

The University of Texas at Austin
Department of Chemical Engineering
ChE 350: Chemical Engineering Materials

UNIQUE #: 15395, SPRING 2022

CLASS TIMES: 10:00 am – 11:00 am on Mondays, Wednesdays, and Fridays in CPE 2.216

RECITATION TIMES: 8:00 am – 9:00 am on Tuesdays in PMA 7.114

Instructor: Wennie Wang

Office: zoom or CPE 4.450

Office hours: Wednesdays 5pm and by appointment

Email: wwwennie@che.utexas.edu

Phone: 512-471-9894

Pronouns: she/her/hers

TA: Suzana Ivandic

Office: zoom or EER 4.614

Office hours: Thursdays 3pm and by appointment

Email: sivandic@utexas.edu

Phone: 501-545-6512

Pronouns: she/her/hers

Course Description

This course is an introduction to the fundamentals and application of materials science and engineering. Materials science is about understanding and predicting how (solid-state) materials respond to various stimuli (e.g., thermal, chemical, mechanical, optical, electrical), and using that understanding to engineer better materials. We will explore what this means in various systems, including metals, ceramics, polymers, and modern materials. Topics will include crystal structures, phase diagrams, diffusion, mechanical properties, and optoelectronic properties with an emphasis on structure-property-processing relationships.

Prerequisites: Chemical Engineering major or consent of instructor.

Course materials

Main text: William D. Callister and David G. Rethwisch. Materials Science and Engineering: An Introduction. Publisher: John Wiley and Sons; 9th (ISBN: 978-1-118-32457-8), or 10th ed. (ISBN: 978-1-119-40549-8)

The assigned readings will come from Callister and Rethwisch. The class will include supplemental videos and reading materials, which will be posted on Canvas announcements and may appear on future quizzes.

Course Outline

All instructions, assignments, readings, rubrics and essential information will be on the Canvas website at utexas.instructure.com. Any changes to the course and announcements will be made on Canvas in as much advance time as possible. **Please be sure to check Canvas regularly.**

Course Requirements and Grading

Coursework: This course will consist of keeping up with reading, homeworks, quizzes, three exams, and one final project report.

Course devices:

- Please be sure to have a device with access to your Canvas student account when participating in lectures. We will use Canvas for various polls.
- It is recommended to have a **non-programmable** (i.e., cannot store information or formulas) calculator. A calculator that is capable of basic arithmetic functions, exponents, logarithms, parentheses is ideal. For exams, only non-programmable calculators will be allowed.

Course mode: Face-to-face unless otherwise specified. Lectures will be recorded and made available on Canvas. All students have the option to attend virtually. Regardless of your attendance type, it is highly recommended to keep up to date with the course content. Please contact Prof. Wang if you have any questions/concerns.

GRADES

Coursework Breakdown:

- Homeworks (10%): Due at the beginning of class (10:00am) on Mondays, upload to Canvas. **Late work:** Work timestamped later than the specified time will lose 1% per minute late unless arranged with the instructor and TA ahead of time.
- Quizzes (15%): At the start of recitation, Tuesdays. Lowest quiz dropped.
- In-class participation (5%): surveys, class discussion, in-class activities
- Mid-term Exams (**02/22, 03/29, 04/26, Tuesdays**) (60%, 20% each)
- Final Project (10%)

Grade breakdown:

> 88% (A), 88-86% (A-), 82-86% (B+), 75-82% (B), 71-75% (B-), 68-71% (C+), 58-68% (C), 55-58% (C-), 50-55% (D), < 50% (F)

COURSE TIPS FOR SUCCESS

Regular Participation: Lecture, office hours, and recitation are all opportunities for you to interact with the course material and with us, the instructor and TA. We are here to help you learn and succeed. Ask questions and ask frequently!

Keep up with the material: These include but are not limited to attending lectures regularly, going through the assigned reading material before class, doing the homework assignments, checking Canvas regularly.

Enjoy the learning process: Materials science is a rapidly expanding and exciting field. There will be challenging topics, but you will (hopefully) have a deeper appreciation of the materials around you.

LECTURE TOPICS

* Readings and supplementary materials will be posted periodically

* Subject to change

Class Topic	Reading (Callister)
Introduction to Materials	Ch 1
Atomic Structure and Interatomic Interactions	Ch 2
Crystallographic systems, directions, planes	Ch 3, parts of Ch 12
XRD and Diffraction	Ch 3
Crystallographic defects	Ch 4
Diffusion in solids	Ch 5
Nucleation and Kinetics	parts of Ch 10
Exam: Tuesday 02/22	
Mechanical Properties of metals and ceramics	Ch 6, parts of Ch 7 & 12
Materials failure- fracture	Ch 8
Materials failure- corrosion	Ch 17
Phase diagrams and phase transformations	Ch 9
Exam: Tuesday 03/29	
Polymers: structure, properties, and synthesis	Ch 14 and 15
Electronic structure and properties	Ch 18
Optical properties of materials	Ch 21
Magnetism	Ch 20
Exam: Tuesday 04/26	
Materials and the Environment	Ch 22
Modern Materials Technologies	
Final Project Report, due on day of Final Exam	

Course Policies

OFFICE HOURS

Office hours are open-door policy, meaning you are welcome to discuss topics including and beyond the course material (e.g., career advice, doing research). Please come by!

