

## SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
BIO	241	General Microbiology	4	3	2	0	4-6	BIO 111	3	English

### A. Course Description

This course covers principles of microbiology with emphasis on microorganisms and human disease. Topics include an overview of microbiology and identification and control of pathogens, disease transmission, host resistance, and immunity. Upon completion, students should be able to demonstrate knowledge of microorganisms and the disease process as well as aseptic and sterile techniques.

### B. Course Outcomes

At the end of this course the student will be able:

1. To recognize the fundamentals of microbiology. To differentiate between the structure of prokaryotic and eukaryotic microorganisms.
2. To identify host-microbe interactions, immunity and human infectious diseases.
3. To compare and distinguish the basic groups of microbes, including prokaryotic microbes (Archaea, Bacteria), and Viruses, as well as eukaryotic microbes.
4. To apply culture techniques, methods of staining and the microscopic, colonial and biochemical identification of microorganisms..

### C. References:

#### Required Textbook

- Tortora, Funke, Case: Microbiology – An Introduction; Pearson (Benjamin Cummings 11e). 12 ed, (2015). ISBN-13: 978-0321929150.
- Brock's Biology of Microorganisms. (2012). Madigan, M., J.M. Martinko, D.A. Stahl and D.P. Clark. 13th edition. [Benjamin Cummings, Boston, MA).

Microbiology Laboratory, New York City College of Technology. McGraw Hill Publishing.(2013). ISBN 13: 9781121951501.

#### Other references:

- <http://ocw.mit.edu/courses/biology/7-06-cell-biology-spring-2007/syllabus>.
- International Journal of Microbiology.
- <http://www.csus.edu/indiv/t/telleena/biol440/http://ocw.mit.edu/courses/biology/7-06-cell-biology-spring-2007/syllabus/>

- [http://www.sci.sdsu.edu/bioadvise/syllabi/Bio350\\_S10.pdf](http://www.sci.sdsu.edu/bioadvise/syllabi/Bio350_S10.pdf)
- <http://www.csus.edu/indiv/t/telleena/biol440/>
- <http://www.washington.edu/students/crscat/microbio.html>

**Other learning material such as computer-based programs/CD, professional standards or regulations and software.**

- CD for Microbiology and life science.

**Course Website:** Google Classroom Webpage: <http://www.imamm.org/>

## D. Topics Outline

### D1. Lectures Topics

#### 1. *Microbes in our Lives*

- Naming and Classifying Microorganisms The Bacteria, The Fungus, The Protozoa, The Algae, The Virus, Multicellular Animal Parasites.
- History of Microbiology: The First Observations of Hooke and Anton van Leeuwenhoek, The Debate over Spontaneous Generation; The Views of Francisco Redi, John Needham
- Lazzaro Spallanzani, The Golden Age of Microbiology. Fermentation and Pasteurization o The Germ Theory of Diseases Vaccination, Modern Developments in Microbiology.
- The Three Domains Classification: Binomial System of Nomenclature, Naming and Classifying Microorganisms.
- Chemical principal.
- Structure of the Atom Chemical Elements: Chemical Bonds, Ionic, Covalent, Hydrogen
- Chemical Reactions Biological Molecules: Acid and Bases, pH and Buffers, Oxidation and Reduction, Functional Groups.
- The Macromolecules: Carbohydrates, Lipids, Proteins, Nucleic acid.

#### 2. *The Anatomy of the Prokaryotic cell (Comparison of Prokaryotic and Eukaryotic Cells – Overview The Prokaryotic Cell).*

- Size, Shape and Arrangements of Bacteria .
- Structures External to the Cell Wall: Glycocalyx, Flagella, Axial Filaments, Pili and Fimbriae.
- The Cell Wall: Composition and Characteristics, Cell Wall and the Gram Stain, Atypical Cell Wall and Damage to the Cell Wall.
- Structures Internal to the Cell Wall: The Plasma Membrane, The Cytoplasm, The Nucleoid, Plasmids and Resistance Factors, Ribosomes and Other Inclusions.

#### 3. *Microbial Metabolism (Catabolic and Anabolic Reactions Enzymes Energy Production Metabolic Pathways Carbohydrate Catabolism)*

- Glycolysis
- Aerobic Respiration, The Krebs's Cycle, The Electron Transport System, Summary of ATP production .
- Anaerobic Respiration and Fermentation Lipid and Protein Catabolism.
- Microbial Growth.

- The Requirements for Growth: Physical Requirements, Chemical Requirements.
- Culture Media: General Media, Selective and Differential Media, Enriched Media.
- Growth of Bacterial Culture: Bacterial Division and Generation Time, The Growth Curve and Growth Phases.
- Measurement of Growth: Estimation of Growth by Direct Methods, Estimation of Growth by Indirect Methods.

#### 4. *The Protozoa*

- Characteristics of Protozoa, Life Cycle, Reproduction and Nutrition, Protective Structures.
- Medically Important Phyla
- Methods of Classification.
- Examples of Each Class and the Diseases They Cause. Trypanosomiasis, Toxoplasmosis and Malaria, Protozoan Diseases of the Digestive System.
- The Fungus
- Characteristics of Fungi
- Nutrition and Cultivation
- Yeast, Molds and Dimorphics
- Sexual and Asexual Spores
- Medically Important Phyla of Fungi
- Methods of Classification Examples of Organisms in Each Class
- Diseases Caused by Fungi
- Superficial Mycoses
- Systemic Mycoses
- Fungal Diseases of the Digestive System
- Histoplasmosis
- Coccidioidomycosis
- Pneumocystis Pneumonia
- Blastomycoses
- Economic Effects of Fungi
- Fungi in the Food and Wine Industries
- Fungi in Agriculture and Forestry
- Fungi and Antibiotics.

