

## Course Syllabus

1	Course title	General Microbiology
2	Course number	0603301
3	Credit hours (theory, practical)	4 (3 lectures and 1 lab.)
	Contact hours (theory, practical)	3 Hours / week (theory), 3 Hours/week (lab.)
4	Prerequisites/corequisites	General Biology II (0304102)
5	Program title	Human Nutrition and 2- Food Science and Technology
6	Program code	
7	Awarding institution	The University of Jordan
8	School	School of Agriculture
9	Department	Human Nutrition and Food Technology
10	Level of course	Second year
11	Year of study and semester (s)	First, second and summer semesters
12	Final Qualification	
13	Other department (s) involved in teaching the course	Biological Sciences, School of Sciences
14	Language of Instruction	English
15	Date of production/revision	2006/2016

### 16. Course Coordinator: Prof. Hamzah Al-Qadiri

Office no. 57, 12:00-3:00 (Sun., Tue., and Thurs.) 10:00-12:00 (Mon., Wed.). h.qadiri@ju.edu.jo

### 17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

### 18. Course Description:

This course covers diversity of microorganisms; evolutionary relationships and taxonomy; microbial cell structure and functions; genetic systems of microorganisms; nutrition and energy; microorganisms and the environment; control of microorganisms; introduction to immunology. The practical part includes staining and culturing techniques; enumeration, isolation and identification.

## 19. Course aims and outcomes:

### A- Aims:

1. Understanding microbial evolution and different microbial ecologies.
2. Knowing different types of microorganisms, their metabolism, genetics and response to change in environment.
3. Knowing microbial biotechnology, industry and genetic engineering.
4. Introducing to microbial diseases and epidemiology.
5. Acquiring basic laboratory skills for counting and identification of microorganism.

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to

Successful completion of the course should lead to the following outcomes:

### A. **Knowledge and Understanding: Student is expected to**

- A1- Know microbial evolution and systematic microbiology (microbial taxonomy)
- A2- Understand the differences and the relationships between microbes and species.
- A3- Understand the principles of microbial growth and metabolism.
- A4- Understand the meaning of microbial ecology.
- A5- Know principles of microbial genetics (i.e. essentials of molecular biology, mutation, genome structure, cloning, and gene function and regulation).
- A6- Introduced to microbial diseases and epidemiology.
- A7- Know the microbial biotechnology, industry, and genetic engineering.

### C. **Subject-Specific Skills: Student is expected to**

- C1- Identify microorganisms on the basis of structural, morphological, and biochemical characteristics.
- C2- Measure microbes respond to changing in environmental factors in order to survive.
- C3- Control growth and metabolism of microorganisms by physical, chemical, and antimicrobial agents.

### D. **Transferable Key Skills: Students is expected to**

- D1- Acquire laboratory skills in microbial counting and identification.
- D2- Acquire skills in report writing and interpretation of results related to experimentation of microorganism.

## 20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Background to the study of microbiology <ul style="list-style-type: none"> <li>- Evolution of microbiology and microorganisms</li> <li>- Pasteur and the refutation of the theory of spontaneous generation</li> <li>- Koch and the demonstration that microorganisms cause disease</li> </ul>	2/ 1st	Prof. Hamzah Al-Qadiri	A-1, A-4, B-4	Exam, Quizzes, Assignments.	Chapter: 11 Madigan and Martinko
Cell structure and function External structures that protect the cells <ul style="list-style-type: none"> <li>- Cytoplasmic membrane, movement of materials into and out of cells</li> <li>- Cellular storage of genetics information</li> <li>- Structures involved with motility of cells</li> <li>- Survival through the production of spores</li> </ul>	3/ 2nd	Prof. Hamzah Al-Qadiri	A-2, B-1, C-1	Exam, Quizzes, Assignments.	Chapters: 4, 7, 9 Madigan and Martinko
Classification of microorganisms Prokaryotic diversity: the bacteria <ul style="list-style-type: none"> <li>- Nomenclature</li> <li>- Classification of bacterial cells</li> <li>- Identification of bacterial cells</li> <li>- The major groups of bacteria</li> <li>- Prokaryotic diversity: the Archaea</li> <li>- Eukaryotic microbial diversity (Survey of fungi, algae, and protozoa)</li> <li>- Microbial genomics</li> <li>- Viruses</li> <li>- Viruses of prokaryotes</li> <li>- Viruses of eukaryotes</li> </ul>	5/ 3-4 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-2, C-1, D-1	Exam, Quizzes, Assignments.	Chapters: 12, 13, 14, 15, 16, chapter 9 Madigan and Martinko
Microbial growth and metabolism <ul style="list-style-type: none"> <li>- Macromolecules</li> </ul> Nutrition, laboratory culture, and metabolism of	5/ 3-4 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-3, B-1, C-2, C-4, D-1, D-2	Exam, Quizzes, Assignments.	Chapters: 3, 5, 6, 8 Madigan and Martinko

