

## **COURSE OUTLINE**

### **Microbiology**

#### **Course Description**

BI 250. Microbiology. 5 hours credit. Prerequisite: It is recommended that the student has taken BI 105, BI 106, or CH 105 with a C or better prior to enrolling in this course. This course will enable the student to identify disease causing microorganisms or agents and their role in the disease process, including principles of microbial cell structure, genetics, metabolism, immunity, and control. The student will also be able to demonstrate proficiency in standard laboratory techniques used in inoculation, isolation, incubation, inspection and identification of bacteria. These techniques also include the examination of fungi, protists, and parasitic worms. In addition, the course will enable the student to demonstrate mechanisms in the prevention and treatment of infectious disease. Three hours of lecture/discussion and four hours of laboratory per week.

#### **Course Relevance**

The principles learned in this course will allow the student to have the foundational skills and knowledge for a career in healthcare and related fields such as pharmacy, dental hygiene, and mortuary science. The principles learned in this course are relevant in understanding the disease process and control of microorganisms as it pertains to their personal health.

#### **Required Materials**

BI 250 Textbook & materials:

Nester, E.W., et. al. (2004). *Microbiology: a human perspective*. (4<sup>th</sup> ed.). Dubuque, IA: McGraw Hill Higher Education.

Lab Manual:

Francisco, D. *Lab Manual-Microbiology*. Local Publishers.

Supplemental Materials:

LeBoffe, M.J., and Pierce, B.E. (2005). *Laboratory atlas for microbiology* (3<sup>rd</sup> ed.). Englewood, CO: Morton Publishing Company.

#### **Learning Outcomes**

The intention is for the student to be able to:

1. Identify disease causing microorganisms or agents and their role in the disease process
2. Demonstrate mechanisms in the prevention and treatment of infectious disease
3. Demonstrate proficiency in standard laboratory techniques

## **Primary Learning PACT Skills that will be DEVELOPED and/or documented in this course**

Through the student's involvement in this course, he/she will develop his/her ability in the following primary PACT skill areas:

1. Writing
  - Through the analysis of laboratory findings, the student will complete a formal written laboratory report
2. Field Related Technology
  - Through the demonstration of the proper use of the microscope to identify a bacteria as gram positive or gram negative

Secondary skills (developed but not documented):

Critical Thinking  
Teamwork  
Internet Use  
Reading  
Listening  
Speaking  
Computer Literacy

## **Major Summative Assessment Task(s)**

These learning outcomes and the primary Learning PACT skills will be demonstrated by

1. Collection and written reflection and analysis of data to determine the identity of unknown microorganisms and their implications in disease, prevention, and treatment.

## **Course Content**

- I. Themes – Key recurring concepts that run throughout this course:
  - A. Microbial structure and function as it relates to the disease process
  - B. Form determines function, vice versa
- II. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
  - A. Relationships between biological systems and their environments
  - B. Demographic diversity of students
- III. Concepts – Key concepts that must be understood to address the issues:
  - A. Biological systems and their environments are interrelated
  - B. Understanding field-related terminology
- IV. Skills/Competencies – Actions that are essential to achieve the course outcomes:
  - A. Reading comprehension
  - B. Writing
  - C. Computer literacy
  - D. Analytical thinking
  - E. Ability to compare and contrast
  - F. Memorization of terms
  - G. Application of concepts
  - H. Use of the microscope

## Learning Units

- I. Explain the scope, development, and the basic concepts of microbiology
  - A. Explain the areas, applications, and importance of microbiology
  - B. Describe the historical development of microbiology
  - C. Apply basic principles of chemistry to the organization of microbes at the
  - D. molecular and cellular levels
  - E. Compare and contrast eukaryotic and prokaryotic organisms
  - F. Apply the various classification systems to microorganisms
  - G. Describe the various techniques for inspection of microbes
  
- II. Apply the basic anatomy of microbes to the physiological needs of bacteria
  - A. Compare and contrast the anatomy of gram positive and gram negative bacteria
  - B. Apply the requirements for bacterial growth to reproduction and the various microbial interactions that influence population growth
  - C. Apply the biochemistry of bacterial metabolism to bacterial needs
  - D. Apply the basic principles of bacterial genetics as they relate to the bacterial chromosome, mutation, recombination, and genetic engineering
  
- III. Apply the control of microorganisms and the use of antibiotics to the disease process
  - A. Apply the physical control of microbes to practices in clinical, laboratory, and general hygiene
  - B. Apply the chemical control of microbes to practices in clinical, laboratory, and general hygiene
  - C. Describe the development of chemotherapeutics and antibiotics
  - D. Apply the mode of action to effectiveness of the major groups of antibiotics
  - E. Apply the interactions between microbe and host to the disease process
  
- IV. Evaluate the major pathogenic bacteria and the diseases they cause
  - A. Investigate the airborne bacteria and the diseases of the respiratory system
  - B. Investigate the intoxications of and infections caused by foodborne and waterborne bacteria
  - C. Investigate the soilborne, arthropodborne, and rickettsial bacterial diseases
  - D. Investigate the sexually transmitted bacterial diseases
  - E. Apply the processes of immunity to the prevention and elimination of disease
  - F. Differentiate between non-specific and specific immunity
  - G. Explain immunity to disease and serological reactions
  - H. Classify the various types of hypersensitivity
  
- V. Evaluate the major pathogenic viruses, fungi, protists, and parasitic worms and the diseases they cause
  - A. Describe the structure, replication and characteristics of viruses and subviral particles
  - B. Investigate the various viral diseases
  - C. Classify the pathogenic fungi

- D. Investigate diseases caused by fungi
  - E. Classify the pathogenic protozoans
  - F. Investigate the diseases caused by protozoans
  - G. Classify the parasitic worms
  - H. Investigate the diseases caused by parasitic worms
- VI. Apply the standard laboratory techniques of microbiology
- A. Apply incubation techniques used in the laboratory
  - B. Apply inoculation techniques used in the laboratory
  - C. Apply isolation techniques used in the laboratory
  - D. Apply inspection techniques used in the laboratory
  - E. Apply identification techniques used in the laboratory

### **Learning Activities**

Independent and collaborative learning activities will be assigned within and outside the classroom to assist the student to achieve the intended learning outcomes. The following teaching/learning activities will assist the student to achieve course outcomes: lecture, lab, class discussion, group activities, a written paper, class presentation, and textbook reading assignments.

### **Grade Determination**

A series of examinations as follows: 4-6 lecture exams will be given and 2 lab exams will be given. Grade determination will be dependent upon total points from: tests, quizzes, assignments, lab reports, and the major summative assessment task.