



## Syllabus for ENGR045-01: Introduction to Materials

Fall 2017

Instructor: Svetla Gargova

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| <b>Designation:</b>  | Introduction to Materials   |
| <b>Catalog Description:</b>                                  | 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.  |
| <b>Text Books and Other Required Materials:</b>              | Materials Science and Engineering: An Introduction, 9th Edition, 2014, by William D. Callister, Jr. and David G. Rethwisch. This book is required for the course. ISBN: 1-1183-2457-9; ISBN13: 978-1-1183-2457-8  |
| <b>Course Objectives/<br/>Student Learning<br/>Outcomes:</b> | <p>Students will apply a 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.</p> <p>Students will be able to</p> <ul style="list-style-type: none"><li>• identify which material properties must be optimized for particular applications,</li><li>• identify candidate materials that, because of their composition and structure, exhibit those properties, and</li><li>• design viable processing strategies that achieve the necessary chemical and physical microstructures in the chosen material.</li></ul> <p>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.</p>   |
| <b>Prerequisites by Topic:</b>                               | CHEM 2 and MATH 21 and PHYS 8, or consent of instructor.  |
| <b>Course Policies:</b>                                      | <p><b>LABORATORY / DISCUSSION SECTIONS.</b> 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. None of these will be graded, but attendance is mandatory, 5% of the course grade. Material covered in the L/Ds can and will be included on homework, midterms and final exams.</p> <p><b>HOMEWORK/ QUIZZES.</b> Homework is a critical component of this course and is designed to help you learn, understand and practice the material. Homework will be assigned frequently throughout the semester and collected at the beginning of class, unless otherwise stated. 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. Homework based quizzes will be administered throughout the semester in class or in lab.</p> |

EXAMS. There will be two in-class midterm as indicated on the accompanying schedule and also be a comprehensive final exam. There will be no make-up exams, unless you are sick during a regularly scheduled exam. Please bring a note from the university clinic or your own doctor verifying 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 will result in zero points (failure) for the particular test.

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

CatCourses. The CatCourses site "Fall 17-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 grade. 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 "read 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](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 25 hours of work on it, per week. Here is one suggestion for how to spend this time effectively:

- Reading the textbook ahead of the lectures: 4 hours/week;
- Attending the lectures: 3 hours/week;
- Attending and participating in lab/discussion: 3 hours/week;
- Homework: 6 hours/week;
- Review, and preparation of review notes: 4 hours/week.

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!

**Academic Dishonesty  
Statement:**

- a) 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.
- b) You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to 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 an e mail, an e mail 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. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

c) During examinations, you must do your own work. No cellphone allowed!

d) Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. 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.

e) If you put your name on any work, it will be assumed that you know the work, and have not copied!

**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. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

**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

Optical Properties

Biomimetic Materials

Economic, Environmental and Societal Issues in MSE

**Class/laboratory**

**Schedule:**

ENGR-045-01 Lecture 30923 TR 12:00-1:15pm CLSSRM 105; ENGR-045-02L 30924 M 8:00-10:50am SE2 160; ENGR-045-03L 30925 T 7:30-10:20am SE2 160; ENGR-045-04L 30926 W 8:00-10:50am SE2 160; ENGR-045-05L 31032 LAB R 7:30-10:20am. SE2 160; ENGR-045-06L 34553 LAB R 1:30-4:20 pm. SE2 160; ENGR-045-07L 34811 LAB T 1:30-4:20 pm. SE2 160

**Midterm/Final Exam**

**Schedule:**

MIDTERM 1 - TBA

MIDTERM 2 - TBA

**Course Calendar:**

FINAL EXAM, Thursday, December 14 from 8:00 am to 11:00 am in COB 105.

Please consult ENGR 45 course schedule.

**Professional  
Component:**

**Assessment/Grading  
Policy:**

- Homework/Quizzes/Labs (20%).
- Midterms (40%)
- Materials Essay (10%)
- Final Exam (30%)

Grade Distribution: Please see UC Merced grading policy.

**Coordinator:**

Svetla Gargova

**Contact Information:**

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Office: AOA 146

**Office Hours:**

Thursday

From 1:30 pm to 2:30 pm in AOA 146

or by appointment