<p>microorganisms</p> <p>Microbial Growth (bacterial growth)</p> <ul style="list-style-type: none"> <li>- Kinetics of bacterial growth</li> <li>- Growth curve of bacteria</li> <li>- Batch and continuous culture of bacteria</li> </ul> <p>Influence of environmental factors on the growth of microorganisms</p> <ul style="list-style-type: none"> <li>- Metabolic regulations</li> </ul> <p>Biosynthesis of macromolecules</p> <p>Microbial energetics (the generation of ATP)</p> <ul style="list-style-type: none"> <li>- Enzymes and microbial metabolism</li> <li>- Heterotrophic generation of ATP</li> <li>- Autotrophic generation of ATP</li> </ul>					
<p>Metabolic diversity and microbial ecology</p> <ul style="list-style-type: none"> <li>- Methods in microbial ecology</li> </ul>	5/ 4-6 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-4, B-4, C-1	Exam, Quizzes, Assignments.	Chapters: 17, 18, 19 Madigan and Martinko
<p>Microbial genetics</p> <ul style="list-style-type: none"> <li>- Gene and gene expression</li> <li>DNA structure</li> <li>DNA replication</li> <li>RNA synthesis (transcription)</li> <li>Protein synthesis</li> <li>Genetic variation</li> <li>- Mutation and DNA recombination</li> <li>- Genome structure</li> <li>- Genetic exchange in prokaryotes</li> <li>- Gene cloning and genomic cloning techniques</li> <li>- Bacterial chromosome</li> <li>Gene function and regulation</li> </ul>	3/ 8 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-5	Exam, Quizzes, Assignments.	Chapters: 7, 10 and Chapter 15 Madigan and Martinko
<p>Control of microorganisms</p> <ul style="list-style-type: none"> <li>- Physical antimicrobial control</li> <li>- Chemical antimicrobial control</li> <li>- Antimicrobial agents used in vivo</li> </ul>	4/ 9-10 <sup>th</sup>	Prof. Hamzah Al-Qadiri	B-1, B-2, C-2, C-3	Exam, Quizzes, Assignments.	Chapter: 20 Madigan and Martinko

Immunology, pathogenicity, and host responses  - Essential of immunology Microbial interactions with human	2/ 10 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-6, C-4	Exam, Quizzes, Assignments.	Chapters: 21, 22 Madigan and Martinko
Environmental microbiology  - Soil and air microbiology - Waterborne microbial diseases - Food preservation and foodborne microbial diseases	3/ 11 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-4, C-4	Exam, Quizzes, Assignments.	Chapters: 28, 29 Madigan and Martinko
Microorganisms as tools for industry and research  - Biotechnology and industrial microbiology - Genetic engineering of microorganism	2/ 12 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-7, B-2, B-3, C-4	Exam, Quizzes, Assignments.	Chapters: 30, 31 Madigan and Martinko
Microbial diseases Epidemiology - Person-to- person microbial disease - Animal-transmitted diseases	3/ 12- 13 <sup>th</sup>	Prof. Hamzah Al-Qadiri	A-6, C-4	Exam, Quizzes, Assignments.	Chapters: 25, 26, 27 Madigan and Martinko
<b>Practical Part</b>					
- Safety measures in the microbiological laboratory - Types of microscopes					
Sterilization techniques - Physical methods - Heat - Radiation - Membrane filtration - Chemical reagents					
Growing of microorganisms - Preparation of culture media (broth and agar) - Preparation of pure culture - Streaking method - Slant and stabbing techniques					

