



Lahore University of Management Sciences

Cell Biology (BIO 313)

Fall 2023

Instructor	Amir Faisal and Khurram Bashir
Room No.	9-317A and 9-319A
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TA Office Hours	
Course URL (if any)	

Course Teaching Methodology (Please mention following details in plain text)

- Teaching Methodology: In Person Teaching
- Lecture details: In person lectures with PowerPoint slides and blackboard usage. Recordings from previous offering may be available for students.

Course Basics

Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2 (WF)	Duration	75 Minutes
Recitation (per week)	Nbr of Rec(s) Per Week	N/A	Duration	N/A
Lab (if any) per week	Nbr of Session(s) Per Week	N/A	Duration	N/A
Tutorial (per week)	Nbr of Tut(s) Per Week	N/A	Duration	N/A

Course Distribution

Core	Biology Majors
Elective	Open to all who have taken pre-requisites
Open for Student Category	Juniors
Closed for Student Category	NA

COURSE DESCRIPTION

Cells are the most complicated entities known to humans and constitute every living organism in this world from bacteria to humans. Understanding the complex workings of different cells is at the heart of understanding how our bodies work. Cell biology, therefore, is one of the most fundamental subjects of biology. This course is organized into 4 modules that will help students understand how eukaryotic cells are organized and how they function. The first module will provide students with an in depth understanding of the dynamic functions of cell membrane and various components of the cytoplasm like endoplasmic reticulum, mitochondria and chloroplasts. The second module will cover intercellular interactions, cell signaling, and extra cellular environment. The third module will introduce students to cell division and differentiation. In this module students will learn about cytoskeleton, cell cycle regulation, cell death, cancer and stem cells. The course will conclude after discussing application of above mentioned principles in specialized immune cells that defend their host against invasion of pathogens.



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COURSE PREREQUISITE(S)

BIO 101 Introductory Biology
BIO 216 Molecular Biology

COURSE OBJECTIVES

The main objective of this course is to help students understand the structure and function of eukaryotic cells. Various components of the cells will be discussed in detail and defects in functionality will be related to human diseases and developmental disorders. Similarly, students will learn about various cellular processes including cell cycle regulation, energy conversion, apoptosis, and immune regulation.

Learning Outcomes

After the successful completion of the course, students will

- Understand and appreciate the complexity of eukaryotic cells
- Develop good understanding of different structural components of cells
- Learn how these structural components coordinate for proper functioning of the cells
- Know important cellular processes such as cell cycle and apoptosis
- Demonstrate how knowledge of cell biology can help understand human diseases and how they can be treated

Grading Breakup and Policy

Assignment(s):	15% (Two assignments worth 7% and 8% each. Students will be assigned a cell biology related topic and they will have to write a mini review about the topic and have to present a poster for research paper related to that topic)
Quiz(s):	20% (Four quizzes 5% each)
Class Participation:	10% (Group discussions at the end of the lectures)
Attendance:	5%
Midterm Examination:	25%
Final Examination:	25%

Harassment Policy

SSE, LUMS and particularly this class, is a harassment free zone. There is absolutely zero tolerance for any behaviour that is intended, or has the expected result of making anyone uncomfortable and negatively impacts the class environment, or any individual's ability to work to the best of their potential.

In case a differently-abled student requires accommodations for fully participating in the course, students are advised to contact the instructor so that they can be facilitated accordingly.

If you think that you may be a victim of harassment, or if you have observed any harassment occurring in the purview of this class, please reach out and speak to me. If you are a victim, I strongly encourage you to reach out to the Office of Accessibility and Inclusion at oai@lums.edu.pk or the sexual harassment inquiry committee at harassment@lums.edu.pk for any queries, clarifications, or advice. You may choose to file an informal or a formal complaint to put an end of offending behavior. You can find more details regarding the LUMS sexual harassment policy [here](#).

To file a complaint, please write to harassment@lums.edu.pk.



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SSE Council on Equity and Belonging

In addition to LUMS resources, SSE's **Council on Belonging and Equity** is committed to devising ways to provide a safe, inclusive and respectful learning environment for students, faculty and staff. To seek counsel related to any issues, please feel free to approach either a member of the council or email at cbe.sse@lums.edu.pk

Rights and Code of Conduct for Online Teaching

A misuse of online modes of communication is unacceptable. TAs and Faculty will seek consent before the recording of live online lectures or tutorials. Please ensure if you do not wish to be recorded during a session to inform the faculty member. Please also ensure that you prioritize formal means of communication (email, lms) over informal means to communicate with course staff.

