

CME 261: Materials for Manufacturing (2 CREDIT HOURS)

Class Lectures: Monday, Wednesday & Friday, 4 – 4:50 pm

Location: Science & Engineering South (SES) 130

This is a 10-week class.

Start Date: Monday, August 22

End Date: Friday, October 28

Course Instructors

Sara Kadkhodaei

Office Hours: Friday 5-6 PM (after class).

Location: SES 130 (starting from September 9th – before then in my office at ERF 3073)

Email: sarakad@uic.edu

Teaching Assistants

Manisha Barse

Office Hours: Monday 10-11 AM

Location: SEL 1084

Email: mbarse2@uic.edu

Javier Obregon

Office Hours: Wednesday 5-5:30 PM

Location: SES 3144

Email: jobreg2@uic.edu

Grading Scheme

Quizzes (~15)	10 % (1 quiz per week)
Problem Sets (~5)	30 % (lowest grade is dropped, even weighting)
Midterm Examination	30 %
Final Examination	30 %
Final Project (Extra Credit)	+10%

Important dates

Labor Day holiday. No lecture.

September 5, Monday

Midterm Examination

September 23, Friday, 4 - 4:50 pm

Final Examination

October 31, Monday, 4:00 – 4:50 pm

Final Project (Submission due date)

December 6, Tuesday, 5:30 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; Manufacturing methods. Service performance. Materials selection. Course Information: Credit is not given for CME 261/ME 261 if the student has credit for CME 260. Prerequisite(s): CHEM 122 and CHEM 123, and PHYS 141, and MATH 181.

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

Final Project (Extra Credit - Optional)

Students have the option to work on a team final project for up to 10% extra credit toward their final grade. You will use the ThermoCalc software for simulating materials processing for manufacturing. The best selected final project will have the option to enter the nationwide and prestigious ASM (American Society of Metals) Undergraduate Design Competition during the summer of 2023. The final project topics will be released during a short lecture after the final exam. Students have more than 5 weeks to work on their projects and submit them at the due date designated above.

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 lectures.

Lecture Meetings & Office Hours: Lecture meetings will be held at the scheduled times at Science & Engineering South building room 130.

TA office hours are scheduled as indicated above. The purpose of the TA office hours will be to:

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

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 lecture meetings will be formally recorded and is required.

Course Instructor / TA Contact

The official office hours for this course are provided above. Additionally, the course instructor and TAs will offer specific appointments that may be arranged by email communication.

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 try 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/due dates of assignments are indicated in the following table.

Assignment	Release Date	Due Date
1	Monday Aug. 29 th , 1 AM	Monday September 5 th , 11:59 PM
2	Monday Sep. 12 th , 1 AM	Monday September 19 th , 11:59 PM
3	Monday Sep. 26 th , 1 AM	Monday October 3 rd , 11:59 PM
4	Monday Oct. 10 th , 1 AM	Monday October 17 th , 11:59 PM
5	Friday Oct. 21 st , 1 AM	Saturday October 29 th , 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. 22 – Aug. 28	- Classifications of materials - The nature of atomic bonding	Ch. 1.1 – 1.5 Ch. 2.1 – 2.4
Week 2 ^a Aug. 29 – Sep. 4	- The nature of atomic bonding - Crystal lattices	Ch. 2.5 – 2.6 Ch. 3.1
Week 3 Sep. 5 – Sep. 11	- Crystal structures: metals, ceramics, polymers	Ch. 3.2 – 3.5
Week 4 ^a Sep. 12 – Sep. 18	- Crystal lattice positions, directions, and planes - X-ray diffraction	Ch. 3.6 Ch. 3.7
Week 5 ^c Sep. 19 – Sep. 25	- Imperfections in lattices	Ch. 4.1 – 4.5
Week 6 ^a Sep. 26 – Oct. 2	- Kinetics and diffusion in solids, Fick’s laws of diffusion	Ch. 5.1 – 5.4
Week 7 Oct. 3 – Oct. 9	- Microstructures and phase diagrams	Ch. 9.1– 9.2
Week 8 ^a Oct. 10 – Oct. 16	- Phase diagrams and lever rule	Ch. 9.3– 9.4
Week 9 ^a Oct. 17 – Oct. 23	- Equilibrium microstructures	Ch. 9.4
Week 10 Oct. 24 – Oct. 30	- Non-equilibrium microstructures - Heat treatment of metals	Ch. 10.1 Ch. 10.2
Week 11 ^c Oct. 31	Final Exam	

^c Midterm/Final exam

^a Assignment release