

BMS8110: GENOMICS AND BIOINFORMATICS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Genomics and Bioinformatics

Subject Code

BMS - Biomedical Sciences

Course Number

8110

Academic Unit

Biomedical Sciences (BMS)

College/School

College of Biomedicine (BD)

Course Duration

One Semester

Credit Units

3

Level

R8 - Research Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Molecular biology or genomics

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to introduce historical development, basic concepts, principles and tools of genomics and bioinformatics, with case discussions and case studies. The students will learn comprehensive functional genomics, evolutionary biology,

systems biology, and cancer genomics in the context of cutting-edge technological development. The students will be trained to acquire various techniques and programming skills for computational and statistical analysis. Students will receive training on communication and presentation. The assessment includes group presentation, assignment, mid-term evaluation, programming, quizzes, and report writing. This course only offers the necessary basic programming training in the beginning. Students are expected to expand their knowledge and skills by intensive literature reading and advanced programming practice within and after class.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)		DEC-A2	DEC-A3
1	Identify and explain basic concepts and principles in Genomics and Bioinformatics		x	x	
2	Combine and compare the major information of scientific literature			x	
3	Apply computational and statistical methods to analyze data		x	x	x
4	Write a report about a real-world case study using bioinformatic data 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 build skills to use bioinformatic tools to address questions in biomedical research.	1, 2	2 hours/week (26 hours in total)
2	Programming practice	Identify tools and design appropriate approaches to analyze data in R.	3	
3	Report writing	Combine, compare and cite literature review and summarize results of data analysis for a real-world case study.	4	

4	Tutorials	Read literature and participate in group discussion on Genomics and Bioinformatics followed by presentation.	2	Tutorial 7hrs (7 sessions x 1hr)
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Additional Information for LTAs

The lecturers may adopt distinct assessment approaches, including but not limited to: presentation, assignment, mid-term evaluation, quizzes.

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Scientific presentation of selected topics in Bioinformatics	1, 2	50	-	Yes
2	Assessment of programming	3	30	Only allowed for assisting programming. AI is not allowed for writing reports.	Yes
3	Attendance of lecture and tutorial sessions	3, 4	20	-	Yes

Continuous Assessment (%)

100

Examination (%)

0

Minimum Continuous Assessment Passing Requirement (%)

50

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)

Assessment Task

Presentation and discussion (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Demonstrate the ability to apply what has been taught in lectures/tutorials in their oral presentation

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

Programming (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Demonstrate the ability to analyse 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

Attendance of lecture and tutorial sessions (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Demonstrate the ability to conduct literature review, perform data analysis, interpret results, form deductions and design experiments according to hypotheses.

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

Presentation and discussion (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Demonstrate the ability to apply what has been taught in lectures/tutorials in their oral presentation

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Programming (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Demonstrate the ability to analyse data by programming in R

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

(F) Not even reaching marginal levels

Assessment Task

Attendance of lecture and tutorial sessions (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Demonstrate the ability to do extensive literature review, search for data, analyse data, interpret results, propose hypothesis and design follow-up experiments.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

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 Genomics, Oxford University Press; 2nd edition. ISBN-13: 978-0199564354, ISBN-10: 0199564353
2	Introduction to Bioinformatics, Oxford University Press, 4th Edition. ISBN-13: 978-0199651566, ISBN-10: 0199651566
3	Bioinformatics and Functional Genomics, Wiley-Blackwell, 3rd Edition. ISBN-13: 978-1118581780, ISBN-10: 1118581784
4	R Cookbook, O'Reilly Media; 1st Edition. ISBN-13: 978-0596809157, ISBN-10: 0596809158