MSE 250: Structure & Properties of Materials

Course and Faculty Information

16 May 24 - 26 Jun 24

Course Description: This course covers basic concepts of material structure and its relation to properties. It also addresses applications to engineering problems.

The course is intended for engineering undergraduate students. A key purpose of this course is to familiarize students with fundamental concepts and terms used in MSE. It introduces the relationship between structure processing-property performance. This is different from most engineering courses in that it is based on:

- Rudimentary introduction of fundamental concepts - "an explanation can never be too clear."
- Focus on terminology - ”need to know the language."
- A limited number of select topics - "not every topic needs to be covered."
- Limited depth of presentation - ”not every detail needs to be presented."
- Student's inquiry and curiosity prevailing - ”nurture the desire to understand and apply."

Credits: 3

Prerequisites: CHM 114 or 113 with Pre- or corequisite(s): CHM 116

Instructors: Dr. David Theodore

Contact Info:

- **Dr. David Theodore**
  Email address: dtheodor@asu.edu

Office Hours: Zoom

Link - https://asu.zoom.us/j/4809657471
Office hours will be held virtually unless other arrangements are made ahead of time. We will be available online during the following timeframes. Days Times (AZ Time zone)

- Tuesday 5:30-6:15 PM (28may24, 4jun, 11jun, 18jun. 25jun24)
- Also available by email all week-days (work-days).

Please note: I will wait online for 10 minutes from the start of the office-hours session. If no students join the meeting within that 10-minute period, I will then end the meeting. If none of the above times works for you, I am also available by appointment.

Communicating with the Instructor

Technical Issus: Contact the **ASU Help Desk** for any technical issues (software, computer, site access etc.)

Course-related Questions: Please email the instructor with any course-related questions.

Use the instructor's ASU email address to communicate with him through your ASU email account.

Title your email with your course number and question topic
(e.g., Email Title = "MSE 250 - Homework 1 question").

Note that the instructor may use the Canvas email function for broadcast messages to the whole class when needed.

Course Learning Outcomes

By the end of this course, you will be able to:

1. Understand the role of materials engineers in contemporary engineering practice.
2. Understand the use and significance of families of materials, metals, polymers, ceramics, semiconductors, composites in contemporary engineering applications.
3. Understand the correlation of electronic structure and bonding of atoms to macroscopic properties.
4. Understand crystal structure and geometry and correlation to macroscopic properties.
5. Understand defects and correlation to properties such as diffusion and plastic deformation.
6. Understand and use principles of electronic band structure to explain the electronic properties of conducting, insulating, and semiconducting materials.
7. Understand methods and significance of mechanical properties of materials derived from tensile, creep, and fatigue tests.
8. Understand the use of principles of phase diagrams to understand and predict microstructures and properties of materials.

9. Understand the effects of structure and processing on properties and microstructure and hardening of steels.
10. Understand the effects of structure and processing on the properties and microstructure of commercial alloys.
11. Understand structure-processing-property relationships in polymers and composites, including thermal properties, mechanical properties, and viscoelasticity.
12. Understand structure-processing-property relationships in ceramics, including amorphous and crystalline materials used in both structural and electronic applications.
13. Understand the nature of various types of composites and structure and property relationships in composite systems.
14. Note HW assignments are due by 11:59 PM on the due date.

Exam Dates:

Please check the Modules page for details of lectures, assignments, exams and dates.

Exam 1 - due 26may24

Exam 2 - due 02jun24

Exam 3 - due 09jun24

Exam 4 - due 16jun24

Exam 5 - due 23jun24

Regular exam availability: Friday 12:01 AM - Sunday 11:59 PM on the exam date

Final exam availability: Friday 12:01 AM - Sunday 11:59 PM on the exam date

Exam Decorum: Students should keep their eyes within the confines of the laptop monitor and keyboard at all times during the exam. (If the student's eyes move to the left or right of the laptop keyboard onto their neighboring physical tabletop or physical desktop, this is being flagged as an exam violation, and the student's grade can be penalized).

If the student needs to use a sheet of paper to sketch out something to help answer a question, they should do so in FRONT of the laptop (and turn the laptop webcam to show their sheet of paper and their writing on it).

Course Format

This online course will follow a pattern.

- **Lectures** –These are videos with embedded questions.
- **Homework (Concepts, Worksheets) --** These will be due weekly, per the date posted in Canvas at the end of each week. Questions will be drawn from the eBooks assigned for this course. The HW assignments are to be submitted online via the Canvas website only. No email submissions.
- **Exams** – There are 4 exams and a final exam. The due dates are listed in the schedule.

