[CENG1500] A First Course on Materials Science and Applications Course Syllabus

No. of Credits: 3

Pre-/co-requisites: None

Lecture Instructor: Prof. Cindy Tang
Tutorial Instructors (by TAs): Angelica Corpuz, Han Ge and Guangyu Wang
Office: Room 4587
Email: cindytang@ust.hk
Office hour: Monday 13:00-14:00

	Lectures	**Tutorials**
Date & Time	Wednesday 15:00 – 16:20 Friday 15:00 – 16:20	Monday 15:00 – 15:50
Location	LTH	LTH

Course Description

This is an introductory course for Chemical and Biological Engineering (CBE) students to provide foundational knowledge on the science and engineering of materials. The course will apply the basics of physics and chemistry to the properties of materials. Students will learn how atomic and microscopic properties affect the macroscopic levels, how materials' structures can be engineered to achieve desired properties, and what unique tools are used to study materials properties.

Intended Learning Outcomes (ILO)

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

ILO1: Understand the basic building blocks, structural components and classification of materials
ILO2: Correlate structure (crystalline and noncrystalline), bonding of atoms, defects, etc to material properties
ILO3: Analyze and use phase diagrams to understand and predict microstructures and properties of materials.
ILO4: Describe the properties of materials (e.g. physical, electrical, thermal, chemical, optical)
ILO5: Common characterization techniques for materials
ILO6: Evaluate materials for practical engineering applications in modern technologies

Textbooks (optional)

1. William D. Callister Jr., David G. Rethwisch. Callister's Materials Science and Engineering, Global Edition, 10th Ed.

   or

2. James F. Shackelford. Introduction to Materials Science for Engineers, 9th Ed

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessment Task	Contribution to Overall Course Grade (%)
Homework (HW)	4% * 5 = 20%
Quizzes	10% * 2 = 20%
Mid-Term Exam	25%
Final Exam	35%

Mapping of Course ILOs to Assessment Tasks

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessed Task	Mapped ILOs	Explanation
Homework (HW)	ILO 1-5	Homework evaluates students' ability to implement the theoretical knowledge discussed in the lectures.
Quizzes	ILO 1-5	These small stakes quizzes will measure individual learning outcomes on key concepts and theories in the course and provide feedback to students.
Mid-Term Exam	ILO 1-2, 4	Exams are designed to assess students' foundational understanding of the concepts, aligning with the lower-order thinking skills of remembering and Understanding.
Final Exam	ILO 1-6	

Homework

HWs are due on 23:59 via online submission on Canvas. Submission due dates are listed in Schedule below.

Late Submission Policy

To ensure fairness for students who submit assignments on time, a penalty for late submission is listed as follows:

- Late submission within 12 hours, 25% penalty will be applied.
- Late submission between 12 to 24 hours, 50% penalty will be applied.
- Late submission for more than 24 hours will not be accepted.

All late submissions are to be submitted via email to cindytang@ust.hk. Time of submission will be determined by email timestamp at time of receipt.

Quiz

Quizzes will be held in-person as per Schedule below.

Mid-Term Exam

Mid-term exam will be held in-person as per Schedule below.

Final Exam

Final exam will be a comprehensive exam covering all the contents taught in the course. Exam schedule will be separately released by HKUST. Please refer to Examination Timetable and Venues | HKUST – Academic Registry for latest timetable.

Report on Illness or Other Circumstances Affecting Assessment

If you have a valid medical reason for missing the quiz, mid-term or final exam, you'll need to email Prof. Cindy Tang (cindytang@ust.hk) *at least 1 hour before* the quiz/exam with:

(i) A medical certificate issued by a registered medical practitioner,
(ii) Filled form "[Form EX-16] Report on Extenuating Circumstances Affecting Assessment" as per HKUST's policy – refer to Application Forms for Current Students | HKUST – Academic Registry, and
(iii) Submit the completed form (after approval by Prof. Cindy Tang) to Academic Registry.

