

The Hashemite University



الجامعة الهاشمية



Faculty of Pharmaceutical Sciences

كلية العلوم الصيدلانية

## Syllabus: Biochemistry (#131702221) Second Semester 2022 /2023

### COURSE INFORMATION

<b>Course Name: Biochemistry (face-to-face learning)</b> <b>Semester: Second</b> <b>Department: Clinical Pharmacy &amp; Pharmacy Practice</b> <b>Faculty: Pharmaceutical Sciences</b>	<b>Course Code: 131702221</b> <b>Section: according to the schedule</b> <b>Core Curriculum: 2013 and 2019 Study Plan</b>
<b>Day(s) and Time(s): According to HU courses timetable/semester</b> <b>Classroom: As per semester (Pharmaceutical Sciences building)</b>	<b>Credit Hours: 3</b> <b>Prerequisites: (1917013210-pharmaceutical organic chemistry 1 or 110103107 and 110108105)</b>

### COURSE DESCRIPTION

This course aims to provide the students with the basic information about the unique physical and chemical properties for macromolecules (carbohydrate, lipids and proteins) and their function in the biological system. The use of water as a universal solvent in biological systems and the acid base properties of water will be studied. The metabolism of carbohydrate, proteins, triglycerides, cholesterol and phospholipids will also be studied. In addition, it covers the bioenergetics and oxidative phosphorylation reactions.

### DELIVERY METHODS

The course will be delivered through a combination of active learning strategies. These will include:

- PowerPoint recorded lectures and active classroom-based discussion  
Students will be encouraged to participate and be actively involved in the learning process. Lectures will start with questions to inquire about the students' prior knowledge of the topic and/or about the previous lecture. Other questions will also be asked at the end of the lecture to gain insight into the students' competencies (to verify whether students have completely understood the topic).
- White board will be used to solve problems and calculations

- Relevant films and Video lectures
- E-learning resources: e-reading assignments and practice quizzes through Moodle and Microsoft Teams

### FACULTY INFORMATION

<b>Name</b>	1- Dr. Iman Mansi 2- Dr. Suhad Bani Melhim
<b>Academic Title:</b>	1- Associate Professor 2- Assistant Professor (respectively)
<b>Office Location:</b>	Third Floor (485), (408)
<b>Telephone Number:</b>	Extension: 3444 3408
<b>Email Address:</b>	1- <a href="mailto:Iman_mansi@hu.edu.jo">Iman_mansi@hu.edu.jo</a> 2- <a href="mailto:suhadmehim@hu.edu.jo">suhadmehim@hu.edu.jo</a>
<b>Office Hours:</b>	<i>As announced per semester</i>  <i>Please send an e-mail (as mentioned above) to meet at any other time.</i>

### REFERENCES AND LEARNING RESOURCES

#### **Required Textbook(s):**

*All compulsory weekly readings are available electronically on Moodle.*

1. Lippincott's Illustrated reviews: Biochemistry, 6th edition, Denise Ferrier, 2014.
2. Lehninger's principles of Biochemistry, 6th edition, Nelson D.L. and Cox M.M., 2012.
3. Biochemistry, 7th edition, Stryer L., 2010., ISBN:978-81-312-3266-8.

#### **Suggested Additional Resources:**

Journals: Biochemical Journal  
Journal of Biological chemistry

#### **Useful Web Resources:**

Moodle HU



## Course Objectives

After course completion students will be able to:

The students are expected to :

1. Demonstrate a good awareness and understanding of biochemical principles
2. Emphasize the main concepts regarding the chemical and physical properties of biomolecules (proteins, carbohydrates and lipids)
3. Know the major functions of the biomolecules in a biological system.
4. Recognize how macromolecules are metabolized inside the body to produce energy
5. Know the main concepts of bioenergetics and oxidative phosphorylation.

## Course Learning Outcomes (CLOs)

### A. Knowledge and Understanding

A.1- Classify biomolecules as belonging to the lipid, carbohydrate, nucleic acid or protein class

A.2- Know the general structures of biomolecules and representative examples for each class

A.3- Explain how these macromolecules are metabolized in our body

A.4- Identify knowledge in foundational sciences that is integral to clinical reasoning.