This is a fully online course; therefore, **it requires a computer with internet access.**

Methods of Instruction:

This course uses Canvas™ for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The course content can be accessed at http://my.asu.edu. or http://myasucourses.asu.edu

- All course matter will be provided or listed (books) on Canvas
- Instructor-assigned activities will be housed in each Module in Canvas.
- Assignments are due by 11:59 PM MST on the due date.
- No late assignments will be accepted without a medical excuse.
- Only one make-up exam is allowed and only with a medical excuse from a medical professional.
- The last day to submit assignments is the day before the last day of classes.

Submitting Assignments

All assignments, unless otherwise announced, MUST be submitted to the designated area of Canvas. Do not submit an assignment via email.

Assignment due dates follow Arizona Standard time. Click the following link to access the Time Converter to ensure you account for the difference in Time Zones. Note: Arizona does not observe daylight savings time.

Grading Procedure

Grades reflect your performance on assignments and adherence to deadlines. Grades on assignments will be available within 48 hours of the due date in the Gradebook.

Your grade will be determined based on the following grading scheme:

item	percentage
Inquiry (Embedded) Questions in Lectures	10
HW concepts	20
HW worksheets	20
Exams	40
Final Exam	10

Letter Grade	Percentage	Letter Grade	Percentage
A+	> 97.0 -100%	B-	> 80.0 – 84 %
A	> 94.0 – 97.0 %	C+	> 76.0 - 80.0%
A-	> 90.0 – 94.0%	C	> 70.0 - 76.0 %
B+	> 87.0 - 84.0 %	D	> 60.0 - 70.0 %
B	> 84.0 – 87.0%	E	60.0 - 0 %

Late or Missed Assignments

Notify the instructor **BEFORE** an assignment is due if an urgent situation arises and you cannot submit the assignment on time.

Follow the appropriate University policies to request an accommodation for religious practices or accommodate a missed assignment due to University-sanctioned activities .
Students should notify faculty at the beginning of the semester about the need to be absent from class due to religious observances.
https://www.asu.edu/aad/manuals/acd/acd304-04.html

Canvas Grades

Canvas grades may not be correct during the semester. So, do not depend on the grades that Canvas shows during the semester. All assignments that are missing (after the deadline) should receive a score of 0. However, for some reason, Canvas will sometimes NOT count such missing assignments in calculating your grade. At the end of the semester, all such missing assignments will be manually set to ZERO and your grade at the end of the semester will be calculated based on that change. So, the grade points you see on Canvas during the semester may NOT be a correct representation of your final grade.

Textbooks

Required:

Intro to Materials Science – Books 1 to 7
David Theodore & Terry L. Alford, *e*-Books, Amazon.com (see links below)

- Intro to Materials Science, Book 1, amzn.com/B07BJ3K3WC
- Intro to Materials Science, Book 2, amzn.com/B07BJ3V42Z
- Intro to Materials Science, Book 3, amzn.com/B07BJ3KM71
- Intro to Materials Science, Book 4, amzn.com/B07BJ445C3
- Intro to Materials Science, Book 5, amzn.com/B07BJ3RP3X
- Intro to Materials Science, Book 6, https://www.amazon.com/dp/B07P27BXC9
- Intro to Materials Science, Book 7,https://www.amazon.com/dp/B07SH2QHM6

Optional Reference Book:

Note: If you would like a paper textbook to read along with this course, we recommend this book.
Materials Science and Engineering: An Introduction, (5th or later edition)
William Callister and David Rethwisch, e-Book

Course Access

Both my.asu.edu and myasucourses.asu.edu can access your ASU courses; bookmark both if one site is down.

Computer Requirements

This is a fully online course; therefore, **it requires a computer with internet access and the following technologies:**

- Web browsers (Chrome , Mozilla Firefox , or Safari)
- Adobe Acrobat Reader (free)
- Webcam, microphone, headset/earbuds, and speaker
- Microsoft Office (Microsoft 365 is free for all currently-enrolled ASU students)
- Reliable broadband internet connection (DSL or cable) to stream videos.

Note: A smartphone, iPad, Chromebook, etc., will not be sufficient for completing your work in ASU Online courses. While you will access course content with mobile devices, you must use a computer for all assignments, quizzes, and virtual labs.

Help

For technical support, use the Help icon in the black global navigation menu in your Canvas course or call the ASU Help Desk at +1-(855) 278-5080. Representatives are available to assist you 24 hours a day, 7 days a week.

Student Success

To be successful:

- check the course daily
- read announcements
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track
- access ASU Online Student Resources

Communicating with your Peers

Community Forum

This course uses a discussion topic called "Community Forum" for general questions and comments. Before posting a question or comment, check the syllabus, announcements, and existing posts to ensure it's not redundant. You are encouraged to respond to the questions of your classmates.

Email questions of a personal nature to your instructor. You can expect a response within 48 hours, on week-days.

Email

ASU email is an official means of communication among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

All instructor correspondence will be sent to your ASU email account.

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule: but, the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check your ASU email and the course site often.