

CE2008D STRUCTURAL ANALYSIS - I

Course Plan

Total hours: 39

Course Outcomes

CO1: To provide basic energy-based analysis techniques for analysing structures

CO2: To acquire knowledge regarding the behaviour of column under axial and eccentric loading

CO3: The graduates will be trained to use different analytical tools for understanding the behaviour of statically determinate and indeterminate structures using force method

CO4: To equip the students with comprehensive methods of structural analysis with emphasis on analysis of elementary structures and to attain ability to pursue higher studies in Civil Engineering

Module 1 (14 hours)

1. Elastic theorems and energy principles: Strain energy and complementary energy
2. Review of strain energy due to axial, bending, shear and torsion, Principle of superposition
- 3, 4 Principle of virtual work
- 5, 6 Castigliano's theorem for deflection
7. Theorem of complementary energy
8. Betti's theorem, Maxwell's law of reciprocal deflections
- 9 - 11. Application of method of virtual work (unit load method)
- 12 - 14. Strain energy method for deflections of statically determinate beams, pin-jointed trusses and rigid frames - temperature effects.

Module 2 (14 hours)

- 15, 16. Theory of columns, Axial loading of short strut, direct and bending stresses
- 17, 18. Long columns, differential equation of elastic curve, Euler's formula, buckling load as an eigenvalue problem, different supports
19. Eccentric loading
- 20, 21. Force method of analysis of indeterminate structures: Indeterminate structures - degree of static and kinematic indeterminacies
- 22, 23. Introduction to force and displacement methods
- 24 - 26. Fixed and continuous beams: Force method of analysis, consistent deformation method
- 27, 28. Shear force and bending moment diagrams, deflection and support settlement

Module 3 (11 hours)

- 29 - 33. Indeterminate Frames and Trusses: Deflection of rigid frames of different geometry by consistent deformation method
34. Settlement effects
- 35, 36. Analysis of trusses by consistent deformation method, externally and internally redundant trusses
- 37 - 39. Effects of support settlement and pre-strains.

