

Course Outline of Microbial Ecology

1. Instructor's Information

Instructor's / Coordinator's Name:	أ.د. يعقوب حسن يعقوب
Office Hours:	Sun – thu: 11-12
Office and Phone:	Ibn Rush - 2130
Email:	jjacob@aabu.edu.jo
Research and Teaching Assistant / Supervisor / Technical (if any):	-

2. Course Description

This course focuses on General Ecological Concepts, Major Microbial Habitats and Diversity. The course covers wide range of topics like terrestrial microbial environments: soil and the subsurface, fresh waters, coastal and ocean waters, the deep sea and deep-sea sediments, hydrothermal vents, marine viruses, symbiosis between microorganisms and plants, animals, and human. The course is also interested in explaining the role of microorganisms in the biogeochemical cycles of the key elements. The course gives also an introduction to the methods and principles of studying natural microbial communities. This will include an introduction to the main methods applied to study the ecology of microorganisms including the culture-dependent and culture-independent analyses of microbial communities as well as measurement of microbial activities in nature

3. Course Information

Course No.:404440	Course Title: Microbial Ecology	Level: 4
Course Type: <u>Theoretical</u> / Practical	Prerequisite / co-requisite: Microbiology 404330	Class Time: Mon, Wed: 12:30-2
Academic Year:2019 / 2020	Semester: 1st	Study hours:

4. Course Objectives:

a-	Learn about the microbial ecosystems and understand the concepts of populations, guilds and communities.
b-	Understand how biofilms are formed, what medical and industrial problems may cause, and how to control biofilm formation
c-	Gain knowledge about the microorganisms inhabit different habitats like soil, fresh water, and marine water and their impact on human.
d.	Learn about the symbiotic relationships of microbes with plants, animals and humans.

d-	Describe the role of microorganisms in the biogeochemical cycles of the key nutrients
e-	Learn about the culture-dependent and culture independent methods to study microbial ecology.

5. Learning Outcomes (Knowledge, Skills, and Competencies)

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

- 1 Define the major concepts in microbial ecosystems and how they are used.
2. Explain how biofilms are formed and their importance in the medical and industrial field and how they are controlled.
3. Describe the microorganisms inhabiting different habitats like soil, fresh water, and marine water and their impact on human.
4. Describe and address the symbiotic relationships of microbes with plants, animals and humans.
5. Explain the role of microorganisms in the biogeochemical cycles of the key nutrients
6. Describe the culture-dependent and culture independent methods to study microbial ecology.

6. Course Content

Week	Subject
First	Introduction, General Ecological Concepts, Major Microbial Habitats and Diversity I: environment and microenvironment.
Second	Major Microbial Habitats and Diversity II: biofilms, microbial mats.
Third	Terrestrial Microbial Environments: soil and the subsurface.
Fourth	Aquatic Microbial Environments I: fresh waters, coastal and ocean waters.
Fifth	Aquatic Microbial Environments II: the deep sea and deep-sea sediments, hydrothermal vents, marine viruses
Sixth	Microbial Symbiosis I: symbiosis between microorganisms.
	First Exam
Eighth	Microbial Symbiosis II: plants as microbial habitats.
Ninth	Microbial Symbiosis III: mammals as microbial habitats.
Tenth	Microbial Symbiosis IV: the human microbiome.
Eleventh	Microbial Symbiosis V: insects and aquatic invertebrates as microbial habitats.
	Second Exam
Thirteenth	Nutrient cycles: the carbon cycle, syntrophy and methanogenesis. the nitrogen cycle, the sulfur cycle, the iron cycle, the phosphorus cycle,

	the calcium cycle, and the silica cycles.
Fourteenth	Microorganisms in air.
Fifteenth	Methods in Microbial Ecology
Sixteenth	Final Exam

7. Teaching and Learning Strategies and Evaluation Methods

No.	Learning Outcomes	Teaching Strategies	Learning Activities	Evaluation Method /Measurement (Exam/ presentations/ discussion/ assignments)
1	Define the major concepts in microbial ecosystems and how they are used.	PowerPoint presentation, Direct discussion	Discussion	Assignments, discussion, exams
2	Explain how biofilms are formed and their importance in the medical and industrial field and how they are controlled.	PowerPoint presentation, Direct discussion	Discussion	Assignments, discussion, exams
3	Describe the microorganisms inhabiting different habitats like soil, fresh water, and marine water and their impact on human.	PowerPoint presentation, Direct discussion	Discussion	Assignments, discussion, exams
4	Describe and address the symbiotic relationships of microbes with plants, animals and humans.	PowerPoint presentation, Direct discussion	Discussion	Assignments, discussion, exams
5	Explain the role of microorganisms in the biogeochemical cycles of the key nutrients	PowerPoint presentation, Direct discussion	Discussion	Assignments, discussion, exams
6	Describe the culture-dependent and culture independent methods to study microbial ecology.	PowerPoint presentation, Direct discussion, demonstrations	Discussion	Assignments, discussion, exams

8. Assessment

Methods Used	Assessment Time	Distribution of grades
1- semester work (report, assignments, attendance)	During semester	10
2- First Exam	Seventh week	20
3- Second Exam	Twelfth week	20
4- Final Exam	Week of the final exams	50

9. Textbook

Main Reference	Microbial Ecology
Author	Larry L. Barton and Diana E. Northup (Author)
Publisher	Wiley Blackwell
Year	2011
Edition	1st
Textbook Website	https://onlinelibrary.wiley.com/doi/book/10.1002/9781118015841

10. Extra References (books and research published in periodicals or websites)

1-	Madigan, M., J. Martinko, D. Stahl and D. Clark, 2009. Brock Biology of Microorganisms. Benjamin Cummings.
2-	Maier, R.; I. Pepper, and C. Gerba, 2009. Environmental Microbiology. 2nd Edition., Academic Press.
3-	Joanne Willey and Linda Sherwood and Christopher J. Woolverton, 2017. Prescott's Microbiology. Mc Graw Hill.