香港城市大學
City University of Hong Kong

SYL

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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Part I Course Overview

Course Title:	Chemical Biology of DNA and RNA
Course Code:	CHEM3081
Course Duration:	1 semester
Credit Units:	3 credits
Level:	B3
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)*	CHEM2071/BCH2071 Biological Chemistry or CHEM2003/BCH2003 Biochemistry or CHEM2007/BCH2007 Principles of Organic Chemistry
Equivalent Courses: *(Course Code and Title)*	BCH3081 Chemical Biology of DNA and RNA
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

In this course, students will be able to:

i) develop an understanding of a wide range of advanced chemical biology techniques, and their application to the study of nucleic acid structure and function studies

ii) devise appropriate chemical biology experiments to address specific basic and applied bioscience problems related to nucleic acids

iii) explore the relationship between nucleic acids and their chemical and biochemical properties

iv) identify the major differences between deoxyribonucleic acids (DNA) and ribonucleic acids (RNA), and the diverse targeting strategies

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.	Explain the key importance and roles of nucleic acids in chemistry and biology (e.g. chemical bonding, structure, dynamics, function)		✓	✓	
2.	Apply the principles of chemical biology to understand the structure and functions of nucleic acids, and facilitate the discovery/design of novel chemicals for targeting purposes		✓	✓	
3.	Critically evaluate the methods and results section of original papers published in high impact peer-review journals such as nature chemical biology, JACS, angewandte chemie		✓	✓	✓
4.	Discover and understand the background of several Nobel Prize Winners' work related to nucleic acids		✓	✓	✓
	** 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	
Lecture and in-class discussion	Student will learn in lecture and in-class discussion about the theory and practise of chemical biology techniques to address questions regarding nucleic acid research. Along with the lecture, there will be a "weekly quiz", "what have you learnt" slide, and "Recap of the last lecture" slide to reinforce their understandings and summary the lecture materials	✓	✓			
Tutorial and group activities	Students will be asked to evaluate relevant papers (chosen by course leader) in small groups, and present their findings to the class. Also, tutorial assignment will be discussed when necessary.	✓	✓	✓	✓	
Oral presentations	Students will be asked to divide into groups and present the key experiments/findings that lead to Nobel Prize (related to nucleic acids). The course leader will assign the name of the Nobel Laureates to each group.			✓	✓	

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: 55 %						
Weekly short quiz	✓	✓			15%	
Tutorial assignment	✓	✓			30%	
Presentation			✓	✓	10%	
Examination: 45 % (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. Weekly short quiz	Ability to explain and discuss the principle of nucleic acids, and their relevance to chemistry and biology	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Tutorial assignment	Ability to articulate knowledge learnt in class to address real-life research questions	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Presentation	Ability to integrate and explain the methodology and results published in research papers in related field	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Ability to articulate and apply the methodologies and approaches introduced in this course to tackle real-life research problems	High	Significant	Moderate	Basic	Not even reaching

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.)

- Introduction to Nucleic Acids
- Solid phase chemical synthesis of nucleic acids
- Principles of antisense oligonucleotides for therapeutics
- Recognition of DNA by synthetic chemical molecules
- RNA secondary and tertiary structure
- Protein recognition of DNA and RNA
- Chemical and enzymatic cleavage of nucleic acids
- RNA enzymes and ribosome
- Chemistry of DNA sequencing

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.	Chemical Biology of Nucleic Acids Springer, 2014 Editors: Erdmann (Deceased), Volker A., Markiewicz, Wojciech T., Barciszewski, Jan (Eds.) ISBN 978-3-642-54452-1
2.	Nucleic Acids: Structures, Properties, and Functions University Science Books, 2000 Victor A. Bloomfield, Donald M. Crothers, Ignacio Tinoco ISBN 0935702490
3.	Principles of Nucleic Acid Structure. Springer, 1984 Authors: Wolfram Saenger ISBN: 978-0-387-90761-1 (Print) 978-1-4612-5190-3 (Online)

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