

MCB 2010 & MCB 2010L

Microbiology with Lab

Course Description

MCB 2010	Microbiology	(3) P
MCB 2010L	Microbiology Laboratory	(1) P

This course provides an introduction to microbiology with emphasis on the role of bacteria, viruses, and fungi in human health and disease. It includes principles of microbial biology, classification, epidemiology and pathogenicity, followed by an overview of infectious diseases, infection control, immunology and antibiotic therapy. The laboratory portion provides an introduction to molecular biological techniques as they relate to microbiology.

Pre-requisite: CHM 1030.

Co-requisite: MCB 2010L must be taken concomitant with MCB 2010.

Rationale

This course helps support the college mission of adding value to the lives of students by providing the foundation to support them with a base level of knowledge necessary to enter their chosen program. Specifically, this course addresses students pursuing science, engineering, biotechnology and pre-professional programs of study. MCB 2010 will concentrate on bacterial genetics, metabolism and pathogens. Ultimately, this course will help students develop a vocabulary sufficient for successful technical communication along with laboratory skills which highlight conceptual relationships and connections, and analytical problem solving skills.

Impact Assessment

MCB 2010 continues to build on concepts introduced in other courses such as anatomy physiology, chemistry and core biology. The principals covered in the courses provide a foundation that is critical to understanding microbiology. The overlap of some difficult concepts such as metabolism and immunology allow students to gain a deeper understanding and help them see the connections of these topics and how they apply to “real world” scenarios.

The laboratory experience is intended to complement the lecture material, thus the lecture and lab courses must be taken together to gain the most from the experience. The laboratory is a truly unique experience for many students because it is very hands on as they continue to learn various microbiology techniques and see the concepts of lecture come to life with the organisms they work with in lab.

Broad Course Objectives

This course supports the departmental goal of providing a foundation in the sciences for students aspiring to science, engineering, biotechnology and pre-professional majors. As such, concepts relating microbiology to other science disciplines will be highlighted. Students will be expected to demonstrate proficiency in these concepts, in concepts related to microbiology, in collecting and analyzing data, and in the development of laboratory skills that are applicable to most disciplines in science today.

In order to achieve these objectives, the instructor will strive to:

1. extend students' ability to apply mathematics and math reasoning to microbiological situations;

2. enable students to develop their critical reasoning skills;
3. Include technology related skills in the assignments;
4. expand students' experience with characteristic properties and biochemical tests;
5. extend students' vocabulary of science concepts and terms;
6. illustrate the methodology of scientific inquiry;
7. provide perspective on the professional activities of science practitioners; and,
8. relate concepts in microbiology to other science disciplines.

Course Outline

The successful student should be able to master the skills and activities listed under each major topic heading.

1. Basic concepts of Microbiology
 - a. Prokaryotes-classification
 - b. Eukaryotes-Parasites and Fungi
 - c. Growth and Reproduction
 - d. Cell Structures and Arrangements
 - e. Culture Media
 - f. Microscopy
 - g. Laboratory Safety
2. Metabolism
 - a. Enzymes and chemical reactions
 - b. Oxidation reduction reactions
 - c. Catabolism of glucose
 - d. Aerobic cellular respiration
 - e. Anaerobic cellular respiration
 - f. Fermentation
 - g. Classification of organisms based on their need for oxygen
3. Bacterial Genetics/genomics
 - a. General structure of DNA
 - b. Bacterial DNA
 - c. DNA Replication
 - d. Protein Synthesis
 - e. Plasmids
 - f. Bacterial conjugation
4. Virology
 - a. Structure of viruses
 - b. Viral Replication
 - c. Bacteriophage replication cycle
5. Growth and control of Microorganisms
 - a. Bacterial growth curve
 - b. Disinfectants and Antiseptics
 - c. Chemotherapeutic Agents
 - d. Antibiotic Assays and Resistance
 - e. Sterilization techniques

6. Pathogenicity and epidemiology
 - a. Virulence factors
 - b. Acquisition and progression of disease
 - c. Reporting occurrence of disease
 - d. Epidemiological studies

7. Immunology
 - a. Innate immune system
 - b. Specific immunity
 - c. Vaccine production
 - d. Disorders of the immune system

8. Major pathogens
 - a. Major bacterial pathogens
 - b. Major viral pathogens
 - c. Major fungal pathogens
 - d. Major protozoan pathogens

Evaluation

Student progress will be evaluated using 3-5 examinations, quizzes, and a comprehensive final. Exam questions will include short answer, multiple choice, and calculations. The laboratory portion of this course will be evaluated on the basis of adherence to safety procedures, the maintenance of a laboratory notebook, laboratory worksheets and reports. Students identify two lab unknowns and take a final exam. In as much as the laboratory assignments require the students to demonstrate their scientific reasoning skills, the grade they earn in the laboratory portion of the course is also indicative of the extent to which they understand and are able to apply these skills.