香港城市大學
City University of Hong Kong

SYL

Course Syllabus

offered by Department of Chemistry
with effect from Semester B 2017/18

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:	Environmental Measurements
Course Code:	BCH4035 (and BCH4035A)
Course Duration:	1 semester
Credit Units:	4 (3) credits
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)*	Nil
Precursors: *(Course Code and Title)*	BCH2004 (and BCH2004A) Principles of Analytical Chemistry BCH2005 (and BCH2005A) Principles of Environmental Chemistry
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Note: BCH4035A 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 develop and apply their knowledge of the principles and techniques in environmental sampling and environmental monitoring, and to master practical skills in environmental measurements, through activities conducted in the field and in the laboratory. (A brief description of how it fits with other courses students take is helpful e.g. that it prepares students to undertake field and laboratory research projects/studies in environmental science).

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.	Apply and explain the concepts and principles of general *in-situ* and *ex-situ* physicochemical and chemical measurement techniques which are used in monitoring of natural waters, sediments and the ambient air.		✓		
2.	Apply and explain the concepts and principles of chemical and instrumental analysis used in the assay of trace levels of heavy metals and organic contaminants in complex environmental matrices.		✓		
3.	Design environmental monitoring programmes which apply relevant statistical, analytical and bio-analytical principles to address specific environmental management and conservation needs.			✓	
4.	Critically evaluate the various environmental monitoring and measurement approaches to manage, protect and conserve local as well as the global ecosystem.			✓	✓
5.	Collect and interpret field and laboratory data and communicate the assimilated information in a professional manner.				✓
	** 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	5	
Case studies and laboratory practices	Students will learn primarily through case studies and laboratory practices where they will gain hands-on experience in the various state-of-the-art chemical and instrumental techniques for trace metal and organic analysis.	✓	✓				
Group critical evaluation tasks	In large and small group critical evaluation tasks students will discuss the principles, limitations, relevance and applicability of the various environmental monitoring and measurement approaches to manage, protect and conserve local as well as the global ecosystem.	✓			✓		
Field practices and group presentation	Through field practices and group presentation students will gain practical skills in: (a) analyzing environmental analytical parameters via the various *in-situ* and *ex-situ* techniques for the analysis of air, sediment and water, and (b) interpreting measurement data and assimilating information for communication with professionals.	✓		✓		✓	

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		BCH4035	BCH4035A	
Continuous Assessment: 45%								
Short Quizzes	✓	✓				7%	10%	
Tutorial Assignments	✓	✓				10%	15%	
Group Presentations			✓	✓	✓	14%	20%	
Fieldwork / Laboratory Reports	✓	✓			✓	14%	--	(for BCH4035 only)
Examination: 55% (duration: 3 hours)								
** The weightings should add up to 100%.*						100%	100%	

