



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number	Course Title	Credits
BIO201	General Microbiology	4
Hours: Lecture/Lab/Other	Co- or Pre-requisite	Implementation Semester & Year
3 lecture/3 laboratory	Successful completion of BIO 101 or BIO 103 (grade of C or better) or consent of instructor	Spring 2022

Catalog description: The study of the morphology, taxonomy and metabolism of microbes with emphasis on fungi, protozoa, helminths, viruses and bacteria. Review of role of microbes in nature and their industrial application and medical importance. The laboratory portion of the course stands alone and is essentially a complete and separate course by itself and will include mini-lectures.

General Education Category:
Goal 3: Science

Course coordinator:
Diane N. Hilker, Professor of Biology
609-570-3367, hilkerd@mccc.edu

Required texts & Other materials:

1. Microbiology, by Tortora, et.al.
Benjamin Cummings Publishing Co., 13th Edition, 2019
ISBN 9780134605180
2. BIO201 General Microbiology Lecture Notes, by D.N. Hilker
MCCC Book Store, Fourth Edition
3. Laboratory Experiments in General Microbiology, by D.N. Hilker
Stipes Publishing Co., 6th Edition. Only carried by MCCC Bookstore
4. Print laboratory lecture notes before each lab. Notes can be found on the course website located at <http://www.mccc.edu/~hilkerd/> OR can be purchased under Optional Texts.

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Highlight the historical events associated with the field of microbiology and immunology. [Supports ILGs #1, 4, 7, 10; PLOs# 1, 2, 3]
2. Distinguish between prokaryotic and eukaryotic cells and understand the evolutionary relatedness of organisms. [Supports ILGs #1, 2, 3, 4, 10, 11; PLOs# 1, 2, 3, 4, 5]
3. Develop a thorough understanding of the molecular structure, growth requirements and metabolic processes of various microorganisms. [Supports ILGs #1, 2, 3, 4, 10, 11; PLOs# 1, 2, 3, 4, 5]
4. Describe the impact of microbes in nature and society, the role of microbes in an ecosystem and human impact on the evolution of microorganisms. [Supports ILGs #1, 2, 3, 4, 9, 10, 11; PLOs# 1, 2, 3, 4, 5]
5. Analyze the various immunological methods that hosts utilize to defend themselves from microorganisms and how these organisms can impact human homeostasis. [Supports ILGs #1, 2, 3, 4, 10, 11; PLOs# 1, 2, 3, 4]
6. Describe the methods available in controlling, preventing and treating infectious disease. [Supports ILGs #1, 2, 3, 4, 7, 10, 11; PLOs# 1, 2, 3, 4, 5]
7. Develop microbiological laboratory skills in applying the scientific method of inquiry to gather and use information for the purposes of critical thinking, information analysis and problem solving in a microbiology laboratory. [Supports ILGs #1, 2, 3, 4, 11; PLOs# 1, 4, 5]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 7. History. Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

Institutional Learning Goal 9. Ethical Reasoning and Action. Students will understand ethical frameworks, issues, and situations.

Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Biology A.S. Program (PLO):

1. Demonstrate an understanding of the fundamental principles, concepts, and terminology of biology
2. Explain the structures and fundamental processes of life at molecular, cellular, and organismal levels
3. View the living world with greater understanding, insight, and appreciation as it relates to the field of biology and contemporary problems and issues
4. Demonstrate the ability to apply the scientific method of inquiry to gather and use information for the purposes of critical thinking, information analysis, and problem solving
5. Exhibit proficiency in the laboratory and in the field by using standard equipment and measurement and observation techniques that allow one to gather, analyze, and interpret qualitative and quantitative data.

Units of study in detail – Unit Student Learning Outcomes:

Unit 1: Introduction to Microbiology [Supports SLOs # 1, 2, 4]

The student will be able to...

- Explain the benefits of microorganisms to the environment and society
- Identify individuals who have contributed to the field of microbiology and immunology
- Classify living organisms based on their molecular and cellular characteristics
- Explore the various methods used to observe bacteria microscopically

Unit 2: Mycology [Supports SLOs # 2, 3, 4]

The student will be able to...

- Characterize the organisms that make up the Fungi Kingdom and discuss their benefits to society
- Compare and contrast fungi to other types of microbes
- Understand the structural composition and growth requirements of yeast and molds
- Understand the effects of mycoses on the human body

5

Unit 3: Animal Parasites [Supports SLOs # 2, 3, 4]

The student will be able to...

- Understand the characteristics of protozoa and their interactions with arthropod vectors
- Compare and contrast protozoa and helminths to other types of microbes
- Explain the features of parasitic helminths
- Understand the effects of protozoa and helminthic infections on the human body

Unit 4: Bacterial Structure and Physiology [Supports SLOs # 2, 3, 4]

The student will be able to...

- Compare and contrast eukaryotic and prokaryotic cells
- Describe the morphological appearance of bacteria
- Explain the physical and chemical growth requirements of bacteria
- Demonstrate knowledge of binary fission and bacterial growth phases
- Compare and contrast methods by which bacteria can exchange genetic information

Unit 5: Virology [Supports SLOs # 1, 3, 4, 5,6]

The student will be able to...

- Explain the characteristics and requirements of viruses
- Compare and contrast bacteriophages with animal viruses
- Classify animal viruses based on their nucleic acid
- Describe prions and compare them to other organisms
- Explain the relationship between viruses and cancer

Unit 6: Bacterial Groups [Supports SLOs # 2, 3, 4]

The student will be able to...

