JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING

NJIT New Jersey Institute of Technology

MECH 239 – 001/003/101/103: Strength of Materials for CE Fall 2025

(3 credits)

Lectures	Sections 001/003: Tue - Thu, 10:00-11:20 pm, KUPF 208
Lab	Section 001, Tue, 8:30-9:30 am, COLT 423 Section 003, Thu, 8:30-9:30 am, COLT 423
Instructor	**Eduardo Castro** Colton 262 ecastro@njit.edu Office Hours: Thu. 3:00-6:00 pm 973-596-6188
Prerequisite	MECH 235 with a grade of C or better and MATH 112, PHYS111/PHYS 111A.
Tutoring	The Lab Instructors will have tutoring hours and will be available to all students in all the Strength of Materials sections. Lab Instructors are available for help with course material and lab questions.

Required Textbook

1. Beer, Johnston, DeWolf and Mazurek, Mechanics of Materials, Eighth Edition, McGraw-Hill, ISBN 978-1-260-11327-3
2. Hsu, C.T. Thomas, Strength of Materials Laboratory Manual, (PDF to be posted on the Canvas site).

Course Description *(from NJIT's course catalog)*

Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behavior of materials under various load conditions. Lab should be taken concurrently.

Course Objectives (General)

By the end of this course, the student will be able to:

1. Identify and calculate the state of stresses and strains in engineering components as a result of different loading conditions
2. Analyze structural members under axial loads, bending, shear, and torsion
3. Identify the behavior of various engineering materials, their performance under loads, and design needs

POLICIES & PROCEDURES

Academic Integrity: It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course. Refer to NJIT's Dean of Students website to become familiar with the Code on Academic Integrity and how to avoid Code violations.

https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Communication: All communication by the instructor will be done through Canvas or email. It is your responsibility to check e-mail, and the course page on Canvas regularly.

Lectures/Class: This is a hybrid course. Attendance to all lectures is expected. Students expecting to miss classes or exams due to religious observances must submit a written list of dates to their instructor, ideally by the end of the second week of class, but no later than two weeks before the anticipated absence. Please turn all cell phones off during class and be respectful to the course instructor and your classmates. You should always bring a pencil and calculator with you to class.

Handouts: Handouts will be posted on Canvas.

Homework: Homework will be assigned to encourage further reading, to extend the material presented in lectures, and to provide practice in arriving at engineering solutions to problems. Completion of the homework is an essential part of the learning process. All homework is to be turned in individually unless specified otherwise on the assignment.

Homework Format: All homework will be submitted electronically on Canvas. Use any 8½ x 11 paper that will clearly show the solution when scanned. At the top of the first page write your name, course and section. All problems must show the figure and data provided with the problem. All homework MUST include a Free-Body-Diagram. All work must be shown for full credit. Upload ONE PDF file, arranged in order by problem number.

Late Homework: Homework sets must be uploaded on Canvas by the due date. Late Homework will be accepted up to 72 hours after the due date with a 30-point penalty on the grade. After 72 hours, submissions will not be accepted.

Late Lab Reports: Lab reports must be uploaded on Canvas by the due date. Late reports will be accepted up to 72 hours after the due date for 75% credit. After 72 hours, submissions will not be accepted.

Homework Grading: All homework will be submitted electronically on Canvas. It is your responsibility to scan your assignment and upload it on Canvas before the due date. All homework will be collected and graded. Presentation will account for 33% of the grade.

Lab Reports: All reports will be submitted electronically on Canvas. It is your responsibility to scan your assignment and upload it on Canvas before the due date. All reports should be word

processed. Graphs are to be computer generated. Three unexcused absences will result in automatic failure of the lab and course.

Exams: Exams are closed book. A formula sheet with all required formulas will be provided.

There will be NO make-up exams unless there is documentation provided to the Dean of Students Office to validate your absence. However, providing a make-up exam will be solely at the discretion of the professor.

Students cannot leave the classroom during exams.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Homework	10%
Lab	15%
3 Exams	50%
Final Exam	25%

The minimum requirements for final letter grades are as follows:

A = 90.0%, B+ = 85.0%, B = 80.0%, C+ = 75.0%, C = 70.0%, D = 67.0%, F < 60.0%

You must receive a passing grade in both the lab and the lecture to pass the course. Failure of either requires repeating both lecture and lab. In other words, failing the lab or the lecture means failing the course.

Students must earn a grade of C or better in this course to register for CE332, CE341 or CE431.

Laboratory Safety: Your safety and the safety of those around you are of prime importance. Efforts have been made to reduce the hazard in the lab as much as possible. If you should see anything that you consider to be a safety hazard report this condition to your lab instructor. Take your experiments seriously. Forces into the thousands of pounds will be used throughout the course and if these forces are released in an uncontrolled manner injuries are possible. Horseplay will not be tolerated and will constitute grounds for dismissal from the course.

Instructor Commitment: You can expect the instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when traveling or unavailable; and to grade uniformly and consistently.

