

ENGR 54: Syllabus
Principles of Materials Science and Engineering
Spring Quarter, 2014

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Office Hours: Tuesdays, 4:30 – 5:30 pm in ET 602 (starting week 2) or by appointment

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Required Textbook: Materials Science and Engineering: An Introduction (9th Edition), by William D. Callister, Jr. and David G. Rethwisch

ISBN: 978-1-118-56243-7 (Hardcover Version w/ Wiley Plus)

Textbook available through the UCI bookstore or from the publishers website at:

<http://www.wiley.com/WileyCDA/Section/id-820326.html>

Note that both the course textbook and WileyPlus access are indicated as “required”. You will be held accountable for required reading in the course textbook, aside from topics specifically covered during lectures and discussion periods.

A bundled version of the textbook and WileyPlus is available in the bookstore and direct from the publisher. We will be making heavy use of the WileyPlus tools, for homework assignments and other learning exercises. A stand-alone WileyPlus access code may also be obtained directly from the publisher, if you chose to utilize a “used” copy of the textbook. However, if you chose to make use of alternatives to the course textbook bundle, it is your responsibility to ensure that you have access to all necessary course learning materials.

Iclickers: The ‘i-clickers’ remotes are an additional required item for this course. Each student must acquire one for this course, and register it by accessing the website:

<http://www.iclicker.com/registration/>. These can be purchased from the campus bookstore. I-clickers will be utilized in lectures and discussion sections throughout the quarter (including this first day of lecture). You should bring your ‘i-clicker’ to all lecture and discussion periods. Once you purchase the remote, you need to register it on the vendor website. The ID number for your

transmitter is provided with the unit you purchase, and will be needed to register the transmitter. You are responsible for maintaining your transmitter, including batteries. No loaners will be available. If you've purchased a transmitter for another class (such as physics or biology), you may be able to use this unit for this course – but only if it is an 'i-clicker' RF transmitter.

Course Website: <https://eee.uci.edu/14s/13000>

Lecture notes will be posted on the class website.

Course Objectives and Topics:

- Atomic Bonding
- Crystal Structures in Metals and Ceramics
- Defects
- Diffusion Mechanisms
- Elastic Properties
- Plastic Deformation
- Strengthening Mechanisms in Alloys
- Failure and Fracture of Materials
- Phase Diagrams
- Steel and Phase Transformations
- Metal Alloys
- Ceramics
- Polymers
- Semiconductors
- Composites

Discussion Sections: The discussion section each week will focus on problem solving relevant to the next week's homework, and reinforcing lecture concepts. Note that the discussion is a critical part of E54 and is used to teach problem solving within the realm of materials concepts. You should come to the discussion sections prepared with questions. Quizzes will be given each week, at the beginning of each discussion session, to test your current understanding of the material. You need to bring your i-clicker with you to the discussion sessions, and be prepared to use it during each session, as is the case with the lecture periods.

UCI is closed on Monday, May 26th. There will be no discussion sections held this week.

Attendance Policy: Attendance is *not* required for the lectures – but is viewed as essential to your performing well in the class. Course credit will be assessed through weekly quizzes administered through the use of the *i-clickers* at the beginning of each discussion period. *i-clicker* responses recorded during *lectures* are not formally a part of the course grade scheme, but are tracked – and will allow the instructor leeway to improve borderline grades at the conclusion of the course. Treating participation as 'optional' is at your own peril.

Grading: Competency based grading will be used (90% and above = A range, 80-89% = B range, 70-79% = C range, etc.)

WileyPlus Homework:	10% (drop lowest 2 scores)
Discussion Section Quizzes:	10% (drop lowest 2 quizzes)
Midterm Exam (two exams):	40%
Final Exam (cumulative):	40%

Clerical errors in exam grading must be brought to the attention of the instructor or TA within 1 week of the return of the exam. A written statement as to what is incorrect must be attached to the front of the exam. Final exams are not returned, but you can make an appointment to review your exam during summer.

Grades will be posted to the class gradebook. Errors must be brought to the attention of the instructor or TAs before the final exam.

WileyPlus Homework: Homework will be assigned each Tuesday and will be due the following Tuesday by 8 pm (with the exception of Homework #1, which will be due two weeks after homework has been assigned). Late homework will not be accepted without prior approval of the instructor.

Homework Questions: If you have a question about the homework, please post it on the NoteBoard. *Questions regarding homework problems and general exam questions should be posted on the Discussion Board and not e-mailed to the TAs or the Professor. If you e-mail us a homework question, you will be asked to post it before we answer - this gives all the students the benefit of our response.* The instructor and TA will monitor the NoteBoard regularly. Any inappropriate comments or derogatory statements as outlined in the UC academic honesty policy will be treated as instances of academic misconduct.

Quizzes: Quizzes will be given during the first ~15 minutes of discussion starting week 2. You will not need a calculator for the quizzes. Prior to each quiz, you will be told which topics will be covered. To accommodate possible absences during the quarter, the lowest 2 quiz grades will be dropped. As such, **no make-up quizzes** will be given.

