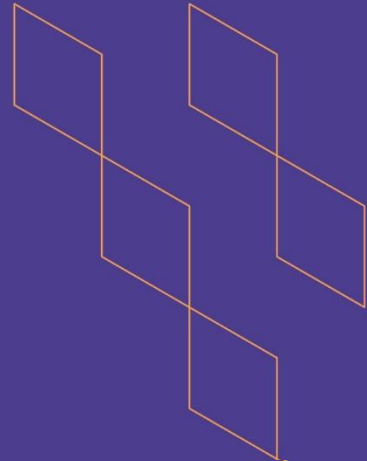




T-104  
2022

## Course Specification



Course Title: <b>Applications of Agricultural Microbiology</b>
Course Code: <b>APSA1604</b>
Program: <b>Sustainable Agriculture Techniques</b>
Department:
College: <b>Applied College</b>
Institution: <b>Umm Al-Qura University</b>
Version: <b>1</b>
Last Revision Date: <b>May 2025</b>



## Table of Contents:

Content	Page
A. General Information about the course	3
1. Teaching mode (mark all that apply)	3
2. Contact Hours (based on the academic semester)	
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	4
D. Student Assessment Activities	5
E. Learning Resources and Facilities	6
1. References and Learning Resources	6
2. Required Facilities and Equipment	6
F. Assessment of Course Quality	6
G. Specification Approval Data	6



## A. General information about the course:

Course Identification	
1. Credit hours:	3 hours
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Track <input type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered:	1 <sup>st</sup> year/level 1
4. Course general Description This course explores the vital roles microorganisms play in agriculture, focusing on their applications in enhancing soil fertility, plant growth, disease control, and sustainable farming practices. Students will learn about beneficial microbes such as nitrogen-fixers, mycorrhizae, and biopesticides, as well as current biotechnological innovations that leverage microbial functions to improve crop productivity and environmental health. Practical examples and case studies will be used to connect microbial science with real-world agricultural solutions.	
5. Pre-requirements for this course (if any): None	
6. Co- requirements for this course (if any): None	
7. Course Main Objective(s)	
<ol style="list-style-type: none"> <li>1. Understand the diversity and ecological roles of microorganisms in agricultural systems.</li> <li>2. Explain the mechanisms by which microbes contribute to soil fertility and nutrient cycling.</li> <li>3. Identify the use of microbial inoculants such as biofertilizers and biopesticides in sustainable farming.</li> <li>4. Evaluate the role of microorganisms in plant diseases</li> <li>5. Evaluate the role of microbiology in plant health, including plant-microbe interactions and disease suppression.</li> <li>6. Explore modern biotechnological tools and microbial innovations used in agriculture.</li> <li>7. Apply microbiological knowledge to solve real-world problems in crop production and environmental management.</li> <li>8. Assess the environmental and economic impacts of microbial applications in modern farming systems</li> </ol>	





### 1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom		100%
2.	E-learning		

### 2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30 h
2.	Laboratory/Studio.	42 h
3.	Field	
4.	Tutorial	
	Total	72 h

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the major groups of agricultural microorganisms and their ecological roles	K1	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
1.2	Explain the principles of microbial interactions with plants and soil environments	K1	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
1.3	Discuss the use and mechanisms of action of biofertilizers, biopesticides, and other microbial products	K3	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
1.4	Analyze the impact of microbial processes on soil health, plant growth, and crop productivity	K3	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.5	Summarize recent developments in agricultural biotechnology involving microbes	K4	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
2.0	Skills			
2.1	Isolate and identify agriculturally important microorganisms using basic microbiological techniques	S1	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
2.2	Evaluate microbial products and technologies for use in various agricultural settings	S4	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
2.3	Design and conduct simple experiments related to agricultural microbiology	S3	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
2.3	Interpret scientific data related to microbial applications in agriculture	S5	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
2.5	Communicate scientific findings and recommendations effectively in both written and oral forms	S2	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
3.0	Values, autonomy, and responsibility			
3.1	Work independently and as part of a team	V2	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam
3.2	Demonstrate responsibilities and accountability	V3	-Lectures -Discussions -Presentations	-Oral presentations -Quizzes -Assignments -Final exam



