"Introduction to Materials Science and Engineering"

Fall 2019_445.102A_002 (3 credits including 1 credit for design)

Professor Eun Soo Park

Syllabus

Lecture room: building **33, room 225** *Hour*: **Tue. & Thu. 12:30 - 01:45**

Lecture target: **Freshmen of MSE** *Prerequisite*: **None**

Class web page: http://etl.snu.ac.kr/portal/index.jsp

Teaching staff

Instructor: **Eun Soo Park**
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Office hours: **by appointment**

Textbook: William D. Calister, Jr., David G. Rethwisch
"Materials Science and Engineering",
9th edition, John Wiley & Sons Inc., 2015

References: J.F. Shackelford, "Introduction to Materials Science for Engineers"
8th edition, Prentice Hall Inc., 2016

Additional reading materials will be provided.

Course Description:

Objective of the course

This is an introductory course of the materials science and engineering. It will overview the basic concepts of constituent, properties, and application of the materials for the next level of advanced courses in MSE.

Course abstract and the related course

To develop new, high-performance materials, it is required to understand the basic fundamentals of materials that leads to differences of properties. As a first step, atomic bonding and the crystal structure will be covered followed by the imperfections in the solid together with diffusion. The microstructural change and phase transformation of the materials will be reviewed to open up the future expansion of the knowledge. At the later part of the lecture, material-specific properties of electrical, optical, thermal, and magnetic materials will be reviewed. The application of the concepts will be exercised using appropriate real-world examples in the industry in each chapters.

Schedule

week 1 *Introduction*

week 2 *Atomic Structure and Interatomic Bonding* (Chap. 2)

week 3 *Fundamentals of Crystallography* (Chap. 3)

week 4 *The Structure of Crystalline Solids* (Chap. 4)

week 5 *Imperfections in Solids* (Chap. 6)

week 6 *Diffusion* (Chap. 7) & *Mid-term*

week 7 *Mechanical Properties of Metals* (Chap. 8)

week 8 *Dislocations and Strengthening Mechanisms* (Chap. 9)

week 9 *Failure* (Chap. 10)

week 10 *Phase Diagram* (Chap. 11)

week 11 *Phase Transformation* (Chap. 12)

week 12 *Polymer Structures* (Chap. 5)

week 13 *Characteristics, Applications, and Processing of Polymers* (Chap. 15)

week 14 *Functional Polymers* (Chap. 16)

week 15 *Presentation of Team project and Final Exam*

Components of Your Grade:

1) Exams (mid: 35% + final: 40%)

There will be two exams, each of which will take 2-3 hours. The exams will be conceptual and difficult. In general, I will not use class time for the exams and instead will reserve separate time slots.

2) Reports and Presentation (15%)

Assignments handed in after the start of class lose credit depending on the timing. If you wish, you may work together on homework assignments. But, you must hand in your own work, in your own words.

3) Attendance (10%)

Remarks: 1) The weight of each component above could be adjusted up to 5% based on students' performance. 2) Student who retakes this course will have their final scores adjusted downward by 10% in order to ensure fairness with other students.

Course Policies, Questions and Answers

Q: Will there be a recitation section?

A: None is planned, but if you really want one, speak up. We can negotiate.
Although most class periods will be lecture, I am hoping that the weekly class meetings will proceed in a discussion style format, so please do ask questions.

Q: What is the policy for attendance?

A: Please be on time. Being late disrupts the instructor and other students. If you cannot attend a class, please let me know in advance by email.

Prof. Eun Soo Park
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