

COURSE OUTLINE

BIOL-205

Cell Biology

4 Credits

Science Core Course

HOWARD COMMUNITY COLLEGE

Description

This is a one-semester course designed for biology majors, biochemistry majors, laboratory science majors, and pre-professional and pre-allied health science students. The course will provide the student with an understanding of biological processes at the cellular and molecular level. Experimental approaches used in cell biology will be emphasized. Topics will include the structure and function of biological membranes, cytoskeletal elements, cell metabolism and energy transformation, cell growth and replication, second messenger systems, signal transduction, electrical properties, cell contact and adhesion and intercellular communication. An emphasis will be placed on eukaryotic cells. The laboratory component will reinforce these topics and introduce the student to techniques used in modern cell biology. Prerequisite: BIOL-201 and CHEM-101. (3 hours lecture, 3 hours lab)

Statement on General Education and Liberal Learning

A liberal education prepares students to lead ethical, productive, and creative lives and to understand how the pursuit of lifelong learning and critical thinking fosters good citizenship. General education courses form the core of a liberal education within the higher education curriculum and provide a coherent intellectual experience for all students by introducing the fundamental concepts and methods of inquiry in the areas of mathematics, the physical and natural sciences, the social sciences, the arts and the humanities, and composition. This course is part of the general education core experience at Howard Community College.

Overall Course Objectives

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

1. Demonstrate an understanding of biological processes at the cellular and molecular level.
2. Explain the application of various research methods used in cell biology.
3. Identify the major features of cell metabolism and energy transduction.
4. Describe the structure and function of proteins and protein filaments.
5. Discuss the structure and function of enzymes and their regulation.
6. Explain the factors that govern the catalytic power of enzymes.
7. Identify the major structural features of biological membrane structure and describe the factors that influence their physical properties.
8. Explain the mechanisms used by cell membranes to transport substances and to generate and maintain electrical potentials.
9. Identify the events involved in the generation and propagation of an action potential.
10. Discuss the mechanism of muscle cell contraction.
11. Identify the events involved in the synthesis of lipids.
12. Discuss the mechanisms involved in the synthesis, sorting and post-translational modification of proteins.
13. Discuss the biogenesis of selected organelles.
14. Identify the structures involved in specialized cell junctions, and their functions.
15. Identify the role of neurotransmitters, neuromodulators and receptors in the transmission of impulses at synapses.
16. Identify the role of hormones, hormone receptors, signal transduction and intracellular messengers in inducing target cell activity.
17. Identify the major events of cell growth and cell division, and their regulation.
18. Apply all of the above to problem solving situations.

Major Topics

- I. The Organization of Cells
 - A. Cell Theory
 - B. Cellular Properties and Organization
 - C. The Foundation of Cellular Chemistry
 - D. Bioenergetics:
 1. Metabolism
 2. Energy Transduction

- II. Proteins and Protein Filaments
 - A. Protein Composition and Structure
 - B. The Cytoskeleton and Cell Motility
 - C. Microtubules
 - D. Actin, Myosin and Muscle Contraction

- III. Biological Membranes
 - A. Structure and Physical Properties
 - B. Membrane Proteins
 - C. Membrane Lipids and Fluidity
 - D. Membrane Potential
 - E. Membrane Transport Systems
 - F. Receptors and Membrane Mediated Control

- IV. Membrane Excitability and Action Potentials
 - A. Membrane Channels and Gating
 - B. The Action Potential and the Conduction of Electrical Impulses
 - C. Excitation/Coupling in Muscle

- V. Intercellular Communications
 - A. Cell Junctions
 - B. Synaptic Transmission
 - C. Neurotransmitters and Neuromodulators
 - D. Hormones, Receptors and Signal Transduction
 - E. Regulation of Cell Function by Intracellular Messengers

- VI. Protein Processing and Organelle Biogenesis
 - A. Synthesis of Lipids and Proteins
 - B. Sorting, Glycosylation and Post-translational Modification
 - C. Secretion
 - D. The Nucleus
 - E. The Mitochondrion

- VII. Cell Cycle, Cell Differentiation and Their Regulation
 - A. Cell Cycle
 - B. Mitosis
 - C. Growth Factors

Course Requirements

Grading/exams: Grading procedures will be determined by the individual faculty member but will be calculated on the basis of exams, lab quizzes and a lab book.

Writing: Specific writing assignments will be determined by the individual faculty member but will include lab reports.

Other Course Information

This course is a Science core course, a Science elective and an Arts and Sciences elective.