

Devi Ahilya University Indore, India Institute of Engineering & Technology				III Year B.E. (Civil Engineering) (Full Time)				
Subject Code and Name		Instruction Hours		Credits				
6VLRC1: Structural Analysis - I		L	T	P	L	T	P	Total
Duration of Theory Paper: 3 hours		3	1	-	3	1	-	4

Course Objective:

1. To understand the concept of determinate and indeterminate structures, analyses of determinate and indeterminate structures.
2. To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems.
3. To impart the principles of elastic structural analysis and behaviour of indeterminate structures.
4. To impart knowledge about various methods involved in the analysis of indeterminate structures.

Prerequisite(s): Mechanics of Materials.

COURSE CONTENTS

Unit I:

Fundamental Concepts In Structures: Definition and Determination of Static and Kinematic Indeterminacy, Beams, Trusses and Frames, Degree of Freedom, Equilibrium and Kinematic Stability, Principle of Superposition, Basic Methods of Structural Analysis.

Virtual work and Energy Principles: Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, and Analysis of Pin-Jointed frames for static loads.

Unit. II:

Slope Deflection Method: Analysis of Continuous beams and Rigid plane frames with and without sway.

Moment Distribution Method: Stiffness and Distribution factors, Carry over factors, Analysis of Continuous beams, Plane rigid frames with and without sway

Unit III:

Kani's method: Analysis of continuous beams and rigid frames with and without sway

Column analogy method: Analysis of continuous beams and rigid frames with and without sway

Unit IV :

Moving Loads And Influence Lines

Effect of moving load , Description of Influence line , Influence line for Reaction, Shear Force and Bending Moment , Load position , Absolute maximum bending moment , Muller Breslau's Principle , Application to beams with one degree of indeterminacy , Influence line for forces in members of determinate trusses.

Unit V: Analysis of Three Hinged and Two Hinged Arches : Parabolic and Circular principles of analyzing Fixed Arches, Influence lines for Three and Two hinged arches for Horizontal thrust, Shear force and B.M. at any section , absolute maximum bending moment, axial thrust.

Suspension bridges: Length of Cable, Maximum tension ,Types of supports, Forces in Towers, two hinged and three hinged stiffening girders, influence line diagrams for bending moment.

REFERENCE

1. Menon, D., "Structural Analysis", Alpha Science International, Limited, 2008.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 12th Edition, 2004.
3. Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.
4. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
5. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
6. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
7. Pandit .G.S, "Theory Of Structures", Vol-I, McGraw-Hill Education (India) Pvt Limited, 1999.
8. Norris C.H., Wilbur J.B. and Utku. Elementry Structural Analysis, McGraw Hill International, Tokyo
9. Timoshenko. S.P & Young. D.H, "Theory of Structures",. McGraw Hill Book Company, International Ed. 1965.

Course Outcomes:

At the end of the course, the student will be able to:

CO. No.	Course Outcomes
CO1	Calculate deflections of beams and pin jointed frame trusses using classical methods like Strain energy and unit load method
CO2	Analyze indeterminate structures by Moment distribution method , Slope Deflection Method , Kani's method and Column analogy method
CO3	Explain the effect of moving loads on structures using influence lines.
CO4	Ability to analyze cable and arch type structures

