

**City University of Hong Kong  
Course Syllabus**

**offered by Department of Materials Science and Engineering  
with effect from Semester A 2023/24**

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**Part I Course Overview**

**Course Title:** Frontiers in Materials

**Course Code:** MSE8022

**Course Duration:** One semester

**Credit Units:** 3

**Level:** R8

**Medium of Instruction:** English

**Medium of Assessment:** English

**Prerequisites:**  
(Course Code and Title) Nil

**Precursors:**  
(Course Code and Title) Nil

**Equivalent Courses:**  
(Course Code and Title) Nil

**Exclusive Courses:**  
(Course Code and Title) Nil

## Part II Course Details

### 1. Abstract

*(A 150-word description about the course)*

The goal of this course is for student to be made aware of the fun and difficulty of science and engineering by experiencing cutting edge initiatives in science and engineering, thus providing an opportunity to strongly motivate them academically. Furthermore, students will gain an understanding of how individual science and engineering results are related to and contribute to society. Students will acquire the following skills from taking this course on cutting edge science and engineering: 1) The skills to process cutting edge science and engineering, and gain an understanding in addition to one's own surveys; 2) The skills to attempt to actively understand the links between science and engineering and society; 3) The skills to engage with interest in science and engineering topics they are encountering for the first time, and to back cast that knowledge to their own learning.

- One-hour presentation for each student including presentation, questions and answers.
- The presentation includes:
  - 1) Introduction, basic knowledge of this topic, operation mechanism, working principle;
  - 2) literature review about this field, current status of this field, what progress already achieved, what kind of problem still need to be resolved;
  - 3) Motivation and objective, what kinds of problem you want to solve, why you want to solve this kind of problem, how you are going to solve this kind of problem, from synthesis, characterization, and application aspects, etc. also what is the impact or result on solving this kind of problem;
  - 4) Research methods, future research direction, what kind of research directions you are going to do, list 1, 2, 3, 4 research directions, for each research direction, what kind of problem you want to solve, list the main characterization techniques that want to use to conduct your research, introduce these main characterization techniques, including the operation mechanism, working principle of these characterization techniques, difference student can mention different aspects of the same characterization technique, such as TEM, SEM, XRD, XPS, etc. what kind of results you expect to obtain, what kinds improvements you expect to achieve: such as electrical conductivity, photoluminescent yield, band gap, FET ON/OFF ratio, overpotential, Tafel slop, energy storage capacity, Lithium ion diffusion coefficient, etc. Then explain the improvements or achievements from thermodynamic or kinetic point of view, or molecular point of view, or quantum mechanics.
  - 5) Project timetable, list the research schedule and milestones.
- During the presentation, every student needs to attend the class, asking some questions, asking good questions will be counted in the final marks.
- For the PPT presentation, please try to deliver fluent presentation, if you can't present the PPT fluently, mark deduction will be applied, so the student is better to prepare the lecture notes

under the PPT slide and repeatedly practice the presentation before his or her presentation timeline.

- After presentation from every student, the student is required to compose a proposal based this PPT presentation. For the assignments, there is no final exam, only this PPT presentation and proposal for final evaluation.

## 2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

| No. | CILOs   | Weighting*<br>(if applicable)                                    | Discovery-enriched curriculum related learning outcomes (please tick where appropriate) |    |    |
|-----|---|--|---|----|----|
|     |   |  | A1  | A2 | A3 |
| 1.  | Prepare and deliver good seminar/conference presentations |  |   | ✓  | ✓  |
| 2.  | Literature search and management                          |  |   | ✓  | ✓  |
| 3.  | Research ethics in Science                                |  | ✓   |    | ✓  |
| 4.  | Literature review organization                            |  |   | ✓  | ✓  |
| 5.  | Scientific data presentation                              |  | ✓   | ✓  |    |
| 6.  | Research proposal writing                                 |  | ✓   | ✓  | ✓  |
|     |   | * If weighting is assigned to CILOs, they should add up to 100%. | 100%  |    |    |

**A1: Attitude**

*Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.*

**A2: Ability**

*Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.*

**A3: Accomplishments**

*Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.*

### 3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

| TLA | Brief Description     | CILO No. |   |   |   |   |   | Hours/week (if applicable) |
|-----|-----------------------|----------|---|---|---|---|---|----------------------------|
|     |                       | 1        | 2 | 3 | 4 | 5 | 6 |                            |
| 1   | Presentations         | √        | √ | √ | √ | √ | √ | 30/semester                |
| 2   | Questions and answers | √        | √ |   |   | √ |   | 9/semester                 |

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

| Assessment Tasks/Activities                              | CILO No. |   |   |   |   |   | Weighting* | Remarks |
|--|----------|---|---|---|---|---|------------|---------|
|  | 1        | 2 | 3 | 4 | 5 | 6 |            |         |
| Continuous Assessment: <u>100</u> %                      |          |   |   |   |   |   |            |         |
| 1. Assignment  | √        | √ | √ | √ | √ | √ | 30%        |         |
| 2. Presentation  | √        | √ |   |   | √ | √ | 30%        |         |
| 3. Proposal  | √        | √ | √ | √ | √ | √ | 40%        |         |
| Examination: <u>0</u> % (duration: _____, if applicable) |          |   |   |   |   |   |            |         |
| * The weightings should add up to 100%.                  |          |   |   |   |   |   | 100%       |         |

## 5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

| Assessment Task | Criterion   | Excellent<br>(A+, A, A-) | Good<br>(B+, B) | Marginal<br>(B-, C+, C) | Failure<br>(F)                       |
|-----------------|---|--------------------------|-----------------|-------------------------|--------------------------------------|
| 1. Assignment   | Select a topic, prepare the Presentation with a group, Writing an proposal  | High                     | Moderate        | Basic                   | Not even reaching the marginal level |
| 2. Presentation | Presentation a topic in a team work, answer the questions raised by teachers and classmate.   | High                     | Moderate        | Basic                   | Not even reaching the marginal level |
| 3. Proposal     | Writing a dummy research proposal for RGC Hong Kong. This include literature reivew, question need to resolve, and plan to solve this problem. Impact and objectives, Research context, Research Questions, and Research Methods. | High                     | Moderate        | Basic                   | Not even reaching the marginal level |

### **Part III Other Information** (more details can be provided separately in the teaching plan)

#### **1. Keyword Syllabus**

*(An indication of the key topics of the course.)*

- Research ethics (plagiarism, data fabrication, attribution, IP, conflict of interest, authorship)
- Preparing and delivering a seminar presentation
- Research proposal organization
- Scientific data presentation
- Research paper organization

#### **2. Reading List**

##### **2.1 Compulsory Readings**

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

|    |   |
|----|---|
| 1. | Estelle Phillips, Colin Johnson, 2022: How to Get a PhD: A Handbook for Students and Their Supervisors. Open University Press, 280pp. |
| 2. | Desmond Thomas, 2016: The PhD Writing Handbook, Bloomsbury Publishing PLC, 240pp.   |
| 3. | Peter J. Feibelman, 2011: A PhD Is Not Enough! A Guide to Survival in Science, Addison - Wesley Publishing Company, 113pp.            |

##### **2.2 Additional Readings**

*(Additional references for students to learn to expand their knowledge about the subject.)*

N.A.