Virginia Western Community College
BIO 150
Introductory Microbiology

Prerequisites

BIO 101 or 141; ENG 111 placement recommendation, co-enrollment in ENF 3/ENG 111, or successful completion of all developmental English requirements.

Course Description

Examines the general characteristics of microbes including cell morphology and physiology, with an emphasis on human pathogens and methods of microbial control. Studies the relationship of microbes to individual and community health. In this survey course, students will begin with a brief history of microbiology, followed by an exploration of the basic concepts of microbial classification, cellular structure, metabolism and genetics. Following this unit, the students begin to explore infectious diseases caused by bacteria and viruses with an emphasis on diseases of skin, genitourinary tract, respiratory system, digestive system, nervous system, and blood. The course concludes with an overview of microbial control (with a focus on antibiotic resistance), epidemiology and the human immune system. Students learn how the human body remains healthy in the face of numerous microbial invaders. Throughout the course, realistic examples from current events are presented and discussed in the context of the course material, and laboratory exercises are conducted to complement the lecture material.

Semester Credits: 4 Lecture Hours: 3 Lab/Clinical/Internship Hours: 3

Required Materials

Textbook:

Microbiology: The Human Experience. Foster, Aliabadi, and Slonczewski. 3rd edition. Norton Publishing. Paperback ISBN: **9781324073345;** eText: **9781324073437**

Lab manual: Exercises in General Microbiology. Biscardi, Juneau, and Ojeda; printed in-house

For virtual sections: Microbiology: The Human Experience with Access code (eText) + Digital Microbiology Laboratory Exercises

Other Required Materials:

Lab Coat
Goggles

Course Outcomes

At the completion of this course, the student should be able to:

- List, compare and contrast the major categories of microbes
- Understand the basic functions of the different components of a prokaryotic cell
- Compare and contrast Describe the bacterial growth curve, and how it is affected by environmental conditions
- Describe the fundamental processes of horizontal gene transfer
- Describe aerobic and anaerobic metabolism, and fermentation
- For common infectious diseases affecting human skin, genitourinary tract, respiratory system, digestive system, nervous system, and blood, students will be able to identify:
    - Etiologic agent
    - Means of transmission
    - Symptoms
    - Treatment
    - Incubation period
    - Basic epidemiology
    - Method of control/treatment
- Outline the basic immune defenses of the human body
- Understand means of microbial control, including antibiotics and antibiotic resistance

Laboratory Objectives:

Upon completion of the laboratory section of this course, students should be able to:

- Use aseptic techniques to safely handle BSL-1 and BSL-2 microorganisms
- Understand the basics of laboratory safety, and use of proper personal protective equipment
- Understand proper hand washing technique
- Use a compound light microscope and oil immersion lenses
- Prepare specimens for Gram stains, and other differential and special stains
- Isolate, culture, and identify unknown microorganisms
- Understand methods used to quantitate microorganisms

- Set up and understand a serial dilution
- Isolate bacterial DNA for sequencing and identification of unknown bacterial species
- Set up a polymerase chain reaction to amplify DNA
- Perform a Kirby-Bauer antibiotic susceptibility test
- Test water for presence of fecal coliform bacteria
- Test soil samples for antibiotic resistant bacteria
- Perform biochemical and aerotolerance testing on unknown bacterial species

Topical Description

Chapter 1: Introduction to Microbiology

- Survey of microbes
- History of microbiology

Chapter 2: Basic concepts of infectious disease

- Microbiota vs. pathogens
- Host-pathogen interactions
- Mechanisms of disease transmission

Chapter 3: Observing Microbes

- Optics and Properties of Light
- Microscopy and staining

Chapter 5: Cell Biology of Bacteria

- Cell wall architecture
- Membrane transport
- Gram negative and Gram positive bacteria
- Specialized bacterial structures

Chapter 6: Bacterial Growth and nutrition

- Growth cycle
    - Environmental factors that influence growth: temperature, pH, water, oxygen, Host factors

Chapter 7: Bacterial Metabolism

- Catabolism: Glycolysis, fermentation pathways, respiration pathways
- Biosynthesis and nitrogen fixation

Chapter 8: Bacterial genetics and biotechnology

- Bacterial genomes
- DNA replication
- Transcription and translation
- Regulation of gene expression: operons
- Horizontal gene transfer: transformation, transduction, conjugation

Chapter 9: Bacterial genomes and horizontal gene transfer

- Bacterial gene transfers

Chapter 12: Viruses

- Genomes
- replication
- HPV
- Influenza
- HIV

Chapter 13: Sterilization, disinfection, and antibiotic therapy

- Chemical and physical agents that kill microbes
- Concepts of antibiotic therapy
- Antibiotic resistance
- Antirvirals and antifungals

Chapter 15: Innate immunity

- Cell types
- Physical barriers
- Inflammation
- Innate immunity
- Phagocytosis
- Antibacterial agents

Chapter 16: Adaptive immune system

- Cell types
- Humoral vs. cell mediated immunity
- Role of antibodies
- Mechanism of vaccines

Chapter 19: Infections of the skin and eye

- Basic anatomy
- Viral infections
- Bacterial infections
- Fungal infections

Chapter 20: Infections of the respiratory tract

- Basic anatomy
- Viral infections
- Bacterial infections
- Fungal infections

Chapter 21: Infections of the digestive system

- Basic anatomy
- GI syndromes
- Viral infections
- Bacterial infections
- Parasitic infections

Chapter 22: Infections of the urinary and reproductive tracts

- Basic anatomy
- STIs
- Non-STIs

Chapter 23: Infections of the nervous system

- anatomy

If time permits:

- Epidemiology
- Microbiome

Notes to Instructors

Teaching Methods

The amount of instructional time allocated to each topic can vary from instructor to instructor, according to their expertise and interest, but all points are covered.

Evaluation Criteria and Procedures

This will vary slightly from instructor to instructor. Normally it entails four or more written lecture exams with practical testing given to cover laboratory materials. Lecture and laboratory information is covered on the same assessment tools. Course may also include reading assignments, oral presentations and case studies.

ADA Statement (PDF)
Title IX Statement (PDF)