City University of Hong Kong
Course Syllabus

offered by Department of Biomedical Sciences
with effect from Semester A 2019/2020

Part I   Course Overview

Course Title:	Bioinformatics
Course Code:	BMS3301
Course Duration:	One 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)*	BMS2201 Molecular Biology of the Cell or BMS1901 Calculus for Life Sciences or BMS2901 Introductory Biostatistics and Data Analysis
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 basic concepts, principles, popular tools in Bioinformatics, with extensive case studies. The student will learn comprehensive functional genomics, evolutional biology, systems biology and cancer genomics in the context of latest technological development. The students will be trained to acquire various techniques and programming skills for critical data analysis. It also aims to teach students important skills about how to communicate and collaborate in their future research projects. The assessment consists of presentation, programming and report writing. The students are expected to expand their knowledge and skills by intensive literature reading and practice within and after class.

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.	Summarize basic concepts and principles in Bioinformatics		✓	✓	
2.	Criticize and summarize the scientific literature			✓	
3.	Apply Bioinformatic methods to analyse data		✓	✓	✓
4.	Write a report to summarize results of Bioinformatic analysis		✓	✓	✓
* 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	
Lectures	Teaching and learning will be based on lectures to understand the basic concepts and principles, and learn how to use bioinformatic tools to address challenges in biomedical research.	✓	✓			Lecture 26hrs (13 lectures x 2 hrs)
Computer Practicals	To learn critical Bioinformatic analyses by programming in R.			✓		Practical 6hrs (3 sessions x 2hrs)
Report writing	To do literature review and summarize results of analysis.				✓	
Tutorials on Oral presentations	Emerging topics and tools in Bioinformatics will be discussed and presented by different groups of students.		✓			Tutorial 7hrs (7 sessions x 1hr)

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: 100 %						
Scientific presentation of selected topics in Bioinformatics	✓	✓			30%	
Assessment of programming			✓		20%	
Writing report to summarize results of Bioinformatic analysis			✓	✓	50%	

* The weightings should add up to 100%.	100%

"Minimum Passing Requirement" for this course:

A minimum of 40% in coursework as well as in examination.

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. Presentation and discussion	Demonstrate the ability to apply what has been taught in lectures/tutorials in their oral presentation	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Programming	Demonstrate the ability to analyse data by programming in R	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Report writing	Demonstrate the ability to do extensive literature review, search for data, analyse data, interpret results, propose hypothesis and design follow-up experiments.	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.)

    Functional genomics; sequence alignment; phylogenetic trees; structural bioinformatics; gene perturbation screen; systems biology; network inference; cancer genomics

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.)

    Nil

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

1.	Introduction to Bioinformatics, Oxford University Press, 4th Edition. ISBN-13: 978-0199651566, ISBN-10: 0199651566
2.	Bioinformatics and Functional Genomics, Wiley-Blackwell, 3rd Edition. ISBN-13: 978-1118581780, ISBN-10: 1118581784
3.	R Cookbook, O'Reilly Media; 1st Edition. ISBN-13: 978-0596809157, ISBN-10: 0596809158
4.	Online materials for R learning: https://www.rstudio.com/online-learning/