ME 620, Mechanics of Materials

Location: Central King Building, Room 315
Time: Mondays, 6:00 PM - 8:50 PM

Instructor

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Office hours: by appointment

Prerequisites

ME315 Stress Analysis or an equivalent, ME616 Matrix Methods in Mechanical Engineering, and Courses on Engineering Mathematics

Textbook/References

For this class, a complete set of lecture notes will be provided and uploaded on Canvas.
Recommended resources:

1. Elasticity: Theory, Applications and Numerics, M.H. Sadd
   This book is available online on NJIT library website.
2. Lecture Notes on The Mechanics of Elastic Solids. Volume I: A Brief Review of Some Mathematical Preliminaries by Professor Rohan Abeyaratne.
   These notes are available online here.

Course Learning Outcomes

At the conclusion of this course, the students will be able to:

- Apply the tensor and vector algebra to calculate the stress and strain in a body in all directions, their maximum and minimum values and their corresponding directions.
- Describe and apply Hooke's law in 3D using the tensor form.
- Derive equilibrium equations for a deformable body under body/external forces
- Identify and apply boundary conditions and solution strategies to solve 2D problems in elasticity

Course Grading Policy

- Homework sets 50%
  Homework sets are assigned weekly and will be posted on Canvas or announced during lectures and are due for submission in about a week after. You must upload your solutions on Canvas

by the due date. Submission by other means will not be accepted. Students should upload a single PDF document per assignment. Homework sets will be self-graded. You will receive the solutions after the due date and must submit your grades within 48 hours. If you don't submit your grade within 48 hours, it will be considered *zero*.

- Midterm Exam I 20%
  The tentative date for the exam is Oct 14th. This date is subject to change according to the course schedule.
- Midterm Exam II 20%
  The date for the final exam is Nov 25th.
- Final project 10%
  The final project will be in the form of a self-study of an advanced topic relevant to the mechanics of materials. Students should first consult the professor to choose a topic. Students should reach out to the professor early in the semester to consult about a topic and finally give a short talk (about 20 minutes), in the form of a tutorial to share their knowledge with the rest of the class.
- In-class activities and pop quizzes: bonus credit up to 10 points
  In-class quizzes will not be announced in advance and student participation is not mandatory.

Makeup exam policy: There will be no makeup exam in any circumstances.

The solutions to the homework problems, exam, and pop quizzes should all be uploaded on Canvas. Submissions by other means are not acceptable. The students are expected to have an electronic device, such as a smartphone, tablet, or laptop to be able to take pictures of their solutions and upload them on Canvas during the class.

A	B+	B	C+	C	F
90-100	82-89	74-81	66-73	60-65	<60

Table 1: Letter grade scaling

Class Topics

- Mathematical preliminaries: scalar, vector, matrix and tensor definition, index notation, coordinate transformation, principal values and directions, vector and tensor algebra
- Deformation, displacement and strain
- Stress and equilibrium
- Material behavior, linear elastic solids
- Formulations and solution strategies
- Strain energy and related principles
- Two-dimensional formulation

- Two-dimensional problem solution
- Extension, torsion and bending of elastic cylinders

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 here[1]. 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.

[1] https://www5.njit.edu/policies/sites/policies/files/NJIT-University-Policy-on-Academic-Integrity.pdf