

## Course E-Syllabus

1	Course title	Cell and Molecular Biology
2	Course number	0304105
3	Credit hours	4
	Contact hours (theory, practical)	(4,0)
4	Prerequisites/corequisites	-
5	Program title	B.Sc. in medicine
6	Program code	05
7	Awarding institution	The University of Jordan
8	School	Science
9	Department	Biological Sciences
10	Level of course	1 <sup>st</sup> year
11	Year of study and semester (s)	2021/2022 Second
12	Final Qualification	School Requirement
13	Other department (s) involved in teaching the course	N/A
14	Language of Instruction	English
15	Teaching methodology	<input type="checkbox"/> Blended <input checked="" type="checkbox"/> Online
16	Electronic platform(s)	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
17	Date of production/revision	27 Feb. 2022

### 18 Course Coordinator:

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### 19 Other instructors:

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**20 Course Description:**

As stated in the approved study plan.

This is a four-credit hour course mandatory for first-year students of medicine and dentistry. The course is designed to introduce students to the basics of cellular and molecular biology. The basics include the study of cell structure and the function of cell components, the chemical structure of the genetic material, molecular processes such as replication, transcription, and translation, in addition to the study of basic molecular biology tools and techniques.

**21 Course aims and outcomes:**

**A- Aims:**

The overall objective is to: 1) cell organization and function of the different components and abnormalities, 2) learn the basic processes of the central dogma of molecular biology including DNA replication, RNA transcription, and protein translation, and 3) become familiar with basic molecular biology techniques involved in recombinant DNA technology.

**B- Intended Learning Outcomes (ILOs):**

Upon successful completion of this course, students will be able to:

**A. Knowledge and Understanding:** Student is expected to:

- A1- Recall cellular and molecules interactions, and protein and enzyme characteristics and functions
- A2- Learn the overall cellular and molecular components of cells.
- A3- Understand the structure of plasma membranes of eukaryotic cells.
- A4- Know the different types of membrane proteins.
- A5- Recognize the role of membrane proteins in transport.
- A6- Understand the structure of the mitochondria.
- A7- Discuss some examples of mitochondrial diseases.
- A8- Understand the structure and function of peroxisomes.
- A9- Understand the structure and role of the endoplasmic reticulum in protein synthesis and sorting.
- A10- Understand the role of the endoplasmic reticulum in lipid synthesis.
- A11- Understand the structure and roles of the Golgi apparatus in the synthesis of cellular molecules.
- A12- Understand the mechanism of vesicular transport.
- A13- Understand the mechanism of endocytosis.
- A14- Understand the structure and role of lysosomes and endosomes.
- A15- Understand the structure of the nucleus and the nuclear membrane.
- A16- Discuss some nuclear lamina diseases.
- A17- Understand the structure and organization of microtubules and their role in vesicular transport.
- A18- Understand the structure and role of intermediate filaments.
- A19- Understand the structure and organization of the actin cytoskeleton.
- A20- Understand the role of actin and myosin in cell movement and muscle contraction.
- A21- Recall the different components of the extracellular matrix.
- A22- Recall the steps involving the synthesis of collagen proteins.
- A23- Know the molecular and cellular changes in a few examples of diseases related to collagen synthesis.
- A24- Understand the mechanisms of cell-matrix and cell-cell interaction.
- A25- Recall the different modes of cell signaling with emphasis on cell surface receptors and their intracellular signaling molecules and their cellular effects.
- A26- Understand the molecular regulation of cell death.
- A27- Understand the phases and molecular control of the cell cycle.
- A28- Recognize the basic features of DNA/RNA structures.
- A29- Understand the concept and uses of gel electrophoresis and Southern blotting
- A30- Discuss the molecular dogma of molecular biology
- A31- Learn the main steps and reactions involved in DNA replication.
- A32- Recognize the type of DNA mutations
- A33- Know and differentiate the mechanisms of DNA repair
- A34- Know the composition of the human genome

- A35- Learn the main steps and reactions involved in RNA transcription.
- A36- Understand the mechanisms of regulating gene expression at the transcriptional level in prokaryotes and eukaryotes
- A37- Know the different tools in measuring gene expression at the RNA level starting with single genes (Northern blotting) to high-throughput technologies (DNA microarrays)
- A38- Learn the main steps and reactions involved in protein translation.

**B. Intellectual Analytical and Cognitive Skills:** Student is expected to:

- B1-Recognize the cellular organelles, their functions, structures, molecular components.
- B2-Understand the bases of diseases at the molecular and cellular levels.
- B3-Recognize the regulation of cell behavior and abnormalities associated with it.
- B4-Recognize the nature of the chemical bonds that compose the DNA and RNA molecules.
- B5-Understand how genetic information flow from DNA into RNA and then into functional proteins.
- B6-Get familiar with basic tools and techniques involved in genetic engineering.
- B7-Interpret data of recombinant DNA technologies.

