CME 260: PROPERTIES OF MATERIALS (3 CREDIT HOURS)

Online Synchronous Class

Synchronous Class Meetings: Monday & Wednesday, 4 – 5:15 pm

Course Instructors

Sara Kadkhodaei
Office Hours: Wednesday 5:15 PM - 6 PM or by appointment via email. The office hour is online on Blackboard collaborate.
Email: sarakad@uic.edu

Teaching Assistants

Joshua Adkins
Office Hours: Monday 1:00 PM - 3:00 PM
Email: jadkin3@uic.edu

Ali Davariashtiyani
Office Hours: Thursday 1:00 PM - 3:00 PM
Email: adavar2@uic.edu

Grading Scheme

Quizzes (~15)	10 % (1 quiz per week)
Problem Sets (6)	30 % (Best 5 of 6, even weighting)
Midterm Examination	30 %
Final Examination	30 %

Important dates

Labor Day holiday. No synchronous lecture.	September 7, Monday
Thanksgiving holiday. No synchronous lecture.	November 24, Wednesday
Midterm Examination	October 13, Wednesday, 4 - 5:15 pm
Final Examination	December 8, Wednesday, 4 - 5:40 pm

Students who have a conflict with the midterm/final examination date and time should notify the instructor by the end of the first week of classes. Overlaps with other courses examinations are considered as an acceptable conflict.

Course Description

Classification of materials; Understanding of atomic bonding and crystalline structures; Introduction to the structure-property relationships; Introduction to the relationship between composition and microstructure; Introduction to mechanical behavior, thermal properties and electronic properties of metals, ceramics, and polymers. Manufacturing methods. Service performance. Materials selection. Course Information: Credit is not given for CME 260 if the student has credit for CME 261. Prerequisite(s): CHEM 112 (or CHEM 122) and MATH 181 and PHYS 141.

Course Summary

- Acquire a fundamental understanding of how structure underpins the emergent physical properties of materials
- Understand the practical aspects of materials processing and its influence on the microstructure and properties of engineering materials

Student Objectives

- Ability to formulate and solve complex materials engineering problems based on the application of materials science concepts and applied mathematics
- Ability to review experimental data from materials testing to distinguish and analyze related materials properties
- Ability to perform materials selection based on evaluation of engineering design constraints and considerations (e.g., strength requirements, processing, manufacturability)

Course Content Delivery

Weekly *Content:* The lecture content will be released to students on a week-by-week schedule. Lecture content will be available for viewing through Blackboard. Students are encouraged to review the content before attending the synchronous meetings.

Synchronous Meetings: Synchronous meetings will be held at the scheduled times using Blackboard Collaborate. The purpose of synchronous meetings will be to:

- Review the topics from that week
- Complete example problems related to the topics of that week
- Answer student questions regarding content

Synchronous meetings will also be recorded and posted to Blackboard.

Course Textbook

James F. Shackelford, *Introduction to Materials Science for Engineers*, 8th Edition
ISBN: 9780133826654, available at the UIC bookstore, through Redshelf, and on reserve at the library.

Extra Readings

Michael McNallan, *Materials for Manufacturing,* 1st edition
ISBN: 9781644960318, available at the Great River Learning

Technology Requirements/Blackboard Use:

Online students will need regular access to a personal computer that runs on a stable Internet connection. Blackboard will be used to distribute all course materials, for the submission and return of graded assignments, and for the communication of grades. Midterm and final exam will be distributed and collected using Blackboard. Expect to use blackboard for all information sharing and deliverable submission in this course, except when noted otherwise.

Attendance Policy

Attendance in synchronous meetings will be formally recorded and is required.

Course Instructor / TA Contact

The official office hours for this course is provided above. Additionally, the course instructor and TAs will offer specific appointments that may be arranged by email communication. Communication in the TA office hours will be facilitated using Zoom. Zoom meeting details will be provided via Blackboard.

Academic Integrity Policy

Students are expected to complete all assignments independently. ***Please note, the posting of any course materials to any public forum, website, or discussion group is not permitted without the express permission of the instructor***. Any unauthorized posting of materials will be treated as academic misconduct. Instances of academic misconduct by students will be handled pursuant to the Student Disciplinary Policy.

