Marwadi University
Marwadi Chandarana Group

Bachelor of Technology

Civil Engineering

Structural Analysis-2

01CI1502

Objective of the Course:

- To provide students with an understanding of the methods for the analysis of indeterminate structures like the Force Method and Displacement Method.
- To develop the student's ability, to analyze indeterminate structures like beams, frames, and trusses using various classical and matrix methods.
- To introduce students to the concept of matrix analysis and its application to structural analysis problems.

Credit Earned: 04

Prerequisite: Structural Analysis-1 and Mechanics of Solids

Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Analyze the fixed beam and propped cantilever beam subjected to gravity loading by employing various methods.
2. Apply the slope deflection method to analyze indeterminate beams and plane rigid jointed frames.
3. Use the moment distribution method to analyze indeterminate beams and plane rigid jointed frames.
4. Understand the concepts of matrix analysis and apply them to solve structural problems.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	01	00	04	50	30	20	25	25	150

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Detailed Syllabus

Sr No.	Title of the Unit	Number of hours
1	**Analysis of Fixed Beam and Propped Cantilever Beam**	**14**
	Review of Indeterminacy, Analysis of Fixed-beam, Analysis of Continuous Beam, Equations for Fixed End Moment for standard Case, Macaulay's method, Moment Area Method, Consistent Deformation Method, Principle of Least work, Castigliano's Second Theorem, Unit load method for indeterminate structures.	
2	**Analysis of Continuous Beam**	**14**
	Slope Deflection Method: Slope deflection equation, Equilibrium conditions, Analysis of continuous beams and rigid frames using slope deflection method. **Moment Distribution Method:** Stiffness, Carryover factor, Analysis of continuous beams & frames including sway using Moment Distribution Method.	
3	**Matrix Method**	**14**
	Flexibility and Stiffness, Released and Restrained Structures, Equilibrium and Compatibility conditions, **Flexibility Method**: Flexibility matrix, Analysis of beam using flexibility method system approach. **Stiffness Method** – Equivalent joint load, development of structure stiffness matrix, Analysis of beam and frames using stiffness method system approach.	
	Total	**42**

List of Tutorials

Sr. No.	List of Tutorial	No. of Tutorial
1	Analyze fixed beam subjected to gravity load and secondary effect.	**2**
2	Apply the concept of strain energy principles to identify the support reactions and internal forces for indeterminate structures using Castigliano's second theorem and unit load method.	**2**
3	Analyze the continuous beams and portal frame using the Slope Deflection method.	**2**
4	Analyze the continuous beams and portal frame using the Moment Distribution method.	**2**
5	Analyze the indeterminate structures using force methods like consistent deformation method and Flexibility Method	**2**
6	Analyze the continuous beams and portal frame using the Direct Stiffness Method	**2**
7	Apply the concept of structural analysis methods and prepare the generalized computer program.	**2**

Each tutorial should cover the theory, provide worked examples, and offer practical applications of the concepts covered. Additionally, the tutorials should encourage students to apply critical thinking skills to solve complex problems.

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	10%	35%	30%	10%	10%

Instructional Method and Pedagogy:

1. At the start of the course, the course delivery pattern, and prerequisite of the subject will be discussed.
2. Lectures will be taken in the classroom with the use of multi-media presentations, white board– a mix of both.
3. Attendance is compulsory in lectures and Tutorials which carries a 5% component of the overall evaluation.
4. Minimum two internal exams will be conducted and an average of two will be considered as a part of a 15% overall evaluation
5. Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular intervals. It carries a weightage of 5%.
6. Surprise tests/Quizzes will be conducted which carry a 5% component of the overall evaluation.

Recommended Study Material

1. Ramamrutham, S; *Theory of Structures*; Dhanpat Rai Publication
2. Junarkar S.B. & Shah H.J.; *Mechanics of Structures Vol-I & II*; Charotar publishing house.
3. Bhavikatti, S. S; *Structural Analysis-II*; Vikas Publishing House Pvt Ltd., 5th Ed.
4. Hibbler R C; *Structural Analysis*; Pearson Education, 6th Edition.
5. Williams, Alan; Structural Analysis: in theory and practice, Elsevier
6. Wang C. K.; *Intermediate Structural Analysis*; Tata McGraw Hill book Company, New Delhi
7. Ryder G.H.; *Strength of Materials*; McMillan
8. Gere & Timoshenko; *Mechanics of Materials*; CBS Publishers & Distributors, Delhi
9. Laursen Harold; *Structural Analysis*; McGraw Hill Education
10. Pandit, G. S; Gupta, S. P, *Structural Analysis: a matrix approach* , Tata McGraw Hill book Company, 2nd Ed.