香港城市大學
City University of Hong Kong

City University of Hong Kong
Course Syllabus

offered by Department of Materials Science and Engineering
with effect from Semester A 2024/25

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

This course is designed to enhance students' abilities related to scientific research during their Ph.D program. Various capabilities will be trained including but not limited to 1. How to grasp the frontiers in their own research; 2. Reading; 3. Justification; 4. Time management; 5. Summarization; 6. Data analysis; 7. Communication skills; 8. Scientific writing; 9. Perseverance; 10. Presentation; 11. Logical thinking etc to make students ready for their research journey.

Upon completion of the course, students will be able to:

1. How to describe **Frontiers in Materials** in their own research fields;
2. To outline some possible elements related to their own research;
3. To use library resources to provide a summary on Frontiers in Materials related to their own research fields;
4. To enhance their ability how to effectively work/communicate with their academic advisor;
5. To understand the importance of timeline for completion of their thesis/dissertation;
6. To reduce/eliminate barriers how to develop a high-quality research result;
7. To learn how to select a research topic of importance to the profession;
8. To learn how to write a narrative that presents a compelling need for their study;
9. To develop a clear and concise purpose statement, delineated by research objectives;
10. To learn how to identify and explain an appropriate theory base for their research;
11. To develop a conceptual model relevant to their research;
12. To learn how to prepare a comprehensive review of the empirical literature related to their topic;
13. To learn how to describe in detail the procedures to be used for their study;
14. To learn how to prepare for the successful defence of their thesis/dissertation proposal.

In class presentation (up to 20 minutes). Your presentation needs to include the following slides: title, what is known about this topic, current knowledge gap and need for the study, problem statement, purpose of the study, research questions/objectives, research design/methods, data source(s), data analysis, and why this study intrigues you. The presentation will be evaluated by all students in the class.

Recorded thesis proposal presentation. 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 has already been achieved, what kind of problem still needs 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;
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, different students 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 kind of improvements you expect to achieve.

5) Project timetable, list the research schedule and milestones.

Written thesis proposal. At the end of this course, each student needs to submit a written thesis proposal.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting* (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.	Communication		√	√	√
4.	Literature review organization			√	√
5.	Scientific data presentation		√	√	
6.	Research proposal writing		√	√	√
		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. Learning and Teaching Activities (LTAs)

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5	6	
Presentations: • Practice narrowing an idea to a clearly defined, limited research agenda • Learn strategies for how to organize, plan, rehearse, and deliver effective oral presentations in a way that is accurate, relevant, and appropriate to the audience • Identify, explore, and practice skills in live oral delivery (with or without multimedia) through feedback from peers and instructors	An opportunity for students to share their individual research proposal	√	√	√	√	√	√	21/semester
Questions and answers: • Reflect on their learning experience in choosing sources, framing questions, translation process	An opportunity for students to answer questions and provide answers	√	√			√		9/semester
Communication skills: • Tips, techniques, exercises, and other activities that give students the opportunity to learn more about effective communication, help guide students' interactions with others, and improve students' communication skills	An opportunity for students to practice effective communication	√	√			√		6/semester
Scientific writing: • Usage of appropriate scientific terminology, demonstration of clarity of thought and expression, logical reasoning, ability to describe the results of experimental findings qualitatively and quantitatively, formulation of ideas, and drawing of conclusions supported by sufficient data and evidence.	An opportunity for students to practice scientific writing	√	√			√		3/semester

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5	6		
Continuous Assessment: _100__%								
1. In class presentation	√	√	√	√	√	√	30%	
2. Recorded thesis proposal presentation	√	√			√	√	40%	
3. Thesis proposal	√	√	√	√	√	√	30%	
Examination: __0__% (duration: , if applicable)								
							100%	

5. Assessment Rubrics

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. In class presentation	Select a topic, prepare the presentation with a group, answer questions	High	Moderate	Basic	Not even reaching the marginal level
2. Recorded thesis proposal presentation	Present your thesis proposal	High	Moderate	Basic	Not even reaching the marginal level
3. Thesis proposal	Writing a PhD thesis proposal. This includes literature review, questions need to resolve, the research plan, impact and objectives, research context, research methods, etc.	High	Moderate	Basic	Not even reaching the marginal level

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. In class presentation	Select a topic, prepare the presentation with a group, answer questions	High	Significant	Moderate	Basic	Not even reaching the marginal level
2. Recorded thesis proposal presentation	Present your thesis proposal	High	Significant	Moderate	Basic	Not even reaching the marginal level
3. Thesis proposal	Writing a PhD thesis proposal. This includes literature review, questions need to resolve, the research plan, impact and objectives, research context, research methods, etc.	High	Significant	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

- Preparing and delivering a seminar presentation
- Effective communication
- Research paper organization
- Research proposal writing
- Scientific data presentation

2. Reading List

2.1 Compulsory Readings

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 Publisbing Company, 113pp.

2.2 Additional Readings

N.A.