



**MECH 237 - Strength of Materials                      HYBRID Course**  
**Fall 2025 for mechanical engineering students**

- 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).
  3. NCEES, Fundamentals of Engineering Supplied-Reference Handbook, latest edition: Pages can be downloaded from the NCEES website for FREE: <https://ncees.org/ncees-publishes-new-version-of-fe-reference-handbook/>

**Lecture:**        **MECH 237-001 and -003**, Wed./Fri., 1:00 -2:20 p.m., KUPF-202  
 (outline on **MECH 237-101 and -HM1**, Mon., 6:00-8:50 p.m., KUPF-203  
 p.3)                • Prof. Milano, P.E., 239-Colton Hall, 973-596-5830, [milano@njit.edu](mailto:milano@njit.edu) Office hours posted on Canvas.

**Lab:**                **MECH 237-001**, Wed., 11:30-12:30 / **-003**, Fri., 2:30-3:30 p.m., Colton-422  
 (see lab            • Yuyue Zhang, PhD Candidate, [yz76@njit.edu](mailto:yz76@njit.edu)  
 schedule on **MECH 237-101 and -HM1**, Mon., 9:00-10:00 p.m., Colton-422  
 p.4)                • Matthew Sonibare, PhD Candidate, [mos25@njit.edu](mailto:mos25@njit.edu)

**Tutoring:**        Homework is good practice. Homework graded by Teaching Assistant:  
 Colton Hall • Yuyue Zhang, PhD Candidate, [yz76@njit.edu](mailto:yz76@njit.edu)  
 Rm. 423            • Matthew Sonibare, PhD Candidate, [mos25@njit.edu](mailto:mos25@njit.edu) Tutoring  
 Schedule to be posted on Canvas.

Lab Instructors are also available for help with course material and lab questions.

**Prerequisite:** *Mech235, Math 112, or equivalents, and a working knowledge of Statics with emphasis on force equilibrium and free body diagrams. 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.*

**All students must have proper prerequisites for Mech 237, Strength of Materials; Mech 235 Statics and Math 112 Calculus II. Students without these prerequisites will be dropped from the course.**

**Civil Engineering students should be registered for MECH 239, Strength of Materials for CE****Course Policies:**

- Attendance is mandatory whether face-to-face or remote learning.
- Please turn OFF your cell phone and put it away. Put away your laptop, tablet, or any other electronic device.
- Take notes and pay attention. Ask questions.
- Be prepared to participate in class problem solving. Bring your calculator for class participation.
- *This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.*

**Quizzes, Exams and Grading Policies:**

- Attendance at exams is mandatory. There will be NO make-up quizzes or exams unless there is documentation provided to the Dean of Students Office to validate your absence.
- Instructors have the discretion to administer exams and/or quizzes announced in class. Exams and quizzes will comprise 50% of your grade.
- There will be a Final Exam in week 15 during Finals Week. This will be 25% of your grade.
- Quizzes / exams must have Free-Body-Diagrams. SHOW all work to earn full credit.
- We do NOT drop the lowest grade. 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, so, do all of your work, please.**

**Homework Policies:**

- Follow the syllabus and do the homework problems suggested. Quiz problems may be taken from homework problems or be very similar to the homework or those Sample Problems in the textbook. Same for exam problems.
- Do your homework. Have it ready each week. Your instructor has the discretion to modify assignments and collection policy. Upload your homework to Canvas. Watch the deadline.
- NO late homework will be accepted. NO credit for homework copied from another source.
- All homework MUST include a Free-Body-Diagram. Show all work to earn full credit.
- For more information on the format for homework and the type of paper, read the information following the course outlines.

See pages 5 and 6 for more details.

**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:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.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](mailto:dos@njit.edu)

**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 they are traveling or unavailable; and to grade uniformly and consistently.

**AI statement:** This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

**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) 596-3414. 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>)

**NJIT classes begin on Tuesday, September 2 and end on Friday, December 11, 2025.**

**F2F = Face-to-Face class lecture**

**ONL = online class lecture**

<u>WEEK</u>	<u>TOPICS</u>	<u>ARTICLES</u>	<u>Homework Problems</u> (HM1 students add problems with *)
1 – F2F Ch. 1	Concept of Stress and Strain with a Review of Statics	p. 1 -26	1.4, 1.10, 1.12, 1.24 (also 1.8* for HM1 students)
2 – F2F Ch. 1 & Ch. 2	Concept of Stresses, continued Stress and Strain - Axial Loading	p. 27-47 p. 57-79	1.32, 1.39, 1.54, 1.67 (HM1: 1.31, 1.40)* 2.1, 2.8, 2.23 (HM1: 2.17)*
3 – F2F Ch. 2	Composites, Temperature Change, and Poisson's Ratio	p. 80-95 p. 96-116	2.37, 2.39, 2.48, 2.58 (HM1: 2.38, 2.42)* 2.61, 2.64 (HM1: 2.50, 2.53, 2.69)*
4 - ONL Ch. 3	Torsion Torsional Stresses in Shafts	p. 148 167	3.1, 3.3, 3.9, 3.17 (HM1: 3.5, 3.13, 3.19)*
5 - ONL Ch. 3	Torsion, Transmission Shafts, Gear Trains, Horsepower	p. 168 193	3.21, 3.25, 3.41, 3.66, 3.76 (HM1: add 3.26, 3.75, 3.157)*
6 – F2F Ch. 4	Pure Bending ( Exam 1)	p. 237 258	4.1, 4.2, 4.3, 4.11, 4.16 (HM1: 4.17, 4.24, 4.43, 4.44)*

