STRUCTURAL ANALYSIS – I

Lectures / Tutorials   : 4 / 1 Periods/Week   Sessional marks : 40
Semester End Exam. : 3 Hours   Semester End Exam. Marks : 60

Credits: 4

Course Objectives:

➢ Students will learn to analyze three hinged and two hinged, circular arches for static and moving loads.
➢ Students will learn about establishing different types of structures and degree of determinacy, calculating reactions and internal forces (axial force, shear, and bending moment) for determinate and indeterminate structures and its components.
➢ Students will learn about calculating deflections for beams and frames using energy methods.
➢ Let the students understand the behavior of various buildings, bridges, and catenary cable systems so that they can reasonably select and analyze a type of building, bridge, or catenary cable system in structural design.
➢ Students will learn about constructing influence lines for beams, trusses and three hinged arches
➢ To analyze the statically indeterminate structures like fixed beams, continuous beams, two hinged arches and influence lines for continuous members by Muller Breslau's principle
➢ Students will learn to analyze multistoried frames by using portal and cantilever methods.

Course Outcomes:

➢ Students will learn to analyze determinate arches subjected to different loading which in turn helps them to resolve forces of certain type of circular and arched structures
➢ Students will have an ability to formulate questions and develop analytical answers for analysis of structures, and solve broad-based structural analysis problems.
➢ Student can make qualitatively correct sketches of deflections and moment diagrams for statically determinate beams and frames.
➢ Students will be able to Determine the stresses in anchors, cables and suspension bridges and also calculate shear and bending in stiffening girders

UNIT – I

Arches

Theoretical and actual arch, Eddy's theorem Types of arches, Three-hinged arch Displacements of statically determinate structures by Energy Methods Virtual Work, Betti's and Maxwell's laws of reciprocal deflections, Applications of virtual work, Deflection of trusses and frames, Castigliano's theorems

UNIT –II

Cables

Equation of the cable subjected to uniformly distributed load, Horizontal tension in the cable, Tension in the cable supported at different levels, Length of the cable, Effect of change in temperature

Rolling loads and Influence Lines

Maximum shear force and bending moment in simply supported beams due to single concentrated load, uniformly distributed load longer than span, uniformly distributed load shorter than span, two

concentrated loads, series of concentrated loads; Concept of influence line, Influence Lines for reaction, shear force and bending moment in simply supported beams, Influence lines for simple trusses and three-hinged arches

UNIT –III
Statically Indeterminate Structures –Compatibility methods
Degree of indeterminancy and stability of structures, Fixed beams, Theorem of three moments, Two-hinged arches, Influence lines for continuous members-Muller-Breslau's principle

UNIT –IV
Statically Indeterminate Structures –Approximate Methods
Indeterminate trusses, Portal frames , Continuous beams, Building frames subjected to gravity loads, Building frames subjected to lateral loads - Portal method

NOTE
Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

Basic structural analysis by CS Reddy, 3rd Edition, Tata McGraw-Hill, 2010.

REFERENCE BOOKS
1. Basic structural analysis by KU Muthu et.al. , IK International,2011.
2. Intermediate structural analysis by CK Wang, Tata McGraw-Hill, 2010.
3. Structural Analysis by Devdas Menon, Narosa Publishinh House, 2008.
4. Structural analysis by RC Hibbeler, 6th Edition, Pearson Education.

WEB REFERENCES:
- http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Structural%20Mechanic%20II/Course%20Objective.html.
- http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Structural%20Analysis/New_index1.html