A.5- Understand metabolism and bioenergetics: metabolic pathways, catabolism, anabolism and free energy changes; concept of high energy carriers, ATP, acetyl CoA, and co-factors NAD<sup>+</sup>, NADP<sup>+</sup>, and FAD; glycolysis, the citric acid cycle, glycogen breakdown, gluconeogenesis, fatty acid metabolism, amino acid metabolism, various types of carbohydrates, (polysaccharides) and glycoprotein.

A.6- learn about protein synthesis and the flow of genetic information; DNA→RNA→Protein.

A.7- Enzymes: mechanisms of enzymes, substrate binding, active site, specificity and rate of reaction, effect of temperature, pH, concentration, Michaelis-Menten, Lineweaver-Burk; enzyme inhibition: competitive, non-competitive regulation of enzymes.

A.8- Determine biochemically relevant constants (such as V<sub>max</sub> or K<sub>m</sub>) from a Lineweaver-Burke plot.

A.9- Understand the biochemical and molecular basis of some inherited diseases

A.10- Relate the biochemical events at the cellular level to the physiological processes at human level.

A.11- Interpret metabolic abnormalities and relate them to possible causes and mechanisms.

A.12- Understanding the role of pharmaceutical supplements found as over-the counter medications such as vitamins (Vitamin B6, B12) in the metabolism of amino acids as well as the role of carnitine role in lipid metabolism. In addition to the role glycosaminoglycans found in pharmacy such as (chondroitin, heparan, keratan sulfate, hyaluronic acid) and their importance to human body.

A.13- Understanding the lipid metabolism and its link to cyclooxygenases and leukotrienes that are targets for anti-inflammatory medications.

## ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their instructor to ensure that their individual needs are met. The University through its Special Need section will exert all efforts to accommodate for individual's needs.

### **Special Needs Section:**

**Tel: 00962-5-3903333** , Extension: 4209

**Location: Students Affairs Deanship/ Department of Student Welfare Services**

**Email: [amalomoush@hu.edu.jo](mailto:amalomoush@hu.edu.jo)  
[amalomoush@staff.hu.edu.jo](mailto:amalomoush@staff.hu.edu.jo)**

## COURSE REGULATIONS

### ***Participation***

Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student should not miss more than 15% of the classes during a semester. *Those exceeding this limit of 15% will receive a failing grade regardless of their performance.* It is a student's responsibility to monitor the frequency of their own absences. **Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in a non-attendance being recorded.**

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

On average, students need to spend 2 hrs of study and preparation weekly. At the beginning of the lectures, be on time and don't leave before the end of the lecture without an accepted excuse. **If you missed a class, it is your responsibility to find out about any announcements or assignments you have missed.** For any clarification, please communicate your instructor at her posted office hours or by appointment. Listen well to the lecture, if you have a question, ask your instructor. You will find the course material at the course team after the lecture.

**Sharing of course materials is forbidden.** No course material including, but not limited to, course outline, lecture hand-outs, videos, exams, and assignments may be shared online or with anyone outside the class. Any suspected unauthorized sharing of materials, will be reported to the university's Legal Affairs Office. If a student violates this restriction, it could lead to student misconduct procedures.

### ***Plagiarism***

Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviours that compromise his/her own integrity as well as that of The Hashemite University.

Plagiarism includes the following examples, and it applies to all student assignments or submitted work:

- Use of the work, ideas, images, or words of someone else without his/her permission or reference to them.
- Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.
- Misrepresentation of the sources that were used.

**The instructor has the right to fail the coursework or deduct marks where plagiarism is detected**

***Late or Missed Assignments***

In all cases of assessment, students who fails to attend an exam, class project or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.
- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with University regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

***Missed Assessments***

In all cases of assessment, students who fails to attend an exam on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a failure grade .for this part of the assessment

- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with university regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

***Cheating***

Cheating, academic misconduct, fabrication and plagiarism will not be tolerated, and the university policy will be applied. Cheating policy: The participation, the commitment of cheating will lead to applying all following penalties together:

- Failing the subject, he/she cheated at
- Failing the other subjects taken in the same course
- Not allowed to register for the next semester
- The summer semester is not considered as a semester