<p>Microscopy and staining (1)</p> <ul style="list-style-type: none"> <li>- Preparation of slides</li> <li>- Motility test (hanging drop technique)</li> <li>- Examination of unstained living organisms</li> <li>- Simple stain</li> </ul>						
<p>Microscopy and staining (2)</p> <ul style="list-style-type: none"> <li>- Gram stain</li> <li>- Spore stain</li> </ul>						
<p>Microbial physiology and biochemical tests (1)</p> <ul style="list-style-type: none"> <li>- Oxidase test</li> <li>- Catalase test</li> <li>- Oxidation/fermentation test</li> </ul>						
<p>Microbial physiology and biochemical tests (2)</p> <ul style="list-style-type: none"> <li>- Carbohydrate metabolism</li> <li>- Protein metabolism</li> <li>- Starch hydrolysis</li> <li>- Casein hydrolysis</li> <li>- Urea hydrolysis</li> </ul>						
<p>Characterization of molds</p>						
<p>Characterization of yeasts</p>						
<p>Conditions affecting microbial growth (1)</p> <ul style="list-style-type: none"> <li>- Microorganism of extreme conditions</li> <li>- Halotolerant</li> <li>- Acid tolerant</li> <li>- Thermotolerant</li> </ul>						
<p>Conditions affecting microbial growth (2)</p> <ul style="list-style-type: none"> <li>- Nutrient requirements</li> <li>- Oxygen requirement (aerobic, anaerobic, and fermentation reactions)</li> </ul>						
<p>Enumeration of microorganisms</p> <ul style="list-style-type: none"> <li>- Direct microscopic count (counting chambers)</li> </ul>						

- Pour plate method					
- Spread plate method					

## 21. Teaching Methods and Assignments:

<p><b>Learning Methodology</b>  The course includes theoretical (3 lectures/ week) and practical sessions (3 practical hours/ week). Learning methods includes lecture, discussions, doing experiment and writing relevant reports.</p>
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## 22. Evaluation Methods and Course Requirements:

Evaluation	Point %	Date
<b>Midterm Exams</b>		
Mid-term theory exam	25	
Mid-term lab exam	10	
<b>Performance in the laboratory</b>	5	Throughout the course
<b>Homework assignments</b>	10	Every week throughout the course
<b>Final Lab exam</b>	15	23/12/2013
<b>Final theory Exam</b>	35	To be assigned by the registration

## 23. Course Policies:

<p>A- Attendance policies:  According to the regulations applied at The University of Jordan.</p> <p>B- Absences from exams and handing in assignments on time:  According to the regulations applied at The University of Jordan.</p> <p>C- Health and safety procedures:  According to the regulations applied at The University of Jordan. (Biosafety Level I and II).</p> <p>D- Honesty policy regarding cheating, plagiarism, misbehavior:  According to the regulations applied at The University of Jordan.</p> <p>E- Grading policy:  According to the regulations applied at The University of Jordan.</p> <p>F- Available university services that support achievement in the course:  According to the regulations applied at The University of Jordan.</p>
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**24. Required equipment:** ( Facilities, Tools, Labs, Training....)

- 1- Microscope
- 2- Autoclaves
- 3- Incubators
- 4- Pipettes
- 5- Centrifuge
- 7- Stomacher
- 8- Glassware
- 9- Refrigerators and freezers
- 10- Vortex mixers
- 11- Computer and printer
- 12- Bunsen burners
- 13- Biosafety cabinet
- 14- Fume hood

**25. References:**

Main Reference/s:

1. Madigan, J., and Martinko, M. J. Brock Biology of Microorganisms, 13th ed. 2015 and 15th ed. 2015 Prentice Hall.

References:

2. Schlegel, H G., General Microbiology, 1986, Cambridge University Press.
3. Alberts, Johnson, Lewis, Raff, Roberts, and Walter, Molecular Biology of the Cells, 4th ed., 2002, Garland Science.
4. Pommerville, J, Fundamentals of Microbiology, 7th ed. , 2004 Jones & Bartlett Publishers.
5. James Chin, Control of Communicable Diseases Manual, 17th ed., 2000, American Public Health Association.
6. Internet :
  - American Society for Microbiology (ASM) ([www.asm.org](http://www.asm.org))
  - Centers for Disease Control and Prevention (CDC) ([www.cdc.gov](http://www.cdc.gov))
  - American Public Health Association (APHA) ([www.apha.org](http://www.apha.org))
  - World Health Organization (WHO) ([www.who.org](http://www.who.org))

**26. Additional information:**

Name of Course Coordinator: Prof. Hamzah Al-Qadiri Signature: ----- Date: -----

Head of curriculum committee/Department: ----- Signature: -----



Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- Signature: -----