7 - ONL Ch. 5	Analysis and Design of Beams for Bending: Shear and Moment Diagrams	p. 347-361	<b>Draw the V &amp; M diagrams:</b> 5.9, 5.10, 5.12, 5.15 (HM1: 5.19, 5.24, 5.54)*
8 -ONL Ch. 5	Section 5.2 Develop Equations	p. 362-370 p. 373-381	<b>Write the equations for these:</b> 5.42, 5.43, 5.46, 5.47
9 – F2F Ch. 5	Section 5.3 Design / Select the Beam ( Exam 2 )	p. 408 410	<b>Design / select</b> the beam for: 5.70, 5.75, 5.77 (HM1: 5.69, 5.76, 5.78)*
10 -ONL Ch. 7	Shearing Stresses: (please read in Ch. 6) Transformations of Plane Stress (Ch. 7)	p. 417-426 p. 477-491	<b>Solve by equations:</b> 7.1, 7.2, 7.6 & 10 (HM1: 7.13, 7.14)*
11- F2F Ch. 7	Mohr's Circle for Plane Stress  Plane Strain, Strain Rosettes ( Exam 3 - tentative)	p. 492-502  p. 538-550	<b>Draw Mohr's Circle:</b> 7.31, 7.33, 7.38, 7.50 (HM1: 7.35, 7.36)* 7.128 & 132 (HM1: 7.147, 7.148)*
12 -ONL Ch. 9	Deflection of Beams, Integration Method	p. 599 622	9.10, 9.13, 9.16 (HM1: 9.8, 9.15)*
13-F2F Ch. 9	Deflection of Beams, Superposition Method / ( Exam 4 )	p. 635-648	9.73, 9.78 refer to table in FE Handbook
14-ONL Ch. 10	Column Buckling under Axial Load (tentative)	p. 691-708	10.10, 10.13, 10.19, 10.26
15	FINAL EXAM - TBA	.	.

Changes will be announced in advance.

Prepared by Milano, 8/14, 1/15, 1/16, 1/17, 8/17, 1/18, 8/18, 1/19, 8/19, 8/20, 7/21, 1/22, 7/22

**NJIT classes begin on Tues., Sept. 2 and end on Fri., Dec. 11, 2025.**

**Our Laboratory Schedule: begins on Wed., Sept. 3 in room 422-Colton Hall.**

**F2F = Face-to-Face class meeting**

**ONL = Online class using Zoom**

**Lab Groups: Exchange contact information with your lab partners. Communicate frequently.**

Wk. begins	Lab Schedule / Topics	Due
1- F2F Sept. 3	Introduction, Safety, Procedures for Lab, Instructions on how to prepare your Lab Reports, Grading Policies. <b>Meet in 422-Colton</b>	READ about Reports in Lab Manual
2 – F2F Sept. 10 F2F	Experiment 1: <b>Pre-Lab Presentation, meet in 422-Colton</b> Tension Test of Metals, Automated Testing of Steel and other metal (refer to Ch. 1 and 2 in text)	Form your lab groups.

3 – F2F Sept. 17	Experiment 1: <b>Experiment, 422-Colton Hall</b> Tension Test of Metals, Automated Testing of Steel and other metal	Formal report due week 5
4 - ONL Sept. 24	Lab Instructor will provide assistance with Analysis of Data and using Spreadsheets for the Labs and how to prepare your Lab Report	.
5 - ONL Oct. 1	Experiment 2: <b>Pre-Lab Presentation, online</b> Torsion Test of Metallic Materials (refer to Ch. 3 in text)	.
6 – F2F Oct. 8	Experiment 2: <b>Experiment, 422-Colton Hall</b> Torsion Test of Metallic Materials	Formal report due week 8
7 - ONL Oct. 15	Lab Instructor will provide assistance with Analysis of Data and guidance to complete your lab reports	.
8 - ONL Oct. 22	Experiment 3: <b>Pre-Lab Presentation, online</b> Stresses, Strains and Deflection of Steel Beams in Pure Bending (refer to Ch. 4 and 5 in text)	.
9 – F2F Oct. 29	Experiment 3: <b>Experiment</b> in 422-Colton Hall Stresses, Strains and Deflection of Steel Beams in Pure Bending	Informal report due week 11
10 - ONL Nov. 5	Experiment 4: <b>Post Lab Assistant &amp; Pre-Lab Presentation, online</b> Strain Measurements in Aluminum Beams using Strain Rosettes (refer to Ch. 7 in textbook)	.
11 – F2F Nov. 12	Experiment 4: <b>Experiment, meet in 422-Colton Hall</b>	Informal report due week 13
12 - ONL Nov. 19	Experiment 5: Pre-Lab Presentation, online Column Buckling. (Refer to Ch. 10 in textbook)	.
13 – F2F Nov. 26	Experiment 5: Column Buckling, meet in 422-Colton.	Analysis due week 14
14 -ONL Dec. 5	Submit your last lab report.	

