City University of Hong Kong
Course Syllabus

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

Part I Course Overview

Course Title:	Forensic Chemistry
Course Code:	BCH8151
Course Duration:	1 semester
Credit Units:	3 credits
Level:	R8
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)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course is a postgraduate taught course tailored for postgraduate research students only.

This course helps students develop knowledge of the various analytical chemical, biochemical and chemometric principles and techniques that are applied to aid the enforcement of the law and the analysis of evidence found at crime scenes or on/in the bodies of crime suspects/victims.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Evaluate the concepts and values of forensic pathology, forensic odontology and forensic anthropology in personal identification and reconstruction.		✓		
2.	Evaluate the operation of firearms and perform simple comparison of markings on bullets and other projectiles, cartridge and shell cases and analyze gunshot residues using various physical and chemical techniques.		✓		
3.	Apply relevant chemical, biochemical and bio-analytical principles to examine and discover to reveal criminalistic and forensic toxicological evidences including glass, soil, fibers and hairs, blood and other body fluids, arson accelerants, explosive residues, residues of chemical warfare, drugs and the various toxic substances in human tissues and organs. Critically evaluate the applicability of various forensic techniques to different scenarios.			✓	✓
4.	Critically evaluate the various forensic techniques in terms of identification, individualization and reconstruction and recommend or advise on the most appropriate selection for an investigation.			✓	✓
	** 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)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lectures	Explain key concepts in the various chemical, biochemical and bio-analytical disciplines of forensic science.	✓	✓	✓	✓	
Case studies and guest seminars	Students will learn to describe the concepts of forensic pathology, forensic odontology and forensic anthropology in personal identification and reconstruction primarily by case studies. Complementary guest seminars will further engage students in discussion of real-life forensic examination.	✓		✓	✓	
Group activities and field visits	In large and small group discovery-based activities and field visits to examine the operation of common firearms and to obtain hands-on experience in analyzing gun-shot residues.		✓	✓		
Case studies, mock crime scene walkthroughs and tutorials	Through a number of forensic case studies and simulated crime scene walkthroughs, students have to apply the various chemical, biochemical and bio-analytical techniques to collection of criminal evidence. Discussion with experts in forensic sciences during guest seminars and tutorials will further prompt students to critically evaluate the applicability of various forensic techniques to different scenarios.			✓	✓	
Group critical evaluation tasks and debates	In large and small group critical evaluation tasks and debates students will discuss the principles, limitations, relevance and applicability of the various forensic techniques and approaches in terms of achieving the three basic goals of forensic science, which are identification, individualization and reconstruction.			✓	✓	

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: 30%						
Short Quizzes	✓		✓		10%	
Tutorial Assignments		✓	✓		10%	
Group Presentations				✓	5%	
Visit Reports		✓	✓		5%	
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 BCH courses:

"A minimum of 40% in both coursework and examination components."

