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

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Study Plan No.	**2021/2022**		**University Specialization**		**Bachelor of Pharmacy**		
Course No.	**0201237**		**Course Name**		**Pharmaceutical Microbiology**		
Credit Hours	**3**		**Prerequisite *Co-requisite**		**Anatomy and Physiology (1)**		
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	☐ 2 Synchronous: 1 Asynchronous		☐ 2 Face to Face: 1 Synchronous		☑ **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 information of microorganisms, their basic structure and mode of growth and their medical, pharmaceutical and environmental importance. It also addresses anti-microbial chemotherapy: focusing on modes of action and prudent use. Moreover, this course is designed to introduce students to the concept and methodologies of sterilization, disinfection, antisepsis and preservation, as well as the role of microorganisms in the spoilage of pharmaceutical products. Principles of sterility testing and pharmaceutical quality assurance are also covered.

Learning Resources

Course Book Information (Title, author, date of issue, publisher ... etc)	1. Engelkirk, Paul G & Duben-Engelkirk, Janet L, (author.) & Burton, Gwendolyn R. W. (Gwendolyn R. Wilson). *Burton's* Microbiology for the health sciences (2015). Wolters Kluwer Health, Philadelphia 2. Gilmore, B. F., & Denyer, S. P., (Eds.). Hugo and Russell's pharmaceutical microbiology, 9th Edition, (2023). John Wiley & Sons. UK.			
Supportive Learning Resources (Books, databases, periodicals, software, applications, others)	1. Prescott, L.M., Harley, J.P., and Klein, D.A. (2008); Microbiology, 7th ed. McGraw Hill, USA 2. Black, J.G. (2015); Microbiology, Principles and Explorations. 9th ed. John Wiley Publication, USA. (Latest edition). 3. Adam Fraise, Jean-Yves Maillard & Syed Sattar. Prin*ciples and Practice of Disinfection, Preservation & Sterilization*. Wiley-Blackwell, UK; 5th Edition (2013). 4. Michael J. Akers. *Sterile Drug Products: Formulation, Packaging, Manufacturing and Quality*. CRC Press; 1st Edition (2010).			
Supporting Websites				
The Physical Environment for Teaching	☑ **Classroom**	☐ Labs	☑ **Virtual Educational**	☐ Others

			Platform	
Necessary Equipment and Software	☑ Moodle. ☑ Microsoft office			
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	Illustrate the structural components of bacteria, fungi, protozoa, and viruses.	**MK3**
K2	Explain the principles of antimicrobial agents, including their classes, selective toxicity, spectrum of activity, and mechanisms of resistance.	**MK3**
K3	Recognize how microbial contamination can lead to spoilage and compromise product safety.	**MK3**
K4	Outline how QA principles ensure reliability and safety in microbiological practices.	**MK3**
K5	List the concepts and common methods of sterilization, disinfection, antisepsis, and preservation.	**MK3**
Skills **The student should be able to:**		
S1	Differentiate between various types of microorganisms based on their structural characteristics and growth patterns**.**	**MS1**
S2	Describe how different resistance mechanisms enable bacteria to survive antimicrobial agents, and how chemical and physical methods reduce microbial contamination.	**MS3**
S3	Explain the factors that contribute to microbial spoilage in pharmaceutical products.	**MS3**
S4	Select appropriate sterilization methods and QA tests for sterile pharmaceutical products.	**MS3**
Competencies **The student should be able to:**		
C1	-	**-**

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%**	30%
Participation / Practical Applications	0	0	**30%**	30%

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

Note: *Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, 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.*

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

Week	Subject	Learning Style*	Reference **
1	Microbiology—the science.	lecture	*Burton's* (1-11)
2	Cell structure and taxonomy.	lecture	*Burton's* (25-37)
3	Acellular microbes.	lecture	*Burton's* (45-56)
4	Prokaryotic microbes.	lecture	*Burton's* (57-72)
5	Eukaryotic microbes.	lecture	*Burton's* (79-88)
6	Controlling microbial growth *in vitro.*	lecture	*Burton's* (134-142)
7	Inhibiting the growth of pathogens *in Vivo* using antimicrobial agents	lecture	*Burton's* (153-162)
8	Drug resistance.	lecture	*Burton's* (163-171)
9	Microbial spoilage, infection risk, and contamination control: Spoilage of pharmaceuticals.	lecture	*Hugo and Russell's* (323-331)
10	Microbial spoilage, infection risk, and contamination control: Source and control of contamination.	lecture	*Hugo and Russell's* (331-337)
11	Microbial spoilage, infection risk, and contamination control: QA and the control of microbial risks in medicine.	lecture	*Hugo and Russell's* (337-341)
12	Chemical disinfectants, antiseptics and preservatives.	lecture	*Hugo and Russell's* (343-364)
13	Sterilization procedures and sterility assurance: Sterilization methods	lecture	*Hugo and Russell's* (404-420)
14	Sterilization procedures and sterility assurance: Sterilization control and sterility assurance.	lecture	*Hugo and Russell's* (422 -431)
15	Sterile pharmaceutical products.	lecture	*Hugo and Russell's* (435-460)
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
1			