MSE 45L – Properties of Materials Laboratory | Fall 2017

Instructor: Lane W. Martin
Laboratory Exercises in 230 Hearst Mining Building, Various Times
Laboratory "Lectures" in 350 Hearst Mining Building, Various Times

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Office: 375 Hearst Mining Building
Office Hours: Monday 3:30-4:30PM, Thursday 3:00-4:00PM
Course Website: bCourses

Graduate Student Instructors: Zilun Gong (aarongong@berkeley.edu; Office hour: Wed. 1:00-2:00PM, 105|106)
Sahar Saremi (s.saremi@berkeley.edu; Office hour: Tue. 11:30AM-12:30PM, 102)
Clarissa Towle (ctowle@berkeley.edu; Office hour: Thurs. 5:00-6:00PM, 101|103)
All GSI office hours will be in 350 HMMB

Laboratory Sections: Sec. 101 – Tuesday 8:00-11:00AM | Sec. 102 – Tuesday 2:00-5:00PM
Sec. 103 – Wednesday 2:00-5:00PM | Sec. 105 – Wednesday 8:00-11:00AM
Sec. 106 – Friday 8:00-11:00AM

Text: Materials Science and Engineering: An Introduction, William D. Callister, Jr. and David G. Rethwisch, 9th Edition, Wiley: Hoboken, NJ (2014).
*This is the same book used in Spring 2016, Fall 2016, and Spring 2017.
** Not required for students taking MSE45L only.

References: A number of texts are on reserve at the Engineering Library, including:

- Materials Science and Engineering: An Introduction (9th Ed., 2014), W. D. Callister, Jr. and D. G. Rethwisch (our book)
- Materials Science and Engineering: An Introduction (8th Ed., 2010), W. D. Callister, Jr. and D. G. Rethwisch
- Introduction to Materials Science for Engineers (7th Ed., 2009), J. F. Shackelford (2 copies)

Prerequisites: Some basic chemistry, physics, and math is all that is required.

Description & Objectives: This 1-unit course consists of one (1) 1-2-hour laboratory safety and ethics training session, five (5) 3-hour laboratory experiences occurring every other week led by the GSIs, and five (5) 1-hour mandatory "lecture" sessions (occurring the week prior to each laboratory experience) in which fundamental information about the laboratory experiments will be taught. The long term objectives of this course are to provide undergraduate materials science and engineering and other engineering and science students hands-on experiences in foundational materials science topics and to serve as a practical extension to the lecture-based course MSE45 – Properties of Materials. MSE45 provides broad coverage of the field for non-majors who may not be able to take another course in materials science & engineering, and it serves as the introductory course in the major field, laying the foundation for understanding the relationship between the internal structure of matter and the properties of materials that make them attractive for engineering

applications. This course will apply these basic principles in a laboratory setting while provide practice writing, ethics, and other skill sets.

Connection to MSE45: MSE45 is a stand-alone, lecture based course that supports an additional laboratory-based based class, MSE45L. MSE45L is a laboratory-based experience that augments the topics of the MSE45 lecture class with hands-on practical experiences. Students taking MSE45 are not required to take MSE45L (although it is recommended), but those taking MSE45L must have already completed of be taking MSE45 concurrently.

Proposed Class Outline and Schedule

Recall that a course is a flowing and changing thing. The following is a proposed outline and timeline for the semester. This will be subject to changes that will be announced well in advance in class.

Laboratory 1: Laboratory Safety and Ethics
- Introduction to best-practices and approaches to safe laboratory work.
- Introduction to concepts of professional engineering ethics, case studies.

Laboratory 2: Recovery, Recrystallization, and Grain Growth
- To measure and compare the hardness of metallic samples.
- To understand the fundamental concepts of mechanical stress and strain.
- To illustrate the use of thermal treatments in the restorative processing of materials that have been shaped by mechanical deformation.
- To understand the detailed microstructural changes occurring during the three stages of annealing.

Laboratory 3: Binary Alloy Phase Diagrams
- To understand how phase diagrams are constructed from cooling curves.
- To compare the as-solidified microstructures of different alloys in binary alloys systems.

Laboratory 4: Heat Treatment of Steel
- To understand the effect of thermal processing (heat treatment) on both the microstructure and properties (hardness) of steel.
- To understand the application of time-temperature-transformation (TTT) curves in ferrous metallurgy.