Academic Honesty

A student-teacher relationship is purely based on honesty, integrity and inspiration. Where teacher's role is to make every effort possible to inspire his students about the subject and develop independent thinking and a problem solving attitude about every concept, students are required to uphold values of truth and honesty and eagerness to learn. In this whole learning process honesty, integrity and commitment by students play a major role in their long term success. It means a student performs all academic work, assignments, exams, quizzes and never gets involved in any unfair activity falling under academic dishonesty like cheating, unauthorized aid of any kind, plagiarism etc. Students are expected to demonstrate extremely high level of integrity and honesty throughout this course.

Any instances of academic dishonesty in this course (intentional or unintentional) will be dealt with swiftly and severely. Potential penalties include receiving an "F" grade on the assignment in question or in the course overall. For further information, students should make themselves familiar with the relevant section of the LUMS student handbook.

Examination Detail

Midterm Exam	Yes/No: Yes Combine Separate: Combine Duration: 3 hours Preferred Date: Exam Specifications: Requires extra sheets
Final Exam	Yes/No: Yes Combine Separate: Combine Duration: 3 hours Preferred Date: Exam Specifications: Requires extra sheets

COURSE OVERVIEW

Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
	Module 1: Organizing Cells		
Week 1	<ul style="list-style-type: none"> ▪ Introduction to the Course ▪ Cell Membrane 	Ch: 10 (617 - 650)	Understand the chemistry and properties of cell membranes. And how these properties of cell membranes are fundamental to various functions of all the cells.



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Week 2	<ul style="list-style-type: none"> Transport Properties of cell membrane 	Ch: 11 (651-694)	How molecules move in/out of the cells. We learn about different models of transport across the plasma membrane.
Week 3	<ul style="list-style-type: none"> Protein sorting 	Ch: 12 (695-748)	How proteins are sorted and moved inside the cells.
Week 4	<ul style="list-style-type: none"> Vesicular Transport 	Ch: 13 (749-812)	We will learn about modifications and packaging of proteins into specific vesicles that take cargo to different locations inside the cells
Week 5	<ul style="list-style-type: none"> Mitochondria and Chloroplast 	Ch: 14 (813-879)	The generation and utilization of energy. How transport of electrons across different molecules is central to the generation and utilization of energy in cells
	Module 2: Cellular Interactions		How cells communicate with each other and their environment
Week 6	<ul style="list-style-type: none"> Cell Signaling 	Ch: 15 (879-964)	
Week 7	<ul style="list-style-type: none"> Cell Signaling 	Ch: 15 (879-964)	
Week 8	<ul style="list-style-type: none"> Cell Junctions Extracellular Matrix and Cell Wall 	Ch: 19 (1131-1204)	
	Midterm Exam		
	Module 3: Cell Division and Differentiation		
Week 9	<ul style="list-style-type: none"> Cytoskeleton 	Ch: 16 (965-1052)	How structure of cells is maintained. Different types of cytoskeletal components
Week 10	<ul style="list-style-type: none"> Cell Cycle 	Ch: 17 (1053 - 1113)	How and when Cells divide. Details about one of the most complicated and highly regulated processes in biology. We learn about various components of cell cycle machinery and how they coordinate with each other during cell cycle
Week 11	<ul style="list-style-type: none"> Cell Cycle 	Ch: 17 (1053 - 1113)	
Week 12	<ul style="list-style-type: none"> Apoptosis 	Ch: 18 (1115-1129)	How and when cells die. What are the components of apoptotic machinery and differences between intrinsic and extrinsic apoptotic pathways
Week 13	<ul style="list-style-type: none"> Cancer 	Ch: 20 (1205-1267)	What is cancer, the molecular basis of cancer
Week 14	<ul style="list-style-type: none"> Stem cells 		
	Module 4: Organism Defense		How innate and adaptive immunity are involved in host defense against pathogens
Week 15	<ul style="list-style-type: none"> Innate Immunity 	Ch: 24 (1485-1539)	



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Week 16	▪ Adaptive Immunity	Ch: 25 (1539-1601)	
	Final Exam		

Textbook(s)/Supplementary Readings

Molecular Biology of the Cell, Fifth Edition 2008

Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter

Essential Cell Biology – An introduction to the molecular biology of cell, Fourth Edition 2014

Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts, Walter