UNIVERSITY OF CALIFORNIA
College of Engineering
Department of Materials Science & Engineering

Professor M. Asta | E45 - Properties of Materials | Spring Semester 2015

LOGISTICS

Course Website bCourses

Lecture **MWF 12-1PM, 277 Cory Hall**

Office Hours **MWF 9-11AM, 216 HMMB**

Textbook **W.D. Callister, Jr. & D. G. Rethwisch**, *Materials Science and Engineering an Introduction*, Ninth Edition, Wiley (2014).

Used copies of the 8th or 7th editions should also work, but avoid the University of Illinois edition.

Laboratory All lab sections meet in **Room 230 HMMB** unless otherwise instructed by GSIs.

Six laboratory exercises complement the lectures in biweekly experiments investigating the properties of materials, using the *Lab Guide* and *Lab Manuals* posted to our *bCourses* site.

Lab 01 *Basics of Mechanical Behavior*
Lab 02 *Recovery, Recrystallization, and Grain Growth*
Lab 03 *Binary Alloy Phase Diagrams*
Lab 04 *Heat Treatment of Steel*
Lab 05 *Electronic Properties of Materials*
Lab 06 *The Uniaxial Tensile Test*

The lab is divided into 4 sections, meeting biweekly according to the following calendar.

Lab Sections	Monday	Tuesday	Wednesday	Thursday	Friday
8-11 AM		101			
2-5 PM		102	103	104	

Each lab section has a primary Graduate Student Instructor (GSI) who is responsible for grading lab reports, and a secondary GSI, who assists with safety and staffing of experimental stations.

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GRADING

"As a member of the UC Berkeley community,I act with honesty, integrity, and respect for others."

Ethics

Please remember that this is your honor code. It is a simple pledge that will serve you well during your academic career, and provide a solid foundation for success in your career as a practicing professional, when you will be held to even higher standards. The National Society of Professional Engineers™ articulates those standards here.

Course Grade

There are no individual thresholds assigned to the different components of your grade. All components are scored, weighted, pooled, then mapped onto a curve for a course grade determination at the **end** of the semester, according to the following guidelines.

Homework 10%

Each homework submitted is to be submitted by uploading solutions in pdf to *bCourses* by 5 pm on the Friday after it is assigned. No raw "word processing" documents are accepted; submissions must be converted to pdf to preserve formatting, which is common professional engineering practice. Deadlines are firm, to allow for timely uploading of solutions as additional study guides. In other words, **no late homework assignments will be accepted**. Your lowest two homework scores will be dropped, and the remaining 9 homework scores will be equally weighted. Homework problems will be based on material in the textbook and the lecture notes.

The topmost objective of your homework assignments is to **guide your self-learning**. Homework is **not** meant to be "group learning" exercise, and certainly not an artistic alteration of answers from others to avoid a plagiarism charge. Your homework submissions MUST be your own work; **consultation with others is strictly forbidden**. Homework sets that contain similar solutions may be considered academic dishonesty, in which case zero points will be awarded for the assignment and a report to the Center for Student Conduct may be considered.

Lab Reports 30%

Due dates for all lab reports will be one week after the end of your lab session. For example, if your lab runs 2-5 pm on a Wednesday one week, the lab report will be due by 5 pm the following Wednesday; if your lab runs 8-11 am on Tuesday, the report will be due by 11 am the following Tuesday, etc. Late submissions will be penalized by a reduction in points (20%) until the cutoff deadline of the beginning of your next lab session, after which no reports will be accepted. Provisions will be made according to campus guidelines for all academic and religious holidays, but students seeking other exceptions (travel, illness, and the like) must request them directly from the course instructor. Each lab report is equally

weighted for the final grade. All lab reports should be submitted as printed hardcopies to the boxes in 350 HMMB.

