

# GUJARAT TECHNOLOGICAL UNIVERSITY

## CIVIL ENGINEERING STRUCTURAL ANALYSIS-II SUBJECT CODE: 2150608 B.E. 5<sup>th</sup> SEMESTER

**Type of course:** Applied Mechanics

**Prerequisite:** Mechanics of Solids, Structural Analysis-I

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

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
		PA	ALA		ESE	OEP				
4	2	0	6	70	20	10	30	0	20	150

**Content:**

Sr. No.	Topics	Teaching Hrs.	Weightage %
1	<b>Energy Principles:</b> Castigliano's theorems , computation of displacements of statically determinate beams, trusses and frames by unit load method, analysis of indeterminate structures – beams, trusses, frames	10	15
2	<b>Slope Deflection Method</b> Analysis of continuous beams for various loading including settlement/ rotation of support, analysis of simple portal frame with sway.	08	15
3	<b>Moment Distribution Method</b> Analysis of continuous beams & frames including sway, use of symmetry of structure up to two storeyed / two bay frames.	08	15
4	<b>Influence line diagrams</b> ILD for statically determinate beams- I.L.D of support reaction, shear force and moment bending moment for beams subjected to u.d.l and several point loads, criteria for maximum effects, ILD for statically determinate trusses, forces in members for u.d.l and point loads	08	15
	ILD for statically indeterminate beams: Muller-Breslau's principle, steps for obtaining I.L for reaction and internal forces in propped cantilever and continuous beams, qualitative I.L for rigid jointed structures having higher degree of statically indeterminacy.	06	10
5	<b>Matrix Methods:</b> Types of skeletal structures, Internal forces and deformations. Introduction and applications of stiffness method to analyze beams, Trusses and plane frames by system approach.	08	15
	Introduction and applications of Flexibility method to analyze beams, Trusses and plane frames by system approach.	08	15

### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	20	25	15	0

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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-II; Charotar publishing house, Anand
2. Wang C. K.; Intermediate Structural Analysis; Tata McGraw Hill book Company, New Delhi
3. Gere & Weaver; Matrix Analysis of framed structures, CBS Publications
4. Ryder G.H.; Strength of Materials; Mcmillan
5. Gere & Timoshenko; Mechanics of Materials; CBS Publishers & Distributors, Delhi
6. Hibbler R C; Structural Analysis; Pearson Education

#### Course Outcome:

After learning the course the students should be able to:

1. Apply equilibrium and compatibility equations to determine response of statically determinate and indeterminate structures.
2. Determine displacements and internal forces of statically indeterminate structures by classical, iterative and matrix methods.
3. Determine internal forces and reactions in determinate and indeterminate structures subjected to moving loads.

#### Term-Work:

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 Tutorials:

1. Prepare working model to understand behavior of portal frame/s with different support condition and different types of joints.
2. Verification of Muller- Breslau's Principle
3. Prepare spread sheet for analyzing structures using matrix method with help of MS-Excel.

#### List of Open Source Software/learning website:

[www.nptel.iitm.ac.in/courses/](http://www.nptel.iitm.ac.in/courses/)

**Active learning Assignments (AL) :** 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.