#### 5. *Viruses, Viroids and Prions*

- General Characteristics of Viruses: Viral Structure
- The Nucleic Acid
- Capsid and Envelope
- Shape and Other Morphological Features
- Taxonomy of Viruses and Some Examples and the Diseases They Cause Cultivation of Viruses
- The Bacteriophage: Structure , Multiplication, The Growth Curve of the Bacteriophage
- Viruses and Cancer.

#### 6. *Specific Immune Response*

- Antigens and Antibodies

- Nature of Antigens , Classes of Antigens , Nature of Antibodies Antibody Structure , Immunoglobulin Classes
- The Duality of the Immune System Cells and Humoral Immunity Immunological Memory T Cells and Cell-Mediated Immunity • Types of T Cells Interrelation of Cell-Mediated and Humoral Immunity

#### Disorders Associated with the Immune System

- Allergies (Hypersensitivities) Autoimmune Diseases
- The Relationship between the Immune System and Cancer
- Immunodeficiencies AIDS

#### 7. *Diseases of the digestive tract*

- Structure and Function of the Digestive System
- Normal Flora of the Digestive System
- Bacterial Disease of the Mouth: Dental Caries, Periodontal Diseases
- Bacterial Diseases of the Lower Digestive System: Staphylococcal Food Poisoning, Shigellosis (Bacillary Dysentery), Salmonellosis and Typhoid Fever, Cholera, Campylobacter Gastroenteritis and Helicobacter Peptic Ulcer Disease
- Diseases of the respiratory tract
- Structure and Function of the Respiratory System .
- Normal Flora of the Respiratory System
- Microbial Diseases of the Upper Respiratory tract: Streptococcal Pharyngitis, Scarlet Fever, Diphtheria, The Common Cold
- Bacterial Diseases of the Lower Respiratory Tract: Pertussis, Tuberculosis, Bacterial Pneumonia
- Viral Diseases of the Lower Respiratory Tract: Viral Pneumonia, Influenza.

#### 8. *Venereal Diseases*

- Gonorrhoea Syphilis Trichomoniasis Genital Herpes Genital Warts.
- Diseases of the Skin and Eyes.
- Acne Measles Small Pox Chicken Pox Rubella Anthrax Gangrene Leishmaniasis.

### D2. Laboratories Topics

1. Laboratory Safety. The use and care of the microscope. Microscopic measurements. Aseptic Techniques. Transfer and colony selection techniques.
2. Bacterial smears and simple stains. Morphological features of bacteria – discussion only. The gram stain. Bacterial anatomy – discussion only.
3. The acid-fast stain. Spore and capsule staining. Negative staining.
4. Bacterial culture characteristics. The use of general media for isolating pure cultures. Pour plate and streak plate methods. The use of selective and differential media.
- 5,6. Epidemiology and related topics. Universal Precautions.

7. Biochemical Activities – Discussion only. Extracellular degradation. Carbohydrate fermentation, Triple Sugar Iron (TSI) agar.
8. IMViC test, Litmus milk, SIM (Multiple Test Systems). Urease test, Nitrate reduction test, Catalase and Oxidase test.
9. Miniature Systems. The protozoa. The Fungi - Molds, Yeast and Mushrooms.
10. The effect of Temperature and pH on microorganisms. Atmospheric Oxygen Requirements. Cultivation of Anaerobes.
11. The inhibitory action of heavy metals\*. The inhibitory action of disinfectants. Antibiotic susceptibility testing: The antibiogram.
12. Immunology 1. Discussion (Antigen-antibody reactions), Agglutination and Precipitation. Immunology 2. ELISA.
13. Microorganisms of the Mouth and Dental Caries\*. Pathogenic microorganisms of the Gastrointestinal Tract\*.
14. Pathogenic Microorganisms of the Respiratory Tract\*. Pathogenic Microorganisms of the Urogenital System and Sexually Transmitted Diseases (STDs)\*.
15. General revision.

### E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

### F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6<sup>th</sup> or 7<sup>th</sup> week.
- **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week.
- **Quizzes & Homework:** During the semester.
- **Lab exam:** 15<sup>th</sup> week.
- **Final Exam:** 16<sup>th</sup> week.

Your course grade will be based on your semester work as follows:

<b>Midterm 1:</b> 15 %	<b>Midterm 2:</b> 15 %	<b>Lab exam:</b> 20 %	<b>Final Exam:</b> 40 %
<b>Quizzes, Homework, Attendance &amp; Participation:</b> 10 %			

The grading distribution:

<b>A+</b>	<b>A</b>	<b>B+</b>	<b>B</b>	<b>C+</b>	<b>C</b>	<b>D+</b>	<b>D</b>	<b>F</b>
[95, 100]	[90, 95]	[85, 90]	[80, 85]	[75, 80]	[70, 75]	[65, 70]	[60, 65]	[0, 60]

## G. Student Workload

#	Teaching/Learning activities	Contact hours	Frequency	Total contact hours	Self-study hours	Total self-study hours	Student learning time
5	Lecture	3	15	45	2	30	75
2	Tutorial	0	0	0	0	0	0
0	Lab\practical	2	15	30	1	15	45
5	Homework	0	4	0	2	8	8
4	Quiz	0.5	2	1	1	2	3
6	Midterm	1.5	2	3	5	10	13
7	Final Exam	2	1	2	12	12	14
<b>Total</b>				<b>81</b>		<b>77</b>	<b>158</b>

The independent self-study is approximately 5 hours per week.

## H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](#)

[goo.gl/ykm7t3](http://goo.gl/ykm7t3)