5. Assessment 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 forensic chemistry.	Able to demonstrate excellent understanding of the principles and practice of various topics of forensic chemistry.	Able to describe and explain the principles of various topics of forensic chemistry.	Able to describe and explain some key principles of selected topics of forensic chemistry.	Able to briefly describe isolated principles of selected topics of forensic chemistry.	Fail to accurately describe and explain relevant principles of any topics of forensic chemistry.
2. Tutorial Assignments	Demonstration of understanding the principles and practice of the selected topics of forensic chemistry.	Able to demonstrate excellent understanding of the principles and practice of the selected topics of forensic chemistry.	Able to describe and explain the principles of the selected topics of forensic chemistry.	Able to describe and explain some key principles of the selected topics of forensic chemistry.	Able to briefly describe isolated principles of the selected topics of forensic chemistry.	Fail to accurately describe and explain relevant principles of any topics of forensic chemistry.
3. Group Presentations	Demonstration of understanding the principles and practice of the selected topics of forensic 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 forensic chemistry.	Able to deliver fluent presentations, with evidence of proper preparation, to describe and explain the principles of the selected topics of forensic chemistry.	Able to deliver presentations, with evidence of proper preparation, to describe and explain some key principles of the selected topics of forensic chemistry.	Able to deliver comprehensible presentations to briefly describe isolated principles of the selected topics of forensic chemistry.	Fail to present relevant principles of any topics of forensic chemistry in coherent and comprehensible manners.
4. Visit Reports	Demonstration of understanding of the operation of various firearms, and the forensic chemistry principles and practice in the examination of trace evidences produced by firearm discharge and terrorist attacks.	Able to demonstrate excellent understanding of the operation of various firearms, and the forensic chemistry principles and practice in the examination of trace evidences produced by firearm discharge and terrorist attacks.	Able to describe and explain the operation of various firearms, and the forensic chemistry principles and practice in the examination of trace evidences produced by firearm discharge and terrorist attacks.	Able to describe and explain some key principles in the: (a) operation of various firearms, and (b) the examination of trace evidences produced by firearm discharge and terrorist attacks.	Able to briefly describe isolated principles in the: (a) operation of various firearms, and (b) the examination of trace evidences produced by firearm discharge and terrorist attacks.	Fail to accurately describe and explain principles in the: (a) operation of various firearms, and (b) the examination of trace evidences produced by firearm discharge and terrorist attacks.
5. Examination	Demonstration of understanding the principles and practice of various topics of forensic chemistry.	Able to demonstrate excellent understanding of the principles and practice of various topics of forensic chemistry.	Able to describe and explain the principles of various topics of forensic chemistry.	Able to describe and explain some key principles of selected topics of forensic chemistry.	Able to briefly describe isolated principles of selected topics of forensic chemistry.	Fail to accurately describe and explain relevant principles of any topics of forensic chemistry.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Forensic toxicology
Drugs of abuse; Dangerous drugs & controlled drugs; Forensic analysis of pharmaceutical materials; Forensic analysis of nonmedicinal agents; Analytical & chemometric methodologies used in forensic toxicology.

Analysis of blood, bloodstains and other biological fluids and stains
Analytical techniques for the identification of blood, semen, saliva, urine, feces, vomitus, vaginal secretions; Determination of bloodstains; Interpretation of bloodstain patterns; Genetic markers in blood.

Examination of physical forensic evidence
Examination and identification of fingerprints, footwear impressions, tool marks, tire tracks & tire impressions.

Microanalysis and examination of trace evidence
Microscopic examination and microanalysis of glass, synthetic fibres, hairs & furs, paint and soil particles; Chemical and instrumental analysis of trace evidence.

Examination of firearms, bullets and explosives
Working principles of modern firearms; Ballistics; Gunshot residues; Chemical natures of common explosives; Chemical analysis of explosives.

Investigation of arson cases
Chemistry and behaviour of fire & explosion; Fire accelerants and their chemical analysis.

Forensic DNA analysis
DNA fingerprinting; Sampling, isolation, extraction and analysis of genetic materials for forensic examinations; Parentage testing.

Forensic medicine, odontology & anthropology
Forensic pathology; personal identification by forensic dentistry; personal identification and reconstruction based on bodily / skeletal remains.

Examination of questioned documents
Interpretation of handwriting; analysis of papers, inks and other materials used to produce documents; counterfeit banknotes; forged documents; anti-counterfeit and anti-forgery technologies.

2. Reading List

2.1 Compulsory Readings

Forensic Chemistry, Suzanne Bell Ed., Pearson Prentice Hall, Pearson Education Inc., Upper Saddle River, New Jersey, 2006.

2.2 Additional Readings

Practical Skills in Forensic Science, Alan Langford, J. Dean, Rob Reed, David Holmes, Jonathan Weyers Allan Jones Eds., Pearson Education Limited, Edinburgh Gate, Essex, UK, 2005.