Laboratory 5: The Uniaxial Tensile Test
- To illustrate the basic properties of strength and toughness of materials.
- To standardize the fundamental concepts of mechanical stress and strain.
- To understand the uniaxial tensile test and the generation of “Stress-Strain” curves.
- To observe the microstructure of a fracture surface obtained in a Charpy impact test.

Laboratory 6: Electronic Properties of Materials
- To understand the nature of electrical conductivity in materials.
- To investigate the change of electrical resistivity with temperature in metals, semiconductors, and insulators.
- To determine the relationship between electrical resistivity and the presence of impurities in these materials.

Date	AM Lab	PM Lab	Assignments Due
Aug. 21	No School		
Aug. 22	No School		
Aug. 23			
Aug. 24			
Aug. 25			
Aug. 28			
Aug. 29	Lab 1 (101)	Lab 1 (102)	
Aug. 30	Lab 1 (105)	Lab 1 (103)	
Aug. 31			
Sep. 1	Lab 1 (006)		
Sep. 4	Academic & Administrative Holiday – No Classes		
Sep. 5	Lab 2 Lecture	Lab 2 Lecture	Lab 1 Report
Sep. 6	Lab 2 Lecture	Lab 2 Lecture	Lab 1 Report
Sep. 7			
Sep. 8	Lab 2 Lecture		Lab 1 Report
Sep. 11			
Sep. 12	Lab 2 (101)	Lab 2 (102)	
Sep. 13	Lab 2 (105)	Lab 2 (103)	
Sep. 14			
Sep. 15	Lab 2 (006)		
Sep. 18			
Sep. 19	Lab 3 Lecture	Lab 3 Lecture	Lab 2 Report
Sep. 20	Lab 3 Lecture	Lab 3 Lecture	Lab 2 Report
Sep. 21			
Sep. 22	Lab 3 Lecture		Lab 2 Report
Sep. 25			
Sep. 26	Lab 3 (101)	Lab 3 (102)	
Sep. 27	Lab 3 (105)	Lab 3 (103)	
Sep. 28			
Sep. 29	Lab 3 (006)		
Oct. 2			
Oct. 3	Lab 4 Lecture	Lab 4 Lecture	Lab 3 Report
Oct. 4	Lab 4 Lecture	Lab 4 Lecture	Lab 3 Report
Oct. 5			
Oct. 6	Lab 4 Lecture		Lab 3 Report
Oct. 9			
Oct. 10	Lab 4 (101)	Lab 4 (102)	
Oct. 11	Lab 4 (105)	Lab 4 (103)	
Oct. 12			
Oct. 13	Lab 4 (006)		
Oct. 16			
Oct. 17	Lab 5 Lecture	Lab 5 Lecture	Lab 4 Report
Oct. 18	Lab 5 Lecture	Lab 5 Lecture	Lab 4 Report
Oct. 19			
Oct. 20	Lab 5 Lecture		Lab 4 Report

Oct. 23			
Oct. 24	Lab 5 (101)	Lab 5 (102)	
Oct. 25	Lab 5 (105)	Lab 5 (103)	
Oct. 26			
Oct. 27	Lab 5 (006)		
Oct. 30			
Oct. 31			Lab 5 Report
Nov. 1			Lab 5 Report
Nov. 2			
Nov. 3			Lab 5 Report
Nov. 6			
Nov. 7	Lab 6 Lecture	Lab 6 Lecture	
Nov. 8	Lab 6 Lecture	Lab 6 Lecture	
Nov. 19			
Nov. 10	Academic & Administrative Holiday – No Class Friday session attend any other laboratory lecture this week		
Nov. 13			
Nov. 14	Lab 6	Lab 6	
Nov. 15	Lab 6	Lab 6	
Nov. 16			
Nov. 17	Lab 6		
Nov. 20			
Nov. 21			
Nov. 22	Non-instructional Day – No Class		
Nov. 23	Academic & Administrative Holiday – No Class		
Nov. 24	Academic & Administrative Holiday – No Class		
Nov. 27			
Nov. 28			Lab 6 Report
Nov. 29			Lab 6 Report
Nov. 30			
Dec. 1			Lab 6 Report

Grading Policies

There are no individual thresholds assigned to the different components of your grade. All components are scored, weighted, pooled, and then **mapped onto a curve for a course grade determination at the end of the semester**. Student learning and growth will be assessed based on the following assignments:

- **Laboratory Time and Laboratory Reports (90% to total grade, 18% for each report)**
  - There are 5 laboratory sections for MSE45L each week (as noted in the table below).

