

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**

**offered by Department of Chemistry
with effect from Semester A 2020/21**

Part I Course Overview

Course Title:	Testing and Certification Sciences
Course Code:	CHEM4085
Course Duration:	1 semester, 13 weeks
Credit Units:	4 CUs
Level:	B4
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>	CHEM2004/BCH2004 Principles of Analytical Chemistry
Precursors: <i>(Course Code and Title)</i>	CHEM3027/BCH3027 Analytical Chemistry
Equivalent Courses: <i>(Course Code and Title)</i>	BCH4085 Testing and Certification Sciences
Exclusive Courses: <i>(Course Code and Title)</i>	Nil.

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to provide students with essential knowledge in quality management and application to the laboratory testing and certification industry. Students will receive training on various contemporary laboratory quality and management practices. These include establishment of traceability, accuracy and reliability in measurement; estimation of uncertainty in measurement; quality control and quality assurance in testing and certification; laboratory and data auditing; accreditation and international standards in quality management for testing and certification (e.g. ISO9001, ISO/IEC17025, ILAC, HKOLAS).

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.	Enumerate basic concepts of international standards in quality and safety management for laboratory testing and certification industry, including ISO9001, ISO/IEC17025, ILAC and HKOLAS.		✓		
2.	Elaborate and apply principles of managerial techniques and auditing skills of international quality and management systems to the testing and certification industry.			✓	
3.	Elaborate and apply appropriate calibration methods and measurement uncertainty estimation in different types of laboratory testing.			✓	
4.	Reflect on the commercial laboratory environment, accreditation requirements and practices in Hong Kong.				✓
		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	
Large class activities	Formal lectures and tutorials enable students to acquire conceptual understanding of the various principles of laboratory quality management systems.	✓	✓	✓		3 hours per week / 7 weeks
Guest talks	Special talks on specific topics of laboratory management by expert guest speakers enable students to understand specific aspects of various laboratory management standards and quality assurance practices.	✓	✓	✓		2 hours per week / 6 weeks
Laboratory practicals	Team-based laboratory exercises provide students with opportunities to understand, perform and report various testing and calibration techniques, as well as, measurement uncertainty estimation.		✓	✓		4 hours per week / 3 weeks
Site visits	Site visits to commercial laboratory operations enable students to understand basic requirements of various laboratory management systems, calibration practices and measurement uncertainty calculation.	✓	✓	✓	✓	4 hour per week / 2 weeks

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> %						
End-of-course written examination	✓	✓	✓	✓	70%	
Laboratory performance assessment and laboratory reports		✓	✓		10%	
Guest talks and company visit reports	✓			✓	10%	
Tutorial assignments	✓	✓	✓		10%	
Examination: <u>70</u> % (duration: <u>3</u> 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. End-of-course written examination	Demonstration of ability in the synthesis of the principles, processes, methodologies, problems and limitations related to various aspects of quality and laboratory management.	Students who complete all assessment tasks/activities and demonstrate excellent synthesis of the principles, processes, methodologies, problems and limitations related to various aspects of quality and laboratory management in detail.	Students who complete all assessment tasks/activities and can describe and explain principles, processes, methodologies, problems and limitations related to various aspects of quality and laboratory management with a high degree of accuracy and thoroughness.	Students who complete all assessment tasks/activities and can describe and explain some key principles, processes and methodologies related to various aspects of quality and laboratory management.	Students who complete all assessment tasks/activities and can briefly describe isolated principles, processes and methodologies related to various aspects of quality and laboratory management.	Students who fail to complete all assessment tasks/activities and/or cannot accurately describe and explain relevant principles, processes, methodologies, problems and limitations related to various aspects of quality and laboratory management.
2. Laboratory performance assessment and laboratory reports	Demonstration of ability to validate new analytical techniques with originality in thought, argument or application, with effective oral and written communication.	Students who demonstrate excellent ability to validate new analytical techniques with originality in thought, argument or application in quality and laboratory management, with professional oral and written communication.	Students who show ability in integration of concepts, analytical techniques and applications in quality and laboratory management with clear oral and written communication.	Students who show ability in practicing analysis techniques in quality and laboratory management, with adequate oral and written communication.	Students who show limited degree of practical skills in quality and laboratory management.	Students who fail to demonstrate their practical skills in quality and laboratory management.
3. Guest talk and company visit reports	Demonstration of capability in analysing the implementation of integrated management systems for testing laboratories, with clarity of explanations, logical and advanced justifications, and creative/personal interpretations and view-points.	Students who are capable of providing a comprehensive analysis of the implementation of integrated management systems for testing laboratories, with clarity of explanations, logical and advanced justifications, and creative/personal interpretations and view-points.	Students who are capable of providing a detailed, critical analysis of the implementation of integrated management systems for testing laboratories.	Students who can provide simple but accurate explanations and basic justifications for the implementation of integrated management systems for testing laboratories.	Students who demonstrate limited ability in the analysis of the implementation of integrated management systems for testing laboratories, with a lack of integrated understanding of applications of relevant concepts and principles as a whole.	Students who cannot provide appropriate analysis and satisfactory justifications to the implementation of integrated management systems for testing laboratories.
4. Tutorial assignments	Demonstration of ability in solving problems related to various aspects of quality and laboratory management.	Students who demonstrate excellent ability in solving problems related to various aspects of quality and laboratory management.	Students who are capable of solving problems related to certain aspects of quality and laboratory management.	Students who show limited ability in solving problems related to certain aspects of quality and laboratory management.	Students who show barely adequate ability in solving problems related to limited aspects of quality and laboratory management.	Students who fail to demonstrate their ability to solve problems related to quality and laboratory management.

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.)

- Commercial laboratory management practice
- ISO9001 & ISO/IEC 17025
- Environmental management in laboratory (ISO14001)
- Safety management in laboratory (OHSAS18001)
- Management/ technical requirements for accreditation
- Calibration practice
- ISO Guide to expression of uncertainty in measurement
- EURACHEM/CITAC Guide of quantifying uncertainty in analytical measurement
- Traceability concept
- Quality assurance in testing
- Standard operation procedure (SOP) for difference testing methods and sampling technique
- Internal auditor requirements
- Laboratory assessor requirements

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.	HKAS 002, HOKLAS 003, HOKLAS 015, HKAS Supplementary Criteria No. 5, and HOKLAS Supplementary Criteria No. 2 & 33.
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2.2 Additional Readings

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

1.	Piotr Konieczka, Jacek Namiesnik. Quality Assurance and Quality Control in the Analytical Chemical laboratory: A Practical Approach. 2 nd Edition, CRC Press, Boca Raton, 2018
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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