Form: Course Syllabus		
	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
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	Number of Pages	06

1.	**Course Title**	Introduction to Biochemistry and Molecular Biology
2.	**Course Number**	0501113
3.	**Credit Hours (Theory, Practical)**	3 Theory
	Contact Hours (Theory, Practical)	30 Lectures
4.	**Prerequisites/ Corequisites**	
5.	**Program Title**	Doctor of Medicine
6.	**Program Code**	05
7.	**School/ Center**	School of Medicine
8.	**Department**	Biochemistry and Physiology
9.	**Course Level**	Bachelor
10.	**Year of Study and Semester (s)**	First year/ Summer Semester
11.	**Program Degree**	Bachelor
12.	**Other Department(s) Involved in Teaching the Course**	--
13.	**Learning Language**	English
14.	**Learning Types**	■Face to face learning ☐Blended ☐Fully online
15.	**Online Platforms(s)**	■Moodle ■Microsoft Teams
16	**Issuing Date**	December 2023
17.	**Revision Date**	May 2025

18. Course Coordinator:

Name: Prof. Nafez Abu Tarboush

Contact hours: Sunday-Thursday 12:30 – 1:30 PM

Office number: 116 Phone number: 065355000/23414

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19. Other Instructors:

Name: Prof. Mamoun Ahram	Contact hours: Sunday-Thursday 1-2 PM
Office number: 148	Phone number: 065355000/23481
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20. Course Description:

A- Course Description:

This course covers the relationship between organic chemistry and biochemistry, structure of water and its properties including polarization and ionization, acids, bases, and buffers. It also covers the study of the structure and classification of carbohydrates, lipids, and amino acid, structure and characteristics of proteins, hemoglobin, fibrous proteins, enzymes including their general properties, classification, kinetics, mechanisms of inhibition and regulation. The course also covers the genetic code and its transcription, translation, protein synthesis, and mutations.

B- Aims:

The aim of this course is to provide students with a thorough understanding of the biochemical structures of components of the human body. The course covers water properties, macromolecules and their characteristics, the concept of structure-function relationship including enzymes.

21. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

PLO's	*National Qualifications Framework Descriptors*		
	Competency (C)	Skills (B)	Knowledge (A)
1.	☐	☐	☒
2.	☐	☒	☐
3.	☒	☐	☐
4.	☐	☐	☒
5.	☐	☒	☐
6.	☒	☐	☐
7.	☐	☐	☒
8.	☒	☐	☐

* Choose only one descriptor for each learning outcome of the program, whether knowledge, skill, or competency.

22. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

Course ILOs #	The learning levels to be achieved						Competencies
	Remember	Understand	Apply	Analyse	Evaluate	Create	
1.	✓	✓					List and recall properties of carbon, water, acids, bases, pH, and physiological buffers.
2.	✓	✓					Define carbohydrates, lipids and cell membranes, nucleic acids, and proteins. List their components, properties, and their simple and conjugated structures.
3.	✓	✓	✓	✓			Describe enzymes structure function relationship, their classes, active sites, free and activation energies, kinetics, regulation, isozymes, coenzymes, and metals.

4.	✓	✓	✓	✓			Differentiate: the types and characteristics of non-covalent interactions; proteoglycans and glycoproteins; the basic mechanism and players of lipid transport in the blood; different secondary structures of proteins and their structural significance; classes of cofactors.
5.			✓	✓	✓		Apply; the molecular expressions of molarity, equivalence, pH, and pKa; Henderson-Hasselbalch equation; concepts of isomerism, isoelectric point, denaturation and renaturation;

							previous information to pathological defects in protein formation, and the uses of different biochemical techniques.
6.			✓	✓	✓	✓	Deduce an apply: the concept of Vo, Vmax, and KM, and their biological significance; Michaelis-Menten equation; the enzyme units (Vmax, turnover number, specificity constant, rate of reaction (Vo), enzyme activity, specific activity).

7.			✓	✓	✓	✓	Link: carbohydrates and lipids to blood typing; and the mechanisms of action of the different classes of inhibitors in relation to the Lineweaver-Burk or double-reciprocal plot.
8.			✓	✓	✓	✓	Appraise: the function of proteins and enzymes in the body under different mechanisms of reversible and irreversible enzyme modification; and the effect of nonspecific inhibitors on protein structure and function.

23. The matrix linking the intended learning outcomes of the course -CLO's with the intended learning outcomes of the program -PLOs:

PLO's * / CLO's	1	2	3	4	5	6	7	8	Descriptors**		
									A	B	C
1	✓	✓	✓	✓		✓	✓	✓	✓		
2										✓	
3											✓
4									✓		
5										✓	
6					✓						✓
7									✓		
8											✓

***Linking each course learning outcome (CLO) to only one program outcome (PLO) as specified in the course matrix.**

****Descriptors are determined according to the program learning outcome (PLO) that was chosen and according to what was specified in the program learning outcomes matrix in clause (21).**

24. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome (SLO)	Descriptors **	Learning Types (Face to Face/Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	**Introduction**	List common and most critical elements in the human body. Differentiate the types and characteristics of non-covalent interactions. Know the biochemical importance and properties of carbon and water.	K S K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	1.2	**Acids, bases, pH, and buffers**	Recall the concepts of acids, bases, amphoteric molecules, and the ionization of water and weak acids. Apply the molecular expressions: molarity, normality, equivalence, pH, and pKa.	K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	1.3	**Acids, bases, pH, and buffers**	Know the chemical concept of different types of buffers, buffering capacity, midpoint, and titration. Apply the Henderson-Hasselbalch equation.	K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	1.4	**Acids, bases, pH, and buffers**	List physiological buffers and translate knowledge in normal and abnormal conditions.	K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	1.5	**Acids, bases, pH, and buffers**	List physiological buffers and translate knowledge in normal and abnormal conditions.	K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2

2	2.1	**Macromolecules and carbohydrates I**	Know the concepts of macromolecules and how they are synthesized and broken down. Define carbohydrates. Comprehend the classifications, drawing, structure, and function of carbohydrates (mono-, di-, oligo-, and poly-). Apply the concept of isomerism to monosaccharides.	K K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	2.2	**Carbohydrates II**	Identify substituted and modified saccharides (mono- and poly-).	K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	2.3	**Carbohydrates III and Lipids I**	Differentiate proteoglycans and glycoproteins. Link carbohydrates to blood typing. Define lipids. Identify the classifications, drawing, structure, and function of lipids (fatty acids, triglycerides, waxes, phospholipids, glycolipids, and steroids.	S S K K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	2.4	**Lipids II**	Identify the classifications, drawing, structure, and function of lipids (fatty acids, triglycerides, waxes, phospholipids, glycolipids, and steroids. Differentiate the basic mechanism and players of lipid transport in the blood.	K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	2.5	**Lipids III**	Recall the complex structure of cell membranes and the function of the different components.	K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
3	3.1	**Nucleic acid**	Define nucleic acids and nucleotides. Identify the classifications, drawings, structure, and functions of nucleic acids.	K K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2

			List modified nucleotides.	K					
	3.2	**Amino acids I**	Define proteins. List amino acids. Differentiate the structure, isomerism, and classes of amino acids.	K K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	3.3	**Amino acids II**	Identify the ionization states of amino acids. Know the concept of isoelectric point. List modified and specialized amino acids.	K K K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	3.4	**Polypeptides and protein structure I**	Recall the four levels of protein structure. Recall of features of the peptide bond. Apply the concept of isoelectric point of amino acids to polypeptides. Differentiate the different secondary structures of proteins and their structural significance. Understand the formation of the tertiary structure of proteins.	K K S S K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	3.5	**Polypeptides and protein structure II**	Define quaternary structure. Know the concept of complex protein structures (glycoproteins, lipoproteins, phosphoproteins). Apply the concepts of denaturation and renaturation to protein structure and function. Apply the previous information to pathological defects in protein formation.	K K S S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2

4	4.1	**Protein structure-function relationship (part I: fibrous proteins)**	Recognize the different classes of proteins (fibrous, globular).	K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	4.2	**Protein structure-function relationship (part II: globular proteins Hemoglobin and Myoglobin - Structure)**	Discuss examples of different proteins from each class (mainly collagen, myoglobin, hemoglobin) in connection to their function in light of previous knowledge.	K, S					
	4.3	**Protein structure-function relationship (part III: globular proteins Hemoglobin and Myoglobin - Regulation)**	Discuss hemoglobin regulation	K, S K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	4.4	**Protein structure-function relationship (part IV: globular proteins Hemoglobinopathies)**	Discuss Hemoglobinopathies		Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	4.5	**Protein structure-function relationship (part V: immunoglobulins)**	Discuss examples of different proteins from each class (immunoglobulins, and plasma proteins) in connection to their function in light of previous knowledge.	K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
5	5.1	**OFF**							
	5.2	**Midterm Exam**							
	5.3	**Protein structure-function relationship (part VI: plasma proteins)**	Discuss examples of different proteins from each class (immunoglobulins, and plasma proteins) in connection to their function in light of previous knowledge.	K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	5.4	**Enzymes (introduction)**	Define enzymes.	K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	5.5	**Enzymes (introduction)**	Recall the general properties and functions of enzymes. List the classes of enzymes and differentiate the reactions they catalyze. Recall the major features of active sites.	K K K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2

			Differentiate types of enzyme-substrate interactions. Recall the concept of free energy and activation energy.	K					
6	6.1	**Enzymes kinetics and mechanisms of regulation – 1**	Define enzyme kinetics. Apply the concept of Vo, Vmax, and KM, and their biological significance. Apply the above terms to the Michaelis-Menten equation. Apply the enzyme units (Vmax, turnover number, specificity constant, rate of reaction (Vo), enzyme activity, specific activity). Link the mechanisms of action of the different classes of inhibitors in relation to the Lineweaver-Burk or double-reciprocal plot. Know the role of the factor of diffusion (compartmentalization and enzyme complexing) in enzyme regulation. Describe how enzyme activity can be regulated by physiological and pharmacological inhibitors. Recall the concept of allosteric regulation. Identify the role of small and large enzyme regulatory molecules. Comprehend the mechanisms of reversible and irreversible enzyme modification. Define modes of regulation. Discuss the effect of nonspecific inhibitors (temperature, pH) on protein structure and function.	K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	6.2	**Enzymes kinetics and mechanisms of regulation – 2**		S S S S K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	6.3	**Enzymes kinetics and mechanisms of regulation – 3**			Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	6.4	**Enzymes kinetics and mechanisms of regulation – 4**		K K K K K K, S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2

