BMS2201: MOLECULAR BIOLOGY OF THE CELL

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Molecular Biology of the Cell

Subject Code
BMS - Biomedical Sciences
Course Number
2201

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
Nil

Precursors
BCH1200 Discovery in Biology (for normative 4-year students) or A Level Biology (for advanced standing I students)

Equivalent Courses
BCH2066 Cell Biology / BMS2206 Cell Biology

Exclusive Courses
Nil

Part II Course Details

Abstract
This course introduces the basic theme of life on earth: cells. Students will learn the interplay of morphology and functions in animal and plant cells in molecular terms. The main objective of this course is to let students appreciate the intimate

relationship between “structure” and “function” in biology: how specialized cellular structures are evolved to accommodate and facilitate particular biochemical reactions and how the defects in cellular structures can lead to human diseases. This course, in company of other core courses in this programme such as Biochemistry, Genetics and Molecular Biology, will provide the basic conceptual framework in human biology, and prepare for more advanced courses such as Systems Biology, Cell Transport and Signalling, and Technology for Regenerative Medicine.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Define the structure and functions of major organelles and subcellular structures in typical prokaryotic and eukaryotic cells	10	x	x	x
2	Relate structures of the plasma membrane of prokaryotic and eukaryotic cells to their functions in sensing and reacting to the environment	20	x	x	x
3	Explore the fundamental mechanisms of cell cycle and signal transduction	20	x	x	x
4	Apply the principles of cytoskeleton on the mechanisms of intracellular transport and cell locomotion	20	x	x	x
5	Integrate cell biology concepts to the developmental and physiological conditions in different cell types of the human body	20	x	x	x
6	Apply knowledge of cell biology to critically read scientific literature	10	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	Lectures, group discussions and presentation	Teaching and learning will be primarily based on lectures, group discussions and presentation.	1, 2, 3, 4, 5	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Quizzes	1, 2, 3, 4, 5	10	
2	Essays and presentations	1, 2, 3, 4, 5	10	

Continuous Assessment (%)

20

Examination (%)

80

Examination Duration (Hours)

3

Additional Information for ATs

Minimum Passing Requirement: A minimum of 40% in both coursework and examination components.

Assessment Rubrics (AR)

Assessment Task

Quizzes

Criterion

Basic knowledge and principle of cell, organelles, cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

Excellent (A+, A, A-)

Deep understanding the principle of cell, organelles, cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

Good (B+, B, B-)

Good understanding the principle of cell, organelles, the cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

Fair (C+, C, C-)

Fair understanding the principle of cell, organelles, cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

Marginal (D)

Partial understanding the principle of cell, organelles, cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

Failure (F)

Fail to understand the principle of cell, organelles, cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

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Assessment Task

Presentations

Criterion

Understanding and analysis of the topics; knowledge depth, logic, and clarity of presentation; and collaboration among peers

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

Examination

Criterion

Principle, processes, and characteristics of cell biology; understanding and analysis of functions of major organelles, the interplay between structure and function, cell signalling, cell cycle, cytoskeleton, immune cells, nerve cells, cancer cells, and stem cells

Excellent (A+, A, A-)

Excellent synthesis of principle, processes, and characteristics of cell biology; deep understanding and analysis of functions of major organelles, the interplay between structure and function, cell signalling, cell cycle

Good (B+, B, B-)

Good synthesis of principle, processes, and characteristics of cell biology; good understanding and analysis of functions of major organelles, the interplay between structure and function, cell signalling, cell cycle

Fair (C+, C, C-)

Fair synthesis of principle, processes, and characteristics of cell biology; adequate understanding and analysis of functions of major organelles, the interplay between structure and function, cell signalling, cell cycle

Marginal (D)

Partial synthesis of principle, processes, and characteristics of cell biology; marginal understanding and analysis of functions of major organelles, the interplay between structure and function, cell signalling, cell cycle

Failure (F)

Poor synthesis of principle, processes, and characteristics of cell biology; poor understanding and analysis of functions of major organelles, the interplay between structure and function, cell signalling, cell cycle

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Part III Other Information

Keyword Syllabus

The basic concept of cells as the functional units of life.

Major organelles in plant and animal cells such as membrane, mitochondria, chloroplast, ER, Golgi body, and cell nucleus. The main focus will be on how the structure of each organelle is closely linked to its functions.

The differences and similarities between prokaryotes and eukaryotes.

The basic concept of the cell cycle and cell death. Major events of cell cycle stages, mitosis, meiosis and apoptosis will be examined.
The cytoskeleton systems of microtubule and actin-myosn. How intracellular transport and vesicular transport can be achieved with the microtubule cytoskeleton. How changes in the actin-myosin cytoskeleton can affect cellular structures and movements, which in turn lead to muscle contractions and behavioural responses to the environment.

Different cell types in a multicellular organism have very different sizes, shapes and functions. The genome contains the instructions for building cells, but how this information is accessed, read and interpreted depends on the cell type and its stage of development. Examples of different cell types, such as nerve cells, immune cells, cancer and stem cells will be examined in the contexts of how these cells are specialized for their functions.

The embryonic development of human beings from a fertilised egg to the formation of the nervous system will be used as an example to illustrate the integral processes of cell division, cell differentiation and morphogenesis.

The malformation or malfunctioning of different cellular structures can lead to human diseases. Students are encouraged to explore examples such as lysosomal diseases, neurodegenerative diseases and nuclear envelope diseases. In addition, the action of natural toxins, such as bacterial alpha-toxins and algal toxins, on the cellular structures will also be explored.

Reading List

Compulsory Readings

	Title
1	Molecular Biology of The Cell, Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter.ISBN: 9780815344322

Additional Readings

	Title
1	Becker’ s World of the Cell. Jeff Hardin, Gregory Bertoni, Lewis Kleinsmith. International Edition, 8th Edition (2011)ISBN13: 9780321709783ISBN10: 0321709780
2	Molecular Cell Biology, Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher.ISBN:142923413X