GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering (Part Time)
Subject Code:2940604
Semester IV
SUBJECT NAME: STRUCTURAL ANALYSIS-II

Type of course: Professional Elective course-I

Prerequisite: Structural Analysis-I

Rationale: This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering. This subject helps in determining statics response of statically indeterminate framed structures. In addition to this, the topics related to applications of Energy Principles, Moving loads will helps the students in developing the basic concepts of structural analysis. Use of professional software in structural analysis is a need of the day and hence it is included in this course.

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Unit-1: Statically Indeterminate structure – Classical methods** **Slope Deflection Method:** Analysis of continuous beams for various loading including settlement/ rotation of support, analysis of simple portal frame with sway. **Moment Distribution Method:** Analysis of plane frames including sway, use of symmetry of structure up to two storeyed / two bay frames.	10	25%
2	**Unit-2 : Statically Indeterminate structures – Matrix methods** **Matrix Methods:** Types of skeletal structures, Internal forces and deformations. Introduction and applications of stiffness method to analyze beams, Trusses and plane frames by system approach. Introduction and applications of Flexibility method to analyze beams, Trusses and plane frames by system approach.	12	25%
3	**Unit-3: Energy Principles + Approximate methods** **Energy Principles:** Castigliano's theorems, Application of castigliano's 1st and 2nd theorm to statically determinate and indeterminate framed structure – beams, plane truss & plane frames. **Approximate methods:** Forces in the framed structure subjected to	10	25%

	Vertical and lateral loads..		
4	**Unit-4: Structure subjected to Moving loads** Influence line diagrams 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 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 diagram for rigid jointed structures having higher degree of statically indeterminacy.	10	25%
5	**Unit-5: Computer Applications in Structural Engg. (for Laboratory only)** Use of professional software such as STAAD-Pro, SAP, ETABS etc. for determining response of structure related to the topics of this course.		

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**20**	**30**	**20**	**10**	**10**

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, NewDelhi
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

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Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Determine response of statically determinate & indeterminate structure by classical & matrix method.	30
CO-2	Apply energy principles in determining response of statically determinate & indeterminate structures.	10
CO-3	Compute approximate internal forces in framed structure subjected to vertical and lateral loads.	10
CO-4	Determine internal forces and reactions in determinate and indeterminate structures subjected to moving loads.	25
CO-5	Determine response of framed structure using professional software	25

List of Experiments/Tutorials:

1. The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial.
2. At least 50% problems will have to solve with professional software and compare results.
3. Experiments may be designed and carried our related to the topics of the course.
4. Practical examinations shall consist of oral based on term-work and above course.

Major Equipment/Software:

1. Any professional software of Structural analysis such as STAAD-pro, SAP, ETABS

List of Open Source Software/learning website:

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