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

NJIT New Jersey Institute of Technology

MECH 237 - Strength of Materials (3 Credits)		Summer 2025
Texts:	1. Beer, Johnson, 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).	
Lecture	**MECH 237-142/143,** Monday, W**ednesday** 6:00-9:00 pm, CKB 223	
Instructor:	**Prof. Eduardo Castro, P.E.,** **262-Colton Hall, 973-596-6188, ecastro@njit.edu** **Office Hours:** Mon, Wed: 4:30 – 6:00 pm Or online by appointment	
Lab: **Colton Hall** **Rm. 422**	MECH 237-**142**, Mon, Wed 5:00-5:50 pm. MECH 237-**143**, Mon, Wed 9:10-10:00 pm. • **Lab Instructor: Oscar Poudel (op72@njit.edu)**	
Tutoring:	Tutoring is not available in the summer sessions	

Prerequisite: *Mech 235, Math 112, or equivalents, and a working knowledge of Statics with emphasis on force equilibrium and free body diagrams.*

Mech 237 provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, as well as an understanding of the mechanical behavior of materials under various load conditions. Lab must be taken concurrently.

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

Course Policies:

- Attendance is mandatory
- Be prepared to participate with board work and/or class problem solving. Bring your calculator for class participation.

Exams and Grading Policies:

- There will be three exams during the term.
- There will be a Final Exam in the final day of classes.
- Exams must have Free-Body-Diagrams. ALL work must be shown for full credit.
- Make-up exams will be at the discretion of the professor and will only be considered if you provide documentation to the Dean of Students Office to validate your absence.
- We do NOT curve the grades.
- 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.

The **Honor Code** will be upheld and any violations will be brought to the immediate attention of the Dean of Students.
Remember to cite your references when writing your lab reports. Each person will contribute to and be responsible for each lab report submitted.

If a student does not contribute in a timely manner to the group report, he/she may be asked to work individually on all the remaining reports.

CLASS	DATE	CLASS	TOPICS	ARTICLES
1 Ch. 1	Wed 5/28	Online	Concept of Stress and Strain with a Review of Statics	p. 1-26
2 Ch. 1 Ch. 2	Mon 6/2	Face to Face	Concept of Stresses, continued Stress and Strain - Axial Loading	p. 27-47 p. 57-79
3 Ch. 2	Wed 6/4	Online	Concept of Stresses, continued Stress and Strain - Axial Loading	p. 27-47 p. 57-79
4 Ch. 10	Mon 6/9	Face to Face	Column Buckling under Axial Load	p. 691-708
5 Ch. 4	Wed 6/11	Online	Pure Bending	p. 237-258
6	Mon 6/16	Face to Face	Exam #1	
7 Ch. 3	Wed 6/18	Online	Torsion Torsional Stresses in Shafts	p. 148-167
8 Ch. 3	Mon 6/23	Face to Face	Torsion Torsional Stresses in Shafts	p. 168-193
9 Ch. 7	Wed 6/25	Online	Mohr's Circle for Plane Stress Plane Strain, Strain Rosettes	p. 477-502 p. 538-550
10	Mon 6/30	Face to Face	Exam #2	
11 Ch. 5	Wed 7/2	Online	Analysis and Design of Beams for Bending: Shear and Moment Diagrams	p. 347-361
12 Ch. 5	Mon 7/7	Face to Face	Analysis and Design of Beams for Bending: Shear and Moment Diagrams	p. 362-370 p. 373-381 p. 408-410
13 Ch. 6	Wed 7/9	Online	Shearing Stresses: Beams and Thin- Walled Members	p. 417-426
14	Mon 7/14	Face to Face	Exam #3	
15 Ch. 2	Wed 7/16	Online	Composites, Temperature Change, and Poisson's Ratio	p. 80-95 p. 96-116
16	Mon 7/21	Face to Face	FINAL EXAM	

