

Course Syllabus

1	Course title	Applied Microbiology	
2	Course number	0334441	
3	Credit hours	3 (2 +1)	
	Contact hours (theory, practical)	5 (2 + 3)	
4	Prerequisites/corequisites	General Microbiology 0304341	
5	Program title	B.Sc. in Biological Sciences	
6	Program code	04	
7	Awarding institution	The University of Jordan	
8	School	Science	
9	Department	Biological Sciences	
10	Course level	Third year	
11	Year of study and semester(s)	2023/2024, second semester	
12	Other department(s) involved in teaching the course	None	
13	Main teaching language	English	
14	Delivery method	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online	
15	Online platforms(s)	<input type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....	
16	Issuing/Revision Date	18.02.2024	



مركز الاعتماد
وإضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

17 Course Coordinator:

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19 Course Description:

As stated in the approved study plan.

Applied Microbiology is a course for Biology undergraduate study. It is three-credit hour course that consists of two 50-minute lectures three-hour laboratory class per week. The course aims to impart the students with basic principles of applied microbiology and industrial biotechnology and their applications and benefits to humankind. It provides an overview on the involvement, utilization and application of microbes in different processes and products. It also covers the importance of waterborne and food-borne diseases and the infectious agents causing them, as they relate to the public health. The laboratory session, which is an integral component, focuses on providing students with a fundamental understanding of how microorganisms are utilized and controlled for the benefit of human and on developing the laboratory skills needed to investigate different aspects of applied



microbiology.

20 Course aims and outcomes:



A- Aims:

1. To explain the roles of microbes in water treatment, food-producing and industrial processes.
2. To have knowledge about the traditional microbiological techniques and various microbial applications used to improve both the public health and human welfare.
3. To assess the use of microbes as tools in industrial microbiology and biotechnology.
4. To provide a conceptual and experimental background in applied microbiology sufficient to enable students to take more advanced courses in related fields.

B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

1. List different types of ecological and symbiotic interactions between microbes and microbes and between microbes and other organisms and provide examples of each.
2. Specify the roles of microbes in the global biogeochemical cycles and list examples of microbes that contribute to key metabolic aspects of these cycles.
3. Distinguish between the processes needed for the degradation and bioremediation of chemicals and xenobiotics in soil and water.
4. Summarize the role of microorganisms in water quality and in waterborne infections and the water quality tests.
5. Understand the wastewater treatment methods and biochemical oxygen demand.
6. Compare roles of microorganisms in fermented food products from plants and animals.
7. Identify microbial food poisoning and spoilage, food-borne diseases with emphasis on prevention measures for them.
8. Be aware of industrial products and the microorganisms that make them and of alternative energy production using microorganisms.
9. Understand the role of biotechnology in production of essential products and pharmaceuticals using genetically engineered microorganisms.

Upon completion of the lab sessions,

students will possess a fundamental understanding of how microorganisms are utilized and controlled for the benefit of human and on developing the laboratory skills needed to investigate different aspects of applied microbiology

CLOs \ SLOs	SLO (1) An ability to identify, formulate, and solve broadly-defined technical or Scientific problems by applying knowledge of mathematics and science and /or technical topics to areas relevant to discipline	SLO (2) An ability to formulate or design a system, process, procedure or program to meet desired needs	SLO (3) An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgement to draw conclusions	SLO (4) An ability to communicate effectively with a range of audiences	SLO (5) An ability to understand ethical and professional responsibilities and the impact of technical and /or scientific solutions in global , economic, environmental, and societal contexts	SLO (6) An ability to function effectively on teams that establish goals plan tasks , meet deadlines and analyze risk and uncertainty
1. List different types of ecological and symbiotic interactions between microbes and microbes and between microbes and other organisms and provide examples of each					X	
2. Specify the roles of microbes in the global biogeochemical cycles and list examples of microbes that contribute to key metabolic aspects of these cycles					X	
3. Distinguish between the processes needed for the degradation and bioremediation of chemicals and xenobiotics in soil and water	X	X			X	
4. Summarize the role of microorganisms in water quality and in waterborne infections and the water quality tests	X	X	X		X	X
5. Understand the wastewater treatment methods and biochemical oxygen demand	X	X	X		X	
6. Compare roles of microorganisms in fermented food products from plants and animals	X	X	X			X
7. Identify microbial food poisoning and spoilage, food-borne diseases with emphasis on prevention measures for them	X	X	X			X
8. Be aware of industrial	X	X	X		X	X