			Define isoenzymes and know their biological and clinical significance.						
	6.5	**Enzymes (cofactors)**	Differentiate between holoproteins and apoproteins. Differentiate classes of cofactors. Define and list vitamins and understand their contribution to enzymatic reactions, emphasizing vitamin C, B vitamins, folic acid, and lipoic acid. Identify the role of metals in the enzyme activity of metal-activate enzymes.	S S K K	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
7	7.1	**Biochemical techniques and protein analysis – 1**	Introduce different biochemical techniques used in medicine and research. Apply the concepts and uses of different protein techniques (salting out and in, dialysis, chromatography (size-exclusion, ion-exchange, affinity, centrifugation, cell fractionation, isoelectric focusing, electrophoresis, immunoassays, protein sequencing, crystallography, and nuclear magnetic resonance).	K S	Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	7.2	**Biochemical techniques and protein analysis – 2**			Face to face		Synchronous Lecturing	Written exam	28.A 1,2
	7.3	**Off**							
	7.4	**Off**							
	7.5	**Off**							
8	8.1	**Final Exam**							

25. Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	SLOs	Descriptors**	Period (Week)	Platform
Midterm exam	**40**	Up to amino acids and peptides	From 1.1 – 3.3	K S	5th week	Paper-based exam
Final exam	**60**	From protein structure to the end	From 3.4 – 7.2	K S	8th week	Paper-based exam
** **K: Knowledge, S: Skills"**						

*** According to the instructions for granting a Bachelor's degree.**

****According to the principles of organizing semester work, tests, examinations, and grades for the bachelor's degree.**

Mid-term exam specifications table*

(The tables below will be completed on separate forms by course coordinators prior to conduction of each exam according to Accreditation and Quality Assurance Centre procedures and forms)

No. of questions/ cognitive level						No. of questions per CLO	Total exam mark	Total no. of questions	CLO/ Weight	CLO no.
Create **%10**	Evaluate **%10**	analyse **%10**	Apply %20	Understand **%20**	Remember %30					
1	1	1	4	2	1	10	100	100	10%	1

Final exam specifications table

No. of questions/ cognitive level						No. of questions per CLO	Total exam mark	Total no. of questions	CLO Weight	CLO no.
Create **%10**	Evaluate **%10**	analyse **%10**	Apply %20	Understand **%20**	Remember %30					
										1
										2
										3
										4
										5

26. Course Requirements:

- ✓ Classroom Lectures
- ✓ Internet connection
- ✓ Online educational material using Moodle platform (Electronic Videos and Activities)

27. Course Policies:

A- Attendance policies:

Attendance will be monitored by the course coordinator. Attendance policies will be announced at the beginning of the course.

B- Absences from exams and handing in assignments on time:

Will be managed according to the University of Jordan regulations. Refer to http://registration.ju.edu.jo/Documents/daleel.pdf

C- Health and safety procedures:

Faculty Members and students must always, conform to Health and Safety rules and procedures.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

As a student in this course (and at this university) you are expected to maintain high degrees of professionalism, commitment to active learning and participation in this course and also integrity in your behavior in and out of the classroom. Students violate this policy would be subjected to disciplinary action according to University of Jordan disciplinary policies

E- Grading policy:

Grade-point average, Rules are preset by the Faculty and Department Councils

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

Availability of comfortable lecture halls, data show, internet service and E learning website https://elearning.ju.edu.jo/ .

28. References:

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

1. Biochemistry; Mary K. Campbell and Shawn O. Farrell, Brooks Cole; 7th edition.
2. Mark's Basic Medical Biochemistry by M. Lieberman of A. Marks, Lippincott, Williams and Wilkins, 2013. 4th edition, Concept in Biochemistry by R. Boyers

B- Recommended books, materials, and media:

NCBI Bookshelf:
(http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Books)

1. The Medical Biochemistry Page: (http://web.indstate.edu/thcme/mwking/home.html)
2. Biochemistry, Garret and Grishan, Second Ed.: http://web.virginia.edu/Heidi/home.htm

29. Additional information:

Name of the Instructor or the Course Coordinator:

Professor Nafez Abu Tarboush — Signature: ..... — Date: 23-6-2025

Name of the Head of Quality Assurance Committee/ Department

Dr Enas Al-Zayadneh — Signature: ..... — Date: 11-5-2025

Name of the Head of Department

Dr Mohammad Al Khatatbeh — Signature: ..... — Date: 23/6/2025

Name of the Head of Quality Assurance Committee/ School or Center

Professor Ayman Wahbeh — Signature: ..... — Date: .....

Name of the Dean or the Director

Professor Ayman Wahbeh. — Signature: ..... — Date: .....