NEW JERSEY INSTITUTE OF TECHNOLOGY

ME 315-101 STRESS ANALYSIS

Fall 2024

Instructor: Dr. Xing Liu (xing.liu@njit.edu)

Lectures: Tuesday 6:00–8:50 pm at ME 224

Office hours: Monday 4:00–5:00 pm at 263 Fenster Hall

Prerequisites: ME 215 Engineering Materials and Processes; Mech 237 Strength of Materials; Math 222 Differential Equations

Textbook: *Mechanics of Materials*, 3rd edition, by Roy R. Craig, JR. (Wiley)

Course Description: This is an introductory course on stress analysis in mechanical design.

Course Learning Outcomes

1. Use Mohr's circle to fully analyze the stress/strain state in a body.
2. Explain how Mohr's circle is related to the stress transformation equations.
3. Solve stress/strain eigenvalue problems.
4. Explain and describe the relationship between stress and strain tensor.
5. Define plane stress/plane strain.
6. Describe the concepts of strain energy and deformation work.
7. Explain Castigliano's theorems and apply them to problems on beam deflections.
8. Apply Castigliano's theorems to indeterminate structures.
9. Explain elastic stability related to column buckling.
10. Solve simple column buckling problems.

Tentative Schedule and Topics

Sep 3	Stress and Strain
Sep 10	Axial Deformation
Sep 17	Torsion
Sep 24	**Problem Session**
Oct 1	**Midterm Exam I**
Oct 8	Transformation of Stress and Strain
Oct 15	Equilibrium of Beams I

Oct 22	Equilibrium of Beams II
Oct 29	**Problem Session**
Nov 5	**Midterm Exam II**
Nov 12	Energy Method I
Nov 19	Energy Method II
Dec 3	Buckling of Columns
Dec 10	**Problem Session**
Dec 17	**Final Exam**

Grading Policy

- **Homework Sets (40%)**

  Homework will be assigned regularly and will be due at the beginning of the following class period. Students coming to class late should be handing in their homework upon their arrival. Homework handed in after class, or completed during class, will not be accepted.

  To allow for easier and more thorough grading, homework submissions should be in the form of hard copies only. In the rare cases of illness or other justified absence from class, homework should be sent as a PDF file attached to an email to the instructor.

- **Midterm Exam I (20%) on Oct 1st**
- **Midterm Exam II (20%) on Nov 5th**
- **Final Exam (20%) on Dec 17th**

  Make-up exams will be given only in cases where the instructor receives notification from the Office of the Dean of Students that there was a legitimate and verified reason for the student missing the exam.

- **Grading Scale**

A	B+	B	C+	C	D
90–100	85–89	80–84	75–79	70–74	60–69

Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code (https://www5.njit.edu/policies/sites/policies/files/NJIT-University-Policy-on-Academic-Integrity.pdf).

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Generative AI

This course expects students to work without generative artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, student use of generative AI (*e.g.*, ChatGPT) is not permitted throughout this course under any circumstance.