

STRUCTURAL ANALYSIS

V Semester: CE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACE008	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60	
<p>COURSE OBJECTIVES: The course should enable the students to:</p> <ol style="list-style-type: none"> I. Describe the process of analysis of various structures such as beams, trusses, arches and frames. II. Analyze statically determinate structures using force and displacement methods. III. Draw the shear force, bending moment and influence diagrams for various structures. IV. Examine the various structures to calculate critical stresses and deformation. <p>COURSE OUTCOMES (COs):</p> <p>CO 1: Understand the concept of trusses and describe the analysis process of trusses by various methods.</p> <p>CO 2: Determine stresses and analysis of two hinged and three hinged arches.</p> <p>CO 3: Evaluate propped cantilever, fixed beam and continuous beam using various methods of analysis.</p> <p>CO 4: Understand the concept of moment distribution method and its application to beams and frame structure.</p> <p>CO 5: Comprehend the concept of moving loads and influence line diagram, its application to beams.</p> <p>COURSE LEARNING OUTCOMES (CLOs):</p> <ol style="list-style-type: none"> 1. Differentiate between the perfect, imperfect and redundant pin jointed frames. 2. Identify the pin jointed frames and rigid joint structures. 3. Understand the determinate and indeterminate structures for rigid jointed and pin jointed frames. 4. Analysis of determinate pin jointed frames using method of joint, method of section for vertical load. 5. Evaluate the determinate pin jointed frames by method of joint, method of section for horizontal and inclined load. 6. Analysis of determinate pin jointed frames by tension coefficient method for vertical, horizontal and inclined loads. 7. Differentiate between three hinged and two hinged arches. 8. Analysis of three hinged circular arches at different levels. 9. Execute secondary stresses in two hinged arches due to temperature and elastic shortening of rib. 10. Analyze the parabolic arches for the shear forces and bending moments. 11. Evaluate the shear forces and bending moments in two-hinged arches using energy methods. 12. Draw the shear forces and bending moments in three hinged arches using energy methods. 13. Derive the moment equation for propped cantilever and fixed beams under various conditions 14. Analysis of propped cantilever and fixed beam using the method of consistent deformation for different loading conditions. 15. Evaluate of continuous beam using the method of clapeyron's equation of three moment. 16. Analysis of continuous beam with sinking support using equation of three moments. 17. Contrast between concept of force and displacement methods of analysis of indeterminate structures. 								

<p>18. Analyze the methods of moment distribution to carry out structural analysis of 2D portal frames with various loads and boundary conditions.</p> <p>19. Apply the methods of slope deflection to carry out structural analysis of 2D portal frames with various loads and boundary conditions.</p> <p>20. Analysis of single storey frames with and without sway using slope deflection and moment distribution method.</p> <p>21. Comprehend the concept of moving loads, and its effect on shear force and bending moment on a beam.</p> <p>22. Evaluate the shear force and bending moment at a section of a determinate beam under moving load.</p> <p>23. Understand the concept of influence line diagram for shear force and bending moment.</p> <p>24. Construct the influence line diagram for shear force and bending movement for the entire beam.</p>		
UNIT - I	ANALYSIS OF PIN-JOINTED FRAMES (TRUSSES)	Classes: 09
Types of frames, perfect, imperfect and redundant. Pin jointed frames (trusses), analysis of determinate pin jointed frames, analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.		
UNIT - II	ARCHES	Classes: 09
Introduction, types of arches, comparison between three hinged and two hinged arches; Normal thrust and radial shear in an arch; Geometrical properties of parabolic and circular arch; Three hinged circular arch at different levels; Absolute maximum bending moment diagram for a three hinged arch; Two hinged arches: Introduction, classification of two hinged arches, analysis of two hinged parabolic arches, secondary stresses in two hinged arches due to temperature and elastic shortening of rib.		
UNIT - III	FORCE METHOD OF ANALYSIS OF INDETERMINATE BEAMS	Classes: 09
<p>Analysis of propped cantilever and fixed beams using the method of consistent deformation, including the beams with varying moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads, shear force and bending moment diagrams for propped cantilever and fixed beams, deflection of propped cantilever and fixed beams; effect of rotation of a support. Continuous beams.</p> <p>Clapeyron's theorem of three moments, analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed, continuous beams with overhang. Effects of sinking of supports.</p>		
UNIT - IV	DISPLACEMENT METHOD OF ANALYSIS: SLOPE DEFLECTION AND MOMENT DISTRIBUTION	Classes: 09
Derivation of slope, deflection equation, concept of moment distribution method, application of the methods to continuous beams with and without settlement of supports. Shear force and bending moment diagrams, elastic curve, application of the methods to single bay, single storey frames with and without sway.		
UNIT - V	MOVING LOADS AND INFLUENCE LINES	Classes: 09
Introduction, maximum shear force, and bending moment; At a given section and absolute maximum shear force and bending moment due to various load cases, focal length; Definition of influence line for shear force, influence line for bending moment, load position for maximum SF at a section, load position for maximum BM at a section, for various loads.		
Text Books:		
<p>1. Devadas Menon, "Structural Analysis Vol.1", Narosa Publishers, New Delhi, 2010.</p> <p>2. S. S. Bhavikatti, "Structural Analysis Vol.1", Vikas Publishing House, New Delhi, 2010.</p>		

3. R. C. Hibbler, “Structural Analysis”, Pearson Education, India, 2008.

Reference Books:

1. T. S. Thandavamoorthy, “Structural Analysis”, Oxford Higher Education, India, 2011.
2. C. S. Reddy , “Basic Structural Analysis”, McGraw Hill Education (India), Delhi, 2000.
3. C. K. Wang, “Intermediate Structural Analysis”, McGraw Hill Education (India), Delhi, 2010.

Web References:

1. <https://lecturenotes.in/subject/154/structural-analysis-1-sa-1>
2. <https://nptel.ac.in/downloads/105101085/>
3. <http://www.ce.memphis.edu/3121/>

E-Text Books:

1. <https://www.kopykitab.com/Structural-Analysis-I-by-S-S-Bhavikatti>
2. <https://www.pdfdrive.com/fundamental-structural-analysis-e25550099.html>