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.	**0201443**		**Course Name**		**Pharmaceutical Biotechnology**	
Credit Hours	**3**		**Prerequisite *Co-requisite**		**Immunology**	
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)	**Sunday, Tuesday, Thursday ()**		**Monday, Wednesday ()**		
Division number	**Time**	**Place**	**Number of Students**	**Teaching Style**	**Approved Model**
				Traditional Learning	**2 Traditional**

Brief Description

This course covers the basic principles of molecular biology and protein structure, it also focuses on topics such as formulation and delivery of biopharmaceuticals and the advances during the past twenty years and their effects on drug discovery and precise medicine.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	Pharmaceutical Biotechnology: Fundamentals and Applications 5th edition. 2019 Daan J. A. Crommelin, Robert D. Sindelar, Bernd Meibohm			
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	1. Pharmaceutical Biotechnology: Concepts and Applications Gary Walsh, 2007. 2. An Introduction to Human Molecular Genetics: Mechanisms of Inherited Diseases, Jack J. Pasternak 2nd Edition, 2005			
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 Email: elearning@zuj.edu.jo; Phone: +962 6 429 1511 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	Recognize the basics of Molecular biology and techniques used in recombinant DNA technology and protein's formulation	**MK2**
K2	Understand the different techniques like PCR, sequencing and reverse transcription and their use in recombinant DNA technology.	**MK2**
K3	Identify the roles of genomics, proteomics, transcriptomic and pharmacogenomics in drug target discovery and treatment responses.	**MK2**
K4	Determine the role of gene therapy in treating diseases.	**MK2**
Skills		
The student should be able to:		
S1	Interpret the factors related to enhancing the production of proteins through rDNA technology, purification, and formulation	**MS4**
S2	Solve problems related to the formulation and delivery of therapeutic proteins.	**MS4**
Competencies		
The student should be able to:		
C1	Evaluate pharmaceutical biotechnology advances in treating different diseases.	**MC3**

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%	**20%**	50%
Asynchronous Interactive Activities	20%	20%	**0%**	0%
Final Exam	50%	50%	**50%**	50%

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 ** (Pages in Course Book)
1	Nucleic acids: Structure and function Replication	Lecture	19-36 from supportive learning resource (2)
2	Genes and genomes Gene Expression and regulation	Lecture	**75-106** from supportive learning resource (2)
3	Protein structure Overview of protein structure Higher level structure	Lecture	**13-33** from supportive learning resource (1)
4	Protein stability and folding Protein post-translational modification	Lecture	**33-56**
5	Specific DNA techniques PCR Gel electrophoresis	Lecture	**43-48** from supportive learning resource (1)
6	DNA sequencing cDNA synthesis	Lecture	**1-19**
7	Recombinant DNA technology. Restriction enzymes Recombinant vectors	Lecture	**37-53** from supportive learning resource (1)
8	Transformation Transfection Recombinant DNA hosts	Lecture	**107-152** from supportive learning resource (2)
9	Production and down-stream processing of biotech products. Expression systems. Contaminants. Production and purification Midterm Exam	Lecture	**57-82**
10	Formulation and delivery techniques of biopharmaceuticals	Lecture	**83-104**
11	Pharmacokinetics and Pharmacodynamics of Therapeutic Peptides and Proteins	Lecture	**105-138**
12	Immunogenicity of Therapeutic Proteins	Lecture	**139-150**
13	Monoclonal Antibodies Therapeutic proteins	Lecture	**151-190** **403-428**
14	"OMIC" Technologies and Precision Medicine	Lecture	**191-238**
15	Gene therapy: Carriers, Technology	Lecture	**323-356**

	Diseases		
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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