressure.	**04**	**10**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
35	35	20	5	5

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; 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 Outcomes:

After studying this subject students will be able to:

1. Apply principles of statics to determine reactions & internal forces in statically determinate structures.
2. Determine displacements of statically determinate structures.
3. Determine stresses due to axial & eccentric loading.
4. Determine buckling load for columns & struts with different end conditions.
5. Determine strain energy stored in a body.
6. Determine stresses in thin cylinders and spherical vessels

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/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.