香港城市大學
City University of Hong Kong

SYL

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:

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Part I Course Overview

Course Title:	**Crystallography/Solid-state Inorganic Chemistry**
Course Code:	**CHEM4084**
Course Duration:	**One Semester**
Credit Units:	**Four**
Level:	**B4**
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**CHEM2006/BCH2006 (Principles of Inorganic Chemistry)**
Precursors: *(Course Code and Title)*	**Nil**
Equivalent Courses: *(Course Code and Title)*	**BCH4084 Crystallography/Solid-state Inorganic Chemistry**
Exclusive Courses: *(Course Code and Title)*	**Nil**

Part II Course Details

1. Abstract

(A 150-word description about the course)

This is an interdisciplinary course on the fundamental and contemporary topics of crystallography and crystal structures, properties and technological applications. As the subject matter is not usually covered in an undergraduate curriculum, brief and intuitive introduction to the structures and properties of solid state materials will be presented on a level accessible for students in year two or above. Exemplary chapters including basic X-ray diffraction theory for structural studies, common structural types of inorganic solids, zeolite materials and recent advances in organic-inorganic porous materials, plasmonic materials, synthesis of solid state materials and their uses in energy, biomedical, electronic and environmental technologies. These technologies include: environmentally friendly catalysts, sensors, and low-cost fabrication of devices such as field effect transistors (FET), light-emitting diodes (LED), solar cells and fuel cells. We will also discuss the frequently used chemical reactions in the fabrication process of these materials.

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.	Carry out basic analysis of the concepts and principles in the X-ray diffraction studies on solid state material.	25%	✓		
2.	Implement reliable and appropriate intellectual procedures for correlating crystalline structures to materials properties, and reliably implement it with accuracy and precision.	25%		✓	
3.	Critically evaluate experiments/processes in the preparation and applications of solid state materials/nanomaterials in the chemical literature and effectively communicate this knowledge within their special study fields.	25%	✓	✓	✓
4.	Identify and uphold the social responsibilities of chemists, with particular concern for biomedical and environmental issues in the solid state and nanomaterials research.	25%		✓	✓
	** If weighting is assigned to CILOs, they should add up to 100%.*	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 and tutorials	Teaching and learning will be based on a combination of lectures and tutorials to elucidate the fundamental and contemporary topics of crystallography and crystal structures, properties and technological applications of solid-state inorganic materials.	✓	✓			
Lectures	Teaching and learning will primarily engage the students in the case studies of the important types of structures and properties of solid-state materials, including basic X-ray diffraction theory, inorganic solids, zeolite materials, organic-inorganic porous materials, plasmonic materials, and their uses in energy, biomedical, electronic and environmental technologies.	✓	✓			
Group activities, Written assignments, presentations	Teaching and learning will primarily involve large and small group activities examining various molecules/materials/procedures, and the implications in modern technology development. Team work is emphasized in the form of group presentation and assignment of selected projects.			✓	✓	
Tutorials and recent primary research articles	Teaching and learning will entails extensive teacher-student interaction and supervised in-depths discussion among the students based on recent primary research articles, in order to foster independent and critical thinking of the students.	✓			✓	

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: 40%						
Tutorial Assignments or Quizzes	✓	✓	✓	✓	20%	
Group Presentations and reports			✓	✓	20%	
Examination: 60% (duration: 3 hours)						
Final Examination	✓	✓	✓	✓	60%	
** 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. Tutorial Assignments or Quizzes	Ability to express, explain and apply the core concepts and equations in the covered subjects of crystallography and solid-state inorganic chemistry.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2.Group presentations and reports	Clear presentation indicative of critical and logical thinking. Ability to enhance the group-works experience, organize a presentation with cohesive content, to analyse and evaluate and scientific problem/issues.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3.Final examination	Ability to tackle the designer problems on crystallography and crystal structures of solid-state materials utilizing the firm grip on the acquired core concepts and topical contents.	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.)

Solids and society. Industrial and environmental importance of solid state materials. Crystal structures, packing of molecules, basic diffraction theory. Properties of solids: porosity, conductivity and semiconductivity, luminescence, and plasmonics. Applications of solids: catalysts, field effect transistors, light-emitting diodes, solar cells, fuel cells, environment sensors, biomedical sensors. Preparation of inorganic-based solids and nano-particles&-materials and methods of crystal growth.

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.	The solid state : A. Guinier and R. Jullien, Oxford University Press, 1989.
2.	Introduction to Crystallography: D. E. Sands. Dover Publications, 1993
3.	Appropriate Selected Research Papers
NOTE: #	These books are only recommended for reading and should NOT be purchased without consulting your lecturer.

2.2 Additional Readings

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

1.	
2.	
3.	
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Annex
(for GE courses only)

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