products and the microorganisms that make them and of alternative energy production using microorganisms						
9. Understand the role of biotechnology in production of essential products and pharmaceuticals using genetically engineered microorganisms	X	X			X	X

21. Topic Outline and Schedule:

Week	Lecture	Intended Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	- The organization of ecosystems	Face to Face			Exams Discussions	See recommended books below
	1.2	- Microbial diversity and habitats	Face to Face			Exams Discussions	See recommended books below
2	2.1	- Ecological associations among microorganisms and between microorganisms and other organisms in a community	Face to Face			Exams Discussions	See recommended books below
	2.2	- Microbes on land (The composition of the lithosphere) - Living activities in soil	Face to Face			Exams Discussions	See recommended books below
3	3.1	- The degradation of synthetic chemicals in soil and water	Face to Face			Exams Discussions	See recommended books below
	3.2	* Bioremediation	Face to			Exams	See recommended

		* Xenobiotics biodegradation, plastics as an example * Solid municipal waste	Face			Discussions	books below
4	4.1	- Freshwater microbiota - Seawater microbiota	Face to Face			Exams Discussions	See recommended books below
	4.2	- Public health and water quality	Face to Face			Exams Discussions	See recommended books below
5	5.1	Microbial water pollution and the transmission of infectious diseases	Face to Face			Exams Discussions	See recommended books below
	5.2	- Water quality and purity assays	Face to Face			Exams Discussions	See recommended books below
6	6.1	- Water treatment (Drinking water purification)	Face to Face			Exams Discussions	See recommended books below
	6.2	* Coagulation and filtration * Chemical purification (Disinfection)	Face to Face			Exams Discussions	See recommended books below
7	7.1	Sewage (Wastewater) treatment and biochemical oxygen demand	Face to Face			Exams Discussions	See recommended books below
	7.2	- Waterborne microbial diseases * Sources of waterborne infection * Waterborne infections in developing countries	Face to Face			Exams Discussions	See recommended books below
8	8.1	- The role of microorganisms in food production (Fermented food)	Face to Face			Exams Discussions	See recommended books below
	8.2	- Microbes in milk and dairy products	Face to Face			Exams Discussions	See recommended books below

		* Cheese * Other fermented milk products					
9	9.1	Fermented meat products	Face to Face			Exams Discussions	See recommended books below
	9.2	- Microbial fermentations in food products from plants * Bread * Beer and other alcoholic beverages	Face to Face			Exams Discussions	See recommended books below
10	10.1	* Vinegar * Fermentation of vegetables and vegetable products	Face to Face			Exams Discussions	See recommended books below
	10.2	* Soy sauce - Microorganisms as food	Face to Face			Exams Discussions	See recommended books below
11	11.1	Microbial growth and food spoilage	Face to Face			Exams Discussions	See recommended books below
	11.2	- Microbial involvement in food-borne diseases (Food poisoning and food infection) - Methods for food preservation (Prevention measures for food poisoning and spoilage)	Face to Face			Exams Discussions	See recommended books below
12	12.1	Industrial microbiology (Putting MOs to work)	Face to Face			Exams Discussions	See recommended books below
	12.2	- General concepts in industrial microbiology - Types of metabolites produced in industrial fermentation - Substance production in the fermentation	Face to Face			Exams Discussions	See recommended books below