As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional integrity. All members of the campus community–students, staff, faculty, and administrators–share the responsibility of ensuring that these standards are upheld so that such an environment exists.

Religious Holidays
The instructor will make an effort to accommodate the observance of religious holidays with respect to coursework and examinations. Students wishing to observe a religious holiday during the academic term must notify the instructor by the end of the first week of classes.

Disability accommodation
The University of Illinois at Chicago is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at UIC. Students with disabilities who require accommodations for access to and/or participation in this course are welcome but must be registered with the Disability Resource Center (DRC). You may contact DRC at 312-413-2183 (v) or 773-649-4535 (VP/Relay) and consult the university resources.

Assignments
Assignments are distributed approximately every other week. The exact release week of assignments is indicated in the following table. Assignments are released on Monday morning at the beginning of the week and are due next Monday at 11:59 pm.

Late Submission Policy for Assignments
The penalty for late submission of assignments is 20%/day, up to two days (including the days of the weekend) of lateness being tolerated. After this time, the late material will NOT be marked, and a grade of zero percent will be registered for the particular part(s) of the course. Unless otherwise specified, deliverables will be due at 11:59 pm of the day indicated. Submissions must be uploaded prior to this time to Blackboard, unless otherwise indicated. In the case of multiple uploads, the TAs will only mark the last submission received before the two-day cutoff. Deliverables received after the deadline will have the full 20%/day penalty levied. Submissions may not be uploaded piecemeal. For example, a student may not submit the first 3 problems of a 6-question problem set assignment before the deadline and then the remainder 1 day late. The total assignment will be considered 1 day late. Each assignment should be submitted as a single file.

Quizzes
You will have one quiz per week in the Weekly Content tab on Blackboard. Quizzes are designed for one attempt only and multiples attempts are not allowed. When you start taking a quiz, you either submit it in time or your test will be timed out. The timing on quizzes is between 10 to 15 minutes. Quizzes are graded automatically by Blackboard and they include 1 or 2 multiple-choice questions. For timed-out or overdue attempts a grade of zero percent is automatically generated. The quizzes cannot be made up.

Course Topics

Meeting Date	Course Material	Readings
Week 1 Aug. 23 – Aug. 29	- Classifications of materials - The nature of atomic bonding	Ch. 1.1 – 1.5 Ch. 2.1 – 2.4
Week 2 [a] Aug. 30 – Sep. 5	- The nature of atomic bonding - Crystal lattices	Ch. 2.5 – 2.6 Ch. 3.1
Week 3 Sep. 6 – Sep. 12	- Crystal structures: metals, ceramics, polymers	Ch. 3.2 – 3.5
Week 4 [a] Sep. 13 – Sep. 19	- Crystal lattice positions, directions and planes - X-ray diffraction	Ch. 3.6 Ch. 3.7

Week 5 Sep. 20 – Sep. 26	- Imperfections in lattices	Ch. 4.1 – 4.5
Week 6 [a] Sep. 27 – Oct. 3	- Kinetics and diffusion in solids, Fick's laws of diffusion	Ch. 5.1 – 5.4
Week 7 Oct. 4 – Oct. 10	- Mechanical behavior	Ch. 6.1 – 6.2
Week 8 [e] Oct. 11 – Oct. 17	- Mechanical behavior	Ch. 6.3 – 6.4
Week 9 Oct. 18 – Oct. 24	- Thermal behavior of materials	Ch. 7.1 – 7.3
Week 10 [a] Oct. 25 – Oct. 31	-Electronic properties of materials	Ch. 13.1 – 13.5
Week 11 Nov. 1 – Nov. 7	- Microstructures and phase diagrams	Ch. 9.1– 9.2
Week 12 [a] Nov. 8 – Nov. 14	- Phase diagrams and lever rule	Ch. 9.3– 9.4
Week 13 Nov. 15 – Nov. 21	- Equilibrium microstructures	
Week 14 [a] Nov. 22 – Nov. 28	- Non-equilibrium microstructures - Heat treatment of metals	Ch. 10.1 Ch. 10.2
Week 15 Nov. 29– Dec. 3	- Materials selection - Case studies of materials selection	Ch. 15.1 Ch. 15.2

[e] Midterm exam

[a] Assignment release