

**City University of Hong Kong
Course Syllabus**

**offered by Department of Computer Science
with effect from Semester B 2018/19**

Part I Course Overview

Course Title: Computational Biology and Bioinformatics

Course Code: CS4465

Course Duration: 1 semester

Credit Units: 3 credits

Level: B4

Arts and Humanities

Proposed Area:
(for GE courses only)

Study of Societies, Social and Business Organisations

Science and Technology

Medium of Instruction: English

Medium of Assessment: English

(BCH2804 Molecules and Cells or
BMS2801 Molecules and Cells or equivalent)
AND

Prerequisites:
(Course Code and Title)

(CS1102 Introduction to Computer Studies or
CS1302 Introduction to Computer Programming or equivalent)

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

(A 150-word description about the course)

This course aims to introduce students concepts and techniques in computational biology and bioinformatics, and to develop practical skills in applying bioinformatics approaches to solve problems in biological studies.

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.	Discover the main characteristics of different computational methods in bioinformatics.		✓		
2.	Perform a critical assessment of the effectiveness and efficiency of current computational biology and bioinformatics techniques.			✓	✓
3.	Identify problems in biological studies that can be analyzed using computational methods.		✓	✓	
4	Create new bioinformatics solutions for practical problems in biological studies by applying and integrating suitable computational tools.		✓	✓	✓
		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.)

Teaching pattern:

Suggested lecture/tutorial/laboratory mix: 2 hrs. lecture; 2 hrs. laboratory.

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	The lecture will focus on the introduction of computational biology and bioinformatics techniques, and the features of the main bioinformatics software tools.	✓	✓	✓		
Laboratory	The laboratory session will allow students to discover the characteristics of the main computational methods in bioinformatics. They will also perform a critical evaluation of the effectiveness and efficiency of these methods.	✓	✓	✓		
Project and Assignments	The students will identify suitable problems in biological studies that are amenable to computational analysis, and create new bioinformatics solutions to address these problems.		✓	✓	✓	
Final Exam	Examination will be arranged to assess students' understanding and ability to discover and assess bioinformatics techniques. Students will also be assessed for their abilities to identify and create bioinformatics solutions.	✓	✓	✓	✓	

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>40%</u>						
Laboratory Participation	✓	✓	✓		10%	
Assignments		✓	✓	✓	10%	
Project Report and Deliverables		✓	✓	✓	20%	
Examination [^] : <u>60%</u> (duration: 2 hours)						
Final Exam	✓	✓	✓	✓	60%	
					100%	

* The weightings should add up to 100%.

[^]For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

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. Laboratory Participation	1.1 CAPACITY for SELF-DIRECTED LEARNING to understand and apply the principles of bioinformatics methods and tools 1.2 CAPACITY for ASSESSING different computational biology and bioinformatics techniques critically	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Assignments	2.1 ABILITY to EXPLAIN different bioinformatics techniques and discover their characteristics 2.2 ABILITY to PERFORM a critical assessment of different computational biology and bioinformatics techniques 2.3 ABILITY to EXPLAIN different examples of problems in biological studies, and their ability to identify the suitable class of problems which are amenable to bioinformatics analysis	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Project	3.1 ABILITY to EXPLAIN in DETAIL and with ACCURACY about different examples of problems in biological studies, and their ability to identify the suitable class of problems which are amenable to bioinformatics analysis 3.2 ABILITY to DISCOVER/INTEGRATE and CREATE new bioinformatics solutions for practical problems in biological studies	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Final Exam	4.1 ABILITY to EXPLAIN and COMPARE in DETAIL and with ACCURACY about different bioinformatics methods 4.2 ABILITY to EXPLAIN in DETAIL and with ACCURACY about different examples of problems in biological studies, and their ability to identify the suitable class of problems which are amenable to bioinformatics analysis	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.)

Pairwise sequence alignment, multiple sequence alignment, phylogenetic tree reconstruction, motif identification, RNA informatics, protein domain annotation and prediction, protein structure prediction, contemporary topics in bioinformatics.

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.)

2.2 Additional Readings

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

1.	W.K.Sung (2009). <i>Algorithms in Bioinformatics: A Practical Introduction</i> . Chapman and Hall/CRC.
2.	J. Pevsner (2015). <i>Bioinformatics and Functional Genomics</i> . Wiley-Blackwell, 3 rd edition.
3.	A. Lesk (2014). <i>Introduction to Bioinformatics</i> . Oxford University Press, 4 th edition.
4	N. Cristianini and M. Hahn (2007). <i>Introduction to Computational Genomics: A Case Studies Approach</i> . Cambridge University Press.