Miami Dade College

Course Description

MCB3023 | Principles of Microbiology | 3.00 credits

This course offers an introduction to the principles of microbiology. Students will learn the taxonomy, biochemistry, genetics, and ecology of microorganisms and will have understanding impact of microorganisms on the advancement of the biological sciences. Prerequisites: BSC2010, 2010L, 2011, 2011L, CHM 2211, 2211L. Corequisites: MCB3023L.

Course Competencies:

Competency 1: The student will demonstrate knowledge of the history of Microbiology by:

1. Describing the development of Microbiology
2. Outlining the contributions of significant scientists and their contributions to the development of Microbiology
3. Summarizing the Germ Theory of Disease

Competency 2: The student will demonstrate an understanding of the structure and function of the fundamental types of microorganisms, including prokaryotes, eukaryotes, and viruses by:

1. Listing similarities of all cell types
2. Describing the structure and function of prokaryotic cells
3. Describing the general structural, morphological characteristics, and replication strategies of viruses
4. Listing the major types of Eukaryotic parasites
5. Comparing Prokaryotic and Eukaryotic cells. Contrasting Bacteria and Archaea
6. Explaining the cellular basis of differential staining in bacteria
7. Contrasting prokaryotic and eukaryotic cell division and development

Competency 3: The student will demonstrate knowledge of bacterial growth and death by:

1. Describing the chemical and physical requirements for microbial growth
2. Explaining how organisms protect themselves from toxic forms of oxygen
3. Comparing pure culture techniques
4. Drawing typical microbial growth and death curves
5. Explaining typical microbial growth and death curves
6. Predicting the effect of different environmental conditions on microbial growth and death curves

Competency 4: The student will demonstrate knowledge of the significant pathways of metabolism by:

1. Relating the major anabolic and catabolic pathways
2. Summarizing the energy yield from each of the catabolic pathways
3. Comparing the major anabolic and catabolic pathways of metabolism

Competency 5: The student will demonstrate knowledge of the flow and control of genetic information within and between cells by:

1. Describing the mechanisms of regulation of gene expression in bacterial cells
2. Explaining the structure and functions of plasmids
3. Demonstrating the causes, consequences, and uses of mutations
4. Discussing how different types of mutagens increase the frequencies of mutations
5. Comparing the acquisition of novel genetic information in microbes via genetic exchange

Competency 6: The student will demonstrate knowledge of the interactions of microorganisms and hosts by:

1. Naming modes of disease transmission
2. Describing mechanisms of microbial pathogenicity
3. Comparing virulence factors of microbial pathogens
4. Explaining the principle of selective toxicity
5. Explaining the physical and chemical methods of microbial control
6. Explaining host defense mechanisms, including both innate and adaptive defenses

7. Discussing the mechanisms of action of antimicrobial agents
8. Comparing methods used for evaluating the effectiveness of antimicrobial agents
9. Discussing the mechanisms of microbial drug resistance

Competency 7: The student will demonstrate knowledge of Genetic Engineering and Biotechnology by:

1. Defining genetic engineering. Describing standard microbial techniques used in Biotechnology
2. Listing applications of recombinant DNA technology
3. Describing the Polymerase Chain Reaction (PCR) and its contributions to microbiology
4. Comparing the benefits and the harmful uses of microorganisms in biotechnology
5. Discussing the safety and ethical concerns of gene manipulation

Competency 8: The student will demonstrate knowledge of the interactions and impact of microorganisms in the environment by:

1. Describe how microbes can adapt to their environments
2. Discussing symbiotic relationships between microbes and their hosts
3. Applying the roles of microbes in global Carbon, Nitrogen, Sulfur, and Phosphorus cycles
4. Demonstrating examples of microbes that contribute to critical metabolic aspects of global cycles. Discuss how microbes may transform their environments

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Describe how natural systems function and recognize the impact of humans on the environment