Requests after the exam date will not be accommodated. Prof. Cindy Tang will consider each case individually and determine an action that is deemed appropriate. Examples of the action may include but not limited to:

- Reject the request if the case does not warrant any special arrangement
- Require students to write a make-up examination* with or without marks deduction
- Require students to re-take a course assessment with or without marks deduction
- Adjust weighting of the grade for the involved assessment that make up the final grade

Communication and Feedback

• Homework assessment marks will be provided via Canvas within three weeks of submission.

• Students seeking clarification or further feedback, including marks, should consult Prof. Cindy Tang within one week of receiving the feedback or as specified otherwise.

• Students who require additional help may look for Prof. Cindy Tang during abovementioned office hour.

Course AI Policy

The use of Generative AI for completion of HWs are NOT permitted.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

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Schedule

Note: There will be no classes on public holidays (1 Oct and 29 Oct). Lecture schedule and content may subject to changes upon course instructor's discretion.

Week	Date	Topic
1	1 Sep	- No tutorial class -
	3 Sep	Lecture: Atomic Structure and Interatomic Bonds
	5 Sep	(HW 1 due on 7 Sep)
2	8 Sep	Tutorial: Revision + HW 1 solution
	10 Sep	Lecture: Interatomic Bonds
	12 Sep	
3	15 Sep	Tutorial: Revision + (HW 2 due 14 Sep)
	17 Sep	Lecture: Crystal Structures – Perfect and Imperfect
	19 Sep	
4	22 Sep	Tutorial: Revision + HW 2 solution
	24 Sep	Lecture: Crystal Structures – Perfect and Imperfect
	26 Sep	Lecture: Diffusion
5	29 Sep	Tutorial: Revision + Quiz 1
	3 Oct	Lecture: Diffusion
6	6 Oct	Tutorial: Revision + Quiz 1 Solution
	8 Oct	Lecture: Mechanical Properties (HW 3 due 12 Oct)
	10 Oct	
7	13 Oct	Tutorial: Revision + HW 3 solution
	15 Oct	Lecture: Failure of Materials
	17 Oct	
8	20 Oct	Tutorial: Mid-Term Exam
	22 Oct	Lecture: Phase diagrams
	24 Oct	
9	27 Oct	Tutorial: Revision + Mid-Term Exam solution
	31 Oct	Lecture: Chemical Properties (HW 4 due 2 Nov)
10	3 Nov	Tutorial: Revision + HW 4 solution
	5 Nov	Lecture: Chemical Properties (HW 5 due 9 Nov)
	7 Nov	
11	10 Nov	Tutorial: Revision + HW 5 solution
	12 Nov	Lecture: Structural Materials –
	14 Nov	Metals, Ceramics, Glasses, Polymers, Composites
12	17 Nov	Tutorial: Revision + Quiz 2
	19 Nov	Lecture: Electronic Materials
	21 Nov	
13	24 Nov	Tutorial: Quiz 2 solution
	26 Nov	Lecture: Materials in Engineering Design + Revision
	28 Nov	

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Final Grade Descriptors

Grade	Short Description	Elaboration on subject grading description
A	Excellent Performance	Students with excellent performance in the course demonstrate a strong grasp of lecture materials, competent completion of all HWs, and exceling in quizzes and exams. They exhibit effective utilization of knowledge and concepts discussed in class.
B	Good Performance	Students with good performance in the course demonstrate a solid understanding of lecture materials, competent completion of HWs, and achieving good performance in quizzes and exams. They showcase commendable utilization of knowledge and concepts discussed in class.
C	Satisfactory Performance	Students with satisfactory performance in the course demonstrate an adequate understanding of lecture materials, partial completion of HWs, and achieving acceptable performance in quizzes and exams. They showcase satisfactory utilization of knowledge and concepts discussed in class.
D	Marginal Pass	Students with marginal pass in the course show limited understanding of lecture materials, inconsistent completion of HWs, and marginal performance in quizzes and exams. They exhibit limited utilization of knowledge and concepts discussed in class.
F	Fail	Students who fail the course display a lack of understanding of lecture materials, inadequate completion of HWs, and poor performance in quizzes and exams. They exhibit little utilization of knowledge and concepts discussed in class.