Devi Ahilya Vishwavidyalaya, Indore, India Institute of Engineering & Technology					III Year B.Tech. (Civil Engineering)	
Course Code & Name	**Instructions Hours per Semester and Credits**					
6RVPC1 **Structural Analysis - I**	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**	**90**	**3**
	20	**10**	**0**	**60**		

Course Learning Objectives:

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 & Applied Mechanics

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.

Course Outcomes:

CO. No.	Course Outcome	POS
CO1	Apply fundamental concepts of structures to determine static and kinematic indeterminacy, equilibrium, stability, and deflections using classical methods and energy principles.	PO-1, PO-2, PO-3
CO2	Analyse indeterminate structures using advanced methods such as Slope Deflection, Moment Distribution, Kani's Method, and Column Analogy.	PO-1, PO-2, PO-3
CO3	Evaluate the effect of moving loads on structures using influence lines and Muller Breslau's principle for beams and trusses.	PO-2, PO-3, PO-4
CO4	Analyse arches (two-hinged, three-hinged, fixed) and suspension bridges, including influence lines for forces and bending moments.	PO-2, PO-3, PO-4
CO5	Integrate structural analysis concepts to design and assess complex structural systems under static and dynamic loading conditions.	PO-2, PO-3, PO-5

Books recommended:

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., Utku – *Elementary Structural Analysis*, McGraw Hill International, Tokyo.
9. Timoshenko, S.P. & Young, D.H. – *Theory of Structures*, McGraw Hill Book Company, International Edition, 1965.

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	

6RVPC1.CO1	-	3	-	2	-	-	-	-	-	-	-	-
6RVPC1.CO2	-	2	-	-	-	-	-	-	-	-	-	-
6RVPC1.CO3	3	-	-	-	-	-	-	-	-	-	-	-
6RVPC1.CO4	-	3	1	-	-	-	-	-	-	-	-	-
6RVPC1.CO5	2	3	3	2	3	-	-	-	-	-	-	-