

CV4101 Structural Analysis III

[Lectures: 26 hrs; Tutorials: 13 hrs; Pre-requisites: CV2012; Academic Unit: 3.0]

Learning Objective

To master the theory and applications of modern matrix analysis for truss, beam and frame structures; to understand the stability analysis of columns and frames; and to get familiar with the computer aided structural analysis. It is limited to small deflection, elastic static and stability analysis.

Course Content

Theory and applications of modern structural analysis. Concept of equilibrium, compatibility and force-displacement relationship. Direct stiffness method. Matrix formulation of trusses, beams and frames. Computer applications by using computer software. Computer modelling of 2D/3D truss and frame structures. Unit displacement method. Introduction to stability. Formulation of stability concepts associated with columns and frames. Elastic stability analysis of framed structures.

Course Outline

S/N	Topic
1	Introduction to matrix method and degrees of freedom
2	Analysis of trusses
3	Analysis of beams
4	Analysis of 2-dimensional frames
5	Unit displacement method
6	Elastic stability analysis of simple struts
7	Elastic stability analysis of frames
8	Computer modelling of 2D/3D truss and frame structures

Learning Outcome

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

- Understand the basic concept of numerical analysis and formulation of analytical models of structures.
- Discretise simple structures, identify degrees of freedom and formulate stiffness matrix.
- Solve simple beams, trusses and frames for joint displacements and member forces.
- Be familiar with the procedure for computer applications for structural analyses.
- Understand the concept of structural stability and its significance in structural design.
- Analyse the stability of simple struts using differential equation approach.
- Analyse the stability of plane frames using matrix approach.

Textbooks

1. McGuire, W., Gallagher, R.H. and Ziemian, R.D., "Matrix Structural Analysis". 2nd edition, John Wiley and Sons, 2000.
2. Simitzes, G.J. and Hodges, D.H., "Fundamentals of Structural Stability." Elsevier, New York, 2006.

References

1. Kassimali, A. "Matrix Analysis of Structures". Cengage Learning, 2012
2. Chen, W.F. and Lui, E.M. "Structural Stability: Theory Implementation". Elsevier, 1987.