City University of Hong Kong
Course Syllabus

offered by Department of Chemistry
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	Academic and Industrial Research, Development and Innovation
Course Code:	CHEM6121
Course Duration:	1 semester
Credit Units:	3 credits
Level:	P6
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)*	BCH6121 Academic and Industrial Research, Development and Innovation
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

In this course, students will be introduced to the academic and industrial aspects of scientific research and its role to increase the basic and applied knowledge of mankind as part of the development of a sustainable society. By completing the course students will be able to describe the brief history of knowledge and the different methods of learning, comprehend the role of serendipity in scientific discovery and differentiate between curiosity driven and problem solving research; will learn the key components of designing, performing, monitoring and evaluating experimental protocols; learn the basics of academic research as well as managing research, development and innovation (R&D&I) in industry including corporate strategy, R&D&I frameworks, core competencies and competitor assessment, strategic alliances, and R&D&I strategy development; and finally understand the importance of core values and ethics in scientific research. The course will enable the students to select a book or an article on modern science and understand the underpinning concepts.

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 (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Students will be able to describe the brief history of knowledge focusing on science and philosophy.	10%	✓		✓
2.	Students will be able to explain the methods and the role of learning in different part of the world.	5%	✓		
3.	Students will be able to analyse the role of serendipity in scientific discoveries and contrast curiosity driven and problem-solving research.	10%	✓	✓	
4.	Students will be able to describe how to design, perform, monitor and evaluate chemical experiments.	10%	✓	✓	✓
5.	Students will be able to explain the methods of management of research, development and innovation in industry, and analyse the role of ethics in scientific research.	65%	✓	✓	✓
		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 real-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)

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

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lectures and tutorials	Students will learn the most important themes in science and philosophy and their role in contemporary theories and practices.	✓						
	Students will learn the characteristics of various learning methods in different part of the world.		✓					
	Students will participate in learning and discussing serendipitous scientific discoveries, curiosity driven research and problem-solving investigations.			✓				
	Students will be engaged in designing, performing, monitoring and evaluating of chemical experiments.				✓			
	Students will learn the key components of managing research, development and innovation in industry, and the role of ethics in scientific research.					✓		
Videos	Students will watch the performing and monitoring of chemical experiments.				✓			

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			
Students will be engaged in Continuous Assessment: 40%								
Students will complete Tutorial Assignments		✓		✓	✓		20%	
Students will participate in Group Presentations			✓				10%	
Students will write Reports	✓						10%	
Students will take Examination: 60% (duration: 2 hours)								
							100%	

Starting from Semester A, 2015-16, students must satisfy the following minimum passing requirement for courses offered by CHEM:

"A minimum of 40% in both coursework and examination components."

5. Assessment Rubrics

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

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. Tutorial Assignments	Ability to explain the concepts and methods of learning and scientific research in academic, governmental and industrial environments.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Group Presentations	Ability to explain and demonstrate serendipitous scientific discoveries, curiosity driven research and problem solving investigations.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Reports	• Capacity for self-directed learning to understand the basics of important themes in science and philosophy and their role in contemporary theories and practices. • Ability to explain the role of science and philosophy in contemporary theories and practices.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Ability to answer questions in details concerning the brief history of knowledge, the different methods of learning, comprehend the role of serendipity in scientific discovery and differentiate between curiosity driven and problem solving research, the key components of designing, performing, monitoring and evaluating experimental protocols, the basics of managing research, development and innovation in industry, and the ethics in scientific research.	High	Significant	Moderate	Basic	Not even reaching marginal levels

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. Tutorial Assignments	Ability to explain the concepts and methods of learning and scientific research in academic, governmental and industrial environments.	High	Significant	Basic	Not even reaching marginal levels
2. Group Presentations	Ability to explain and demonstrate serendipitous scientific discoveries, curiosity driven research and problem solving investigations.	High	Significant	Basic	Not even reaching marginal levels
3. Reports	• Capacity for self-directed learning to understand the basics of important themes in science and philosophy and their role in contemporary theories and practices. • Ability to explain the role of science and philosophy in contemporary theories and practices.	High	Significant	Basic	Not even reaching marginal levels
4. Examination	Ability to answer questions in details concerning the brief history of knowledge, the different methods of learning, comprehend the role of serendipity in scientific discovery and differentiate between curiosity driven and problem solving research, the key components of designing, performing, monitoring and evaluating experimental protocols, the basics of managing research, development and innovation in industry, and the ethics in scientific research.	High	Significant	Basic	Not even reaching marginal levels

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.)

History
Science
Philosophy

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.	Lecture slides

2.2 Additional Readings

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

1.	Scaruffi P. *A Brief History of Knowledge,* Createspace (2004)
2.	Brown, P. C.; Roediger III, H. L.; McDaniel, M. A. Make It Stick: The Science of Successful Learning, Harvard University Press, Cambridge, MA (2014)
3.	Roberts, R. M. Serendipity: Accidental Discoveries in Science, Wiley, New York (1989)