CEE 423 Matrix Analysis of Structures
Fall 2023

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Office hours: Monday & Wednesday 2.30-4 pm or by appointment at A220

Class times and location: 3.30-4.50PM @ M166, Tuesday and Thursday

Required Textbook None

Reference Textbooks

2. Kassimali, Matrix Analysis of Structures, 2012
4. J. Fish, T. Belytschko, A First Course in Finite Elements, 2007
6. R. C. Hibbeler, Structural Analysis, 2018
7. K. H. Gerstle, Basic Structural Analysis, 1974

Prerequisites Graduate standing, Senior undergraduate or permission of instructor

Description Use of matrix analysis for structural systems, geometric matrices, stability, analysis of geometrically nonlinear systems and introduction to the finite element method.

Course Objectives

1. Combine classical methods of Structural Analysis with programming and commercial software.
2. Determine deflections and forces in statically determinate and indeterminate structures using force and stiffness methods
3. Use a physical interpretation of stiffness matrices to assemble stiffness matrices analytically
4. Write and use computer programs which implement the matrix stiffness method
Course Outcomes

1. Calculate deflections, reactions and internal forces for trusses, beams and frames using analytical and computer-based methods
2. Extend the study of linear elastic analysis to include nonlinear aspects of structure behavior
3. Be able to interpret computer output and validate results using simplified models and hand calculations

Course Outline

1. Introduction
3. Contragradient law. Nodal Forces
4. Displacement Method of Analysis (Indirect Method): Trusses, beams and frames
5. Direct Stiffness Method for trusses, beams, and frames
6. Additional topics: Thermal effects, settlement, prestress tendons, initial stresses, and non-prismatic members
7. Principle of virtual work, Rayleigh-Ritz. Approximate interpolation functions
8. Introduction to the Finite Element Method
9. Nonlinear aspects of structure behavior

Course Assessment Grades are determined based on the following components

- 30% Homework
- 30% Midterm (Tu-10/31/23)
- 35% Final Project (due Tu-12/5/23)
- 5% Participation

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Students who experience a personal emergency should contact the instructor as soon as possible to arrange to complete coursework. Should public health recommendations prevent in-person class from being held on a given day, the instructor or the university will notify students.

Support for Wellness and Mental Health

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