BMS3204: MOLECULAR BIOLOGY

Effective Term
Semester A 2023/24

Part I Course Overview

Course Title
Molecular Biology

Subject Code
BMS - Biomedical Sciences
Course Number
3204

Academic Unit
Biomedical Sciences (BMS)

College/School
Jockey Club College of Veterinary Medicine and Life Sciences (VM)

Course Duration
One Semester

Credit Units
3

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
BCH1200/CHEM1200 Discovery in Biology (for normative 4-year students) or
A Level Biology (for advance standing I students)

Precursors
Nil

Equivalent Courses
BCH3017/CHEM3017 Molecular Biology

Exclusive Courses
Nil

Part II Course Details

Abstract
In this course, students will:

- Explore the relationship between genes and their activities at the molecular, biochemical and organismal level
- Develop an understanding of a range of advanced molecular genetic techniques and strategies, and their application to functional genomic studies
- Identify the major differences between prokaryotic and eukaryotic genes/genomes, and diverse gene regulatory mechanisms
- Devise appropriate recombinant DNA experiments to address specific applied genetic problems
- Will learn how to clone and characterize genes in the final year project (BMS4206)

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Relate the molecular structure to the function and information encoded in DNA, RNAs and proteins.	25		x	
2	Apply the principles of molecular biology to elucidate gene control mechanisms and functions, and facilitate the discovery/design of novel proteins in prokaryotic and eukaryotic systems.	45	x	x	
3	Evaluate the impact of recombinant DNA technology in agriculture, forensic science, medicine, pharmaceuticals, and industry.	15	x	x	
4	Discover aspects of current in vitro and in vivo molecular techniques and their applications in functional genomics and/or systems biology.	15	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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Group discussion activities, written assignments and tutorials	Students will undertake large and small group discussion activities, written assignments and tutorials to examine different levels of DNA expression and control mechanisms that operate in bacteria and eukaryotes.	1, 2, 3, 4	

2	Tutorials	In large and small group sessions, students will learn how to clone genes, construct DNA libraries, express and characterize recombinant proteins. Using computer softwares (e.g. Foldit), students will attempt to design (and discover) "newer" and "better" proteins to address specific challenges and opportunities in the fields of biotechnology and medical sciences. Tutorials will be supplemented with case examples to enable students to collect, process, present and interpret molecular data using a variety of bioinformatics resources.	2	
3	Group discussion activities and written assignments	Students will undertake large and small group discussion activities and written assignments to examine case studies of particular aspects of biotechnology.	3	
4	Use of Internet resources and investigation of scientific literature	Through extensive use of Internet resources and investigation of scientific literature, students in small groups will apply their knowledge to provide a review on the development and application of a variety of new in vitro and in vivo molecular techniques (e.g. new PCR-based techniques, DNA fingerprinting techniques, DNA microarrays functional genomics, etc) and clearly communicate and evaluate their findings orally and in writing.	4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Quizzes	1, 2	10	
2	Tutorial / Discussion	1, 2	10	
3	Presentation / Essay	1, 2, 3, 4	20	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

Additional Information for ATs

“Minimum Passing Requirement” for this course:
A minimum of 40% in both coursework and examination components.

Assessment Rubrics (AR)

Assessment Task

1. Quizzes/Tutorial Discussion

Criterion

Ability to explain and discuss the principles of DNA replication, transcription, and gene expression regulation in prokaryotic and eukaryotic systems

Excellent (A+, A, A-)

Shows excellent understanding of the general principles, and ability to explain, explore and integrate the knowledge

Good (B+, B, B-)

Shows good understanding of the general principles, and ability to explain, explore and integrate the knowledge

Fair (C+, C, C-)

Shows adequate understanding of the general principles, and ability to explain, explore and integrate the knowledge

Marginal (D)

Shows a weak understanding of the general principles, and ability to explain, explore and integrate the knowledge

Failure (F)

Shows very poor understanding of the general principles, and ability to explain, explore and integrate the knowledge

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Assessment Task

2. Presentation / Essay

Criterion

(1) Content and context (2) Presentation skills (3) Questions &Answers

Excellent (A+, A, A-)

Deep understanding and critical analysis of the topics; excellent knowledge depth, logic and clear oral presentation; and excellent collaboration among peers

Good (B+, B, B-)

Good understanding and critical analysis of the topics; good knowledge depth, logic and clear oral presentation; and good collaboration among peers

Fair (C+, C, C-)

Fair understanding but lack of critical analysis of the topics; adequate knowledge depth, logic and clear oral presentation; and some collaboration among peers

Marginal (D)

Partial understanding and lack of critical analysis of the topics; marginal knowledge depth, and lacking logic and clear oral presentation; and some collaboration among peers

Failure (F)

Fail to understand the topics; poor knowledge depth, and lacking logic and clear oral presentation; and poor collaboration among peers

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Assessment Task

3. Examination

Criterion

Ability to explain and describe the principles of DNA replication, transcription, and gene expression regulation in prokaryotic and eukaryotic systems. Ability to apply the basic molecular biological principles/ knowledge to problem solving.

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

- In vitro and in vivo genetic manipulation
- Gene structure, function and regulation
- Biochemical engineering
- Creation and application of transgenic animals and plants
- Molecular biology and biotechnology
- Bioinformatics – application of basic computational techniques

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Robert J. Weaver (2008) Molecular Biology. (4th edition), McGraw-Hill Co., Inc., USA.
2	James D. Watson et al (2008) Molecular Biology of the Gene. (6th edition), Pearson, CSHL Press, Inc.
3	Online Resources: To be provided, as required, in lectures and tutorials.