13	13.1	Industrial products and the MOs that make them	Face to Face			Exams Discussions	See recommended books below
	13.2	<ul style="list-style-type: none"> * Amino acids * Citric acid * Vitamins * Pharmaceutical products * Enzymes * Microorganisms as industrial products * Alternative energy sources using microorganisms * Biofuels 	Face to Face			Exams Discussions	See recommended books below
14	14.1	Biotechnology industry <ul style="list-style-type: none"> - Products from genetically engineered microorganisms 	Face to Face			Exams Discussions	See recommended books below
	14.2	<ul style="list-style-type: none"> - Expressing mammalian genes in bacteria 	Face to Face			Exams Discussions	See recommended books below
15	15.1	<ul style="list-style-type: none"> - Production of genetically engineered somatotropin 	Face to Face			Exams Discussions	See recommended books below
	15.2	<ul style="list-style-type: none"> - Other mammalian proteins and products - Genetically engineered vaccines 	Face to Face			Exams Discussions	See recommended books below

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Laboratory reports and exams	30		1-3, 5, 6	weekly	



Midterm theory exam	30		1-3, 5, 6	7	In-class exam
Final theory exam	40	All topics	1-3, 5, 6	16	In-class exam

23 Course Requirements

(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):

24 Course Policies:

A- Attendance policies:

Absence from lectures should not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course.

B- Absences from exams and submitting assignments on time:

You should talk to your instructor as soon as possible if you miss an exam. All such cases will be dealt with according to the rules outlined in your student handbook.

C- Health and safety procedures:

Lab coat must be worn during the entire laboratory sessions. Gloves must also be worn in certain occasions.

Masks must be worn during the whole period of the lab session. In addition, physical distancing must be taken in consideration. Hands must be properly and thoroughly washed.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All violations pertaining to cheating, plagiarism, misbehaviour will be dealt with in accordance to the rules outlined in your student handbook.

E- Grading policy:

All exams are made up of the following question forms: multiple choice questions, True or False questions, matching questions, essay questions, "fill in the blank" questions.

F- Available university services that support achievement in the course:



25 References:

A- Required book(s), assigned reading and audio-visuals:

1. "Prescott's Microbiology". 2013. Ninth Edition. Joanne Willey, Linda Sherwood and Christopher J. Woolverton. Publisher: McGraw Hill.
2. "Brock Biology of Microorganisms". 2014. Fourteenth Edition. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A. Stahl and Thomas Brock. Publisher: Pearson.
3. "Fundamental Food Microbiology". 2014. Fifth Edition. Bibek Ray and ArunBhunia. Publisher: CRC Press.
4. "Microbiology: A Human Perspective". Sixth Edition. 2009. Eugene W. Nester, Denise G. Anderson, C. Evans Robert, Jr. and Martha T. Nester. Publisher: McGraw Hill.
5. "Microbiology: An Introduction". 2016. Twelfth Edition. Gerard J. Tortora, Berdell R. Funke and Christine L. Case. Publisher: Pearson.
6. "Soil Microbiology: An Exploratory Approach". 1999. Mark S. Coyne. Publisher: Delmar.

LABORATORY MANUAL:

"Basic Laboratory Manual for Applied Microbiology". 2022. Hesham M. Al-Younes. Publisher: Dar Wael for Publishing and Distribution, Amman, Jordan.

B- Recommended books, materials, and media:

26 Additional information:



Name of Course Coordinator: Prof. Hesham M. Al-Younes		Signature: -----
----- Date: 18.02.2024		
Head of Curriculum Committee/Department: Dr. Amer Imraish		Signature: -----
Head of Department: Dr. Mamoun Irshaidat		Signature: -----
Head of Curriculum Committee/Faculty: Prof. Saber Al-Rousan		Signature: -----
Dean: Prof. Mahmoud Al-Jaghoub		Signature: -----