MSE 5300/3300
Introduction to Materials Science & Engineering
(Fall 2009)
11:00 am - 12:30 pm, Tue & Thur
Woolf Hall 210

Instructor: Michael H. Jin, Ph. D.
Assistant Professor
Materials Science & Engineering

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Course Prerequisites: Permission of instructor

Required Textbook: *Fundamentals of Materials Science and Engineering; An Integrated Approach, 2nd. Ed.*, William D. Callister, Jr.
* Textbook comes with a CD-Rom which contains useful figures (movies), Self-Assessment Exercises, and Concept Check Answers.

Teaching Assistant: Soo Kim
Office: 100 Woolf Hall
Office hours will be held at conference room in 325 Woolf Hall.
Office Hours: TBA
Phone: (817) 272-0589 **Email:**soocraft@naver.com **Mailbox**: 19031

Course Description: Physical, mechanical, electrical and chemical properties of metals, semiconductors, ceramics, polymers and composites, with an emphasis on understanding fundamental issues. Relationships between the processing, micro and macro structure of materials with their properties.

Attendance Policy: Students are expected to attend each class and to sign classroll for each class. If instructor finds a student who has his/her name checked in the roll without being present, it'll be considered to be an unethical conduct and the student could face a serious penalty together with losing all the credit for the attendance (10%). If you have to be absent or to have to leave early, notify the instructor in advance. If a student is absent more than 5 times without notifying

an instructor, the student will lose the 10% credit. If a student is absent more than 1/2 of the class time for any reason, the student cannot get a credit for this course.

Withdrawal Policy: Students, who withdraw from the course after the last day to drop with an automatic 'W', must talk to the instructor beforehand to avoid 'F'.

Classroom etiquettes:

- Students should NOT hold conversation.
- Students are not allowed to use a laptop computer unless there is any medical excuse.
- Wireless communication devices MUST be silenced.

Course Website:

TBA	
Login:	PWD:

Students are responsible to visit the website routinely (once/day) to look for new announcements, lecture notes, homework, and solutions.

Course Grading Policy: Final grade of this course will be determined as follows. Please note that different policy applies to MSE 3300 and MSE 5300:

MSE 3300

Attendance	10%
Homework	15%
Exam 1	25%
Exam 2	25%
Exam 3 (hour exam)	25%
Total	100%

MSE 5300

Attendance	10%
Homework	15%
Exam 1	20%
Exam 2	20%
Exam 3 (comprehensive)	35%
Total	100%

A	≥ 90% of full credit
B	≥ 80%
C	≥ 70%
D	≥ 60%
F	< 60%

Homework (HW) and Teaching Assistant (TA):

- HW will be assigned weekly and will be collected at class time.

- HW grading will be made by TA and all the questions regarding homework and any protest against grading should be asked/made to TA.
- TA will help you with the HW during his/her office hours. However, TA will NOT give you direct answers. You must do your part before seeing the TA.
- HW should be done by individual effort. Although discussion as a group is allowed, answers should be written in each student's own words. HWs that are identical (or similar) will receive 0% credit.
- HW solutions will be posted on course website regularly.
- Assignments (mostly HWs) submitted after due will get '- 20%' of total credit only when it is submitted within 24 hours after due. The late submission has to be informed to the instructor and/or TA in advance, so they could expect it.

Missed Exams and Makeup Work:

- If a student misses any hour exam for any reason, the student will take a make-up exam at the end of the semester. The make-up exam will be a comprehensive exam and will cover the entire material the course covered throughout the semester like the final exam does. In other words, the student will take extra final exam. If a student misses multiple exams, the student will take the same number of 'extra' comprehensive final exams as the number of exams the student has missed.

Course content and schedule (tentative):

Aug	25	Chapter 1	Introduction
	27	Chapter 2	Atomic Structure and Interatomic Bonding
Sep	1	Chapter 3	Structures of Metals and Ceramics
	3	"	"
	8	"	"
	10	Chapter 4	Polymer structures
	15	Chapter 5	Imperfections in Solids
	17	Chapter 6	Diffusion
	22	Review for EXAM #1 and Q&A	
	24	**EXAM #1**	
	29	Chapter 7	Mechanical Properties
Oct	1	Chapter 8	Deformation and Strengthening Mechanisms
	6	Chapter 9	Failure
	8	Chapter 10	Phase Diagram
	13	"	"
	15	"	"
	20	Chapter 11	Phase Transformations
	22	"	"
	27	"	"
	29	"	"
Nov	3	Review for EXAM #2 and Q&A	
	5	**EXAM #2**	
	10	Chapter 16	Corrosion and Degradation
	12	**No class**	
	17	Chapter 12	Electrical Properties of Materials

	19	Chapter 17	Thermal Properties
	24	Chapter 18	Magnetic Properties
	26	**No class (Thanksgiving)**	
Dec	1	Chapter 19	Optical Properties
	3	Review for Exam #3 and Q&A	
	7-11	**EXAM #3**	

Student Learning Outcomes:

1. Understand electronic configuration of atoms, types of primary and secondary bonding.
2. Learn three dimensional packing of atoms for different types of materials - the concept unit cell, Bravais lattices, crystal structures, and basic knowledge on crystallography.
3. Learn structures of polymeric materials – isomerism, molecular weight and distribution, and crystallinity.
4. Learn different type of defects
5. Understand fundamental laws of diffusion
6. Learn basic principles of stress and strain, and related mechanical properties of materials.
7. Learn mechanical properties of polymers – viscoelasticity
8. Understand slip systems and their implication in plastic deformation. Plastic deformation of ceramic and polymer materials.
9. Learn strengthening mechanism and heat treatment of metals.
10. Learn failure mechanism of materials – cracks and stress concentration
11. Understand fundamentals of phase transformation including lever rule, phase diagram, and invariant reactions.
12. Understand kinetics of phase transformation and how they could affect the mechanical properties of materials.
13. Learn principles of electrochemistry and how corrosion can occur.
14. Learn basic theory of electrical conduction and understand different electrical conduction behavior of different materials.

<u>Assessment:</u>

All the learning outcomes are probed and evaluated through weekly homework, 10 min in-class quizzes, and exams.

Homework: After finishing each chapter, a set of problems will be given to the class to practice. Homework is graded to find out how well students are following the content of the class.

In-class quiz: In the beginning of each class, the instructor selects 3~6 students to ask questions and get answers interactively to probe the progress of students. It is designed such that students are intentionally selected in order to test broad spectrum of students and each student approximately gets an equal number of chances to be selected throughout the semester.

Exam: There are three exams during the semester and they include three hour-exams for MSE 3300 and two hour-exams and one comprehensive final exam for MSE 5300. In order to test the level of students' understanding before exam, the old exam material is given to the class to practice. During the review session before exam, students ask questions related to the old exam problems, which tells instructor what are the weakness and the strength of the students. Grading exam is typically the last measure of probing the achievement of students.

American With Disabilities Act

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 - The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "***reasonable accommodation***" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with **informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.** If you require an accommodation based on disability, I would like to meet with you in the privacy of my office during the first week of the semester to make sure that you are properly accommodated.

Academic Dishonesty

It is the philosophy of the University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

"Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)

Corrosion engineering is the application of science and art to prevent or control corrosion damage economically and safely (Smidt, 1994). This address to corrosion as one of material problems, particularly metals, which capable to extend the life span (Yip, 2006). Corrosion is the destruction or deterioration form of a material due to reaction with its environment (Callister, 2005) and (Henkel & Pense, 2002). Effect of parameter controlled in tin coating on the MILD steel substrate. Article.