

Course Syllabus

**offered by Department of Chemistry
with effect from Semester A 2020/21**

This form is for the completion by the Course Leader. The information provided on this form is the official record of the course. It will be used for the City University's database, various City University publications (including websites) and documentation for students and others as required.

Please refer to the Explanatory Notes on the various items of information required.

Prepared / Last Updated by:

Name: Dr. LY Thuc Hue Academic Unit: Department of Chemistry

Phone/email: 34429329/thuchly@cityu.edu.hk Date: 18 November 2019

**City University of Hong Kong
Course Syllabus**

**offered by Department of Chemistry
with effect from Semester A 2020/21**

Part I Course Overview

Course Title: Graphene: Fundamentals and Emergent Applications

Course Code: CHEM3082

Course Duration: 1 Semester

Credit Units: 3

Level: B3

Arts and Humanities

Proposed Area: Study of Societies, Social and Business Organisations

(for GE courses only)

Science and Technology

Medium of Instruction: English

Medium of Assessment: English

Prerequisites: Nil
(Course Code and Title)

Precursors: PHY1201 (General Physics I), BCH1100 (Chemistry),
CHEM1300 (Principles of General Chemistry),
CHEM2008/BCH2008 (Principle of Physical Chemistry)
(Course Code and Title)

Equivalent Courses: BCH3082 Graphene: Fundamentals and Emergent Applications
(Course Code and Title)

Exclusive Courses: Nil
(Course Code and Title)

Part II Course Details

1. Abstract

(A 150-word description about the course)

Graphene is the world's first 2-dimensional material and is the thinnest, strongest, and most flexible material known to exist. Graphene, a special form of carbon, can conduct electricity and heat better than anything else. In this course, we will introduce you to the exciting world of graphene science and technology. You will learn about the fundamentals of graphene and how this material offers new insights into nanotechnology and quantum physics. You will also learn about emerging practical applications for graphene. Topics covered include material properties, electronics, physics, physical chemistry, synthesis and characterization techniques and applications.

Graphene offers a wealth of potential future applications; in composites, solar cells, sensors, superchargers, etc. The list is endless. You will be able to decide whether or not graphene can contribute to your own applications, research and future career.

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.	Know what is graphene, a 2D-layered material, how is it different from 3 dimensional materials that we encounter everyday	20%	√	√	
2.	Basic knowledge on how to perform graphene material synthesis, characterizations and application orientated properties	30%	√	√	
3.	Knowhow and appreciate scientific articles on graphene research	30%		√	√
4.	Decide whether or not graphene can contribute to your career advancement	20%		√	√
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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	
Lectures	Student will learn in lecture about graphene, from fundamentals, synthesis, characterizations, and their applications. A "5mins quiz" which recap the content of last lecture will be given at begin of each class to reinforce students' understanding.	√	√			
Experiment demonstration	Students will have a real experience on how to prepare graphene (mechanical exfoliation – in-class, chemical vapour deposition (CVD)-video) and characterize it (AFM, Raman in CHEM's lab).	√	√			
In-class and online discussions	Students will join some forums/e-courses, related to graphene and then have in-class discussion or in canvas.	√	√	√	√	
Group projects (Oral presentations/reports)	Group presentation on selected topics, scientific papers related to graphene. The topics will be decided through on-/off-line discussions. Students will be asked to write reports after each group presentation and give grade for each presentation.	√	√	√	√	

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				
Continuous Assessment: <u>40%</u>								
5 mins quiz/ assignment	√	√					20%	
Group presentation	√	√	√	√			10%	
Report	√	√	√	√			10%	
Examination: <u>60%</u> (duration: <u>2 hours</u>)								
* The weightings should add up to 100%.							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.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. 5 mins quiz/ assignment	Ability to explain and discuss the fundamentals of graphene, synthesis, characterizations and applications.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2.Group presentation	Ability to enhance the group-works experience, organize a presentation with cohesive content, to understand the topics completely.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Report	1. Ability to communicate scientific information 2. Ability to analyse and evaluate and scientific problem/issues.	High	Significant	Moderate	Basic	Not even reaching marginal levels
4.Final examination	Ability to integrate the knowledge in this lecture to their interesting research.	High	Significant	Moderate	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.)

- Introduction to Graphene
- Properties of Graphene
- Methods for Obtaining Graphene
- Characterization Techniques
- Applications of Graphene
- Graphene, C60 and other carbon related materials
- Graphene and You

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.	
2.	
3.	
...	

2.2 Additional Readings

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

1.	Online Resources: To be provided, as required.
2.	
3.	
...	

A. Please specify the Gateway Education Programme Intended Learning Outcomes (PILOs) that the course is aligned to and relate them to the CILOs stated in Part II, Section 2 of this form:

GE PILO	Please indicate which CILO(s) is/are related to this PILO, if any (can be more than one CILOs in each PILO)
PILO 1: Demonstrate the capacity for self-directed learning	
PILO 2: Explain the basic methodologies and techniques of inquiry of the arts and humanities, social sciences, business, and science and technology	
PILO 3: Demonstrate critical thinking skills	
PILO 4: Interpret information and numerical data	
PILO 5: Produce structured, well-organised and fluent text	
PILO 6: Demonstrate effective oral communication skills	
PILO 7: Demonstrate an ability to work effectively in a team	
PILO 8: Recognise important characteristics of their own culture(s) and at least one other culture, and their impact on global issues	
PILO 9: Value ethical and socially responsible actions	
PILO 10: Demonstrate the attitude and/or ability to accomplish discovery and/or innovation	

GE course leaders should cover the mandatory PILOs for the GE area (Area 1: Arts and Humanities; Area 2: Study of Societies, Social and Business Organisations; Area 3: Science and Technology) for which they have classified their course; for quality assurance purposes, they are advised to carefully consider if it is beneficial to claim any coverage of additional PILOs. General advice would be to restrict PILOs to only the essential ones. (Please refer to the curricular mapping of GE programme: http://www.cityu.edu.hk/edge/ge/faculty/curricular_mapping.htm.)

B. Please select an assessment task for collecting evidence of student achievement for quality assurance purposes. Please retain at least one sample of student achievement across a period of three years.

Selected Assessment Task