香港城市大學
City University of Hong Kong

SYL

Course Syllabus

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

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:	Molecular Biology
Course Code:	BCH3017
Course Duration:	1 semester
Credit Units:	4 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)*	BCH1200 Discovery in Biology (for normative 4-year students) or A Level Biology (for advance standing I students)
Precursors: *(Course Code and Title)*	BCH2003 Biochemistry, BCH3012 Genetics, BCH2013 Microbiology
Equivalent Courses: *(Course Code and Title)*	BCH4017 Molecular Biology
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:

- explore the relationship between genes and their activities at the molecular, biochemical and organismal level
- develop an understanding of a range of advanced molecular genetic techniques and strategies, and their application to functional genomic studies
- identify the major differences between prokaryotic and eukaryotic genes/genomes, and diverse gene regulatory mechanisms
- devise appropriate recombinant DNA experiments to address specific applied genetic problems
- will learn how to clone and characterize genes in the final year project (BCH4036)

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.	Relate the molecular structure to the function and information encoded in DNA, RNAs and proteins.	25%		✓	
2.	Apply the principles of molecular biology to elucidate gene control mechanisms and functions, and facilitate the discovery/design of novel proteins in prokaryotic and eukaryotic systems.	45%	✓	✓	
3.	Evaluate the impact of recombinant DNA technology in agriculture, forensic science, medicine, pharmaceuticals, and industry.	15%	✓	✓	
4.	Discover aspects of current in vitro and in vivo molecular techniques and their applications in functional genomics and/or systems biology.	15%	✓	✓	✓
** 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	
Group discussion activities, written assignments, tutorials and laboratory practicals	Students will undertake large and small group discussion activities, written assignments, tutorials and laboratory practicals to examine different levels of DNA expression and control mechanisms that operate in bacteria and eukaryotes.	✓	✓	✓	✓	
Tutorials, and laboratory practicals	In large and small group sessions including tutorials, and laboratory practicals, students will learn how to clone genes, construct DNA libraries, express and characterize recombinant proteins. Using computer softwares (e.g. Foldit), students will attempt to design (and discover) "newer" and "better" proteins to address specific challenges and opportunities in the fields of biotechnology and medical sciences. Tutorials will be supplemented with case examples to enable students to collect, process, present and interpret molecular data using a variety of bioinformatic resources.		✓			
Group discussion activities and written assignments	Students will undertake large and small group discussion activities and written assignments to examine case studies of particular aspects of biotechnology.			✓		
Use of Internet resources and investigation of scientific literature	Through extensive use of Internet resources and investigation of scientific literature, students in small groups will apply their knowledge to provide a review on the development and application of a variety of new in vitro and in vivo molecular techniques (e.g. new PCR-based techniques, DNA fingerprinting techniques, DNA microarrays functional genomics, etc) and clearly communicate and evaluate their findings orally and in writing.				✓	

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: 40%						
Short Quizzes	✓	✓			3%	
Laboratory Report	✓	✓			15%	
Tutorial / Discussion	✓	✓			6%	
Oral Presentation / Essay			✓	✓	16%	
Examination: 60% (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

(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. Short Quizzes/Tutorial Discussion	Ability to explain and discuss the principles of DNA replication, transcription, and gene expression regulation in prokaryotic and eukaryotic systems	Shows excellent understanding of the general principles, and ability to explain, explore and integrate the knowledge	Shows a good understanding of the general principles, and ability to explain, explore and integrate the knowledge	Shows adequate understanding of the general principles, and able to explain, explore and integrate the knowledge	Shows a weak understanding of the general principles, and marginal ability to explain, explore and integrate the knowledge	Shows very poor understanding of the general principles, and unable to explain, explore and integrate the knowledge
2. Laboratory Report	Ability to produce a concise and precise scientific lab report.	**Background** information is researched and cited. Hypothesis is stated in "If…then…" format and explained. **Data is complete** and relevant. Tables are easy to read and units are provided. Graphs are labeled and show trends. Questions are answered completely and correctly. **Conclusion** summarizes experiment, cites	**Background** information is researched and cited. Hypothesis is stated but not explained and not in "If…then…" format. **One component of data incomplete**: ___Tables ___Graphs ___Questions **One component of conclusion missing**:	**Background** information is vague or brief. Hypothesis is stated but not explained and not in "If…then…" format. **Two components of data incomplete or one missing**: ___Tables ___Graphs ___Questions **Two components of conclusion missing:**	**Background** is vague or brief, hypothesis is vague, or background or hypothesis is missing. **Data** is brief and missing significant pieces of information. **Conclusion is brief** and is missing significant pieces of	No introduction is presented. No data reported. **No conclusion** present.

		data, addresses hypothesis, and cites sources of error. Report is well organized and cohesive and contains no mechanical errors. Presentation seems polished.	___Summary ___Data ___Hypothesis ___Errors Report is well organized and cohesive but contains some spelling or grammatical errors.	___Summary ___Data ___Hypothesis ___Errors Report is somewhat organized with some spelling or grammatical errors.	information. Report contains many errors.	 No attention to detail evident.
3. Oral Presentation / Essay	(1) Content and context (2) Presentation skills (3) Questions &Answers	(1) Content and context Excellent logical structure with coverage and relevance. The work is presented in an accurate, concise and coherent fashion. (2) Presentation skills Fluent language with a formal but conversational tone and no help from cue cards. Keeps eye contact with audience throughout the presentation. Good timing. (3) Questions &Answers Can answer all questions in	(1) Content and context Good logical structure with coverage and relevance. The work is presented in an accurate fashion. (2) Presentation skills Appropriate use of language with the help of cue cards. Keeps eye contact with audience. Good timing. (3) Questions &Answers Can answer all questions in	(1) Content and context Acceptable logical structure with coverage and relevance. The work is presented in an acceptable fashion. (2) Presentation skills Reading from single-page notes or cue cards. Occasional eye contact with audience. Either too short or overruns by only one to two minutes. (3) Questions &Answers Fails to answer most questions and has difficulty understanding many	(1) Content and context No structure with no/little coverage and relevance. Very easy to find mistakes in the presented work. (2) Presentation skills Mumbling. No eye contact with audience. Very poor timing (e.g., either far too short or manages to present only a small part of the material). (3) Questions &Answers Fails to answer most questions and has difficulty understanding many	Zero contribution in the whole presentation, including information research, data processing, preparation works and presentation

		(3) Questions &Answers Provides detailed answers to all questions. Illustrates the answers with additional PowerPoint slides (prepared in advance).	detail.	Can answer most questions	of them.	
4. Examination	Ability to explain and describe the principles of DNA replication, transcription, and gene expression regulation in prokaryotic and eukaryotic systems. Ability to apply the basic molecular biological principles/ knowledge to problem solving.	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.)

- In vitro and in vivo genetic manipulation
- Gene structure, function and regulation
- Biochemical engineering
- Creation and application of transgenic animals and plants
- Molecular biology and biotechnology
- Bioinformatics – application of basic computational techniques

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.	Robert J. Weaver (2008) Molecular Biology. (4th edition), McGraw-Hill Co., Inc., USA.
2.	James D. Watson et al (2008) Molecular Biology of the Gene. (6th edition), Pearson, CSHL Press, Inc.
3.	Online Resources: To be provided, as required, in lectures and tutorials.

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