

ENGR 045 Course Calendar Fall 2021

Syllabus for ENGR 045-01: Introduction to Materials Science and Engineering

Fall 2021

Instructor: Svetla Gargova

Designation: Introduction to Materials Science and Engineering

Catalog Description: Relationship between the structure, processing, properties, and performance of materials. The application of physical and chemical principles in the context of engineering materials: atomic bonding, crystal structure, defects, thermodynamics, and kinetics.

Text Books and Other Required Materials:

Materials Science and Engineering: An Introduction, 10th Edition WileyPLUS Student Package by Callister, Inclusive Access.
ISBN: 9781119659297

Course Objectives/ Student Learning Outcomes:

Students will apply basic knowledge of physics, chemistry, mathematics, and biology to develop an understanding of how structure and processing affect the properties and performance of materials. Students will learn the basic principles of materials selection. Students will also become quite adept at thinking in 3D. Students will be able to

- identify which material properties must be optimized for particular applications,
- identify candidate materials that, because of their composition and structure, exhibit those properties, and
- design viable processing strategies that achieve the necessary chemical and physical microstructures in the chosen material.

Students will practice these skills – and hone the appropriate information

– gathering computational and data-handling proficiency – in homework, laboratory, and discussion exercises. Students will demonstrate these skills and proficiency formally in the midterm and final examinations.

Prerequisites by Topic: CHEM 2 and MATH 21 and PHYS 8, or consent of instructor.

Course Policies:

1. Be on time with all class assignments and labs. Tardiness is discouraged.
2. No late assignments will be accepted. Medical or family emergencies will be considered on a case-by-case basis.

3. No make-up quizzes and exams. If you miss the exam, a zero score will be assigned to the missed quiz and exam.
4. Homework assignments are to be submitted by the due date. You may discuss homework problems with your classmates, but you are responsible for your own work.
5. You are encouraged to read the sections in the textbooks related to the covered topics prior to the lecture as well as after.
6. After an assignment grade has been posted online, students must see the instructor within one week if they wish to discuss the assignment grade and their work. University's rules on academic honesty concerning exams and individual assignments will be strictly enforced. See UC Conduct Standards: <http://studentlife.ucmerced.edu/what-we-do/student-judicial-affairs/uc-conduct-standards>

LABORATORY / DISCUSSIONS/PROJECTS. (10%) Learning a subject is enhanced by doing the subject - working in the laboratory, discussing concepts, and solving (many) practice problems. Your Laboratory/Discussion Sections (L/Ds) are designed to support your efforts to learn the course material by working with it in as many ways as possible. You will experience a variety of practical, computational, and analytical exercises in the L/Ds. The material covered in the L/Ds can and will be included in homework, quizzes, midterms, and final exams.

HOMEWORK (20%). Homework is a critical component of this course and is designed to help you learn, understand, and practice the material. Assignments can be found in the weekly Module and posted on Canvas. Homework will be given on regular basis, once per week, or after each chapter. You will have about a week to complete the homework, use the "End of Week X Checklist" to see all due dates and times. Late homework will not be accepted. You are encouraged to work with your peers when doing homework. However, each student must turn in his/her own homework assignment and it must reflect his/her own work. You must explicitly identify all peers with whom you worked and list their names on the first page of your homework. Verbatims will receive a grade of zero for the assignment.

QUIZZES (15%). Weekly quizzes will be administered throughout the semester except for Week 1.

EXAMS (25%). There will be two synchronous midterms as indicated on the accompanying schedule. There will be no make-up exams unless you are sick during a regularly scheduled exam. Please provide a note from the university clinic or your own doctor to verify your illness. Crib sheets will not be allowed during any of the exams. However, calculators will be allowed when necessary, provided that they are not used to store data or formulas pertaining to the course. During the examinations, you must do your own work. Any collaborative behavior or verbatims will result in zero points for the test.

FINAL EXAM (20%). The final is a synchronous comprehensive exam.

MATERIALS ESSAY (10%). 10% of your overall grade is from the Material Essay. Please see the Materials Essay Module for detailed guidelines.

DROPPING THE COURSE. Please see the UC Merced General Catalog and the Registrar's / Student First website for details.

