MECH 210 – Materials Science and Engineering, Spring 2021

Instructor: Chuen H. Hsu, PhD

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Office hours: WF 10:00-11:50 AM on Zoom:
https://csuchico.zoom.us/j/89165938088?pwd=Z0NhYXJiRktFRU4xc3FBWnFXR01Edz09

Zoom meeting ID: 891 6593 8088, Passcode: 093519

Class times: MWF 9:00-9:50 AM on Zoom

Classroom: URL for lectures on Zoom:
https://csuchico.zoom.us/j/85878514624?pwd=b0xVNXBsWklZdE1oUjM5NWs5WWZhQT09

Zoom meeting ID: 858 7851 4624, Passcode: 418270

Prerequisites: CHEM 107 or CHEM 111, PHYS 202A or PHYS 204A

Corequisite: MECH 210L for MECA, MECH, and SMFG majors only

Course Usage of Blackboard Learn

Copies of the course syllabus and major assignments may be found on Blackboard Learn. You are responsible for regularly checking the online resources, which is accessed through the Chico State Portal.

Course Description and Goals

Processing, structure, properties, and performance of engineering materials. Applied knowledge of material properties as engineering design parameters. Advanced manufacturing processes, including microfabrication are discussed.

Student Learning Objectives

Upon successful completion of this course, students are expected to have knowledge of

1. Atomic bonding, crystal structures and microstructures of materials. Molecular structures of polymeric materials.
2. Microstructural imperfections and their effects on properties of materials.
3. Fick's Laws and steady state and non-steady state diffusion.
4. Elastic, plastic, viscoelastic deformation of materials.
5. Dislocations, Effects of cold work on material properties.
6. Strengthening methods of materials.
7. Fundamental fracture mechanics of materials.
8. Various methods of mechanical testing and property analysis.
9. Processing methods of materials.
10. Phase diagrams and applications in material processing.
11. Ceramic materials.
12. Polymers and composite materials, and processing methods.

13. Electrochemical corrosion, corrosion rate, and prevention of corrosion.
14. Oxidation of metals.

Textbook

Materials Science and Engineering: An introduction, 8th edition by William D. Callister, Jr. and David G. Rethwisch. John Wiley & Sons, Inc., ISBN 978-0-470-41997-7
(older or newer editions, 6th to 9th editions may be used)

Classroom Protocol

On-time class attendance is required. For on-line classes, some common expectations include, but limited to:

1. Students are initially muted on entry, unmute only when there is a need to communicate with the instructor and the class.
2. Avoid inappropriate talk and material. No screen sharing without instructor's permission.
3. No disruptive behavior that interferes with or obstructs the teaching or learning process in the context of a classroom or educational setting.
4. Respect others' privacy.

Dropping and Adding

You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc., found at https://www.csuchico.edu/sro/registration/class-add-drop.shtml . There are new deadlines and penalties for adding and dropping classes.

Assignments, Tests, and Grading Policy

Assignments

About ten problem sets will be assigned for the semester. These problem sets will be posted on the Blackboard Learn class site. Solutions are due in one document *in* pdf *format* by the dates specified. *No late homework will be graded*.

Homework solutions should be arranged in numerical order of problem numbers with all pages numbered. Class number and your name should be shown on the first page. The final answer of all problems should be enclosed in a box. At least half of the problems will be graded. Solution key to the problems will be posted on the Blackboard class website.

Tests

There will be unannounced in-class quizzes (10 minutes each), two midterm tests (50 minutes each) and a final exam (2 hours) for the semester. All tests are open-book. Midterm tests primarily cover the topics discussed after the previous test. The final exam is comprehensive.

There will be no makeup quizzes. Makeup midterm tests will be given only with documented compelling reasons. Students will take the final exam on the day and time scheduled by the university.

Answers to the test problems should include relevant work in a logical order with explanation where necessary. When calculation is needed to arrive at a final answer, formulas used along

with numerical substitutions and correct units should be clearly shown. A complete and correct answer is necessary for full credits.

Grading Policy

The overall course grade will be based on homework, attendance, quizzes, midterm tests, and final exam.

Homework	25%
Quizzes and attendance	10%
Midterm test	40%
Final exam	25%

A	≥ 85%
B	75% - 84%
C	65% - 74%
D	60% - 64%

A minimum of 60% of combined grade of 75% for all tests, that is 0.6[10%+40%+25%] = 45%, is also required to pass the course.

University Policies and Campus Resources

Academic Integrity

Students are expected to be familiar with the University's Academic Integrity Policy. Your own commitment to learning, as evidenced by your enrollment at California State University, Chico, and the University's Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Judicial Affairs. The policy on academic integrity and other resources related to student conduct can be found on the Student Judicial Affairs web site.

Americans with Disabilities Act

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

Accessibility Resource Center
530-898-5959
Student Services Center 170
arcdept@csuchico.edu

MECH 210 – Materials Science and Engineering
Lecture Topics

Week	Days	Topics	Readings
1	1/25 – 1/29	Introduction Crystal structures, Crystallographic position, direction, plane, and indices	Chapter 2 3.1 – 3.10
2	2/1 – 2/5	Volume, planar, and linear densities, Crystal analysis, X-ray diffraction	3.11 – 3.17
3	2/8 – 2/12	Imperfections in solids	4.1 – 4.11
4	2/15 – 2/19	Diffusion	5.1 – 5.6
5	2/22 – 2/26	Mechanical properties of metals (**Test 1**)	6.1 – 6.12
6	3/1 – 3/5	Dislocations, Strengthening mechanisms	7.1 – 7.13
7	3/8 – 3/12	Failure	8.1 – 8.15
8	3/15 – 3/19	University Holidays, no classes	- - - -
9	3/22 – 3/26	Phase Diagrams	9.1 – 9.13
10	3/29 – 4/2	Gibbs phase rule, Fe-Fe_3C phase diagram, Phase diagrams of alloys	9.14 – 9.20
11	4/5 – 4/9	Phase transformation, Development of microstructure (**Test 2**)	10.1 -10.9
12	4/12 – 4/16	Applications and processing of metal alloys	11.1 – 11.9
13	4/19 – 4/23	Ceramics, Polymeric structures	12.1–1 –12.9 14.1 – 14.14
14	4/26 – 4/30	Characteristics, applications, and processing of polymers	15.1 – 15.24
15	5/3 – 5/7	Composites	16.1 – 16.15
16	5/10 – 5/14	Electrochemical corrosion, Corrosion rate, Oxidation	17.1 – 17.4, 17.10
17	***5/17* (*Mon*)**	***Final Exam***, *10:00 – 11:50 AM*	