

Course Code: BIO 123

Course Title: Microbiology

Department: Natural Sciences

Effective Date: Summer 2026

PCS Code: 1.1 - Baccalaureate/Transfer

CIP Code: 26.0502

Repeatability: 0

Credit Hours

Catalog Notation: 3-3-4

Credit Hour Distribution:

Lecture: 3

Lab: 3

Clinical: 0

Total: 4

General Course Information

Catalog Description

Basic principles of microbiology including classification and morphological and physiological characteristics of microbes; microbial biochemistry, genetics, and evolution; microbial control; the pathogenesis of infectious diseases and principles of host immunity, with associated laboratory techniques in culturing, identifying, and experimentally manipulating microorganisms.

General Course Objectives

Give a general overview of Microbiology. Serve the needs of students enrolled in the various Allied Health programs. Provide an optional elective for prospective Life Science transfer students.

Minimum Placement Levels

English	Reading	Math
None	Placement out of CCS 098	None

Prerequisites

Credit in BIO 101, BIO 121, BIO 141, or equivalent with a grade of C or higher; or admission into the Veterinary Technology program and credit in BIO 111 with a grade of C or higher

Methods of Evaluation

12-15 lecture objective exams, 12-15 homework assignments, 2-4 laboratory practical exams including a final paper evaluating data from a primary literature article, 10-13 pre-lab quizzes, and 10-13 Laboratory Reports.

Instructional Materials and Additional Supplies

Microbiology, Nina Parker, Mark Schneegurt, Anh-Hue Thi Tu, Philip Lister, Brian M. Forster; OpenStax; Houston, TX; 2022.

Lab Manual: Laboratory Techniques in Microbiology, Chelsea Lloyd.

Course Content

General Learning Outcomes (GLOs)

- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Morphology, Growth, and Classification	<ol style="list-style-type: none"> List the characteristics of living organisms. Name the major groups of microscopic life forms and sort them into the three domains of life. Describe the major types of light and electron microscopes and when they are used. Explain how microbes are classified. Distinguish between eukaryotes and prokaryotes. Describe bacterial growth and reproduction, including the nutritional and environmental requirements for growth. Describe how growth curves are performed and what happens during each phase. Calculate bacterial growth over time using generation time. Identify common prokaryotic morphologies and describe the functions of common cell structures. 	7	0	0
Biochemistry and Metabolism	<ol style="list-style-type: none"> Explain the structure, function, and regulation of enzymes. Describe redox reactions and how ATP is synthesized by bacteria. Compare and contrast aerobic respiration, anaerobic respiration, fermentation, and their products. Describe their relevance to human health and disease. 	4	0	0
Genetics	<ol style="list-style-type: none"> Describe the structure and function of DNA and RNA; explain DNA replication, transcription, and protein synthesis. Explain mechanisms of mutation and horizontal gene transfer; describe how they impact microbial evolution. Explain how microbes are used in genetic engineering. 	3	0	0
Viruses	<ol style="list-style-type: none"> List the characteristics of viruses. Compare and contrast animal viruses and bacteriophages. Explain how different viruses replicate based on their genome composition and structure. Describe how replication mechanisms influence viral evolution. Explain how viruses lead to acute and chronic disease, including cancer. Describe virus/host interactions, how viruses are cultivated in the lab, and how viral infections are prevented and treated. Compare and contrast viruses, viroids, and prions. 	3	0	0
Microbial Control	<ol style="list-style-type: none"> List the types of physical and chemical microbial control agents; describe their modes of action and what microbes they can affect. Identify the major classes of antimicrobial drugs, their mode of action, and what microbes they affect. Describe how we assess the efficacy of antimicrobial agents and drugs. Explain the mechanisms of antimicrobial resistance and ways humans can curb the spread of resistance. 	6	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Epidemiology	<ol style="list-style-type: none"> 1. Define incidence, prevalence, morbidity, and mortality. Define endemic, sporadic, epidemic, and pandemic disease patterns. 2. Outline how infectious diseases spread from reservoirs to hosts via various modes of transmission; describe ways to curb the spread of infectious disease. 3. Distinguish infection and disease. 4. For each infectious disease discussed, describe its mode of transmission. 	3	0	0
Immunity	<ol style="list-style-type: none"> 1. Describe and explain host defenses against pathogens via innate and adaptive immunity, including the cells and physiological responses involved. 2. Distinguish between immunity, hypersensitivity, and immunodeficiency. 3. Compare and contrast between cell-mediated and antibody-mediated immunity. 4. Explain how antibodies are produced and their functions in adaptive immunity and in diagnostic tests. 5. Explain how different types of vaccines work to induce adaptive immunity and how they are produced. 	7	0	0
Infections and the Disease Process	<ol style="list-style-type: none"> 1. Compare and contrast pathogens versus opportunistic pathogens, and endogenous versus exogenous infections. 2. Describe common infections of the following body systems: skin, respiratory tract, gastrointestinal tract, urinary and reproductive systems, nervous system, and circulatory system; include the infection's etiology, mode(s) of transmission, virulence factors, pathogenesis, signs and symptoms of disease, diagnosis, treatment, and prevention. 	12	0	0
Unknowns	<ol style="list-style-type: none"> 1. Identify unknown organisms based on their morphology and biochemical activity. 	0	4	0
Applied Microbiology	<ol style="list-style-type: none"> 1. Safely handle and culture live microorganisms. 2. Isolate and characterize antibiotic-producing bacteria in soil samples and test them for activity against pathogens. 	0	5	0
Microscopy	<ol style="list-style-type: none"> 1. Name the parts of a microscope and explain their functions. 2. Use a bright field microscope correctly to characterize and/or identify microorganisms. 	0	2	0
Aseptic Technique, Cultivation	<ol style="list-style-type: none"> 1. Cultivate and isolate microorganisms and maintain a pure culture using aseptic technique. 2. Explain contamination and how to identify it and mitigate it. 3. Culture microbes using broth, agar slants, and agar plates. 4. Describe when to use each type of medium; compare and contrast selective and differential media. 	0	6	0
Staining Technique	<ol style="list-style-type: none"> 1. Prepare a smear and do a gram stain correctly to view bacteria using a microscope. 2. Compare and contrast gram-positive and gram-negative bacteria. 	0	6	0
Eukaryotes	<ol style="list-style-type: none"> 1. Differentiate and identify eukaryotic parasites (fungi, protozoa, and helminths) via microscopy. 	0	8	0
Metabolic Activities	<ol style="list-style-type: none"> 1. Perform and interpret various biochemical tests to characterize and identify bacteria based on their metabolic and enzymatic activities. 2. Describe why these microbes perform these activities. 	0	14	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	45	0