***Student Complaints Policy***

Students at The Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

## COURSE ASSESSMENT

### *Course Calendar and Assessment*

Students will be graded through the following means of assessment:

Assessment	Grade Weighting	Deadline Assessment
First Exam	25%	~ 6 <sup>th</sup> week
Second Exam	25%	~ 10 <sup>th</sup> week
Quizzes	10%	During the semester
Final Exam	40%	~ 15 <sup>th</sup> /16 <sup>th</sup> week

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment as listed below with their grade weighting taken into account. The criteria for grading are listed at the end of the syllabus

Students will be graded through the following means of assessment:

#### **Description of Exams**

Test questions will predominately come from material presented in the lectures and the lectures themselves. Semester exams may be conducted during the regularly scheduled lecture period. Exam may consist of a combination of multiple choice, short answer, match, true and false, and/or descriptive questions.

**Quizzes:** Unannounced quizzes will be given during or/and at the end of each chapter based upon the previous lectures. It will enforce that you come prepared to the class.

No make-up exams, homework or quizzes will be given. Only documented absences will be considered as per HU guidelines. Make-up exams may be different from regular exams in content and format.

Grades are not negotiable and are awarded according to the following criteria:

Letter Grade	Description	Grade Points
A+	Excellent	4.00
A		3.75
A-		3.50
B+	Very Good	3.25
B		3.00
B-		2.75
C+	Good	2.50
C		2.25
C-		2.00
D+	Pass	1.75
D	Pass	1.50
F	Fail	0.00
I	Incomplete	-

## WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

*Lecture hours and weeks are approximate and may change as needed”*

Note: The course is provided as 2 lecture per week (Sunday/Tuesday, Monday/Wednesday), one lecture period covers 1.5 lecture hours (75 minutes). The course content specifies chapters of the textbook that will be included in exams. **All lectures are delivered by face-to-face learning.**

<u>Topic 1</u>	Introduction	Week 1	Lectures 1-2
<u>Topic 2</u>	Water and pH	Week 2	Lecture 3
<u>Topic 3</u>	Biochemistry of Amino Acids and Peptides	Week 2,3	Lectures 4,5,6
<u>Topic 4</u>	Biochemistry of Proteins and allosteric Protein	Week 3	Lecture 6
<u>Topic 5</u>	Globular proteins	Week 4	Lectures 7,8
<u>Topic 6</u>	Fibrous proteins	Week 5	Lecture 9
<u>Topic 7</u>	Enzymes and enzyme kinetics	Week 5,6	Lectures 10,11
	<b><u>First exam</u></b>	<b>Week 6</b>	
<u>Topic 8</u>	Biochemistry of Carbohydrates.	Week 7	Lecture 12
<u>Topic 9</u>	Glycosaminoglycans and Glycoproteins.	Week 7	Lecture 13,14
<u>Topic 10</u>	Biochemistry of Lipids.	Week 8	Lecture 14
<u>Topic 11</u>	Biological Membranes (plasma membrane)	Week 8	Lecture 15
<u>Topic 12</u>	Metabolism of glucose (Glycolysis and TCA cycle, gluconeogenesis).	Week 9,10	Lectures 16-18
	<b><u>Second exam</u></b>	<b>Week 10</b>	
<u>Topic 13</u>	Metabolism of mono and disaccharides-fructose/galactose.	Week 11	Lecture 19
<u>Topic 13</u>	Pentose phosphate pathway and NADPH.	Week 11	Lecture 20
<u>Topic 14</u>	Glycogenesis and glycogenolysis	Week 12	Lecture 21
<u>Topic 15</u>	Metabolism of protein and urea cycle	Week 12, 13	Lectures 22-24
<u>Topic 16</u>	Metabolism of fatty acids	Week 13	Lectures 25
<u>Topic 17</u>	Metabolism of phospholipids and cholesterol	Week 14	Lectures 26,27
<u>Topic 18</u>	Integration of metabolism	Week 15	Lecture 28
<u>Topic 19</u>	Bioenergetics and oxidative phosphorylation	Week 15	Lecture 29
	<b><u>Final Exam</u></b>	<b>Week 15</b>	