THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Matrix Structural Analysis

CIVILEN 5310

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Analysis of frame structures by force and displacement methods using matrices.

Prerequisites and Co-requisites:
Prereq: 4310 (531).

Course Goals / Objectives:
- Provide a solid foundation in the mathematical formulation and computational aspects of Matrix Structural Analysis Methods
- Learn structural modeling techniques for analysis of practical structures using computer programs based on matrix methods

Course Topics:

- Introduction, Review of Matrix Algebra and Basis Concepts (Chapter 1 & Appendix A)
- Introduction to flexibility and stiffness methods: Review of Matrix Algebra; Stiffness analysis of One-dimensional bars; Structures with specified non-zero displacements and Thermal Effects; Stiffness Analysis of Two-Dimensional Trusses
- Plane Truss Element Stiffness Matrix : Coordinate Transformations and Global; Stiffness Matrix; Trusses with support movements; Temperature Changes and Fabrication errors; Stiffness Analysis of Beams and Two-Dimensional (Plane) Frames
- Beam Element Stiffness Matrix: 2-D Frame Element Stiffness Matrix Transformation Matrix for the Frame Element; Non-Nodal Loads; Thermal Effects in Beams and Frames; Support Movements in Beams and Frames
- Force Method (Flexibility Analysis):Introduction; Basic Equations for Flexibility Method; The Flexibility Method for Trusses
- The Flexibility Method for Beams: Computer Modeling Issues and Additional Topics
- Discussion of Bandwidth: Combining Different Elements to Model a Structure;Elastic and Inclined Supports; Internal Hinges in Beam and Frame Elements; Non-Uniform Members; Modeling and Analysis of Roof and Bridge Trusses Using Computer Programs
- Stiffness Analysis of Three-Dimensional (Space) Trusses
- Space Truss Element Stiffness Matrix: Coordinate Transformation and Global Stiffness Matrix; Stiffness Analysis of Grids
- Grid Element Stiffness Matrix, Coordinate Transformation and Global Stiffness Matrix

---

Designation:

Elective