ANALYSIS OF STRUCTURES

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACEC14	Core	3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

Prerequisite: Theory of Structures

I. COURSE OVERVIEW:

The course of Structural Engineering comprises a set of fundamental theorems of mechanics that obey physical laws required to study and predict the behavior of structures for computation of deformations, internal forces and stresses. This course mainly discusses the energy, force and displacement methods for the analysis of arches, determinate and indeterminate beams and trusses. This course also includes the effects of rolling loads on bridge girders and truss girders. Through this course content engineers can analyze the response of various structural members under different loading conditions for design, safety and serviceability.

II. COURSE OBJECTIVES:

The Students will try to learn:

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.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Outline** about various types of arches for selecting appropriate arch in field applications.	Understand
CO 2	**Make use of** energy principles in the analysis of two hinged arches for computing resultant thrust and evaluating secondary stresses due tothermal and rib shortening effects.	Apply
CO 3	**Apply** the concepts of Castigliano's theorem for analysingindeterminate trusses.	Apply
CO 4	**Analyse** the continuous beams using the concepts of slope-deflection, moment distribution and Kani's methods for design of rigid frames with and without side sway.	Analyse
CO 5	**Summarize** the effects of rolling loads for thorough understanding ofthe variations in internal forces on bridge girders due to moving vehicular loads.	Understand
CO 6	**Apply** the concept of influence line diagrams for analyzing beams,bridge girders and trusses in real time problems.	Apply

IV. COURSE SYLLABUS:

MODULE –I: ARCHES (9)

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.

MODULE -II: ANALYSIS OF INDETERMINATE STRUCTURES (9)

Indeterminate Structural Analysis –Determination of static and kinematic indeterminacies – Analysis of trusses with up to two degrees of internal and external indeterminacies using Castigliano's theorem.

MODULE -III: SLOPE-DEFLECTION AND MOMENT DISTRIBUTION METHOD (9)

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.

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.

MODULE -IV: KANI'S METHOD (9)

Introduction to Kani's method – Rotation factor- Application to continuous beams with and without settlement of supports.

MODULE -V: MOVING LOADS AND INFLUENCE LINES (9)

Introduction - maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, UDL longer than the span, UDL shorter than the span, two-point loads with fixed distance between them and several point loads. 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.

V. TEXT BOOKS:

1. B.C. Punmia, A.K Jain &A.K.Jain, "Theory of Structures", Laxmi Publications 12th Edition, 2004.
2. C.S.Reddy, "Basic Structural Analysis", Tata McGraw Hill, 3rd Edition, 2010.

VI. REFERENCE BOOKS:

1. S.S.Bhavikatti, "Structural Analysis - Vol. 1&2",Vikas Publications, 4th Edition, 2011
2. Vazirani and Ratwani, "Analysis of Structures–Vol.II", Khanna Publishers, 16th Edition, 2015.
3. Ramamrutham, "Theory of Structures", Dhanpat Rai Publications, 9th Edition, 2014.
4. C.K.Wang, "Intermediate Structural Analysis", Standard Publication, 1st Edition, 2010.

VII. WEB REFERENCES:

1. https://nptel.ac.in/courses/105105166/
2. https://www.youtube.com/watch?v=qhEton-EEOw&list=PL83821B43A558F579

VIII. 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