Department of Mechanical and Aerospace Engineering

The Hong Kong University of Science and Technology

MECH 2410 – Engineering Materials I Spring 2024

Lectures:

Tuesday & Thursday 12:00-13:20

Course Description:

MECH2410 is an introductory course on materials science and engineering. This course introduces the fundamental laws and physics for engineering materials. It covers the topics including atomic structures and bonding, crystallography and crystal structures, mechanical behaviors, defects in solids, strengthening mechanism, diffusion and phase transformation. Specifically, we will highlight the metallic materials: mechanical properties, synthesis methods and applications.

By the end of this course, you should be able to:

(i) Analyze and explain key physical and mechanical behaviors of the classical engineering materials;

(ii) Explain the underlying mechanism for the specific physical/mechanical property of the material based on the understanding of atomic structure, bonding and crystallography.

(iii) Explain the relationship between the processing parameters and the associated mechanical properties and phenomena such as modulus, ductility and strengthening of the material

(iv) To identify the proper materials with the physical/mechanical properties serving the suitable engineering applications.

Pre-requisite: *None*

Required Textbook: *MATERIALS SCIENCE AND ENGINEERING: An Introduction*; 9th Edition (or 10th Edition), William D. Callister, Jr. (Selected chapters)

Instructor: Sherry CHEN (Office: 2572, Lift 27/28; email: xianchen@ust.hk)

Office Hours: by appointment.

Tutorials:

Tutorials will start in the ***2nd week*** of the semester to provide you with the knowledge of concepts taught in lecture and recitations of relevant examples and problems.

Assessments:

The assessments of MECH2410 are subject to six parts: 1. Homework assignment; 2. In-class quizzes; 3. Experiment report; 4. Mid-term exam; 5. Final exam.

Grade distribution:

1. Homework assignment – 25%
2. In-class quizzes – 10%
3. Experiment report – 10%
4. Mid-term exam – 15%
5. Final exam – 40%

Laboratory Sessions:

There are three Practical experiments in this course: Hardness Testing, Tensile Testing, and Impact Testing, demonstrated in two laboratory sessions. Laboratory sessions will be conducted on group basis.

Lab reports are to be submitted on a **group** basis onto Canvas no later than **1-week** after each of your experiment session. Lab reports will not be accepted if you did not attend the lab session. You only need to attend one lab session to finish your lab assessment.

Plagiarism and Academic Dishonesty:

Any form of plagiarism or academic dishonesty will not be tolerated in this course. Any plagiarized (in part or in full) homework assignment(s) and/or lab report(s) will receive a zero on the first incidence. Any further incidences will be reported to the department according to the HKUST Policy on Academic Integrity (http://tl.ust.hk/integrity/student-5.html)

Suggested References (a copy of each is "Course Reserved" for 3 days loan at the Library):

1. Askeland, D.R. & Wright, W.J. (2006). *The Science and Engineering of Materials* (5th ed.). Stamford, CT.: CENGAGE Learning
2. Smith, W. F., & Hashemi, J. (2010). *Foundations of materials science and engineering (5th ed.)*. Boston, Mass. [u.a.: McGraw-Hill Higher Education.
3. Shackelford, J. F. (2005). *Introduction to materials science for engineers (6th ed.)*. Upper Saddle River, N.J: Pearson/Prentice Hall.

Tentative Course Timetable

Week #	Lecture content
1-2	Introduction to Material Science and Engineering
3-4	Atomic Structure and interatomic bonding (Zeyuan)
5-7	Crystallography and crystal structure
7-8	Mechanical Properties of Materials (Ruhao)
9 (break)	Defects of crystalline solids (Jason)
10	
11	Theory of Strengthening of Metals (Yuzi)
7	Theory of Strengthening of Metals (Maybe Yuzi) **Mid-term Exam**
8	Diffusion (Yuzi)
9-10	Diffusion (Yuzi) Phase diagrams (Ruhao)
11-12	Phase transformation
13-14	