Materials Science and Engineering 280
Engineering Materials
Fall 2020

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Office Hours via Zoom: email for appointment

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Course Description/Objectives: The long-term objective of this course is to aid practicing engineers in materials selection and design by understanding the interplay among structure, processing, properties, and performance. This course provides a broad overview of the field and serves as the introductory course in the major field.


Prerequisite: CHEM 102 and PHYS 211

Lectures and Zoom class meetings: After the first day of class, pre-recorded lectures will be posted. We will meet as a class through Zoom approximately every other class period for in-class quizzes and group exercises (schedule TBA). I encourage you to watch the lectures at the regularly scheduled class time when do not have Zoom class meetings and review notes before in-class quizzes. The whole-class Zoom meetings will take place during the regularly scheduled class period: Tu or Th 12:30 – 1:50 PM. Please make sure you do not have any time conflicts at these times.

Quizzes will be based on specified lecture video(s) and will be held during class Zoom meeting periods. The main purposes of the quizzes are to ensure that you watch the lecture videos and learn the course topics on a regular schedule. As such, quizzes will be open book/notes but you will not be permitted to discuss with others and there will be a time limit. Quizzes will be multiple-choice or short-answer type questions and will be submitted through Gradescope.

In-class group exercises: During Zoom class meetings, after the quizzes, you will be placed in a group of ~4 students and work together on the in-class exercise sheets. These exercise sheets will contain some descriptions of new concepts that build on the corresponding video lectures and questions to help you understand these concepts. These sheets will be available prior to class on Compass. While you will work in a group, each person must submit their own answers through Gradescope (which will have the same questions as you will see on the worksheet available on Compass without the description of the concepts) to receive credit.

Grading: In-class quizzes (~10) 20% (50% for effort; 50% for correct answers)
In-class group exercises (~10) 20% (50% for effort; 50% for correct answers)
Homework (~10 problem sets) 20%
Midterm exam (tentative schedule: Oct 15, 12:30 – 2:20 PM) 15%
Final exam (comprehensive – Dec 11, 1:30 – 4:30 PM) 25%

Compass 2g (https://compass2g.illinois.edu/): Lecture videos, lecture slides, announcements, discussion board, etc.


CBTF online (https://cbtf.engr.illinois.edu/index.html): This course uses the College of Engineering Computer-Based Testing Facility service CBTF Online for its exams. The policies of the CBTF are the policies of this course, and academic integrity infractions related to the CBTF are infractions in this course. If you have accommodations identified by the Division of Rehabilitation-Education Services (DRES) for exams, please email your Letter of Accommodations (LOA) to CBTF Manager Carleen Sacris at sacris1@illinois.edu before you make your first exam reservation. If you have any issue during an exam, please inform the proctor immediately. Work with the proctor to resolve the issue at the time before logging off. Review all instructions on the CBTF website before your first exam: https://cbtf.engr.illinois.edu/cbtf-online/index.html

Accommodations: To obtain disability-related academic adjustments and/or aids, students should contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, e-mail: disability@illinois.edu, or go to the DRES website. If you are concerned you have a disability related condition that is impacting your academic progress, academic screening appointments are available on campus that can help diagnose a disability. For rare circumstances, such as extended illness and family emergencies that make it difficult for you to keep up with coursework, you should contact Professor Shim as soon as possible to discuss options. In these cases, I encourage you to reach out to the Dean of Students office, which can help you contact and manage accommodations with all of your courses.

Zoom Etiquette: Any synchronous meetings, including our classes and office hours, will be conducted on Zoom. You will need to log in to Zoom to attend the course. You can do so at: illinois.zoom.us/signin using your NetID and password. Please mute yourself if you are not speaking. A good Zoom trick is to press and hold spacebar to temporarily unmute (this is called “push to talk”). During class, you can ask questions by pushing the “raise hand” button or typing in the Zoom chat.

Academic Integrity: Honesty and integrity are fundamental to our community. Guidelines for academic integrity are detailed in Article 1, Part 4 of the Illinois Student Code. Any confirmed violations of that code will be taken seriously and may result in failure for the course.

Tentative Topics and Reading

| Introduction | Chapter 1 |
| Atomic Structure and Bonding | Chapter 2 |
| Crystal Structure | Chapter 3 |
| Polymer Structure | Chapter 4 & Chapter 14.11 |
| Imperfections | Chapter 5 |
Diffusion Chapter 6
Mechanical Properties Chapter 7
Deformation & Strengthening Chapter 8
Failure Chapter 9
Phase Diagrams Chapter 10
Phase Transformations Chapter 11
Composites Chapter 15
Materials Selection & Design Chapter 21