AI statement: The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the **NJIT Library AI Citation page**. If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

Students with Documented Disabilities: NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 5963414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

Course Schedule:

WEEK	DATE	CLASS	TOPICS	ARTICLES
1 Ch. 1	Tue 9/2 Thu 9/4	Face to Face	Concept of Stress and Strain with a Review of Statics	p. 1 -26
2 Ch. 1 Ch. 2	Tue 9/9 Thu 9/11	Online	 Concept of Stresses, continued Stress and Strain - Axial Loading	 p. 27-47 p. 57-79
3 Ch. 2	Tue 9/16 Thu 9/18	Face to Face	Composites, Temperature Change, and Poisson's Ratio	p. 80-95 p. 96-116
4 Ch. 10	Tue 9/23 Thu 9/25	Online	Column Buckling under Axial Load	p. 691-708
5	Tue 9/30 Thu 10/2	Face to Face	Exam #1	
6 Ch. 4	Tue 10/7 Thu 10/9	Online	Pure Bending	p. 237-258
7 Ch. 3	Tue 10/14 Thu 10/16	Face to Face	Torsion Torsional Stresses in Shafts	p. 148-167
8 Ch. 3	Tue 10/21 Thu 10/23	Online	Torsion Torsional Stresses in Shafts	p. 168-193
9	Tue 10/28 Thu 10/30	Face to Face	Exam #2	
10 Ch. 7	Tue 11/4 Thu 11/6	Online	Mohr's Circle for Plane Stress Plane Strain, Strain Rosettes	p. 477-502 p. 538-550
11 Ch. 5	Tue 11/11 Thu 11/13	Face to Face	Analysis and Design of Beams for Bending: Shear and Moment Diagrams	p. 347-361
12 Ch. 5	Tue 11/18 Thu 11/20	Online	Analysis and Design of Beams for Bending: Shear and Moment Diagrams	p. 362-370 p. 373-381 p. 408-410

13	Thu 11/25 Tue 12/2	Face to Face	Exam #3	
14 Ch. 6	Thu 12/4 Tue 12/9	Online	Shearing Stresses: Beams and Thin-Walled Members	p. 417 -426
15			FINAL EXAM	.

Laboratory Schedule:

WEEK	DATE	Lab Topic	Due
1	001-Tue 9/2 003-Thu 9/4	No Lab this week	
2 Online	001-Tue 9/9 003-Thu 9/11	Introduction, Safety, Procedures for Lab, Instructions on how to prepare your Lab Reports, Grading Policies	READ about Reports in Lab Manual
3 Colton 423	001-Tue 9/16 003-Thu 9/18	Data Analysis for Lab Reports	
4 Online	001-Tue 9/23 003-Thu 9/25	**Experiment 1**: Pre-Lab Presentation	
5 Colton 422	001-Tue 9/30 003-Thu 10/2	**Experiment 1**: Tension Test of Metals, Automated Testing of Steel and other metal	Formal report due 10 days later
6 Online	001-Tue 10/7 003-Thu 10/9	**Experiment 2**: Pre-Lab Presentation	
13 Colton 422	001-Tue 10/14 003-Thu 10/16	**Experiment 2** : Compression Test of Steel Columns, Column Buckling	Formal report due 10 days later
8 Online	001-Tue 10/21 003-Thu 10/23	**Experiment 3**: Pre-Lab Presentation	
9 Colton 422	001-Tue 10/28 003-Thu 10/30	**Experiment 3**: Stresses, Strains and Deflection of Steel Beams in Pure Bending	Formal report due 10 days later
10 Online	001-Tue 11/4 003-Thu 11/6	**Experiment 4**: Pre-Lab Presentation	.
11 Colton 422	001-Tue 11/11 003-Thu 11/13	**Experiment 4**: Torsion Test of Metallic Materials	Formal report due 10 days later

12 Online	001-Tue 11/18 003-Thu 11/20	**Experiment 5**: Pre-Lab Presentation	.
13 Colton 422	001-Tue 12/2 003-Tue 11/25	**Experiment 5**: Strain Measurements Using Strain Rosettes in Aluminum Beams	Informal report due 7 days later
14	Thu 12/5 Tue 12/10	No Lab this week	

Course Objectives Matrix - MECH 239 Sections 001/003/101/103

Strategies, Actions and Assignments	**ABET Student Outcomes (1-7)**	Program Educational Objectives	**Assessment Measures**
Student Learning Outcome 1: Identify and calculate the state of stresses and strains in engineering components as a result of different loading conditions.			
Introduce the concept of determining stresses and strains from the member forces.	1	1	Weekly homework and quizzes.
Provide the principles of normal and sharing stress and how to determine the principal stresses.	1	1, 2	Weekly homework and quizzes.
Student Learning Outcome 2: Analyze structural members under axial loads, bending, shear, and torsion.			
Provide the basic concepts and effects of axial loads, bending, shear, and torsion on structural components.	1	1	Weekly homework, quizzes and lab experiments.
Introduce the methods used to solve determinate and indeterminate problems. Compare analytical work with results from MD Solids software program.	1	1, 6	Weekly homework, quizzes and review of assigned problems.
Student Learning Outcome 3: Identify the behavior of various engineering materials, their performance under loads, and design needs.			
Introduce a state-of-the-art analysis with Instron testing apparatus.	1, 7	1, 2, 6	Homework and lab experiments.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
2. **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
3. **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Student Outcomes

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
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