



Boston University College of Engineering

Mechanical Behavior of Materials

Spring 2021

Instructors:

Instructor	Prof. Scott Bunch
Office	110 Cummington Mall, Room 404
Email	bunch@bu.edu
Phone	617-353-7706
Office Hours	Friday 1:25pm-2:15pm or by appointment

Lecture:

Room	PHO 205
Time	TR 1:30-3:15pm

Course Materials:

Textbook:	<i>Mechanical Behavior of Materials</i> , N.E. Dowling, S.L. Kampe, and M.V. Kral, Fifth Edition, Pearson (2019).
Website:	Blackboard (http://learn.bu.edu)

Course Description: Fundamental concepts of modern materials behavior and materials engineering. Emphasis on analytical and numerical methods for predicting material properties and behavior, as well as some discussion of the relationships between solid structure and material properties. Topics include: constitutive relations, fracture, fatigue, plasticity, creep, damping, impact, and deformation. Elastic, plastic, and viscous behavior. Some discussion of the effects of processing--thermodynamics, kinetics--may be addressed. Specific examples from ceramics, metals, polymers, and composites is given, with the emphasis changing for each offering.

Topics Covered:

Chapter 1:	Introduction to Mechanical Behavior of Materials
Chapter 2:	Structure, Defects, and Deformation in Materials
Chapter 3:	Mechanical Testing: Tension Test and Stress-Strain Mechanisms
Chapter 4:	Mechanical Testing: Additional Basic Tests
Chapter 5:	Stress-Strain Relationships and Behavior
Chapter 6:	Review of Complex and Principal States of Stress and Strain
Chapter 7:	Yielding and Fracture under Combined Stresses
Chapter 8:	Fracture of Cracked Members
Chapter 9:	Fatigue of Materials: Introduction and Stress-Based Approach
Chapter 10:	Stress-Based Approach to Fatigue: Notched Members
Chapter 11:	Fatigue Crack Growth
Chapter 12:	Environmentally Assisted Cracking
Chapter 16:	Time-Dependent Behavior: Creep and Damping

Class Policies and Course Components

Communication: The course website is on BlackBoard (learn.bu.edu). Electronic materials will be posted periodically throughout the semester, so check the website often for updates. These will include the course syllabus, lecture slides, and homework solutions. Note that while graded assignments will be posted for your review, I do NOT use the Blackboard Grade Center to calculate semester grades. Ignore any interpretation of your grade based on whatever Blackboard-reported “points” that are displayed.

Homework: One of the best methods to learn the material is to read the text before the material is presented in class, attend and pay attention in class, and work through the assigned problem sets. The course is structured to give you ample feedback regarding your understanding of the material through the problem sets and quizzes. By working through the problem sets, you will prepare yourself for the in-class quiz, which in turn will prepare you for the in-class exams.

Another helpful practice is to alternate teaching the problems to your classmates, which will force you to think about how to tackle and solve a problem. It is common for engineers to work in groups, so keeping in mind the Ethics Code, we encourage you to form groups to work out (but not copy) the problem sets. The quizzes and exams are solo efforts, however, it is in your best interest to make sure you understand the problem set and not rely too heavily on your classmates or the GST.

A perfect homework solution (this applies to quizzes and exams as well) should be:

- (a) legible and well organized
- (b) demonstrate a thought process and worked-out steps
- (c) correct!

Each problem will be graded on a 10/7/0 scale. A high score of 10 indicates that you worked through the entire problem and came to a correct or mostly correct solution. A score of 7 indicates that you made a valiant effort and a 0 will be given for a minimal attempt or lack thereof. Partial credit will be given for all forms of evaluation, so steps (a) and (b) are in your best interest!

Please keep the following rules in mind when writing up your solution:

- (a) Your name and problem set number must appear at the top of every sheet.
- (b) Start each problem on a new page.
- (c) Indicate the final solution by drawing a solid box around it.

Problem sets will be based on lecture material, and generally will be due at the beginning of the lecture. Late problem sets are not permitted and will receive a zero.

Quizzes: (~15 mins) will be *based* on the homework problems, and will be given on the lecture *following* the homework due date. Each quiz will be graded on a 10-point scale. Your problem sets will likely not be graded and returned to you before the quiz, so please study the posted solutions to the problem sets in order to prepare for the quiz. The two lowest scores will be dropped, but if you miss a quiz **without prior arrangement**, you will be given a zero that cannot be dropped.

Exams: There will be 2 midterm examinations. They are all 1 hour and 45 minutes each.

Exam 1: Covering Chapter 1-8	Tuesday 3/16/2021
Exam 2: Covering Chapter 9-12, 16	Thursday 4/29/2021

DO NOT MAKE TRAVEL PLANS FOR THESE DATES.

Make-up exams will be given only in extreme circumstances. It is your responsibility to let your instructor know as far in advance as possible of an unavoidable conflict or medical emergency.

If you qualify for extended time on exams, per evaluation from the Office of Disability Services, it is your responsibility to present your documentation to your instructor at **least** a week before the first exam. If you expect to receive extended time based off previous semesters, please let your instructor know at the beginning of the semester, even if you haven't received your documentation yet. We cannot accommodate last-minute requests (less than a week prior to the first exam) for extended time.

Exams and quizzes are open book, open notes, and open internet. The only thing prohibited is consulting other people while taking the exam or quizzes. This includes fellow classmates, former classmates, and any online consultants. You are allowed to consult books and all other internet resources and if you use these sources they must be cited on your quiz or exam. **Failure to cite any outside help could result in a zero.**

Paper Presentations: At the beginning of every class we will have a paper presentation on a relevant materials science topic.

- A presentation on a scientific journal article related to the lecture topic of the day
- One or 2 students during each class will present
- Presentation should be 10 minutes total (8 min. presentation + 2 min. for questions)
 - You can use whatever format you wish for the presentation.
- The presentation will be grading according to the following rubric
 - Relevance to class topic 0-5
 - Clarity of the presentation 0-5
 - Correctness of the presentation 0-5
 - Ability to answer questions related to the paper 0-5
- Included with the presentation should be a 1 page summary of the paper
- The paper should be 12pt Times New Roman font single spaced and should address the following:
 - Summarize the main point/s of the paper? 0-5
 - Explain the importance of the work? 0-5
 - Mention any limitation or drawbacks to the work? 0-5
 - What are some unanswered questions or exciting possibilities for future work based on this paper? 0-5

Course Grading:

Grading for ME 306 is broken down as following:

Homework	5%
Quizzes:	30%
Exam 1:	30%
Exam 2:	30%
<u>Participation/Video Presentation:</u>	<u>5%</u>
Total:	100%

It is the student's responsibility to check with the Professors to make sure that all grades have been recorded correctly, and that you are not missing any points on the grade sheet. Inquiries about test and lab scores will be accepted up to 2 weeks after the assignment is returned. Beyond that, there will be no change in grades.

Boston University Academic Conduct Code: Honesty is a core value of Boston University. Any violations of the BU academic honesty and integrity standards ***will be pursued*** through appropriate University channels. This includes, but is not limited to: cheating, plagiarism and misrepresentation. If you have any questions as to what constitutes an honor code violation, please ask. ***Ignorance is not an excuse for cheating.*** You may access the BU Academic Conduct Code at:
<http://www.bu.edu/academics/policies/academic-conduct-code/>

Students with Disabilities: If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs can be addressed.

Religious Observation: I respect individuals' rights to follow their own religious expression. Please let me know if a religious observation conflicts with a due date.



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I have read the entire syllabus and understand that I am responsible for following the policies and deadlines outlined in the syllabus.

Name: _____

BUID: _____

Signature: _____