16CE308 STRUCTURAL ANALYSIS - III

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
13	45	5	15	2	-

Course Description and Objectives:

This course offers the knowledge of curved beams, cables and plastic analysis of beams. The objective of the course is to introduce to the students to analysis of curved beams, cables and plastic analysis of beams and to analyze beams and frames by matrix approach with both stiffness and flexibility method of analysis.

Course Outcomes:

The Students will be able to:

- analyze the curved beams for bending and twisting moment calculations.
- analyze cables under point loads and uniformly distributed loads.
- calculation of section modulus and plastic moment capacity.
- analyze the continuous beams using matrix methods of structural analysis.

SKILLS:

- ✓ *Determine tension in cables under point loads and uniformly distributed loads.*
- ✓ *Calculate section modulus of a section and plastic moment capacities using static and kinetic methods.*
- ✓ *Analyze the continuous beams using flexibility and stiffness methods.*
- ✓ *Analyze the portal frames using flexibility and stiffness methods.*

UNIT - 1 **L-9, T-3**

CABLES: Analysis of cables under uniformly distributed and concentrated loads, Shape of the cable under self-weight, Effect of temperature changes in suspension cables, Anchor cables.

UNIT - 2 **L-9, T-3**

PLASTIC BEHAVIOUR OF STRUCTURES: Idealized stress-strain curve for mild steel, Ultimate load carrying capacity of members carrying axial forces, Moment-Curvature relationship for flexural members, Evaluation of fully plastic moment, Shape factor, Collapse load factor, Upper and lower bound theorems, Collapse load analysis of simply supported, Propped cantilever and fixed beams.

UNIT - 3 **L-9, T-3**

FLEXIBILITY METHOD (MATRIX APPROACH): Flexibility matrix analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method with matrix approach.

UNIT - 4 **L-9, T-3**

STIFFNESS METHOD (MATRIX APPROACH): Stiffness matrix, Relationship between flexibility matrix and stiffness matrix, Analysis of continuous beams, Rigid jointed plane frames (Single bay, single storey with vertical legs only) by stiffness method with matrix approach.

UNIT - 5 **L-9, T-3**

INTRODUCTION TO FEM: A brief history of FEM, Need of the method, Equilibrium equations boundary conditions, Compatibility, Strain-displacement relations, Linear constitutive relations, Principle virtual work, Principle of stationary potential energy, Different types of elements, Shape functions.

TEXT BOOKS:

1. Vazirani and Ratwani, "Analysis of Structures", Vol.1 and 2, 13th edition, Khanna Publishers, Delhi, 2003.
2. S. S. Bhavikatti, "Strucutral Analysis" Vol. 2, 3rd edition, Vikas Publishing House Pvt. Ltd., New Delhi 2009.
3. R. T. Chandrupatla and A. D. Belegundu, "Introduction to Finite Elements in Engineering", Prentice Hall of India, 1997.

REFERENCE BOOKS:

1. C. S. Reddy, "Basic Structural Analysis", 2nd edition, Tata McGraw Hill Publications, New Delhi, 2009.
2. R. C. Hibbeler, "Structural Analysis", 8th edition, Prentice Hall Publications, 2011.

ACTIVITIES:

- *Calculate the cable sag under the application of point loads.*
- *Write a programming code for analysis of any structure using flexibility method.*
- *Write a programming code for analysis of any structure using stiffness method.*
- *Analyze the continuous beam using any analysis software and compare the results with manual procedure.*