**22. Topic Outline and Schedule:**

Week	Lecture	Topic	Teaching Methods*/platform*	Evaluation Methods**	References
1-2	1-2	Introduction to cell biology: Discovery of cells. Basic properties of cells. Two fundamentally different classes of cells	*	**	Ch.1 (pp. 1-18)
	3--6	Cellular membrane: The chemical composition of membranes. The movement of substances across cell membranes	*	**	Ch. 8 (pp. 311-348)
2-3	7	Mitochondria	*	**	Ch. 9 (pp.368-372) +395
	8	Peroxisomes	*	**	Ch. 9 (pp.392-394)
	9-10	Cellular organelles and membrane trafficking	*	**	Ch. 12 (pp.463-495)
3-4	11-12	Lysosome, endocytosis, endocytosis, and lysosomal storage diseases	*	**	Ch.12 (pp.496-510)
	13	Structure and function of the cell nucleus	*	**	Ch. 6 (pp.225-243)
	14-16	The cytoskeleton: Microtubules. MTOC.	*	**	Ch. 13 (pp.517-540)
5-6	17	The cytoskeleton: Intermediate filaments	*	**	Ch. 13 (pp.541-543)
	18-20	The cytoskeleton: Microfilaments. Myosin. Muscle contractility and cellular motility	*	**	Ch. 13 (pp.544-563)
	21-23	The extracellular matrix and cell interactions	*	**	Ch. 11 (pp.426-452)
6-7	24-26	Cell signaling pathways: GPCR and RTK	*	**	Ch. 15 (pp.624-665)
	27-28	Cell division: The cell cycle	*	**	Ch. 14 (pp.578-588)
	3	<b>Midterm Exam</b>	*	**	
8-9	29-30	Nucleic acid structure	*	**	Campbell, Ch. 2, pp. 49-52

					Ch. 4, pp. 108-109P 196-211
	31-32	Gel electrophoresis and Southern blotting	*	**	Campbell, Ch. 4, pp.118-119, 124-125, 129-130
	33-34	introduction into the molecular dogma of molecular biology and DNA replication	*	**	Campbell, Ch. 4, p. 110 Ch.6, pp. 192-206
	35	DNA mutations	*	**	Online resource
<b>9-10</b>	36	DNA repair	*	**	Campbell, Ch.6, pp. 207-219
	37	The human genome	*	**	Campbell, Ch.5, pp. 153-163
	38-40	RNA transcription			Campbell, Ch. 4, pp. 112-115 Ch. 7, 239-242, 245-251, 277-278, 286-289
<b>10-11</b>	41	Regulation of transcription in prokaryotes	*	**	Campbell, Ch.7, pp.243-245, 251-255, 260-275, 288
	42-44	Regulation of transcription in eukaryotes	*	**	Campbell, Ch.7, pp.243-245, 251-255, 260-275, 288
	45-46	Analysis of gene expression	*	**	Campbell, Ch. 4, pp.130-132
<b>12</b>	47-49	Translation and its regulation			Campbell, Ch. 8, 297-319

\* Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting

\* Platform is Microsoft Teams; unless otherwise indicated by your instructor

\*\* Evaluation methods include: Midterm exam and Final exam

### 23 Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
Midterm Exam	50	Cell Biology part	TBD	TBA
Final Exam	50	Molecular Biology Part	TBD	TBA

## 24 Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):

Student are **required** to have access to the following:

- A computer (with webcam & microphone)
- Active and dependable internet connection
- E-Learning website (not the mobile application) works smoothly on their computer.
- Make sure to install the application (platform) which will be used by your instructor to conduct the live meetings (Microsoft Teams).

## 25 Course Policies:

A- Attendance policies:

Absence from lectures should not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course.

B- Absences from exams and submitting assignments on time:

You should contact **your instructor** as soon as possible if you miss an exam. All such cases will be dealt with according to the rules outlined in your student handbook.

C- Health and safety procedures:

N/A

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All violations pertaining to cheating, plagiarism, misbehavior will be dealt with in accordance to the rules outlined in your student handbook.

E- Grading policy:

All exams are made up of MCQ' and will be graded automatically.

F- Available university services that support achievement in the course:

- Microsoft Teams → live meeting → <https://teams.microsoft.com>
- University of Jordan's E-Learning online educational portal → <http://www.elearning.ju.edu.jo>
- Optional mobile application to access E-Learning platform (Moodle)

## 26 References:

A- Required book(s), assigned reading and audio-visuals:

1. **Karp's Cell Biology. 8th edition (Global Edition). By: Iwasa and Marshal, John Wiley & Sons, 2016.**
2. **The Cell: A Molecular Approach, Geoffrey M. Cooper and Robert E. Hausmann, 7th edition, Sinauer Associates, 2018.**
3. **Recorded lectures on YouTube**

## 27 Additional information:

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Name of Course Coordinator: **Dr. Amer Imraish** Signature:

Date: 27.2.2022

Head of Curriculum Committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of Curriculum Committee/Faculty: ----- Signature: -----

Dean: ----- Signature: -----