E 45L Labs	M	Tu	W	Th	F
8:00-11:00AM		101	105		106
2:00-5:00PM		102	103		

  - All laboratory sections meet in room **230 HMMB** unless otherwise noted by the GSIs.
  - The six laboratory exercises complement the lectures offered in MSE45 in biweekly experiments investigating the properties of materials. Refer to the Laboratory Guide and Laboratory Manuals on bCourses. The labs include:

    - Laboratory 1: Laboratory Safety and Ethics
    - Laboratory 2: Recovery, Recrystallization, and Grain Growth
    - Laboratory 3: Binary Alloy Phase Diagrams
    - Laboratory 4: Heat Treatment of Steel
    - Laboratory 5: The Uniaxial Tensile Test
    - Laboratory 6: Electronic Properties of Materials
  - All students **must complete the Laboratory 1 report**, but students can drop one score (or simply not do) one of Laboratory 2, 3, 4, 5, and/or 6 reports. In other words, **only 5 of the 6 reports are required to get a full grade**. Those completing all 6 reports will receive the summation of the best 5 scores from all assignments.
  - Each laboratory will be staffed by a primary Graduate Student Instructor (GSI) who is responsible for grading laboratory reports and providing a lesson at the start of the session and a secondary GSI who assists with safety and staffing of experimental stations.
  - Reports must be completed following the guidelines outlined in the **Laboratory Guide** (available online).
  - Laboratory reports are to be submitted electronically through bspace and are due 1 week from the end of your laboratory.
    - Example if you are in laboratory section 102, your report will be online by 5:00PM on the next Tuesday.
  - Laboratory grading concerns – 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. This is a natural result of the variability of the graders. To account for this, at the end of the semester all lab scores are normalized and treated based on average and standard deviation values for the different sections. This removes any variations in grading styles among lab sections.

- **Laboratory and Lecture Section Participation (10% of total grade)**
  - Your attendance in Lecture and Laboratory is essential to the success of this class.
  - You will be assess based on participation in those sections for a portion of your grade.
  - Your laboratory notebook will also be assessed for best practices in note taking.

Late Assignments

- **No late assignments will be accepted unless prior arrangements are made with the instructor for valid excuses.**
  - Valid excuses include, but are not limited to, deaths in the family, jury duty, hospitalization for illness, etc.
  - Non-valid excuses include, but are not limited to, oversleeping, “my printer didn’t work,” “I wasn’t here when you assigned it,” etc.
- If you have concerns I am happy to discuss with you about your specific situation and clarify any questions you have.

Re-grading Policy

- Re-grading of reports is a timely and serious undertaking. The Instructor takes the academic integrity of this course and your work very seriously. In turn, you will be asked to take a similar stance on these materials. In order to assure only valid cases come before the class staff, the following policies will be in place. Failure to adhere to these policies will mean that your requests will go unheeded:
  - Students are required to type up a written request for re-grading. This request should including the following information:

- Student Name and ID
- Assignment or Exam in question
- Problem number in question
- A written description, using complete sentences, out-lining the suspected mis-grading. This includes a detailed description of what you have done and why you think it merits a re-grade.

- Re-grade request along with the original assignment/exam will first go to the Instructor for consideration. At this point the Instructor can reject re-grade requests that do not meet the above standards. Compliant requests will then go to the appropriate grader or GSI who will consider the request.
  - Simple fixes such as addition errors will be rectified immediately.
  - More extensive requests will go to the appropriate grader or GSI who will then consult with the Instructor with one of two outcomes: 1) a complete re-grade of the entire assignment or 2) rejection of the appeal. Note that complete re-grading may under other errors on other problems that could lower or increase your grade further.
- The results of this re-grading will be final and binding.
- Attempts to "doctor" or manipulate assignments after grading to enhance scores will be dealt with under the auspices of the Academic Code of Conduct.

Academic Code of Conduct

- This course will execute a "zero-tolerance" policy concerning cheating and plagiarism.
- Students are referred to the University of California, Berkeley Student Code for complete details on the Student Code. Special attention should be given to Section V and Appendix II of (http://sa.berkeley.edu/code-of-conduct).
- Cheating and plagiarism will be dealt with according to established campus policy. Students caught cheating will receive a failing grade.