Exams:

Midterm Exam 1: Wednesday, April 23 rd
Midterm Exam 2: Wednesday, May 21 st
Final Exam: Monday, June 9 th 7-9pm
Final Exam Location TBA

Exams are closed book and closed notes. Graphing calculators may be used during the exam. However, any attempt to access the stored data portion of the calculator will be considered as academic dishonesty. Students in violation of this will be subject to the penalties outlined in the academic honesty section below. An equation sheet and all necessary constants will be provided

with each exam. The equation sheet that you will be given will be posted on the website prior to the exam for your reference.

Email the professor **before** an exam if you cannot attend due to a documented illness. The type and duration of make-up exams and whether a make-up exam will be offered are strictly at the discretion of the professor.

Academic Honesty: The complete policy statement on academic honest is printed in the *University of California, Irvine 2013 – 2014 General Catalogue*, with appropriate appendices available at: <http://www.editor.uci.edu/catalogue/appx/appx.2.htm>. Students are encouraged to form study groups, and may – if you wish – communicate with each other regarding *approaches* to solving homework assignments. However, the homework submitted for grading must be the individual work of the student. **Direct copying of homework will result in NO CREDIT for either of the paired homework assignments. In no case are students allowed to work together or share information on the examinations – including any electronic communication.** The instructor of this course considers any and all acts of dishonesty defined in the academic honesty policy as major infractions, and will likely result in a grade of ‘F’ and further penalties to the student. *Cell phones, text-messaging devices, etc. are not allowed in your possession for exam periods. If extraordinary circumstances require that you be in contact via these devices, prior approval of the instructor must be obtained.*

The instructor has a zero-tolerance policy on academic dishonesty and academic misconduct. The consequences of violating the academic honesty/misconduct policies may include receiving a failing grade (“F”) in the course.

Secret Numbers: You have been assigned a secret number to use when picking up your midterm exams. This number is used for identification purposes *instead of your name or student ID*. This aids us in returning materials to you without compromising confidentiality. Log into the EEE website for this class to find out your secret number. *You must know this secret number when picking up your exam.*

Approximate Schedule for Lecture Topics, Required Readings, Homework, and Examinations

Week 1. March 31st, April 2nd

- Introduction to Materials Science and Engineering
- Materials, Atomic Bonding & Review of Introductory Chemistry & Physics (Read Ch.1- 2)
- Unit Cell, Atomic Packing Fraction, Density, Crystal Structures in Metals and Ceramics, Miller Indices and Miller-Bravais Indices for Planes and Directions (Read Chapter 3 through page 83)

Week 2. April 7th, 9th

- Single Crystal, Polycrystalline, Anisotropy, X-ray Diffraction, Amorphous Materials (Read Ch. 3 pp. 84-96)
- Composition, Defects, Dislocations, Grain Boundaries, Microscopy Evaluation of Microstructures (Read Chapter 4)
- Diffusion (Read Chapter 5 except Section 5.4)

Week 3. April 14th, 16th

- **Homework #1** due on **Tuesday, April 15th**
- Stress, Strain, Elastic Deformation, Plastic Deformation, Tensile Properties, Hardness, Ductility, Resilience, Toughness, Safety Factor, Thermal Expansion Coefficient (Read Chapter 6)

Week 4. April 21st, 23rd

- **Homework #2** due on **Tuesday, April 22nd**
- Strengthening Mechanisms, Dislocations, Grain Size Reduction, Strain Hardening (Read Chapter 7). Materials Selection Software.
- MIDTERM EXAM 1, Wednesday, April 23rd on all material covered through April 16th.

Week 5. April 28th, 30th

- **Homework #3** due on **Tuesday, April 29th**
- Failure (Read Chapter 8)
- Phase Diagrams (Read Chapter 9)

Week 6. May 5th, 7th

- **Homework #4** due on **Tuesday, May 6th**
- Phase Diagrams (Read Chapter 9)
- Phase Transformations and Metal Alloys (Read Chapters 10, 11)

Week 7. May 12th, 14th

- **Homework #5** due on **Tuesday, May 13th**
- Ceramics (Read Chapter 12, skim chapter 13)
- Polymer Structures (Read Chapter 14)

Week 8. May 19th, 21st

- **Homework #6** due on **Tuesday, May 20th**
- Polymeric Materials Characteristics (Read Chapter 14)
- MIDTERM EXAM 2, Wednesday, May 21st on all material covered from April 28th through May 14th.

Week 9. May 26th, 28th

- **Memorial Day, May 26th. No Class, Campus Closed.**
- **Homework #7** due on **Tuesday, May 27th**
- Composites (Read Chapter 16)

Week 10. June 2nd, 4th

- **Homework #8** due **Tuesday, June 3rd**
- Electrical Properties (Read Chapter 18)
- Final Exam Review In Class

Final Exam Week June 9th-12th

- **Final Exam** (comprehensive) **Monday, June 9th 7-9pm**