In the laboratory you will be working in small groups to gather data, which, most of the time, must be shared by all members of your lab group. This is **not** plagiarism. Rather, it should be considered an incentive to work with your group members to secure the best data set possible. Reading the laboratory protocols ahead of time to be sure of the data required for your report will help you to properly prepare. Afterwards, with your data set in hand, you will **individually** analyze, render in drawings, plot in graphs, interpret, and present your findings in your **own** formal laboratory report. Points will be deducted for not individually executing the content requested in the lab manual.

Sharing a plot made by one of your lab group members is considered plagiarism. The incorporation of any analysis or interpretation or text that is not your own **i**s considered plagiarism. If you include content from an external resource (e.g., book or journal or lecture notes) in your writeup, it must be cited appropriately in professional citation format; failure to do so is also considered plagiarism. **Incidents of plagiarism will lead to a score of zero on the lab** and a report to the Center for Student Conduct may be considered.

After your graded lab reports are returned, you may notice differences in scoring between lab sections. Sometimes one GSI may appear to be stricter in the grading than another. To account for this, at the end of the semester all lab scores are normalized, removing any variations in grading styles among lab sections.

The lab manuals, as well as a lab guide containing detailed guidelines on the formatting requirements and grading policies for your lab reports can be found in the documents uploaded to the "labs" folder under the "Files" link on the *bCourses* site.

Midterm Exams 30%

Two in-class midterm exams will be given during normal class times on two different Fridays during the semester (see calendar for dates). Midterm exams begin at 12:10 PM and end at 1:00 PM sharp. Each exam is worth 15 % of your grade.

Studying for exams can be done effectively as a **group** effort. This is **not** plagiarism. Please consider organizing/joining study groups and challenging one another on the concepts covered in lecture and in the homeworks. Your lecture notes, not the textbook, are your best guide to examination content. If a topic is not covered in lecture, it will not be on the exam, even if it is covered in the text.

The midterm examinations are "closed book", with no reference materials permitted. No "Blue Books" are permitted. No electronic devices other than a calculator are permitted. Cell phones must be turned OFF. You are allowed a supply of pencils and pens, erasers, and a straightedge (long enough to construct figures across an 8 ½ × 11 inch page).

Final Exam 30%

The midterm exams will focus on sequential coverage with little or no overlap. By contrast, the final examination is a fully "comprehensive" one, covering all concepts developed throughout the semester. It is a "closed book" 3-hour exam (no 10-minute delay at start).

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Date	Lecture (12-1 PM)	AM Lab	PM Lab	HW/Exams
Tue, Jan 20, 2015	*Instruction Begins*			
Wed, Jan 21, 2015	Introduction			
Thu, Jan 22, 2015				
Fri, Jan 23, 2015	Mechanical Properties Part 1: Stress & Strain			
Mon, Jan 26, 2015	Elastic versus Plastic Deformation			
Tue, Jan 27, 2015		Orientation	Orientation	
Wed, Jan 28, 2015	Strength, Hardness, Toughness, Ductility		Orientation	
Thu, Jan 29, 2015			Orientation	
Fri, Jan 30, 2015	Materials at the Atomic Level: Crystals & Glasses			**HW01**
Mon, Feb 2, 2015	Periodic Table and Bonding			
Tue, Feb 3, 2015		Lab01	Lab01	
Wed, Feb 4, 2015	Bonding (cont.): Primary and Secondary Bonds		Lab01	
Thu, Feb 5, 2015			Lab01	
Fri, Feb 6, 2015	Crystallinity and Crystal Systems			**HW02**
Mon, Feb 9, 2015	Concepts of "Lattice" and "Motif"			
Tue, Feb 10, 2015				
Wed, Feb 11, 2015	Crystallographic Notation: Indices			
Thu, Feb 12, 2015				
Fri, Feb 13, 2015	Crystalline Defects: Point Defects, Dislocations			**HW03**
Mon, Feb 16, 2015	President's Day Campus Holiday			
Tue, Feb 17, 2015		Lab02	Lab02	
Wed, Feb 18, 2015	Crystal Defects: Dislocations, Grain Boundaries		Lab02	
Thu, Feb 19, 2015			Lab02	
Fri, Feb 20, 2015	Crystal Structures of Engineering Materials			**HW04**
Mon, Feb 23, 2015	Structural Analysis by Diffraction			
Tue, Feb 24, 2015				
Wed, Feb 25, 2015	Thermodynamics			
Thu, Feb 26, 2015				
Fri, Feb 27, 2015	Phases, Components, Phase Rule			**HW05**
Mon, Mar 2, 2015	Phase Diagrams			
Tue, Mar 3, 2015		Lab03	Lab03	
Wed, Mar 4, 2015	Predicting Microstructural Development		Lab03	
Thu, Mar 5, 2015			Lab03	
Fri, Mar 6, 2015	**Exam**			**Midterm 01**
Mon, Mar 9, 2015	Diffusion in Solids			
Tue, Mar 10, 2015				
Wed, Mar 11, 2015	Reaction Kinetics			
Thu, Mar 12, 2015				
Fri, Mar 13, 2015	TTT Curves			**HW06**

