

<b>INSTITUTE</b>	<b>FACULTY OF TECHNOLOGY</b>
<b>PROGRAM</b>	<b>BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)</b>
<b>SEMESTER</b>	<b>6</b>
<b>COURSE TITLE</b>	<b>ADVANCED STRUCTURAL ANALYSIS</b>
<b>COURSE CODE</b>	<b>01CI0611</b>
<b>COURSE CREDITS</b>	<b>3</b>

**Objective:**

- 1 To understand the concept of determinate and indeterminate structures subjected to moving loads.
- 2 To analysis the structure using the stiffness member approach.
- 3 To identify the behavior of frame structures using approximate analysis.
- 4 To apply the concept of stiffness method in finite element method.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Apply the finite element method to solve one-dimensional civil engineering problems.
- 2 Determine internal forces and reactions in determinate and indeterminate structures subjected to moving loads.
- 3 Compute approximate internal forces in framed structures subjected to gravity and lateral loads.
- 4 Analyze the skeletal structures using the stiffness member approach including the effects of temperature changes and support settlements.

**Pre-requisite of course:** Mechanics of Solids, Structural Analysis-1 and Structural Analysis-2

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	0	50	30	20	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Influence Line Diagrams</b> 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 a higher degree of static indeterminacy. ILD for Truss	12

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
2	<b>Stiffness Method: Member Approach</b> Stability and Determinacy of structure, Formulation of the member stiffness matrix., Analysis of skeletal structures using stiffness member approach, Composite Structures, Concepts of Symmetry and Anti-symmetry, Temperature change and lack of fit, support settlement, Material and Geometry Nonlinearity	15
3	<b>Approximate Analysis</b> Approximate methods of the analysis for the building frames subjected to gravity and lateral loads, Portal method and Cantilever method, Substitute Frame method, Calculation of Wind Load	10
4	<b>Introduction to Finite Element Analysis</b> Introduction and History of Finite element method, Application of FEM to One-dimensional Problems	5
<b>Total Hours</b>		<b>42</b>

#### **Textbook :**

- 1 Analysis of Structure Vol-2, Vazirani, V. N., Ratwani, M. M., Duggal, S. K., Khanna Publishers, 2011
- 2 Mechanics of Structures Vol-II, Junarkar, S. B. & Shah, H. J., Charotar Publishing House Pvt. Ltd, 2010
- 3 Theory of Structures, Punmia, B. C., Jain, Ashok K., Jain, Arun K., Laxmi Publication Pvt. Ltd., 2014

#### **References:**

- 1 Matrix Analysis of Framed Structures, Matrix Analysis of Framed Structures, Gere. J. M. & Weaver, W. , C. B. S. Publishers & Distributors, 2004
- 2 Indeterminate Structural Analysis, Indeterminate Structural Analysis, Wang, C. K., Tata MacGraw Hill Education Private Limited, 2011
- 3 Introduction to the Finite Element Method: a numerical method for engineering analysis, Introduction to the Finite Element Method: a numerical method for engineering analysis, Desai, Chandrakant S. and Abel, John F., CBS Publications, 2012
- 4 Theory of Structures, Theory of Structures, Ramamrutham, S., Narayan, R., Dhanpat Rai Publishing Company, 2010

#### **Suggested Theory Distribution:**

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

Distribution of Theory for course delivery					
<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
5.00	10.00	35.00	30.00	10.00	10.00

**Instructional Method:**

- 1 At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- 2 Lectures will be taken in class room with the use of multi-media presentations, white board– mix of both.
- 3 Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- 4 Minimum two internal exams will be conducted and average of two will be considered as a part of 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 interval. It carries a weightage of 5%.
- 6 Various task will be assign based on computation analysis by preparing spreadsheet or computer program which will carries 5% component of the continuous evaluation.

**Supplementary Resources:**

- 1 <https://archive.nptel.ac.in/courses/105/106/105106222/>
- 2 <https://archive.nptel.ac.in/courses/105/105/105105109/>
- 3 <https://archive.nptel.ac.in/courses/105/105/105105180/>