

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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**City University of Hong Kong
Course Syllabus**

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with effect from Semester A 2020/21**

Part I Course Overview

Course Title:	Analytical Chemistry
Course Code:	CHEM3027 (and CHEM3027A)
Course Duration:	1 semester
Credit Units:	4 (3) credits
Level:	B3
Proposed Area: (for GE courses only)	<input type="checkbox"/> Arts and Humanities <input type="checkbox"/> Study of Societies, Social and Business Organisations <input type="checkbox"/> 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)	BCH3027 (and BCH3027A) Analytical Chemistry
Exclusive Courses: (Course Code and Title)	Nil

Note: CHEM3027A 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 an understanding of the principles of analytical chemistry with an emphasis on the common analytical methods and instruments. It builds upon introductory courses in analytical chemistry and extends the scope to include the more in-depth principles of analytical chemistry and the functions of equipment for qualitative and quantitative analysis. In this course, students will have practical experience in analytical, environmental and separation techniques and designing innovative analytical methods, and opportunities of presentation of experimental results. This course offers students knowledge and skills that will allow them to undertake courses in analytical chemistry and instrumental analysis at a more advanced level. Additionally, it prepares graduates with knowledge, discovery capability, and experience in analytical chemistry for industrial applications, laboratory analysis and research studies.

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 the principles of common analytical techniques including chromatography, atomic spectroscopy, mass spectrometry, potentiometry and fluorescence spectroscopy.	40%	✓	✓	
2.	Explain the functions of analytical instruments employed in the above techniques and design innovative analytical methods.	40%	✓	✓	
3.	Conduct analysis using analytical instruments and analyse the qualitative and quantitative results.	15%		✓	
4.	Select, design and justify the most appropriate techniques for a range of samples.	5%			✓
		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 and tutorials	In lectures and tutorials, students will develop an understanding on the principles and applications of various analytical techniques including chromatography, atomic spectroscopy, mass spectrometry, potentiometry and fluorescence spectroscopy.	✓				1.5
Lectures and tutorials	In lectures and tutorials, students will develop an understanding on the functions of common analytical instruments leading to the design of innovative analytical methods.		✓			1
Practical sessions	Students, in the form of small groups (two to four students each group), will take part in practical sessions in which they will gain experience on using instruments for analysis and develop discovery capability. Students will present, analyse and discuss their experiment results in the form of written reports.			✓		2
Tutorials	In tutorials, students will discuss and compare common analytical techniques, design and select the most appropriate techniques for different samples from a discovery approach.				✓	0.5

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>30%</u>						
Assignments	✓	✓			5%	
Tests	✓	✓			10%	
Lab Reports			✓		15%	
Examination: <u>70%</u> (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. Assignments	ABILITY to develop an understanding on principles of analytical techniques	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Tests	ABILITY to describe and explain basic concepts of analytical chemistry to solve problems	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Lab Reports	ABILITY to conduct analytical chemistry experiments, and present and discuss results in written reports	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	ABILITY to describe, explain, and integrate concepts of analytical chemistry and apply them to solve problems	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.)

Chromatographic Separations

Theory of chromatography.

Gas Chromatography

Principles. Carrier gases, stationary phases and detectors. Applications. GLC and GSC.

High Performance Liquid Chromatography

Principles. Instrumentation. Mobile and stationary phases. Partition, bonded-phase, adsorption, ion-exchange and size-exclusion chromatography. Applications.

Atomic Spectrometry

Principles. Instrumentation. Interferences. Effects of temperature. Applications.

Mass Spectrometry

Principles. Ion sources, mass analysers and transducers. Applications.

Potentiometry

Principles. Reference and indicator electrodes. Glass electrodes. Ion-selective electrodes. Applications.

Fluorescence Spectroscopy

Principles. Instrumentation. Applications.

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.	Fundamentals of Analytical Chemistry 9th Edition, Douglas A. Skoog, Donald M. West, F. James Holler and Stanley R. Crouch, Brooks Cole, 2014.
2.	Principles of Instrumental Analysis 7th Edition, Douglas A. Skoog, F. James Holler and Stanley R. Crouch, Brooks Cole, 2017.

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