Date	Lecture (12-1 PM)	AM Lab	PM Lab	HW/Exams
Mon, Mar 16, 2015	Polymers and Polymerization			
Tue, Mar 17, 2015		Lab04	Lab04	
Wed, Mar 18, 2015	Viscoelastic and Elastomeric Behavior		Lab04	
Thu, Mar 19, 2015			Lab04	
Fri, Mar 20, 2015	Control of Kinetics in Engineering Alloys			**HW07**
Mon, Mar 23, 2015	*Spring Break*			
Tue, Mar 24, 2015	*Spring Break*			
Wed, Mar 25, 2015	*Spring Break*			
Thu, Mar 26, 2015	*Spring Break*			
Fri, Mar 27, 2015	*Spring Break*			
Mon, Mar 30, 2015	Electrical and Electronic Properties			
Tue, Mar 31, 2015				
Wed, Apr 1, 2015	Magnetic Properties			
Thu, Apr 2, 2015				
Fri, Apr 3, 2015	Optical Properties			**HW08**
Mon, Apr 6, 2015	Dielectrics, Ferroelectrics, Piezoelectrics			
Tue, Apr 7, 2015		Lab05	Lab05	
Wed, Apr 8, 2015	Solid State Devices		Lab05	
Thu, Apr 9, 2015			Lab05	
Fri, Apr 10, 2015	Dislocations and Plasticity			**HW09**
Mon, Apr 13, 2015	Strengthening Mechanisms			
Tue, Apr 14, 2015				
Wed, Apr 15, 2015	Failure of Engineering Materials			
Thu, Apr 16, 2015				
Fri, Apr 17, 2015	Brittle Fracture: Griffith Crack Model			**HW10**
Mon, Apr 20, 2015	Fracture Toughness and Fatigue Damage			
Tue, Apr 21, 2015		Lab06	Lab06	
Wed, Apr 22, 2015	Composite Materials		Lab06	
Thu, Apr 23, 2015			Lab06	
Fri, Apr 24, 2015	**Exam**			**Midterm 02**
Mon, Apr 27, 2015	Isostrain and Isostress Loading			
Tue, Apr 28, 2015				
Wed, Apr 29, 2015	Environmental Degradation of Materials			
Thu, Apr 30, 2105				
Fri, May 1, 2015	Materials Selection and Design			**HW11**
Mon, May 4, 2015	*RRR*			
Tue, May 5, 2015	*RRR*			
Wed, May 6, 2015	*RRR*			
Thu, May 7, 2105	*RRR*			
Fri, May 8, 2015	*RRR*			
Mon, May 11, 2015	*Finals Week*			
Tue, May 12, 2015	*Finals Week*			
Wed, May 13, 2015	**Final Exam, 3:00PM-6:00PM**			**Final Exam**
Thu, May 14, 2105	*Finals Week*			
Fri, May 15, 2015	*Finals Week*			