

**J. Sargeant Reynolds Community College
Course Content Summary**

Course Prefix and Number: BIO 205 **Credits:** 4

Course Title: General Microbiology

Course Description:

Explores the structure and function of microorganisms and their relationship to the environment and humans. Emphasizes the various groups of microorganisms, their growth and metabolism, roles in the functioning of ecosystems, genetics, their roles in human health, the use of microbes in industrial applications and biotechnology and methods of microbial control. Lecture 3 hours. Recitation and laboratory 3 hours. Total 6 hours per week. 4 credits

General Course Purpose:

This course will enable biology majors to build a solid and broad foundation in their understanding of the biology of microorganisms and their roles in ecosystems, human health, and biotechnology applications. The course includes lecture and hands-on laboratory components. Both components will emphasize giving students a firm understanding of the importance of microorganisms and the techniques used to study them.

Course Prerequisites/Corequisites:

Prerequisites: ENG 111, BIO 101, BIO 102, and CHM 111
Corequisite: CHM 112

Course Objectives:

Upon completing the course, the student will be able to:

Scientific Literacy

Evaluate different perspectives, opinions, and statements about biological issues in terms of their logic, content, scientific merit, and biases.

Quantitative reasoning

Perform accurate calculations, interpret scientific data and graphs, and use results to support conclusions.

Analyze data collected through experiments in lab. Present and discuss the findings and conclusions derived from data, with chart/spreadsheet and graphs.

Critical thinking

Discriminate among degrees of credibility, accuracy, and reliability of information.

Contrast the advantages and/or disadvantages of different microscopes (bright-field, phase contrast, fluorescent, and electron) for a given situation.

Discuss common features of all living things and contrast microbes that are non-cellular.

Identify underlying features and differentiate between *Bacteria*, *Archaea*, and *Eukarya*. Compare and contrast the structure of cell membranes and cell walls in *Bacteria* and *Archaea*.

Differentiate between aerobic respiration, anaerobic respiration and fermentation metabolic pathways and relate these metabolic reactions to microbial identification tests

Microbial Metabolic Diversity, Growth and Control: Metabolic diversity of *Bacteria* and *Archaea*, Microbial Division and Growth, Microbial Control

Given an energy source and a carbon source, categorize the metabolic lifestyle of an organism (e.g., chemoheterotroph, chemolithoautotroph, photoheterotroph, or photoautotroph).

Compare the differences between oxygenic and anoxygenic photophosphorylation.

Identify and describe two or more fermentation pathways.

Summarize the diverse roles of prokaryotes in the global carbon, sulfur and nitrogen cycles.

Summarize an example where the waste product of one microorganism serves as an important substrate for another organism (e.g., ammonia-oxidizing bacteria or ammonia-oxidizing archaea and nitrite-oxidizing bacteria, hydrogen producers and methanogens, sulfide oxidizers and sulfate reducers, etc.).

List the stages of biofilm formation and maturation

Analyze whether the mechanism of action for a given antibiotic would affect Gram-positive and/or Gram-negative cells.

Describe how mutations and horizontal gene transfer, together with selective pressure, can lead to a rise of antibiotic resistance (or xenobiotic bioremediation or spread of virulence mechanisms).

Given a particular situation, predict the best method (e.g., physical, chemical, biological, etc.) for controlling bacterial growth.

Identify and summarize the different phases of a microbial growth curve.

Given the starting concentration of a culture and the number of generations that occur, calculate the final concentration of the culture.

(**Microbial Genetics** ~~5~~ **Tc 0.059** ~~5~~ **Decen the 4e 4p** **hasontigre.**

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Outline the major taxonomic groups within Bacteria, Archaea and microbial Eukarya.
Summarize the diversity of prokaryotes involved in nutrient cycling.
Predict the replication cycle of a virus based on the genome it carries.
Compare and contrast the multiplication of animal viruses and bacteriophages.

Impact of Microorganisms: Immunology, Epidemiology, Host-Microbe Interactions, Applied Microbiology

Laboratory Skills and Scientific Thinking

Effective Date/Updated: August 1, 2023