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

"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. Short Quizzes	Demonstration of understanding the principles and practice of various topics of environmental analytical chemistry, and apply them in real world problems.	Able to demonstrate excellent understanding of the principles and practice of various topics of environmental analytical chemistry, and apply them in real world problems.	Able to describe and explain the principles of various topics of environmental analytical chemistry, and apply them in real world problems.	Able to describe and explain some key principles of selected topics of environmental analytical chemistry, and apply them in real world problems.	Able to briefly describe isolated principles of selected topics of environmental analytical chemistry, and show limited ability to apply them in real world problems.	Fail to accurately describe and explain relevant principles of any topics of environmental analytical chemistry.
2. Tutorial Assignments	Demonstration of understanding the principles and practice of the selected topics of environmental analytical chemistry, and apply them in real world problems.	Able to demonstrate excellent understanding of the principles and practice of the selected topics of environmental analytical chemistry, and apply them in real world problems.	Able to describe and explain the principles of the selected topics of environmental analytical chemistry, and apply them in real world problems.	Able to describe and explain some key principles of the selected topics of environmental analytical chemistry, and apply them in real world problems.	Able to briefly describe isolated principles of the selected topics of environmental analytical chemistry, and show limited ability to apply them in real world problems.	Fail to accurately describe and explain relevant principles of any topics of environmental analytical chemistry.
3. Group Presentations	Demonstration of understanding the principles and practice of the selected topics of environmental analytical chemistry, and the ability to present those principles and practice in concise, orderly and professional manners.	Able to deliver fluent, well organized and well prepared presentations to demonstrate excellent understanding of the principles and practice of the selected topics of environmental analytical chemistry.	Able to deliver fluent presentations, with evidence of proper preparation, to describe and explain the principles of the selected topics of environmental analytical chemistry.	Able to deliver presentations, with evidence of proper preparation, to describe and explain some key principles of the selected topics of environmental analytical chemistry.	Able to deliver comprehensible presentations to briefly describe isolated principles of the selected topics of environmental analytical chemistry.	Fail to present relevant principles of any topics of environmental analytical chemistry in coherent and comprehensible manners.
4. Fieldwork / Laboratory Reports	Demonstration of ability to apply the principles and practice of the various environmental analytical chemistry techniques in environmental monitoring, and the ability interpret monitoring data and communicate the information in concise, orderly and professional manners.	Able to demonstrate excellent ability in applying the principles and practice of various environmental analytical chemistry techniques in environmental monitoring, and in interpreting monitoring data and communicate the information in concise, orderly and professional manners.	Able to apply the principles and practice of various environmental analytical chemistry techniques in environmental monitoring, and interpret monitoring data and communicate the information in concise and orderly manners.	Able to apply relevant principles and practice of selected environmental analytical chemistry techniques in environmental monitoring, and interpret monitoring data and communicate the information in comprehensible manners.	Able to demonstrate limited ability in applying isolated principles and practice of selected environmental analytical chemistry techniques in environmental monitoring, and interpret monitoring data and communicate the information in comprehensible.	Fail to accurately apply relevant principles and practice of any environmental analytical chemistry technique in environmental monitoring.
5. Examination	Demonstration of understanding the principles and practice of various topics of environmental analytical chemistry, and apply them in real world problems.	Able to demonstrate excellent understanding of the principles and practice of various topics of environmental analytical chemistry, and apply them in real world problems.	Able to describe and explain the principles of various topics of environmental analytical chemistry, and apply them in real world problems.	Able to describe and explain some key principles of selected topics of environmental analytical chemistry, and apply them in real world problems.	Able to briefly describe isolated principles of selected topics of environmental analytical chemistry, and show limited ability to apply them in real world problems.	Fail to accurately describe and explain relevant principles of any topics of environmental analytical chemistry.

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.)

Strategies in Environmental Monitoring

Design of environmental monitoring and sampling programmes. Statistical analysis and interpretation of environmental data: univariate, multivariate analysis, discrimination analysis, time-trend analysis. Case studies.

Trace analysis

Working practise for the sampling and analysis of trace metals and organics in solid, liquid and air phases. Various preconcentration techniques: precipitation and co-precipitation, liquid-liquid extraction, solid-liquid extraction, ion-exchange, solid phase extraction, solid phase microextraction, super-critical fluid extraction, purge-and-trap technique and closed-loop stripping.

Water and Sediment Quality Measurement

Selection of water and sediment quality parameters, field measurements of some water quality and hydrology parameters. Working practise for water and sediment sampling and handling samples. Classical and instrumental methods of water and sediment analysis. Biological monitoring at individual, population and community levels.

Air Quality Measurement

General sampling and analysis techniques. Modern air pollution monitoring devices. Basis of methods for analysis of selected organic and inorganic pollutants. Techniques for particulate matter. Methods for chemicals in air of the workplace.

Environmental Modelling and its Applications

Modelling techniques and assumptions in water and air quality modelling. Applications of Geographic Information Systems (GIS). Case studies.

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.)

N.A.

2.2 Additional Readings

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

1.	*Basic Concepts of Environmental Chemistry*, Des W. Connell, Lewis Publishers, CRC Press LLC, NY, 1997.

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