Fall Semester 2015

COURSE: Materials Science and Engineering 201
TITLE: Phases and Phase Relations
LEVEL: Undergraduate
CREDIT: 3 hours lecture; 3 semester hours
TIME: TR 9:30-10:50 AM
LOCATION: 106B1 Engineering Hall

DESCRIPTION: Introduction to bonding, crystal structures, phase equilibria and microstructure. Quantitative examination of phases (crystalline and non-crystalline structures) and the relationships between phases (phase diagrams and phase transitions).

INSTRUCTOR: Cecilia Leal
Office: 201c MSEB
Phone: 217-300-1955
Email: cecilia@illinois.edu

OFFICE HOURS: Mondays 5-7 pm MSEB 205A (Teaching assistant).

TEACHING ASST:

PREREQUISITES: CHEM 104, MATH 241, MSE 182, and PHYS 212

ASSESSMENT: Problem sets (5) 20%
i-clicker sessions (between 8-11, best 5) 10%
2 midsemester exams, 1 hr. 40%
Final, comprehensive exam, 3 hrs. 30%


LECTURE Notes: Compass2g http://compass2g.illinois.edu
LECTURE Videos: Echo 360 (copy paste link below into web browser)
https://recordings.engineering.illinois.edu:8443/ess/portal/section/2e8c4a17-3c92-4ae2-b38c-2895aacb38b2

TENTATIVE EXAM SCHEDULE

<table>
<thead>
<tr>
<th>Midterm Exam No. 1</th>
<th>Tuesday, October 06, 10:00-10:50 AM, 106B1 Eng. Hall</th>
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<tbody>
<tr>
<td>Midterm Exam No. 2</td>
<td>Tuesday, November 10, 10:00-10:50 AM, 106B1 Eng. Hall</td>
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<tr>
<td>Final Exam</td>
<td>1:30-4:30 PM, Thursday, December 14, TBD</td>
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NOTE: No calculators/devices will be necessary/allowed during exams. Class attendance is not required but is strongly recommended and may be mandatory on certain occasions. Homeworks can be worked in collaboration but the names of all the students involved should be listed.
TENTATIVE TOPIC SCHEDULE

Introduction
Bonding
Crystals and Crystal Structures
Defects in Crystalline Solids
Diffusion
Polymer Structures
Phase Diagrams
Phase Transformations
Processing of Materials
Intro to Mechanics
Ethics in Science and Engineering
1.5 hours, Chapter 1
3 hours, Chapter 2
5 hours, Chapter 3
3 hours, Chapter 5
3 hours, Chapter 6
4 hours, Chapter 4
6 hours, Chapter 10
4 hours, Chapter 11
1.5 hours, Chapter 14
1.5 hours, Chapter 7
1.5 hours

COURSE OBJECTIVES

• Understand the relationship between bonding and crystal structures
• Understand how the structure of different crystals is determined
• Learn the important differences between amorphous and crystalline solids
• Understand the types and importance of defects in crystalline solids
• Understand the relation between Gibb's phase rule and phase diagrams
• Understand how to examine materials properties using phase diagrams
• Understand the relationship between phase transformations, microstructure and properties
TENTATIVE SCHEDULE

Aug 25, Introduction
Aug 27, Bonding 1, i-clicker Session survey, not for grade
Sep 1, Bonding 2
Sep 3, Crystals 1, HW1 assignment, i-clicker Session1
Sep 8, Crystals 2
Sep 10, Crystals 3, HW1 due, i-clicker Session2
Sep 15, Crystals 4
Sep 17, Defects 1, HW2 assignment, i-clicker Session3
Sep 22, Defects 2
Sep 24, Diffusion 1, i-clicker Session4
Sep 29, Diffusion 2, HW2 due
Oct 1, MidTerm1 Prep
Oct 6, MidTerm1
Oct 8, Polymers 1, HW3 assignment, i-clicker Session5
Oct 13, Polymers 2
Oct 15, Polymers 3, HW3 due, i-clicker Session6
Oct 20, Phase Diagrams 1
Oct 22, Phase Diagrams 2, i-clicker Session7
Oct 27, Phase Diagrams 3
Oct 29, Phase Diagrams 4, HW4 assignment, i-clicker Session8
Nov 3, Phase Diagrams 5
Nov 5, MidTerm2 Prep
Nov 10, MidTerm2, HW4 due
Nov 12, Transformations 1, i-clicker Session9
Nov 17, Mandatory Ethics lecture
Nov 19, Transformations 2, i-clicker Session10

Break
Dec 1, Processing, HW5 assignment
Dec 3, Mechanics, i-clicker Session11
Dec 8, Final Prep, HW5 due

Dec 14, Final