Course Plan for Bachelor Program - Study Plan Development and Updating Procedures/ Pharmacy Department	QF02/0408-4.0E

Study Plan No.	**2021/2022**		**University Specialization**		**Bachelor of Pharmacy**	
Course No.	**0201219**		**Course Name**		**Biochemistry**	
Credit Hours	**3**		**Prerequisite** *Co-requisite		**Pharmaceutical Organic Chemistry (2) + Anatomy and Physiology (2)**	
Course Type	☐ Mandatory University Requirement	☐ University Elective Requirement	☐ Faculty Mandatory Requirement	☐ Support course family requirements	☑ **Mandatory Requirement**	☐ Elective Requirement
Teaching Style	☐ Full Online Learning		☐ Blended Learning		☑ **Traditional Learning**	
Teaching Model	☐ 1 Synchronous: 1 Asynchronous		☐ 1 Face to Face: 1 Asynchronous		☑ **2 Traditional**	

Faculty Member and Study Divisions Information *(to be filled in each semester by the subject instructor)*

Name	Academic rank	Office No.	Phone No.	E-mail	
Office Hours (Days/Time)					
Division number	**Time**	**Place**	**Number of Students**	**Teaching Style**	**Approved Model**
				Traditional Learning	**2 Traditional**

Brief Description

This course provides an overview of the key aspects of biochemistry by relating molecular interactions to their effects on the human body as a whole. It covers the structural organization, function, and metabolism of the three major biomolecules: proteins, carbohydrates, and lipids, with emphasis on their interrelations, as well as their homeostatic regulation. The fundamental concepts of enzyme activities and kinetics are introduced, as well as the basic concepts of bioenergetics.

توفر هذه المادة نظرة عامة على الجوانب الرئيسية لعلم الكيمياء الحيوية من خلال ربط التفاعلات الجزيئية بتأثيراتها على جسم الإنسان ككل. وتشمل المادة التنظيم التركيبي، والوظيفة، والتمثيل الغذائي لثلاثة من الجزيئات الحيوية الرئيسية: البروتينات، والكربوهيدرات، والدهون، مع التركيز على الترابط بينها وتنظيمها في ظل الاتزان الداخلي. كما يتم تقديم المفاهيم الأساسية لنشاط الإنزيمات وحركياتها، بالإضافة إلى المفاهيم الأساسية في علم الطاقة الحيوية.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	1. Lehninger's principles of Biochemistry 6th edition, edited by Nelson D.L. and Cox Michael.M., 2013, Freeman. 2. Lippincott Illustrated Reviews: Biochemistry 5th edition, edited by Harvey R.A., 2010, Lippincott Williams & Wilkins.
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	1. Marks' basic medical biochemistry: a clinical approach / Michael Lieberman, Allan Marks; illustrations by Mathew Chansky. 3rd edition Copyright © 2009 2. Harper's Illustrated Biochemistry, 29e Robert K. Murray, David A Bender, Kathleen M. Botham, Peter J. Kennelly, Victor W. Rodwell, P. Anthony Weil. Copyright © 2012 by The McGraw-Hill Companies, Inc

Supporting Websites				
The Physical Environment for Teaching	☑ **Classroom**	☐ Labs	☑ **Virtual Educational Platform**	☐ Others
Necessary Equipment and Software	Moodle			
Supporting People with Special Needs				
For Technical Support	E-learning &Open Educational Resources Center E-mail: elearning@zuj.edu.jo Phone: +962 6 4291511 ext. 425/362.			

Course learning outcomes *(K= Knowledge, S= Skills, C= Competencies)*

No.	Course Learning Outcomes	The Associated Program Learning Output Code
Knowledge **The student should be able to:**		
K1	Outline the structure, function, and interrelationships of proteins, carbohydrates, and lipids, along with their associated disorders.	**MK3**
K2	Identify the fundamental aspects of enzyme kinetics and different types of enzyme inhibitors.	**MK3**
K3	Discuss the main concepts of bioenergetics and the oxidative phosphorylation of biomolecules.	**MK3**
K4	Describe the major pathways involved in carbohydrates, lipids & proteins metabolism and their homeostatic regulation.	**MK3**
K5	Explain metabolic effects of insulin (in well-fed state) and glucagon (in stress-state).	**MK3**
Skills The student should be able to:		
S1	Relate the biochemical events at the cellular level to the physiological processes occurring in the whole body.	**MS2**
S2	Integrate the metabolic pathways of the three major dietary components and the complete integrated metabolic map.	**MS2**
S3	Interpret common metabolic abnormalities, their possible causes, and underlying mechanisms.	**MS2**
Competencies **The student should be able to:**		

