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.	**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	☐ 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 information of microorganisms, their basic structure and mode of growth. Medical, pharmaceutical and environmental importance of some microorganisms. Anti-microbial chemotherapy: mode of action and prudent use. Moreover, this course designed to introduce students for the concept and methodologies of sterilization, disinfection, antisepsis and preservation, and how microorganisms spoil pharmaceutical products. The principles of sterility testing and pharmaceutical quality assurance.

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. Denyer, S. P., N. A. Hodges, S. P. Gorman, and B. F. Gilmore. *Hugo and Russell's Pharmaceutical Microbiology*. Wiley-Blackwell, UK; 8th Edition. (2011). 3.
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. Princ*iples 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 Platform**	☐ **Others**
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	Determine the structure and function of different components of bacteria, fungi, protozoa and virus.	**MK3**
K2	Identify antibiotics, selective toxicity, spectrum of activity and resistance mechanisms in the context of antimicrobial agents.	**MK3**
K3	Identify sources of microbial contamination and their harmful effect of spoilage on pharmaceutical products.	**MK3**
K4	Recognize the general principles of Quality Assurance in the context of microbiology.	**MK3**
K5	Describe the concept and methods of sterilization, disinfection, antisepsis and preservation.	**MK3**
Skills **The student should be able to:**		
S1	Identify different types of microorganisms and the demonstrated microbial growth.	**MS1**
S2	Discuss different bacterial resistance mechanisms and the different chemical and physical methods used to control microbial contamination.	**MS3**
S3	Explain the factors that increase the risk of spoilage and how to detect and prevent it.	**MS3**
S4	Select the appropriate method of sterilization and QA tests for sterile pharmaceutical products.	**MS3**
Competencies **The student should be able to:**		
C1	Raise the level of awareness on cross-contamination among public health staff and the general public.	**MC1**
C2	Communicate effectively with the drug manufacturing bodies concerning GMP for microbial quality monitoring and aseptic manufacturing.	**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 **
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 of pharmaceutical products. **Midterm Exam**	lecture	*Hugo and Russell's* (273-287)
10	Contamination of non-sterile pharmaceuticals in hospital and community environments.	lecture	*Hugo and Russell's* (287-291)
11	Chemical disinfectants, antiseptics and preservatives.	lecture	*Hugo and Russell's* (312-333)
12	Non-antibiotic antimicrobial agents: mode of action and resistance.	lecture	*Hugo and Russell's* (334-350)
13	Sterilization procedures and sterility assurance.	lecture	*Hugo and Russell's* (352-369)
14	Sterility test.	lecture	*Hugo and Russell's* (369-372)
15	Sterile pharmaceutical products.	lecture	*Hugo and Russell's* (381-401)

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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