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:	Principles of Environmental Chemistry
Course Code:	CHEM2005 (and CHEM2005A)
Course Duration:	1 semester
Credit Units:	4 (3) credits
Level:	B2
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)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	BCH2005 (and BCH2005A) Principles of Environmental Chemistry
Exclusive Courses: *(Course Code and Title)*	Nil

Note: CHEM2005A does not contain any practical component, and has a credit unit value of three (3).

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to enable students to gain basic knowledge and training in environmental chemistry. Building from fundamental knowledge in chemistry and environmental sciences, the course will cover the forms, interactions, and distribution of major components in the environment, and use relevant chemical concepts to rationalize aspects of environmental chemistry. In this course, students will develop practical experience in environmental chemistry and analysis. The skills and understanding accumulated during this course will prepare students for more advanced and specialized studies in chemistry as well as environmental sciences.

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.	Describe the major chemical processes in the atmosphere, hydrosphere, lithosphere and biosphere, and apply relevant chemical concepts to explain aspects of environmental chemistry.	15 %	✓		
2.	Describe the changes caused by anthropogenic activities to the atmosphere, hydrosphere, lithosphere and biosphere and apply relevant chemical concepts to analyze these changes.	15 %	✓		
3.	Compare and relate the nature, reactivity, speciation, and mobility of important chemical components in the hydrosphere, atmosphere, biosphere, and lithosphere.	20 %		✓	
4.	Based on the formula of a chemical species, hypothesize its chemical and physical properties and relate this to its environmental effects, distribution and behavior.	20 %			✓
5.	Analyze and solve mathematical problems relevant to the hydrosphere, lithosphere and atmosphere.	20 %		✓	
6.	Perform environmental analysis experiments and derive information and conclusions based on the observed data.	10 %		✓	
		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	5	6	
Lectures, interactive questioning and tutorials, and videos	Lectures, interactive questioning and tutorials, and videos will enable students to recognize the basic concepts and chemical processes in the environment and give them practice in explaining these to peers.	✓						
Lectures, interactive questioning and tutorial, and seminars from experts in relevant fields	Lectures, interactive questioning and tutorial, and seminars from experts in relevant fields will enable students to recognize the range of anthropogenic activities that have led to adverse impacts upon the environment, and to analyze the scientific evidence of these impacts.		✓					
Web-based lectures, videos and tutorial teaching methods	Web-based lectures, videos and tutorial teaching methods will enable students to acquire knowledge regarding nature and behaviour of important chemical components in the environment, in order to draw relationships between them.			✓				
Problem-solving activities, e.g. virtual simulation and interactive tutorials	Problem-solving activities, e.g. virtual simulation and interactive tutorials will provide students with experience in critically evaluating the composition and structure of chemical species, in order to predict the chemical-physical properties and hence environmental behavior.				✓			
Step-by-step problem-based tutorials and assignments (with timely model answers)	From step-by-step problem-based tutorials and assignments (with timely model answers), students will gain the experience and technique to solve the mathematical problems.					✓		
Experiments in the laboratory	Students will perform experiments in the laboratory, whereby clear relationships with the course content and ILOs will be highlighted.						✓	

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: 30%								
Tutorials and assignments	✓	✓	✓	✓	✓		20%	
Practicals						✓	10%	
Examination: 70% (duration: 3 hours)								
** 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. Tutorials and assignments	Ability to analyze and solve problems relevant to the hydrosphere, lithosphere, biosphere, and atmosphere	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Practicals	Ability to perform environmental analysis experiments and derive information and conclusions based on the observed data	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Ability to describe the major concepts and chemical processes related to environmental chemistry; ability to compare and relate the nature, reactivity, speciation, and mobility of important chemical components in the environment; and ability to hypothesize the chemical and physical properties of a chemical species	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.)

Basic Concepts
The environment. Environmental pollution. Important chemical concepts.

Natural waters (hydrosphere)
Important properties of water and their effects and significance. Water quality parameters. Gas solubility, aqueous reactions and Henry's law. Alkalinity and acidity. Ionic species in water. Speciation of metal pollutants. Humic substances, metal chelates, pesticides and organic toxins in water.

Minerals, clay, soil and sediments (lithosphere)
Formation of sediments and weathering of rocks. Nature of soil. Binding properties of clays. Mobility of ions in environment.

Biochemistry of important elements (biosphere)
Plant nutrients. Chemical processes involving nitrogen in soil. Acid rain.

Atmosphere
Structure and chemical components of the Earth's atmosphere. Impacts of anthropogenic activities upon the atmospheric environment and fates of contaminants. Modelling of atmospheric processes.

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.	S. E. Manahan, Environmental Chemistry, 8th Ed., CRC Press, Boca Raton, 2005.
2.	D.W. Connell, Basic Concepts of Environmental Chemistry, 2nd Ed., Taylor & Francis/CRC Press, Boca Raton, 2005.

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