

ME 305: Mechanics of Materials

Spring 2025

Instructor: Prof. Abigail Plummer Office: 730 Commonwealth (EMA), 217 Email: plummer@bu.edu Office Hour: M 10–11am GST: Nick Ananchenko Email: nickan@bu.edu	Lecture: 750 Commonwealth (EPC), 209 M & W, 8–9:45am Discussion: 8 St. Mary's (PHO), 201 B2: M 4:40–5:30pm (office hour) B3: W 4:40–5:30pm 750 Commonwealth (EPC), 206 B1: Th 11:15–12:05pm
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Big picture: We will quantitatively describe how forces deform materials. We will study stretching, compression, bending, twisting, shear, and inflation, focusing on simple geometries and applying lessons to engineered systems when possible.

Learning objectives:

- Understand **concepts** related to stress, strain, and mechanical properties of materials.
- Use external loads to **solve** for internal forces/stresses and deformations/strains in structures.
- Understand how to **design** structures that can withstand given external loads.

Textbook: *Mechanics of Materials* by Russell C. Hibbeler, 11th ed., Pearson

Course websites: Announcements and files will be posted to Blackboard (<https://learn.bu.edu/>). Gradescope (<https://www.gradescope.com/>) will be used for assignments.

Assignments:

- Weekly homeworks (10%): With few exceptions, homeworks will be due Friday afternoon at noon via Gradescope. Solutions will be posted shortly afterwards so extensions will not be possible. In recognition of the fact that circumstances may arise which prevent students from submitting assignments, the lowest homework grade will be dropped at the end of the semester.
- Check-up quizzes (two; 4% each): We will have two 30-minute quizzes during the semester. The problems will be related to the homework assignments turned in up to that point. Their primary purpose is to give you a chance to see how you are doing in the course to date.
- Lab reports (15% total): There will be labs during the weeks of 2/3, **2/24**, and 4/14.
- Midterm (one test, 26%): The midterm is scheduled for 3/19, the week following spring break.
- Final exam (35%): Date to be set by registrar—please do not make travel plans before the end of the exam period.
- Participation (6%): During lecture and discussion section, you will often work through problems while instructors circulate. Please come to class ready to enthusiastically participate in these exercises. A third of this grade will be automatically awarded upon completion of Reviews A and B.

Discussion sections: Discussion sessions are optional and will focus on Q&A related to homework and worked examples beyond those in lecture. Active participation in discussion can also increase your participation grade for the course.

Collaboration Policy:

- Discussion and the exchange of ideas are essential to working as an engineer. For homework assignments in this course, you are encouraged to consult with your classmates. However, after discussions with peers (or course instructional staff), make sure that you can work through the problem yourself and ensure that any answers you submit for evaluation are the result of your own efforts. In addition, you must cite any books, articles, websites, lectures, etc. that have helped you with your work using appropriate citation practices. Similarly, you must list the names of students with whom you have collaborated on problem sets.
- No collaboration is permitted on exams and quizzes.
- See the BU Academic Conduct Code (<https://www.bu.edu/academics/policies/academic-conduct-code/>) for general information on academic integrity. Behavior inconsistent with the Academic Conduct Code will be referred to the Academic Conduct Committee.

Accommodations for students with documented disabilities: If you are a student with a disability or believe you might have a disability that requires accommodations, requests for accommodations must be made in a timely fashion to Disability & Access Services, 25 Buick St, Suite 300, Boston, MA 02215; 617-353-3658 (Voice/TTY). If you qualify for extended time on exams, please provide your documentation at least a week before the first exam. If you expect to receive extended time based off previous semesters, please let us know at the beginning of the semester, even if you haven't received your documentation yet.

Schedule

Class Number	Date	Topic (subject to shift)	Readings & Assignments
1	1/22	Statics review; stress	1.1–1.4 <i>Review A out, due 1/31</i>
2	1/27	Stress; strain	1.1–1.4; 2
3	1/29	Material behavior	3.1–3.5 <i>Homework 1 out 1/31, due 2/7</i>
4	2/3	Axial loading	4.1–4.7
5	2/5	Axial loading	4.1–4.7 <i>Homework 2 out 2/7, due 2/14</i>
6	2/10	Axial loading	4.1–4.7
7	2/12	Torsion	5.1–5.5; 5.8 <i>Homework 3 out 2/14, due 2/21</i>
8	2/18	Torsion	5.1–5.5; 5.8
9	2/19	Check-up quiz Torsion	5.1–5.5; 5.8 <i>Homework 4 out 2/21, due 2/28</i>
10	2/24	Bending stresses in beams	6.1–6.5; 6.9
11	2/26	Bending stresses in beams	6.1–6.5; 6.9 <i>Review B out 2/28, due 3/7</i>
12	3/3	Bending stresses in beams	6.1–6.5; 6.9
13	3/5	Beam deflection	12.1–12.2; 12.5–12.7; 12.9
14	3/17	Midterm review	
15	3/19	Midterm <i>covering homeworks 1–4</i>	<i>Homework 5 out 3/21, due 3/28</i>
16	3/24	Beam deflection	12.1–12.2; 12.5–12.7; 12.9
17	3/26	Beam deflection	12.1–12.2; 12.5–12.7; 12.9 <i>Homework 6 out 3/28, due 4/4</i>
18	3/31	Shear stresses in beams	7.1–7.2
19	4/2	Combined loadings	8.1–8.2 <i>Homework 7 out 4/4, due 4/11</i>
20	4/7	Combined loadings	8.1–8.2
21	4/9	Check-up quiz Stress transformations	9.1–9.5 <i>Homework 8 out 4/11, due 4/18</i>
22	4/14	Stress transformations	9.1–9.5
23	4/16	Strain transformations	10.1–10.3 <i>Homework 9 out 4/18, due 4/30</i>
24	4/23	Buckling	13.1–13.3
25	4/28	Buckling	13.1–13.3
26	4/30	Energy/Review	