

STRUCTURAL ENGINEERING

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACEB13	Core	L	T	P	C	CIA	SEE	Total
		2	1	0	3	30	70	100
Contact Classes: 30	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 45		

COURSE OBJECTIVES:

The students will try to learn:

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| I | The behavior of arches under the action of uniformly distributed loads and concentrated loads. |
| II | The concepts of energy methods for analyzing the components of various industrial structures. |
| III | The analysis of indeterminate beams and rigid frames by displacement methods for designing framed structures. |
| IV | The concept of rolling loads and influence lines for analyzing the bridge girders and truss girders in complex structures. |

COURSE OUTCOMES:

After successful completion of the course, Students will be able to:

- CO 1 **Explain** various types of arches and select appropriate arch in field applications.
- CO 2 **Make use of** energy principles in the analysis of arches for computing resultant thrust at springings of arches.
- CO 3 **Analyse** two hinged arches for evaluating secondary stresses due to thermal and rib shortening effects.
- CO 4 **Explain** civil engineering structures based on static and kinematic indeterminacies for choosing appropriate method for analysis.
- CO 5 **Analyse** the indeterminate trusses for member forces due to applied loads, lack of fit and temperature changes.
- CO 6 **Apply** the concepts of slope-deflection, moment distribution and Kani's methods for analysing continuous beam with and without support settlement.
- CO 7 **Analyse** rigid frames with and without side sway for end moments, shear forces and support reactions.
- CO 8 **Explain** the effect of rolling loads for thorough understanding of the variations in internal forces due to moving vehicular loads.
- CO 9 **Apply** the concept of influence line diagrams for analysing beams, bridge girders and trusses in real time problems.

MODULE - I	ARCHES	Classes: 09
<p>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.</p>		

MODULE - II	ANALYSIS OF INDETERMINATE STRUCTURES	Classes: 09
Indeterminate Structural Analysis –Determination of static and kinematic indeterminacies – Analysis of trusses with up to two degrees of internal and external indeterminacies using Castiglione’s theorem.		
MODULE - III	SLOPE-DEFLECTION & MOMENT DISTRIBUTION METHOD	Classes: 09
<p>Introduction- Derivation of slope deflection equation-Application to continuous beams with and without settlement of supports - Analysis of single-bay, single-storey, portal frame including side sway.</p> <p>Introduction to moment distribution method - Application to continuous beams with and without settlement of supports - Analysis of single-bay, single-storey, portal frame including side sway</p>		
MODULE - IV	KANI’S METHOD	Classes: 09
Introduction to Kani’s method – Rotation factor- Application to continuous beams with and without settlement of supports.		
MODULE - V	MOVING LOADS & INFLUENCE LINES	Classes: 09
Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, UDL load shorter than the span, two point loads with fixed distance between them and several point loads – Equivalent uniformly distributed load – Focal length. Definition of influence line for SF, Influence line for BM – load position for maximum SF at a section – Load position for maximum BM at a section Point loads, UDL longer than the span, UDL shorter than the span.		
Text Books:		
<ol style="list-style-type: none"> 1. B.C. Punmia, A.K Jain &A.K.Jain, Theory of Structures, Twelfth Edition, 2004, Laxmi Publications. 2. C.S.Reddy, Basic Structural Analysis, Third Edition, 2010, TATA Mc. Graw Hill. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Bhavikatti - Analysis of Structures – Vol. I &2 ,Vikas publications 2. Vazirani&Ratwani, Analysis of Structures–Vol.II, Sixteenth Edition, 2015, Khanna Publishers. 3. Ramamrutham, Theory of Structures, Ninth Edition, 2014, Dhapat Rai Publications. 4. C.K.Wang, Intermediate Structural Analysis, , First Edition, 2010, Standard Publication. 		
Web References:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105105166/ 2. https://www.youtube.com/watch?v=qhEton-EEOW&list=PL83821B43A558F579 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://www.kopykitab.com/Structural-Analysis-I-by-S-S-Bhavikatti 2. https://www.pdfdrive.com/fundamental-structural-analysis-e25550099.html 		