

CIPC3003 ADVANCED STRUCTURAL ANALYSIS (3-0-0)

Course objectives

- To develop skills to idealize, formulate, and analyze determinate and indeterminate structures (beams, trusses, and frames) using classical and matrix structural analysis methods.
- To analyze practical problems related to usage of Two hinged arches and stiffening girders
- To acquire knowledge regarding concept of plastic analysis of structures
- To develop skills in interpreting and predicting solutions from structural analysis.

Module-I: (08 Hrs)

Introduction to Force and Displacement methods of structural analysis, Analysis of continuous beam and plane frame by slope deflection method, moment distribution method and Kani's method.

Module-II: (06 Hrs)

Two hinged arches and analysis of suspension cable with two hinged stiffening girders, Influence lines for indeterminate beams, influence lines for two hinged arches and stiffening girders. Analysis of fixed arches.

Module-III: (08 Hrs)

Plastic Analysis: Plastic modulus, shear factor, plastic moment of resistance, load factor, equilibrium/static method and kinematic/mechanism method, Simple cases of beams and frames (continuous beam and simple rectangular portals), Application of upper and lower bound theorems, Determining the collapse load using both theorems and the concept of mechanisms

Module-IV: (08 Hrs)

Matrix method of analysis: Development of Stiffness and Flexibility matrices for bars, trusses, plane frames, use of flexibility and stiffness method for analysis of trusses, beams and plane frames.

Course Outcomes:

After successfully studying this course, students will able to:

- Understand the basic concept of slope-deflection, slope deflection method, moment distribution method and Kani's method.
- Adopt the methods for analysis of two hinged arches, cables with stiffening girders
- Use the methods for analysis of indeterminate structures subjected to rolling or moving loads and their maximum influence on two hinged arches, cables with stiffening girders
- Understand plastic analysis of structures and design members based on it
- Apply the basic concepts of flexibility and stiffness matrix methods in structural analysis

Books:

- C. K. Wang, Intermediate Structural Analysis, McGraw Hill Education; first edition
- R C Hibbeler, Structural Analysis, Pearson Education, tenth edition
- C S Reddy, Basic Structural Analysis, McGraw Hill Education, third edition.
- S. S. Bhavikatti, Structural Analysis-II, Vikas Publishing, Fifth edition.
- G.S. Pandit & S. Gupta, Structural Analysis: A Matrix Approach, McGraw Hill Education; second edition
- V.K. Manicka Selvam, Fundamentals of Limit Analysis of Structures (A Course in Plastic Analysis of Structures), Dhanpat Rai Publications, second edition
- S. Kothandaraman & G. Vasudevan, Matrix Methods of Structural Analysis, Pearson Education, First edition
- S. Ramamrutham, Theory of Structures, Dhanpat Rai Publication, Ninth edition