

BMS5008: FUNDAMENTAL AND ADVANCED MULTI-OMICS RESEARCH

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Fundamental and Advanced Multi-omics Research

Subject Code

BMS - Biomedical Sciences

Course Number

5008

Academic Unit

Biomedical Sciences (BMS)

College/School

College of Biomedicine (BD)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate 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

The course aims to provide lectures and practice to help students to understand the principles and applications of various -omics approaches. Topics include (1) principles of sequencing and commonly used sequencing platforms; (2) Genome sequencing transcriptome sequencing and their road applications; (3) Epigenetic modifications and regulation; (4) Transcriptional and post-transcriptional regulation; (5) Advances of proteomics and challenges; (6) Integrative data analyses and comprehensive functional genomics; (7) Gene editing, genome manipulation, emerging challenges during medical and therapeutic implementations (8) Novel inter-disciplinary and data-driven sciences. In all topics, special attention will be paid to building a fundamental understanding of omics research and applying knowledge to approach biological questions.

Course Intended Learning Outcomes (CILOs)

| CILOs | | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|-------|---|---------------------|--------|--------|--------|
| 1 | Describe fundamental concepts of sequencing technology and distinguish the difference between distinct sequencing platforms, and their capacity and applications in various research scenarios. | 40 | x | x | |
| 2 | Explain the advantages and disadvantages of commonly used assays in projects that use omics approaches. Determine/apply assays to appropriately capture the desired features given certain samples. | 30 | x | x | x |
| 3 | Combine essential skills to evaluate the quality and merits of recent multi-omic research via critical thinking and simultaneously gain the ability to design or improve experiments. | 30 | | 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 introduction and seminars to engage in the interactive learning process | 1, 2, 3 |
| 2 | Tutorial | Participate in oral presentation and group discussion on a given topic for case study | 1, 2, 3 |

Assessment Tasks / Activities (ATs)

| | ATs | CILO No. | Weighting (%) | Remarks ("- " for nil entry) | Allow Use of GenAI? |
|---|---|----------|---------------|--|---------------------|
| 1 | Complete assignment for presentation | 1, 2, 3 | 40 | - | Yes |
| 2 | Attend lectures, tutorials and seminars | 1, 2, 3 | 20 | Attending lectures and tutorial sessions are mandatory | Yes |
| 3 | Final assessment | 1, 2, 3 | 40 | The assessment format: proposal writing or exam | No |

Continuous Assessment (%)

100

Minimum Continuous Assessment Passing Requirement (%)

50

Additional Information for ATs

The final assessment (exam or proposal writing) covers the content of week 1-13

Assessment Rubrics (AR)**Assessment Task**

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

Criterion

Ability to analyse and criticise the multi-omics research

Excellent

(A+, A, A-) Outstanding performance on all CILOs. Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.

Good

(B+, B, B-) Substantial performance on all CILOS. Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

Fair

(C+, C, C-) Satisfactory performance on the majority of CILOS possibly with a few weaknesses. Being able to profit from the course experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal

(D) Barely satisfactory performance on a number of CILOS. Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure

(F) Unsatisfactory performance on a number of CILOS. Failure to meet specified assessment requirements, little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature.

Assessment Task

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

Criterion

Ability to analyse, state and apply the principles and subject matter learnt in the course

Excellent

(A+, A, A-) Outstanding performance on all CILOs. Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.

Good

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Failure

(F) Unsatisfactory performance on a number of CILOS. Failure to meet specified assessment requirements, little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature.

Assessment Task

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

Criterion

Ability to analyse and criticise the multi-omics research

Excellent

(A+, A, A-) Outstanding performance on all CILOs. Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.

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Part III Other Information

Keyword Syllabus

Principles of sequencing,
Genomics,
Proteomics,
Phylogenetic,
Epigenetics,
Evolution,
Gene editing,
Precision medicine,
Ethics

Reading List

Compulsory Readings

| Title | |
|-------|-----|
| 1 | Nil |

Additional Readings

| Title | |
|-------|--|
| 1 | Introduction to genomics, third edition, by Arthur M. LESK |