

<b>Devi Ahilya University, Indore, India</b> <b>Institute of Engineering &amp; Technology</b>			
<b>Subject code and name</b>	<b>Type</b>	<b>L-T-P</b>	<b>Credits</b>
VLR6C1 : Structural Analysis - I	<b>L</b>	<b>T</b>	
	<b>PC</b>	<b>3-1-0</b>	<b>4</b>

**Objective of the subject:**

- To understand the concept of determinate and indeterminate structures, analyses of determinate and indeterminate structures.
- To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems.

**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, 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

**Kani's method and Column analogy method** applied to indeterminate beams.

**Unit III:**

**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 IV :**

**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

**Unit V:**

**Indeterminate Trusses :** Energy method , application to analysis of indeterminate pin jointed Plane trusses - lack of fit - temperature effects.

## 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:

1. Analyze one dimensional and two dimensional problems using classical methods
2. Analyze indeterminate structures
3. Analyze structures for gravity loads, moving loads and lateral loads