Mechanisms for Direct Evaluation of Learning Outcomes

Type of Assessment / Learning Style	Fully Electronic Learning	Blended Learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm Exam	30%	30%	**30%**	0%
Participation / Practical Applications	0	0	**30%**	60%

Asynchronous Interactive Activities	30%	30%	**0**	0
Final Exam	40%	40%	**40%**	40%

Note 1: *Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, and work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.*

Note 2: *According to the Regulations of granting Master's degree at Al-Zaytoonah University of Jordan, 40% of final evaluation goes for the final exam, and 60% for the semester work (examinations, reports, research or any scientific activity assigned to the student).*

Schedule of Simultaneous / Face-to-Face Encounters and their Topics

Week	Subject	Learning Style*	Reference **
1	Amino Acids Peptides and Protein	Lecture	- Lehninger's principles of Biochemistry –Chapter 3, Section: 1,2 - Lippincott Illustrated Reviews: Biochemistry- Chapter 1
2	Structure of Protein	Lecture	- Lehninger's principles of Biochemistry –Chapter 4, Section: 1,2,3,4 - Lippincott Illustrated Reviews: Biochemistry- Chapter 2
3	Protein function	Lecture	- Lehninger's principles of Biochemistry –Chapter 5, Section: 1 - Lippincott Illustrated Reviews: Biochemistry- Chapter 3
4	Enzymes as Catalysts Regulation of Enzymes	Lecture	- Lehninger's principles of Biochemistry –Chapter 6, Section: 1,2,3,5 - Lippincott Illustrated Reviews: Biochemistry- Chapter 5
5	Bioenergetics Electron-Transport Chain Oxidative Phosphorylation	Lecture	- Lehninger's principles of Biochemistry –Chapter 13, Section: 1,4 Chapter 19, Section: 1,4 - Lippincott Illustrated Reviews: Biochemistry- Chapter 6
6	Introduction to Metabolism	Lecture	- Lehninger's principles of Biochemistry –Chapter 12, Section: 1,2 - Lippincott Illustrated Reviews: Biochemistry- Chapter 8
7	Chemistry, Digestion and Transport of Carbohydrates	Lecture	- Lehninger's principles of Biochemistry –Chapter 7, Section: 1,2 - Lippincott Illustrated Reviews: Biochemistry- Chapter 7
8	Carbohydrates Metabolism : Generation of ATP from Glucose:	Lecture	- Lehninger's principles of Biochemistry –Chapter 14, Section: 1,3 Chapter 16, Section: 1,2,3

	Glycolysis Tricarboxylic Acid Cycle		- Lippincott Illustrated Reviews: Biochemistry- Chapter 8,9
9	Gluconeogenesis and Maintenance of Blood Glucose Levels Pentose Phosphate Pathway of Glucose Oxidation Midterm Exam	Lecture	- Lehninger's principles of Biochemistry –Chapter 14, Section: 4,5 - Lippincott Illustrated Reviews: Biochemistry- Chapter 10, 13
10	Chemistry, Digestion and Transport of Dietary Lipids	Lecture	- Lehninger's principles of Biochemistry –Chapter 17, Section: 1 - Lippincott Illustrated Reviews: Biochemistry- Chapter 15
11	Lipid Metabolism: Oxidation of Fatty Acid Synthesis of Fatty Acids, Triacylglycerols and Cholesterol	Lecture	- Lehninger's principles of Biochemistry –Chapter 17, Section: 2 Chapter 21, Section: 1,2,4 - Lippincott Illustrated Reviews: Biochemistry- Chapter 16,18
12	Ketone Bodies Production and Oxidation Lipoprotein Metabolism	Lecture	- Lehninger's principles of Biochemistry –Chapter 17, Section: 3 - Lippincott Illustrated Reviews: Biochemistry- Chapter 18
13	Protein Digestion and Absorption Amino Acids: Disposal of Nitrogen Amino Acid Degradation and Synthesis	Lecture	- Lehninger's principles of Biochemistry –Chapter 18, Section: 1,2,3 - Lippincott Illustrated Reviews: Biochemistry- Chapter 19,20
14	Hormonal Regulation of Metabolism	Lecture	- Lehninger's principles of Biochemistry –Chapter 23 Section: 3
15	Integration of Metabolism	Lecture	- Lippincott Illustrated Reviews: Biochemistry- Chapter 23,24
16	Final Exam	-	-

** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.*
*** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.*

Schedule of Asynchronous Interactive Activities *(in the case of e-learning and blended learning)*

Week	Task / Activity	Reference	Expected Results
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