- Explain how bacteria are grouped based on their metabolic processes, biochemical characteristics and structural and morphological appearances
- Understand the benefits and detrimental effects of bacteria to the environment and society
- Explain their importance in various ecosystems

Unit 7: Applied Microbiology [Supports SLOs # 4]

The student will be able to...

- Explore food preservation methods in preventing microbial spoilage
- Describe the use of microbes in the food industry and their industrial uses
- Examine the use of microbes in energy production
- Explain the role of microbes in genetic engineering and give examples of their applications in the medical and agricultural fields

Unit 8: Infection and Disease-An Introduction to Microbial Pathogenesis [Supports SLOs # 3, 4]

The student will be able to...

- Understand the terms that are used to describe the types, occurrences and duration of infectious disease
- Investigate the methods infectious diseases are spread and their host-parasite relationships

- Describe a microbe's physiological features and metabolic reactions, including exoenzymes and toxins, that enables them to alter their pathogenicity

Unit 9: Resistance to Infection-Cellular Defenses [Supports SLOs # 4,6]

The student will be able to...

- Describe a host's first line of defense when combating an infection including both non-aggressive and aggressive measures
- Describe a host's second line of defense and differentiate between the various types of phagocytic cells
- Analyze the steps of an inflammatory response when combating an infection and the roll of various proteins and cells in the body

Unit 10: Immunology-Antibodies and Humoral Defense [Supports SLOs # 4, 6]

The student will be able to...

- Compare and contrast cellular and humoral defenses
- Understand the difference between antigens and antibodies
- Characterize the five types of immunoglobulins and explain their molecular structure
- Analyze T and B lymphocytes and explain their role in immunological development
- Understand immunological disorders and the role of antibodies in tissue transplants and hypersensitivity reactions

Unit 11: Methods of Microbial Control-Preventing and Controlling Microbial Infections [Supports SLOs # 1, 3, 6]

The student will be able to...

- Understand the various physical and chemical methods of microbial control
- Differentiate between antiseptics vs. disinfectants
- Explain the general principles of microbial chemotherapy and historical events surrounding antibiotic discoveries
- Describe the various mechanisms of action that anti-bacterial antibiotics exert on bacteria and the side effects of antibiotics
- Understand the general mechanisms of action that anti-fungal, anti-protozoan, anti-helminthic and anti-viral drugs exert on microbes
- Describe how drug resistance occurs and the dangers of antibiotic abuse globally

Unit 12: Microbial Diseases of the Skin, Eyes and Respiratory Tract [Supports SLOs # 3, 4, 5, 6]

The student will be able to...

- Understand the anatomy and the normal flora of the skin, eyes and upper/lower respiratory tract
- Describe the various bacterial, viral, fungal, and protozoan diseases of these areas and the methods used to treat and identify them

Unit 13: Microbial Diseases of the Digestive System [Supports SLOs # 3, 4, 5, 6]

The student will be able to...

- Understand the anatomy and normal flora of the digestive system
- Differentiate between an intoxication and infection
- Describe the various bacterial, viral, fungal, protozoan and helminthic diseases of this area and the methods used to treat and identify them

Unit 14: Microbial Diseases of the Urinary and Reproductive Systems [Supports SLOs # 3, 4, 5, 6]

The student will be able to...

- Understand the anatomy and normal flora of the urinary and reproductive systems
- Describe the various bacterial, viral, fungal, and protozoan diseases associated with the urinary and reproductive systems and the methods used to treat and identify them
- Describe other sexually transmitted diseases including AIDS

Unit 15: Microbial Diseases of the Nervous and Cardiovascular Systems [Supports SLOs # 3, 4, 5, 6]

The student will be able to...

- Understand the anatomy of the nervous and cardiovascular systems
- Describe the various bacterial, viral, fungal, protozoan and helminthic diseases associated with these systems and the methods used to treat and identify them

Laboratory Component: The laboratory exercises permit an understanding of techniques, reinforce certain lecture material and introduce concepts and material not presented in lecture. [Supports SLOs # 2, 3, 5, 6, 7]

The student will be able to...

- Conduct experiments independently as well as with others in the laboratory
- Master the necessary microbiological laboratory skills when applying the scientific method of inquiry
- Use critical thinking skills when gathering and analyzing information and problem solving in a microbiology laboratory
- Identify an unknown microorganism and present their findings orally and written

Evaluation of student learning:

Lecture: 75% of **total** course grade

- Exams (70%): There will be a total of 5 exams given in the course. All exams count.
- Class Assignments (5%): There will be 10 Class Assignments given on Blackboard with each worth 10 pts (100 points total). They are to be submitted individually without collaboration with fellow classmates. Use your notes from the lecture Power Point presentations. Don't use outside resources; use your lecture notes.

Laboratory: 25% of **total** course grade

- Laboratory quizzes (90%): There will be a total of 11 (10 point) quizzes given. The lowest quiz will be dropped and the best 10 quiz grades will be counted in the laboratory grade There are no make-up quizzes when absent.
- Identification of an Unknown Microorganism (10%): Students will be given an unknown microorganism to identify over the course of three lab sessions. Correct identification (written laboratory report and oral presentation required) will result in 10 points and will count 10% of your laboratory grade. Failure in attempting the unknown will result in a zero for the entire laboratory portion of the course. There is no partial credit given in identified incorrectly.

Note:

- The students' performance will also be constantly evaluated by the laboratory instructor.
- Absence from more than 2 lab classes will result in the instructor withdrawing a student from the course or failing the course if it occurs after the withdrawal deadline for the semester.