

University of Massachusetts, Amherst
Department of Civil & Environmental Engineering
CEE 549: Structural Stability (Spring 2023)

Instructor:

<PROF_FIRST_NAME> <PROF_LAST_NAME>
234A Marston Hall
<PROF_EMAIL>

Office Hours:

Tuesday and Thursday 1pm-2pm (234A Marston Hall)

Course web page: TBD

Catalog Description: Linear and nonlinear buckling of columns, beam-columns, frames and plates. Role of linearization in formulation of stability problems. Adjacent equilibrium, kinetic, imperfection and energy criteria for stability analysis. Variational approaches for formulating and solving buckling problems.

Prerequisites: CE-ENGIN 331 & MATH 331 or equivalent with permission of instructor.

Text: None required.

Course Objective: Students should leave this course knowing principles of structural stability and learning the FEM software ABAQUS.

Course Learning Objectives / Outcomes: At the end of the course, students should be able to confidently state, “I can . . .”

1. Formulate mechanical stability modeling.
2. Calculate elastic column buckling capacities.
3. Calculate inelastic column buckling capacities.
4. Use FEM to calculate stability phenomena.
5. Use ABAQUS to model a structure.
6. Use ABAQUS to identify stability phenomena.

Class Schedule:

Lectures, TT 2:30pm-3:45pm

Midterm exam date on TBD

No Final Exam.

Conflicts must be addressed prior to the end of the second week of class.

Assessment Methods: Students' performance in the class will be assessed through midterm and final examinations, homework assignments, and in-class exercises. Solutions to the homework will be distributed. The final grade will be determined based on the following weighting:

Homework	50%
Final Presentation	50%

Academic Honesty: Students are subject to University policies regarding academic honesty. These policies are available at:

http://www.umass.edu/dean_students/code_conduct/acad_honest.htm

Homework policies:

- Homework is given each **Thursday** in class.
- Homework is due on the **next Thursday** at the **beginning of the class**.

Example: Say homework is assigned on Thursday (2/5/2023), then it is due on Thursday (2/12/2023).

- Homework solutions will be posted on the website on **Tuesday afternoon**.
- **Staple** the pages appropriately and write your **First Name**, **Last Name**, and **Student ID** on top of all the homework pages to prevent any hassle in case they are separated.
- **Number** the homework **pages** indicating the total number of pages (e.g., Page 2 of 6).
- **Use ruler** for drawing any straight lines.
- Write on **only** one side of the **engineering paper**.
- Start each new problem at the top of a fresh page.
- Use a pencil with enough lead hardness, so that good contrast to the paper is produced.
- It is **NOT** enough to simply obtain “an answer” to a homework problem. Solutions need to be written up in a clear professional engineering manner with all the steps included.
- **Homeworks which do not meet the minimum requirements of neatness and clarity will be returned ungraded.**

Syllabus:

1. Introduction,
2. Mechanical Stability Models
3. Classical or Bifurcation Method
4. Energy Method
5. Small- δ VS Large- δ Analysis
6. Elastic Buckling of Columns
7. Inelastic Column Buckling
8. Beams and Columns - Frame Stability
9. ABAQUS – Introduction
- 10.ABAQUS – Simple Truss, pre- and post-processing
- 11.ABAQUS – Eigenmode analysis of mechanical models using rigid bodies
- 12.ABAQUS – Eigenmode analysis of structures with deformable bodies
- 13.ABAQUS – Inelastic buckling
- 14.ABAQUS – 3D structure modeling and analysis

We are all members of an academic community with a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect. The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing or speak with Dr. <NAME>, Director of Engineering Diversity Programs (<EMAIL>, <PHONE>, Marston 128).