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.

### Laboratory Safety

Your safety and the safety of those around you are of prime importance. Safety glasses must be worn at all times. 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. 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. 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, so, do all of your work, please. **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. **CITE your resources. Any material that is "copied and pasted" without reference to your source will receive no credit. Plagiarism will not be tolerated and will be reported to the Dean of Students.**

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

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.

Reports are graded on the presentation as well as results. The report should be organized in a logical format. Refer to the Report Writing module in Canvas. Results should be discussed intelligently, with good technical language. Be advised that your discussion and conclusions will count as 20% of the report. Discuss your actual values and compare them to published values. Do not simply present percent errors. State the property values. Refer to the objectives and discuss how the objectives were met. Be specific. The lab manual can help with this.

Due dates for the lab reports are listed on the syllabus. After the due date, reports will be accepted for 75% credit. Papers more than one week late will not be accepted.

**Quizzes, Exams, and Final Exam** (Attendance at exams is mandatory. Excuse absences will require appropriate documentation.) Dates are **tentative**, subject to change.

<u>DAY Sections -001 / -003</u>	<u>EVE Sections -101 / HM1</u>
Exam 1: Friday, October 10	Monday, October 13
Exam 2: Friday, November 1	Monday, November 3
Exam 3: Friday, November 15	Monday, November 17
Exam 4: Wednesday, December 3	Monday, December 1

1. Quiz/exam problems will include theory as well as numerical problems. Questions on the laboratory may also be asked.
2. All quizzes, exams and the final exam are closed books. Only the FE Handbook may be used as a resource BUT no additional notes may be written in the handbook. Other resources may be provided.
3. All answers must be accompanied by the appropriate and correct units.
4. Quizzes, exams and the final are to be taken with a fully charged calculator. Calculators may not be borrowed during the quizzes.
5. No mid-term warning notice will be given. Maintain your own records of grades.
6. Students cannot leave the classroom during quizzes or exams.
7. Cell phones (and other electronic devices) must be OFF and put away during exams.
8. A grade of "I" (incomplete) will not be given for unsatisfactory academic performance.

## Homework

1. Homework sets are due weekly and uploaded to the Canvas website.
2. Homework must be submitted in sets, arranged in order as in the course outline.
3. The homework should be written on quadrille 8½ x 11 engineering pad or equivalent. The proper form consists of doing the problems on one side of the pad paper.
4. On the top of each page, in the space provided, PRINT your name, course and **section**. **Put the problem number in the upper right corner**. Write on **ONLY** the front side of the paper.
5. All problems must have a F.B.D. or some figure to describe the problem.
6. Homework will be scanned and uploaded to the module provided on the Canvas site.
7. **NO LATE Homework will be accepted. NO credit for work copied from a solution source.**

*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.*

<u>GRADING</u>	<u>GRADE RANGE</u>	<u>GRADE</u>
Quizzes / Exams .... 50%	100 - 91	A
Final Exam ..... 25%	90 - 86	B+
Laboratory ..... 15%	85 - 81	B
Homework ..... 10%	80 - 71	C+
	70- 66	C
*NOTE: There is no grade of D for CE students.	65 - 60	D*
	59 and below	F

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

Prepared by Milano, 8/25/14, 1/8/15, 1/16, 1/17, 8/17, 1/18, 8/18, 1/19, 8/19, 1/20, 8/20, 7/21, 9/22, 7/23, 7/24, 8/25

## Outcomes Course Matrix MECH 237 – 001, 003, 101 & HM1 - Strength of Materials

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures
<b>Student Learning Outcome 1: Identify and calculate the state of stresses and strains in engineering components because of different loading conditions.</b>			
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.

<b>Student Learning Outcome 2: Analyze structural members under axial loads, bending, shear, and torsion.</b>			
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.
<b>Student Learning Outcome 3: Identify the behavior of various engineering materials, their performance under loads, and design needs.</b>			
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 in 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
- Updated 8/2025