CatCourses. The CatCourses site "Fall 2021-ENGR 045 01" will be used for periodic course announcements, and for the distribution of class notes, L/Ds exercises, homework sets. You can also check the scores that you have received on your homework assignments, quizzes, and exams. Warning: pay no attention to any letter grade that is reported on CatCourses, except for the midterm and final grades. Handouts for a given week will normally be posted during the preceding weekend and can be annotated electronically or printed. To encourage you to take effective notes, and to think about the material, the lecture slides are "ready-to-write only".

CONDUCT. Note that most of the handouts provided in this course are protected by copyright, and are flagged accordingly on CatCourses. They are for your personal use only. Re-posting the files or their contents on sites such as (for example) "Course Hero" is an explicit violation of this copyright. Students and instructors are expected to honor UC Merced's Founding Principles of Community: http://www.ucmerced.edu/about_ucmerced/values.asp .

FINAL THOUGHTS. If you are in trouble (behind in homework, doing worse in the course than you would like, etc.) for whatever reason, please let us know. We'll try to help! As is always the case at university, there is quite a lot of material in this course, and not a lot of time in which to learn it. There are many resources available to help you. We strongly encourage you to take advantage of them. Because this is a 4-unit course, you should plan to do at least 20 hours of work on it, per week. Here is one suggestion for how to spend this time effectively:

Ø Reading the textbook ahead of the lectures: 4 hours/week;

Ø Attending the lectures: 3 hours/week;

Ø Attending and participating in lab/discussion: 3 hours/week;

Ø Homework, Quizzes, and Projects: 6 hours/week;

Ø Review, and preparation of review notes: 4 hours/week.

Academic Dishonesty Statement:

It is a good idea to explicitly block out time for all these activities in your schedule. The same is true for your other courses too!

1. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.
2. You are encouraged to study together and to discuss information and concepts covered in lectures and the sections with other students. You can give "consulting" help or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by

someone else, in the form of text, email, an email attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. The penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

3. During examinations, you must do your own work. Any collaborative behavior during the examinations will result in failure of the exam and may lead to failure of the course and University disciplinary action.
4. During examinations, you must do your own work.
5. If you put your name on any work, it will be assumed that you know the work, and have not copied it!
6. A grade of zero will be given for assignments containing at least one verbatim problem.

Disability Statement: Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design, and diversity. Any student who feels he or she may need accommodation based on the impact of a disability should contact me privately to discuss his or her specific needs. Also, contact Disability Services at (209) 228-7884 as soon as possible to become registered and thereby ensure that such accommodations are implemented in a timely fashion.

Topics: Introduction

Atomic Structure & Interatomic Bonding

The Structure of Crystalline Solids

Imperfections (Defects) in Solids

Diffusion,

Mechanical Properties of Metals

Dislocations & Strengthening Mechanisms

Failure

Phase Diagrams

Development of Microstructure and Control of Mechanical Properties in Metals

Applications and Processing of Metal Alloys

Structures and Properties of Ceramics

Applications and Processing of Ceramics

Polymer Structures

Characteristics, Applic. & Processing of Polymers

Composites

Corrosion and Degradation of Materials

Electrical Properties

Thermal Properties

Magnetic Properties

Class/Laboratory Schedule:

Midterm/Final Exam Schedule:

MIDTERM 1 -

MIDTERM 2 -

FINAL EXAM,

Course Calendar: Please consult ENGR 45 course schedule.

Assessment/Grading Policy:

- Homework (20%)
- Labs (10%)
- Quizzes (15%)
- Midterms (25%)
- Materials Essay (10%)
- Final Exam (20%)

Grade Distribution Grade Total Scores (%)

A+ 96 +

A 93 - 96

A – 90 - 93

B+ 86 – 90

B 83 - 86

B – 80 - 83

C+ 76 - 80

C 73 - 76

C – 70 - 73

D + 65 – 69

D 62 - 65

D – 58 - 62

F < 58

Coordinator: Svetla Gargova

Information: Email: sgargova@ucmerced.edu

Office: 146 Academic Office Annex

Zoom Office Hours: Thursday from 1:20 pm to 2:20 pm or by appointment.

Teaching Assistants (TAs):

Hansong Lee - Email: hlee287@ucmerced.edu

Office Hours: Thursdays 1:30-3:30 pm, SE2 Lobby

Samuel Chiovoloni - Email: schiovoloni@ucmerced.edu

Office Hours: Monday, Wednesday 11:00-12:00, SE2 Lobby