BMS3301: BIOINFORMATICS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Bioinformatics

Subject Code
BMS - Biomedical Sciences
Course Number
3301

Academic Unit
Biomedical Sciences (BMS)

College/School
College of Biomedicine (BD)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
BMS2201 Molecular Biology of the Cell or BMS2206 Cell Biology or BMS1901 Calculus for Life Sciences or BMS2901 Introductory Biostatistics and Data Analysis

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to introduce basic concepts, principles, and popular tools in Bioinformatics, with extensive case studies. The student will learn comprehensive functional genomics, evolutionary biology, systems biology, and cancer genomics in the context of the latest technological development. The students will be trained to acquire various techniques and programming skills for critical omics 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 presentations, assignments, mid-term evaluation, programming, and report writing. The students are expected to expand their knowledge and skills by intensive literature reading and practice within and after class.

An introduction session on R programming is included to learn the basics. Students are highly encouraged to explore advanced programming skills through self-study.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain basic concepts and principles in Bioinformatics		x	x	
2	Identify and criticize the scientific literature			x	
3	Create bioinformatic pipelines to analyse data		x	x	x
4	Write a report to summarize the results of bioinformatic analysis		x	x	x

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 real-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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Attend lectures to understand the basic concepts and principles, and learn how to use bioinformatic tools in biomedical research.	1, 2	Lecture 26hrs (13 lectures x 2 hrs)
2	Computer practice	Participate in programming practice designed in practical sessions to learn critical Bioinformatic analyses by programming in R.	3	Practical 4hrs (2 sessions x 2hrs)
3	Report writing	Collect, read, compare literature review and summarize results of analysis.	4	

4	Tutorials	Emerging topics and tools used in Bioinformatics will be discussed and demonstrated to facilitate building programming skills	2	Tutorial 7hrs (7 sessions x 1hr)

Additional Information for LTAs

The lecturers may use distinct activities listed below to assess the performance:
Presentations, assignments, mid-term evaluation (exam), and online quizzes

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Complete assignments, mid-term evaluation and/or quizzes of selected topics in Bioinformatics	1, 2	40	-	No
2	Complete the assignment of programming practice	3	20	-	Yes
3	Writing a report to summarize results of bioinformatic analysis	3, 4	40	Page limitation applies	No

Continuous Assessment (%)

100

Examination (%)

0

Examination Duration (Hours)

0

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

0

Additional Information for ATs

"Minimum Passing Requirement": A minimum of 40% in continuous assessment as well as in examination."

Assessment Rubrics (AR)

Assessment Task

1. Attendance, assignment, presentation mid-term evaluation and quizzes

Criterion

Attend lectures/tutorial session accordingly to demonstrate the ability to apply what has been taught in lectures/tutorials.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
2. Programming

Criterion
Demonstrate the ability to analyze various types of omics data by programming in R

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
3. Report writing

Criterion
Demonstrate the ability to conduct an extensive literature review, search for data, and analyse data. Interpret results to form logical deductions, write compelling discussions, propose reasonable hypotheses, and design follow-up experiments.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

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

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
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/