## C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to microbiology: Definition and overview; history; types of microorganisms	2
2.	Agricultural Microbiology: classification of agriculturally important microorganisms; microbial ecology in soil and plant environment	2
3.	Soil Microbiology and nutrient cycling: Soil as a microbial habitat; role of microbes in nutrient cycling (carbon, nitrogen, phosphorus; and sulfur cycles); decomposition of organic matter and humus formation	4
4.	Plant-microbes' interactions: Rhizosphere and phyllosphere microbiology; Rhizobium-legume symbiotic nitrogen fixation; Mycorrhizal-plant symbiotic association; plant growth-promoting rhizobacteria and fungi	4
5.	Microbial plant diseases: Diseases caused by fungi; bacteria and viruses	6
6.	Microbial inoculants and biofertilizers: Biofertilizers (types, production and applications); Quality control of microbial inoculants	2
7.	Biological control and biopesticides: Microbial control agents against plant pathogens and pests; mechanisms of diseases suppression by microbes; commercial biopesticides	2
8.	Microbial biotechnology in agriculture: Genetic engendering of microbes for agricultural applications; microbial consortia and synthetic biology in farming; use of microbial products in post-harvest technology and storage	4
9.	Environmental and sustainable applications: Roles of microbes in composting and organic farming; microbial remediation in contaminated soil; microbial contribution to climate-smart and sustainable agriculture	2
10.	Microorganisms and fuel production for agriculture: Microbial production of ethanol from agricultural waste; microbial production of biogas from animal and agricultural waste	2
Total		30

## D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Periodical Exam(s)	3	10%
2.	Mid Term Exam (Theoretical)	6	20%
3.	Mid Term Exam (practical)	7	10%
4.	Reports and essay	5	10%
5.	Final Practical Exam	15	10%
6.	Final Exam	16	40%

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)





## E. Learning Resources and Facilities

### 1. References and Learning Resources

Essential References	<p>Madigan M, Aiyer J, Buckley D et al. (2021) Brock Biology of Microorganisms 16<sup>th</sup> edition. Pearson Education. ISBN: 978-1292404790</p> <p>Willey J, Sandman K, Wood D. (2022) Prescott's Microbiology. McGraw Hill. ISBN: 978-1256123031</p> <p>Smith, H, Brown AE. (2021) Benson's Microbiological Applications Complete Version 15<sup>th</sup> edition. McGraw Hill. ISBN: 978-1260258981</p> <p>Eldor P, Frey N. (2023) Soil Microbiology: Ecology and Biochemistry 5<sup>th</sup> edition. Elsevier. ISBN 978-0128229415.</p> <p>Gentry, T. et al., (2021) Principles and Applications of Soil Microbiology 3<sup>rd</sup> edition. Elsevier. ISBN 978-0128202029.</p>
Supportive References	
Electronic Materials	Kaniyar N. (2025) Basics of Agricultural Microbiology. Educohack Press. ISBN 9789361529535
Other Learning Materials	Multi- media associated with the textbook and the relevant websites.

### 2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms are already provided with data show. Equipped laboratory to carry out basic microbiological experiments
Technology equipment (projector, smart board, software)	Projectors
Other equipment (depending on the nature of the specialty)	

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	<p>Indirect: regular surveys to evaluate teaching effectiveness and course relevance</p> <p>Direct: CLO's assessment</p>







Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of student's assessment	Peer review	Direct: Annual review of course content by faculty members and external experts
Quality of learning resources	Students	Indirect: regular surveys to evaluate quality of learning resources
The extent to which CLOs have been achieved	Peer review	Direct: Annual review of course content by faculty members and external experts
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

## G. Specification Approval Data

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851110214476/195626
DATE	18/2/1447

