Boston University College of Engineering

ME 306
Prerequisites: CAS PY 212 (CH 131 recommended)

Introduction to Materials Science

Spring 2019

Instructors:

Instructor	Prof. Scott Bunch	Prof. Keith A. Brown
Office	110 Cummington Mall, Room 404	8 St. Mary's Street Rm 920
Email	bunch@bu.edu	brownka@bu.edu
Phone	617-353-7706	617-353-4841
Office Hours	T 9:45-10:45am or by appointment	W 3-4pm or by appointment

Lecture:

Section	A1	A2
Room	PHO 203	CAS B20
Time	TR 1:30-3:15pm	MW 12:20-2:05pm

Laboratory Coordinator: Kara Mogensen
karam@bu.edu
617-358-1565

Laboratory Hours:

Monday	10:10-11:55am, 2:30-4:15pm
Tuesday	9:00-10:45am, 3:30-5:15pm
Wednesday	10:10-11:55am, 2:30-4:15pm
Thursday	9:00-10:45am, 3:30-5:15pm
Friday	10:10-11:55am

Labs take place in EPIC

Teaching Assistants:

GST	Alison Lanzi	Ayesha Akter	Xuedong Zhu	Metehan Calis
Email	lanzia@bu.edu	ayesha21@bu.edu	xdzhu@bu.edu	mcalis@bu.edu

Course Materials:

Textbook: *Materials Science and Engineering: An Introduction (Ninth Edition or Etext),* by William D. Callister, Jr., John Wiley and Sons 2013

Website: Blackboard (http://learn.bu.edu)

Course Description: Structure and properties of solids; crystalline structure; defect structures; atom movement and diffusion; nucleation and growth; deformation; phase diagrams; strengthening mechanisms; heat treatment; ferrous/nonferrous alloys; ceramics; polymers; composites. Includes lab.

Course Outcomes:

As an outcome of completing this course, students will:

1. Gain an understanding of the fundamental principles of materials science.
2. Gain exposure to different classes of engineering materials.
3. Gain laboratory experience in the area of processing/structure/property correlations in materials.
4. Gain experience in working in a team environment.

5. Gain experience in communicating key engineering results in the form of class presentations and project reports.
6. Gain a clear understanding of laboratory safety issues and practices.

Topics Covered:

Chapter 1:	Introduction to Materials
Chapter 2:	Atomic Structure and Interatomic Bonding
Chapter 3:	The Structure of Crystalline Solids
Chapter 4:	Imperfections in Solids
Chapter 5:	Diffusion
Chapter 6:	Mechanical Properties of Metals
Chapter 7:	Dislocations and Strengthening Mechanisms
Chapter 8:	Failure
Chapter 9:	Phase Diagrams
Chapter 10:	Phase Transformations in Metals
Chapter 12:	Structure and Properties of Ceramics
Chapter 14:	Polymer Structures
Chapter 15:	Characteristics, Applications, and Processing of Polymers

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, quiz solutions, homework solutions, and lab documents. Note that while grade assignments will be posted for your review, we 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. Assistance will be provided in the homework review sections, so please seek out help if you need it!

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, so 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! If you are short on time (particularly for the quizzes and exams), please at least attempt to set up and show your steps for how to solve the problem. Please keep the following rules in mind when writing up your solution:

(a) Your name, section number, and problem set number must appear at the top of every sheet.
(b) Do not submit work that has ragged edges.
(c) Start each problem on a new page.
(d) 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 50 minutes each.

Exam 1: Covering Lectures 1-10	A1: Thursday 3/7, A2: Wednesday 3/6
Exam 2: Covering Lectures 11-24	TBD during final exam week

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.

Calculators are allowed during exams; all other electronic devices (cell phones, smart phones, laptops, tablets, etc.,) are prohibited.

Discussion Sections: There are no discussion sections for this course.

Homework help sections: There will be homework help sections the night before the deadline of every problem set between 5pm and 7pm in EMA 205. These are staffed by GSTs who will be available to answer questions about the problem sets.

Labs: There are four laboratory assignments during the semester.

- Students should attend their scheduled laboratory times. Making up of missed labs will be permitted only when the lab is missed for a valid reason. Valid reasons include serious documented illness or observance of a religious holiday.
- Except in cases of extreme emergency, any absence must be approved – in writing – by Prof. Bunch or Prof. Brown prior to the scheduled laboratory time.
- By 10pm the day before your lab you must submit the pre-lab survey which is available on Blackboard. (i.e. if your lab is Monday 10:10-11:55 you must submit your pre-lab by 10pm on Sunday)
- Students will not receive credit for turning in a laboratory report if they have not physically completed the laboratory exercise.

- Laboratory reports are due at 4pm on the date listed. They should be handed in at the ME main office (room 101 in 110 Cummington Mall). Electronic submission is acceptable in special circumstances and should be via email to the course professors. Late reports WILL NOT be accepted without prior approval of the course instructor. It is the responsibility of the student to make sure that submitted files can be opened without issue.

Laboratory Schedule

Week 1	1/22-1/25	No Lab
Week 2	1/28-2/1	No Lab
Week 3	2/4-2/8	No Lab
Week 4	**2/11-2/15**	**Lab Safety (Xuedong Zhu)**
Week 5	**2/18-2/22**	**Lab 1 (Virtual lab) – Lab report due 2/22 (Xuedong Zhu)**
Week 6	**2/25-3/1**	**Lab 2 - Lab report due 3/18 (Metehan Calis)**
Week 7	3/5-3/8	No Lab
Week 8	3/11/3/15	No Lab – spring break
Week 9	**3/25-3/29**	**Lab 3 – Lab report due 4/5 (Ayesha Akter)**
Week 10	4/1-4/5	No Lab
Week 11	**4/8-4/12**	**Lab 4 – Lab report due 4/19 (Alison Lanzi)**
Week 12	4/15-4/19	No Lab
Week 13	4/22-4/26	No Lab
Week 14	4/29-5/3	No Lab

Video Presentation: At the beginning of every class we will have a video presentation by 4 students on a relevant materials science topic.

- The video should be 5 minutes or less and should be relevant to the topic of the day. The topics of the day are listed on the video presentation signup sheet which is posted to Blackboard.
- A link to the video needs to be submitted to the course professors **by 8pm the day before** your presentation.
- Every student in the class will present once.
- In addition to showing the video, each group present a brief (5 minute) powerpoint presentation to discuss why they chose the video and what aspect(s) of materials science are covered.
- These presentations will be grading according to the following rubric
    - **Relevance of video to materials science 0-5**
    - **Clarity and correctness of powerpoint presentation 0-5**
    - **Clarity and correctness of spoken presentation 0-5**
    - **Ability to answer questions related to video 0-5**

Course Grading:

Grading for ME 306 is broken down as following:

Homework	5%
Lab Reports:	20%
Quizzes:	20%
Exam 1:	25%
Exam 2:	25%
Participation:	5%
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.

Classroom Courtesy: To preserve an open and distraction-free learning environment for all students, the following policies apply:

- Cell phone use is not permitted in class or during exams. This includes calls, texting, web browsing, games, etc.
- Quiet, odor-free snacks and closed drinks are permitted during class; students who arrive late having purchased food, or are consuming noisy, crunchy, etc. food will be asked to leave the classroom.
- Students disrupting class or distracting their classmates will be asked to leave the classroom.

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/

Boston University College of Engineering

Introduction to Materials Science

Spring 2019

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: _____