BMS2803: BIOLOGY OF CELLS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Biology of Cells

Subject Code
BMS - Biomedical Sciences
Course Number
2803

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
Completion of all Year 1 courses with C grade or above

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract
This course, together with the Animal Body courses and the Biology of Populations, Species and Ecosystems course, forms a series examining the levels of organisation of life. Biology of Cells or cell biology introduces the basic unit of life: the

cell; and its constituent structures and cycle in their exposure to molecular biology. 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 certain disease states.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the structure and functions of major organelles and subcellular structures in typical prokaryotic and eukaryotic cells, including both animal and plant 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 andsignal 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 animal body	30	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	Lectures will provide fundamental concepts and principles of biology at the cellular and subcellular level.	1, 2, 3, 4, 5	2 hours/week for 11 weeks

2	Small group workshops	Students build on their understanding of fundamental concepts and principles of biology at the cellular and subcellular level in clinical case studies and short quizzes.	1, 2, 3, 4, 5	1 hour/week for 5 weeks
3	Laboratory classes	Students learn basic molecular and cell biology techniques, prepare and analyse cytology and histology slides including the use of differential staining to explore cell structure including observations of the nucleus and organelles, extending to chromosomes.	1	4 hours for 3 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Quizzes	1, 2, 3, 4, 5	20	
2	Group presentation	1, 2, 3, 4, 5	20	
3	Laboratory skills	1	10	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

3

Additional Information for ATs

Minimum Passing Requirement: A minimum of 30% in coursework as well as in examination, and the total minimum passing requirement for the whole BVM course is 50%.

Assessment Rubrics (AR)

Assessment Task

1. Quizzes

Criterion

Basic knowledge andprinciple of cell structure, cell,organelles, cellsignalling, cell cycle,cytoskeleton,immune cells, nervecells, cancer cells,and stem cells

Excellent (A+, A, A-)

Will exhibit excellent synthesis ofprinciples, processes, and characteristics of cell biology; deep understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Good (B+, B, B-)

Will exhibit good synthesis ofprinciples, processes, and characteristics of cell biology; good understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Fair (C+, C, C-)

Will exhibit basic competence in synthesis ofprinciples, processes, and characteristics of cell biology; basic understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Marginal (D)

Will exhibit some deficiencies in synthesis ofprinciples, processes, and characteristics of cell biology; some deficiencies in understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Failure (F)

Will exhibit lack of competence in many aspects of thesynthesis ofprinciples, processes, and characteristics of cell biology; deep understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Assessment Task

2. Group presentation

Criterion

Understanding andanalysis of thetopic; knowledgedepth, logic, andclarity ofpresentation; andcollaboration amongpeers

Excellent (A+, A, A-)

Will exhibit excellent synthesis ofprinciples, processes, and characteristics of cell biology; deep understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Good (B+, B, B-)

Will exhibit good synthesis ofprinciples, processes, and characteristics of cell biology; deep understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Fair (C+, C, C-)

Will exhibit basic competence in synthesis ofprinciples, processes, and characteristics of cell biology; basic understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Marginal (D)

Will exhibit some deficiencies in synthesis ofprinciples, processes, and characteristics of cell biology; some deficiencies in understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Failure (F)

Will exhibit lack of competence in many aspects of thesynthesis ofprinciples, processes, and characteristics of cell biology; deep understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Assessment Task

3. Laboratory skills

Criterion

Student demonstrates technical and observational skills during laboratory exercises.

Excellent (A+, A, A-)
Will exhibit high competence in technical and observational skills during laboratory exercises.

Good (B+, B, B-)
Will exhibit good competence in technical and observational skills during laboratory exercises.

Fair (C+, C, C-)
Will exhibit basic competence in technical and observational skills during laboratory exercises.

Marginal (D)
Will exhibit some deficiencies in technical and observational skills during laboratory exercises.

Failure (F)
Will exhibit lack of competence in technical and observational skills during laboratory exercises.

Assessment Task
4. Examination

Criterion
Student can describe the principles, processes, and characteristics ofcell biology;can analyse the functionsof the major organelles and the interplay between structure andfunction; can explain cell signalling; can describe the cell cycle and the function of the cytoskeleton; can distinguish major cell types e.g. immune cells, nerve cells, cancer cells, and stem cells.

Excellent (A+, A, A-)
Will exhibit excellent synthesis ofprinciples, processes, and characteristics of cell biology; deep understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Good (B+, B, B-)
Will exhibit good synthesis ofprinciples, processes, and characteristics of cell biology; good understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Fair (C+, C, C-)
Will exhibit basic synthesis ofprinciples, processes, and characteristics of cell biology; basic understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Marginal (D)
Will exhibit some deficiencies in synthesis ofprinciples, processes, and characteristics of cell biology; some deficiencies in understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

Failure (F)
Will frequently exhibit lack of capacity to synthesise principles, processes, and characteristics of cell biology; little understanding andanalysis of functions of major organelles, the interplay between structure and function, cell signalling, cellcycle.

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 diseases. Students are encouraged to explore examples such as lysosomal diseases, neurodegenerative diseases and nuclear envelope diseases. 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	Nil

Additional Readings

	Title
1	Hardin, J., Bertoni, G. and Kleinsmith, L. (2011). Becker’ s World of the Cell. InternationalEdition, 8th Edition. ISBN13: 9780321709783; ISBN10: 0321709780
2	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. Molecular Biology of The Cell. ISBN: 9780815344322
3	Lodish, H., Berk, A., Kaiser, C., Krieger, M., and Bretscher, A. Molecular Cell Biology. ISBN:142923413X
4	Chapter 12: Intracellular Transport, in “A comprehensive approach to Life Science”. A webtextbook edited by the University of Tokyo :http://csls-text3.c.u-tokyo.ac.jp/inactive/12_00.html