

Course Outline for: BIOL 2043 Microbiology**A. Course Description:**

1. Number of credits: 4
2. Lecture hours per week: 3
Lab hours per week: 3
3. Prerequisites: BIOL 1100 or 1501 or 2041 (C or higher); CHEM 1050 or 1061 (C or higher)
4. Corequisites: None
5. MnTC Goal: #3 Natural Sciences

A rigorous lab course intended for students pursuing careers in the medical professions. This course examines the biology of bacteria, protozoa, fungi, helminths, viruses, and prions. Topics include prokaryotic and eukaryotic cell structure and function, microbial metabolism, microbial genetics, physical and chemical methods of control, host defenses, and clinical applications. Lab exercises mandate following biosafety level 2 practices for handling microbial pathogens. Lecture 3 credits, 3-hour lab 1 credit.

B. Date last reviewed/updated: January 2023**C. Outline of Major Content Areas:**

Lecture: Subtopics listed under each main topic may vary due to recent developments in the field and current events.

1. Survey of Microorganisms
 - a. Biologic classification
 - b. Groups of microorganisms
2. General Characteristics of Microorganisms
 - a. Bacteria
 - b. Archaea
 - c. Protozoa
 - d. Fungi
 - e. Helminths
 - f. Acellular infectious agents
3. Microbial Metabolism
4. Growth and Nutrition of Microbes
5. Inhibition of Microbial Growth
 - a. Disinfection
 - b. Antisepsis
 - c. Sterilization
6. Chemotherapeutic Agents
 - a. Source

- b. Basis for action
 - c. Mechanisms of resistance
- 7. Microbial Genetics
 - a. Mechanisms of genetic transfer in bacteria
 - b. Drug resistance
 - c. Basis of microbial evolution
- 8. Characteristics Contributing to Microbial Pathogenicity
 - a. Portals of entry and exit
 - b. Generation time
 - c. Virulence factors
- 9. Host Defenses
 - a. Non-specific: Innate immune system
 - b. Specific: Adaptive Immune System
 - c. Immune disorders and immunodeficiencies
- 10. Bacterial Diseases of Humans
- 11. Viral Diseases of Humans
- 12. Fungal Diseases of Humans
- 13. Protozoal Diseases of Humans

Laboratory: Students will actively participate in lab by completing studies related to:

1. Microscopy
2. Staining of Bacteria
3. Aseptic Techniques
4. Bacterial Isolation Techniques
5. Physical and Chemical Methods of Control
6. Immunology
7. Microbes in the Environment
8. Effectiveness of Hand Scrubbing
9. Bacteria of the Respiratory Tract
10. Bacteria of the Gastrointestinal Tract
11. Identification of Unknown Bacteria
12. Study of Selected Fungi
13. Study of Selected Parasitic Protozoa and Helminths
14. Molecular Diagnostics

D. Course Learning Outcomes:

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

1. Define basic principles of microbiology. (Goal 3a)
2. Demonstrate understanding of basic principles of microbiology (Goal 3a)
3. Formulate and test hypotheses in a laboratory setting. (Goal 2a, 2b, 2c, 2d, 3b)
4. Evaluate experimental results and communicate interpretations both orally and in writing. (Goal 2a, 2c, 3b, 3c)
5. Integrate learning from both lecture and laboratory in problem solving. (Goal 2a, 2c, 3c)
6. Correlate course work with current and practical microbiological issues. (Goal 2d, 3d)

7. Evaluate policies and personal choices from the perspective of infectious diseases.
(Goal 2d, 3d)

E. Methods for Assessing Student Learning:

A variety of evaluation and assessment methods may be used:

1. Assignments and quizzes
2. Case studies
3. Individual technique assessment
4. Laboratory quizzes and presentations
5. Laboratory reports
6. Laboratory examinations
7. Written examinations
8. A final comprehensive exam

F. Special Information:

Instructors will include the most recent version of the Departmental Expectations document in their course syllabus

When offered on-campus,

- The laboratory portion of the course is delivered in the Biology Learning Center (BLC).
- Instructors will include the most recent version of the Biology Learning Center (BLC) Expectations document in their course syllabus.
- One or more labs require the use of Biosafety Level 2 standards.
- Students are required to wear a lab coat while in the BLC and to tie hair securely back.
- Experiments include sampling the student's microbial flora.