We will do either completely in-person office hours or completely remote office hours, as announced on Canvas.

Please also let Prof. Wang know if you have any announcements you would like given at the start of class (e.g., student org events, general useful knowledge).

COLLABORATING ON HOMEWORKS

You are allowed to collaborate (i.e., discuss, brainstorm) with your classmates in small groups (~3-5) on the homeworks. The work you turn in must entirely reflect your own work (e.g., you may not simply copy each other's answers). If you choose to collaborate, please list the names of the people you worked with for that particular assignment at the top of the first page.

No collaboration or discussion with others is allowed on exams or the final project.

ACADEMIC INTEGRITY EXPECTATIONS

You are expected to uphold all standards of academic integrity described in the University Code of Conduct and the Student Honor Code.

Students who violate University rules on academic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on academic dishonesty will be strictly enforced.

For further information, please visit the Student Conduct and Academic Integrity website at:

<http://deanofstudents.utexas.edu/conduct>.

CONFIDENTIALITY OF CLASS RECORDINGS

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

SHARING OF COURSE MATERIALS IS PROHIBITED

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class without explicit, written permission of the instructor. Unauthorized sharing of materials promotes cheating. The University is well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to [Student Conduct and Academic Integrity](#) in the Office of the Dean of Students. These reports can result in sanctions, including failure of the course.

GETTING HELP WITH TECHNOLOGY

Students needing help with technology in this course should contact the [ITS Service Desk](#).

University Resources for Students

SERVICES FOR STUDENTS WITH DISABILITIES (SSD)

I am committed to creating an accessible and inclusive learning environment in this class. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information:

<http://diversity.utexas.edu/disability/>.

If you are already registered with SSD, please discuss with and/or deliver your Accommodation Letter to Prof. Wang at the start of the semester your accommodations and needs in this course.

COUNSELING AND MENTAL HEALTH CENTER (CMHC)

If you or anyone you know is experiencing symptoms of stress, anxiety, depression, academic concerns, loneliness, difficulty sleeping, or any other concern impacting your wellbeing – you are strongly encouraged to connect with CMHC. The Counseling and Mental Health Center provides a wide variety of mental health services to all UT students including crisis services, counseling services with immediate support and well-being resources. Additionally, CARE Counselors are located within the academic schools and colleges. These counselors get to know the concerns that are unique to their college's students. For more information on CMHC, visit <https://cmhc.utexas.edu> or call 512-471-3515.

Important Safety Information

If you have concerns about the safety or behavior of fellow students, TAs or professors, contact BCCAL (the Behavior Concerns and COVID-19 Advice Line) at <https://safety.utexas.edu/behavior-concerns-advice-line> or by calling 512-232-5050. Confidentiality will be maintained as much as possible, however the university may be required to release some information to appropriate parties.

CLASSROOM SAFETY AND COVID-19

To help preserve our in-person learning environment, please consider the following:

- Adhere to university [mask guidance](#). Masks are strongly recommended inside university buildings for vaccinated and unvaccinated individuals.
- [Vaccinations are widely available](#), free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated.
- [Proactive Community Testing](#) remains an important part of the university's efforts to protect our community. Tests are fast and free.
- We encourage the use of the [Protect Texas App](#) each day prior to coming to campus.
- If you develop COVID-19 symptoms or feel sick, stay home and contact the [University Health Services'](#) Nurse Advice Line at 512-475-6877. If you need to be absent from class, contact [Student Emergency Services](#) and they will notify your professors. In addition, to help understand what to do if you have been had close contact with someone who tested positive for COVID-19, see this [University Health Services link](#).
- [Behavior Concerns and COVID-19 Advice Line](#) (BCCAL) remains available as the primary tool to address questions or concerns from the university community about COVID-19.
- Students who test positive should contact [BCCAL](#) or self-report (if tested off campus) to [University Health Services](#).
- Visit [Protect Texas Together](#) for more information.

TITLE IX DISCLOSURE

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, to report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit <http://www.titleix.utexas.edu/>, contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419. Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as sexual misconduct, including the types of sexual misconduct covered under Texas Senate Bill 212. The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors.

Faculty members and certain staff members are considered “Responsible Employees” or “Mandatory Reporters,” which means that they are required to report violations of Title IX to the Title IX Coordinator. **I am a Responsible Employee and must report any Title IX-related incidents** that are disclosed in writing, discussion, or one-on-one. Before talking with me or with any faculty or staff member about a Title IX-related incident, be sure to ask whether they are a responsible employee. If you want to speak with someone for support or remedies without making an official report to the university, email advocate@austin.utexas.edu. For more information about reporting options and resources, visit the [Title IX Office](#) or email titleix@austin.utexas.edu.