Syllabus of CENG 1500L1

A First Course on Materials Science and Applications

2019/20 Spring
09:00–10:20 am (Monday and Wednesday), Room LTJ

Instructor: Professor Minhua Shao, Tel.: 3469-2269, Room: CYT2005, email: kemshao@ust.hk

Scope
The scope of this course is to introduce different categories of materials and to elucidate their applications. We will study basic concepts of different kinds of materials and the basic structures at different scales. The focus of the course is the structure/property relationship. Design and applications will be explored. After the course, the students are able to understand basic techniques for measuring the common properties of materials, and for fabricating and processing of novel materials, and evaluate the social, economical, and environmental impact of materials.

Course intended learning outcomes (ILOs)
CILO 1 Describe the basic structures and properties of materials used in our daily life, and discuss the novel applications of selected advanced materials
CILO 2 Understand basic techniques for measuring the common properties of materials, and for fabricating and processing of novel materials
CILO 3 Evaluate the social, economical, and environmental impact of materials

Methodology
Textbook and group projects (optional). For the part of the textbook, lecture-based learning will be conducted (CILO 1-3). Homework will be assigned once a week (CILO 1-2). Mid-term exam will be conducted on-line in April and Final exam in May (CILO 1-2). Both exams will be open books and notes. All lecture notes will be posted on Canvas at least one day before the lecture. The students are responsible for downloading them from the website. Lectures will be video recorded and shared with students.

For the optional group projects, each group will consist of 1-2 students (CILO 2-3). The group will select one topic about materials and their applications and give a 15 min presentation in the last week of the class.

[Note] This course will be delivered online using Zoom for this semester until further announcement.

Lectures
Lecture 1 introduction
Lecture 2 Atomic structure and bonding
Lecture 3 Crystal structure
Lecture 4 Lattice position and plane
Lecture 5 X-ray diffraction
Lecture 6 Crystal defects
Lecture 7 Diffusion
Lecture 8 Mechanical properties I
Lecture 9 Mechanical properties II
Lecture 10 Thermal behaviour
Lecture 11 Phase diagram I
Lecture 12 Phase diagram II
Lecture 13 Phase diagram III
Lecture 14 Heat treatment I
Lecture 15 Heat treatment II
Lecture 16 Structure materials-metals and polymers
Lecture 17 Structure materials-ceramics and composites
Lecture 18 Electronic materials-conductors and superconductors
Lecture 19 Electronic materials-insulators and semiconductors

Skills Trained
Problem solving, Critical thinking, Team, Presentation, Writing and Communication

Grading Methodology

No group project

Homework: 10% (CILO 1-2)
Mid-term exam: 40% (CILO 1-2)
Final exam: 50% (CILO 1-2)

With group project

Homework: 10% (CILO 1-2)
Mid-term exam: 30% (CILO 1-2)
Final exam: 40% (CILO 1-2)
Project presentation: 20% (CILO 2-3)

Assignments/homework:
Weekly homework assignment. The answers will be posted on the Canvas course web. There will be 10 homework assignments through the semester. Each assignment counts 1 point toward the final score.

Other Information:
Tutorial venue: Room LTC, 3:00 – 3:50 pm (Monday)
Office hours: Room CYT2005 (Cheng Yu Tung Building) and online, Monday: 4:00-5:00 pm or appointment
PG TAs: HW grading, tutoring
NAMBAFU, Gabriel (GSNAMBAFU@connect.ust.hk)
DELMO, Emest Pahuyo (EPDELMO@connect.ust.hk)
PENG, Yikai (YPENGAPO@connect.ust.hk)

Textbook

Reference