

**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:	Principles of Analytical Chemistry
Course Code:	CHEM2004 (and CHEM2004A)
Course Duration:	1 semester
Credit Units:	4 (3) credits
Level:	B2
Proposed Area: <i>(for GE courses only)</i>	<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: <i>(Course Code and Title)</i>	Nil
Precursors: <i>(Course Code and Title)</i>	Nil
Equivalent Courses: <i>(Course Code and Title)</i>	BCH2004 (and BCH2004A) Principles of Analytical Chemistry
Exclusive Courses: <i>(Course Code and Title)</i>	Nil

Note: CHEM2004A 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 provide students with an understanding of the principles of analytical chemistry, including quantitative analysis based on titrations and instrumental analysis based on modern analytical instruments. It is an introductory course in analytical chemistry. In this course students will develop practical experience in laboratory analysis of the properties and concentrations of chemical molecules, and practice classical and instrumental techniques for the qualitative and quantitative analysis of compounds. The knowledge and skills from this course will prepare graduates for industrial and research applications in analytical chemistry.

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 basic principles of analytical chemistry, with emphasis on solution equilibrium and classical methods of analysis, and on selected instrumental analysis methods such as spectroscopy and chromatography, and understand the use of such principles in chemical, biochemical and environmental analysis.	45%	✓		
2.	Select an appropriate instrumental procedure for an analytical or environmental analysis based on spectroscopic and chromatographic methods, and reliably implement it with accuracy and precision.	20%	✓	✓	
3.	Design an experimental protocol for analytical or environmental analysis and implement with accuracy and precision.	20%		✓	✓
4.	Communicate the chemical measurement and analysis results to relevant professionals in written reports with conclusions based on statistical analysis of the experimental data.	15%		✓	✓
		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	Teaching and learning will be primarily based around lectures and tutorials examining basic principles of classical and instrumental analytical chemistry and their applications in chemical, biochemical and environmental analysis.	✓				3
Lectures, tutorials and practicals	Teaching and learning will be based on a combination of lectures and tutorials and practicals to explain how to select or design an appropriate instrumental method or procedure and apply data analysis techniques for practical chemical, biochemical and environmental analysis.		✓			2
Design of an experimental protocol	Based on the knowledge of analytical or environmental analysis on equilibrium calculation and titration methods, students will design an experimental protocol for these measurements.			✓		2
Practicals	Teaching and learning will be based on practicals to help students to prepare written reports on their practicals with conclusions based on statistical analysis of the experimental data.				✓	2

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>						
Tutorial assignments and/or quizzes	✓	✓	✓	✓	15%	30% weighing for students taking CHEM2004A
Practicals	✓	✓	✓	✓	15%	0% weighing for students taking CHEM2004A
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. Tutorial assignments	Ability to explain in detail of applying principles, concepts and methods to solve chemical, biochemical and environmental problems using instrumental analytical methods	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Practicals	Develop practical experience in laboratory for chemical analysis	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	Capacity for self-directed learning to understand the principle of analytical chemistry and practical applications	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.)

Data treatment
Gravimetric methods
Aqueous solutions
Equilibrium calculations
Titrimetry/Precipitate formation
Complex-formation/ Complex titrations
Acid-base titrations/ Non-aqueous titrations
Basic electrochemistry
REDOX titrations
Potentiometry
Spectrophotometry
Atomic spectroscopy/ Molecular spectroscopy
Gas chromatography/ Liquid chromatography

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.	Quantitative Chemical Analysis (Sixth Edition) Author: Daniel C. Harris Publisher: W. H. Freeman and Company
2.	Fundamentals of Analytical Chemistry Authors: Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch Publisher: Brooks Cole
3.	Online Resources: To be provided, as required, in lectures and tutorials.

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