ME 315, Stress Analysis Central King Building (CKB) Room: 226

Mondays, 6:00-8:50 pm

Instructor

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Prerequisites

 $\rm ME$ 215 – Engineering Materials and Processes; Mech
 237 – Strength of Materials; Math
 222 – Differential Equations

Textbook/References

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

- 1. Mechanics of Materials, 3rd edition, By Roy R. Craig, JR.
- 2. Elasticity: Theory, Applications and Numerics, M.H. Sadd This book is available online on NJIT library website.

Course Learning Outcomes

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

- Use Mohr's circle to fully analyze the stress/strain state in a body
- Explain how Mohr's circle is related to the stress transformation equations
- Solve stress /strain eigenvalue problems
- Apply various failure theories needed in the design process
- Explain and describe the relationship between stress and strain tensor
- Define plane stress/ plane strain Explain Airy's Stress function for 2D problems
- Develop equations for and solve axisymmetric problems plate with hole, point loads on a half-space
- Solve problems involving thick- walled cylinders, shrink-fits, and rotating disks
- Explain Castigliano's theorems and apply them to problems on beam deflections, and rotations

- Apply Castigliano's theorems to indeterminate structures
- Explain elastic stability related to column buckling
- Solve simple column buckling problems

Class Schedule and Topics

Sep 11	Review of Basic Concept and Formulation- Stress Tensor
Sep 18	Displacement and Strain- Hooke's law
Sep 25	Transformation, Mohr's circle and Principle Stresses
$Oct \ 2$	Problem Session
Oct 9	Mid-term Exam 1
Oct 16	Equilibrium and Compatibility
Oct 23	Plane Problems and Airy Stress Function
Oct 30	Axisymmetric Problems
Nov 6	Problem Session
Nov 13	Midterm Exam 2
Nov 20	Strain Energy and Failure Theories
Nov 27	Castigliano's theorem and applications
Dec 4	Buckling of Columns
Dec 11	Problem Session
Dec 18	Final Exam

Course Grading Policy

• Homework sets 40%

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 then you 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 9th**. This date is subject to change according to the course schedule.

• Midterm exam II 20%

The tentative date for the exam is **Nov 13th**. This date is subject to change according to the course schedule.

- Final exam 20%
- In-class activities and pop quizzes: bonus credit up to 10 points In-class quizzes <u>will not be announced in advance</u> and student participation is not mandatory.

The solutions to the homework problems, midterm exam I, midterm exam II, final exam, and pop quizzes should be all 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.

А	B+	В	C+	С	D
93-100	86-92	78-85	70-77	62-69	55-61

Table 1: Letter grade scaling

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 here¹. 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.

 $^{^{1}} https://www5.njit.edu/policies/sites/policies/files/NJIT-University-Policy-on-Academic-Integrity.pdf$