

**Syllabus of CENG 1500L1**  
***Introduction to Materials Science and Engineering***

Fall, 2016

10:30 – 11:50 am (Monday and Wednesday), Room LTF

**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.

**Methodology**

Textbook and group projects (**optional**). For the part of the textbook, lecture-based learning will be conducted. Home work will be assigned once a week. Mid-term exam will be conducted in October and Final exam in December. Both exams will be open books and notes, but no internet (no computer, cell phone or tablet during exam). All the lecture notes will be posted on the Canvas website at least one day before the lecture. The students are responsible for downloading them from the website.

For the **optional** group projects, each group will consist of **1-3** students. The team will select one topic about materials and their applications and give a 15-20 min presentation in the end of November. The team formation and topic selection have to be completed by October 31, 2016 (email to TA and the instructor).

**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%  
Mid-term exam: 40%  
Final exam: 50%  
Office hours: 0 or -5 points

### With group project

Homework: 10%  
Mid-term exam: 30%  
Final exam: 40%  
Project presentation: 20%  
Office hours: 0 or -5 points

### Assignments/homework:

Weekly homework assignment. The answers will be posted in the Canvas course web. There will be 10 homework assignments through the semester. Each assignment counts 1 point toward the final score. **At least one** office hour appearance. Otherwise, 5 points will be deducted from the final score.

### Other Information:

Tutorial venue: Room LTC, 6:00 – 6:50 pm (Tuesday)  
Office hours: Room CYT2005 (Cheng Yu Tung Building), Wednesday: 4:00-5:00 pm  
PG TAs: Xueping Qin (xqinaa@ust.hk; Room 7102)  
Yuze Yao (yyaoae@connect.ust.hk; Room 7102 )  
HW grading, tutoring

### Textbook

James F. Shackelford, *Introduction to Materials Science for Engineers*, 7<sup>th</sup> Edition, Person Education, 2009; or 8<sup>th</sup> Edition, 2016.

### Reference

Brian S. Mitchell, *An Introduction to Materials Engineering and Science*, John Wiley, 2004.