Laboratory Schedule

CLASS	DATE	Lab Topic	Due
1 Online	Wed 5/28	Introduction, Safety, Procedures for Lab, Instructions on how to prepare your Lab Reports, Grading Policies	READ about Reports in Lab Manual
2 Face to Face	Mon 6/2	Data Analysis for Lab Reports	
3 Online	Wed 6/4	**Experiment 1**: Pre-Lab Presentation	
4 Face to Face	Mon 6/9	**Experiment 1**: Tension Test of Metals, Automated Testing of Steel and other metal	Report due 10 days later
5 Online	Wed 6/11	**Experiment 2**: Pre-Lab Presentation	
6 Face to face	Mon 6/16	**Experiment 2** : Compression Test of Steel Columns, Column Buckling	Report due 10 days later
7 Online	Wed 6/18	**Experiment 3**: Pre-Lab Presentation	
8 Face to Face	Mon 6/23	**Experiment 3**: Stresses, Strains and Deflection of Steel Beams in Pure Bending	Report due 10 days later
9 Online	Wed 6/25	**Experiment 4**: Pre-Lab Presentation	.
10 Face to Face	Mon 6/30	**Experiment 4**: Torsion Test of Metallic Materials	Report due 10 days later
11 Online	Wed 7/2	**Experiment 5**: Pre-Lab Presentation	.
12 Face to Face	Mon 7/7	**Experiment 5**: Strain Measurements Using Strain Rosettes in Aluminum Beams	Informal Report due 7 days later
13	Wed 7/9	No Lab this week	
14	Mon 7/14	No Lab this week	

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.

Grading Policies for LAB

Your lab grade will represent 15% of your course grade. The lab grade will be averaged into your lecture grade to determine your final grade. 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. **Three unexcused absences will result in automatic failure of the lab and course.**

All reports should be word processed. Graphs are to be computer generated.

The results of the experiment are the results you must work with. Do not "cook" the results to produce the "expected" results. Draw your conclusions based on these results. If they are not as expected (you should have an idea of the expected results), account for the discrepancies.

Reports are also graded on your presentation. Is the material presented in a logical way? Can all of the required results be found with ease? Are the results discussed intelligently, in a good technical language? Be advised that your discussion and conclusions will probably carry more weight than production of the right answers.

Due dates are listed on the syllabus. After the due date reports will be accepted up to 72 hours late for 75% credit.

You should keep a copy of the work you turn-in.

EXAMS and FINAL (Attendance at exams is mandatory. Excused absences will require appropriate documentation.)

1. All exams including final exam are closed book. All necessary formulas will be provided with the exam.
2. All problem solutions must be done on paper provided. The format of the solution must include assumptions and the solution and answer clearly shown.
3. The solution must illustrate the understanding of the material. Correct numerical solutions alone are insufficient for any credit.
4. All answers must be accompanied by the appropriate and correct units.
5. Exams and the final are to be taken with a fully charged calculator. Calculators may not be borrowed during exams.

6. The dates of the exams are shown on the schedule above. Dates may be changed at the instructor's discretion with a minimum of 2 weeks notice.
7. The grade of "I" (incomplete) will not be given for unsatisfactory academic performance.
8. No mid-term warning notice will be given. Maintain your own records of grades.
9. Students cannot leave the classroom during exams.
10. Cell phones (and other electronic devices) must be OFF and put away during exams.

HOMEWORK

1. Homework sets must be uploaded on Canvas by the due date.
2. Upload ONE PDF file, arranged in order by problem number.
3. All homework will be collected and graded. Presentation will account for 33% of the grade
4. Late homework will be accepted up to 72 hours after the due date. However, there will be a 30-point penalty for late homework.
5. All homework MUST include a Free-Body-Diagram. All work must be shown for full credit.
6. Use any 8½ x 11 paper that clearly shows your work when scanned.
7. On the top of each page write your name, course and **section**, and problem number.
8. All problems must show the figure and data provided with the problem

Students are expected to properly maintain their registration status. If your name does not appear on the final grade sheet, it is not possible to assign you a grade and it will be necessary for you to repeat the course.

GRADING	GRADE RANGE	GRADE
3-Exams ……..50%	100 - 90	A
Final Exam ……. 25%	< 90 - 85	B+
Laboratory ……. 15%	< 85 - 80	B
Homework ……. 10%	< 80 - 75	C+
	< 75 - 67	C
	< 67 - 60	D*
	<60	F

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

Students will be consulted for any substantial changes to the course outline. Changes will be discussed and announced in advance.

Course Objectives Matrix - MECH 237 Strength of Materials

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 shearing stresses 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 scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 – Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward 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 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 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.

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 and inclusive 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 conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 2/13/18, 5/18/18