BIOL 303: Cell Biology

This detailed course description provides information about course topics & content. It is not a course syllabus. Summer course syllabi are updated in the spring, and may not be available until summer classes begin.

Instructor Information

Instructor	Email	Course Format	Number of Credits
Valerie Olmo	valolmo@umbc.edu	Lecture	4

General Information

Delivery Format

In-Person

Prerequisite /Co-requisite:

BIOL 303

Course Materials

Currently Used Materials

• Cell and Molecular Biology: Concepts and Experiments, Karp, 7th Edition

Course Objectives/Learning Outcomes:

By the end of this course, the student will be able to:

- Know how the structures of key cellular components (including membranes, organelles, the cytoskeleton, and the genetic material) relate to their functions, how these functions are regulated at the molecular level, and how such components work as systems to carry out processes such as cell division, intracellular transport, signaling, and communication with other cells and external agents
- Ask the sorts of questions that generate testable hypotheses, how to design experiments that rigorously test those hypotheses, and how to interpret experimental findings.
- Understand the many types of cell and molecular biological techniques currently in use, and how to apply them to address specific cell and molecular processes
- Convey their ideas effectively to others, and to work with and learn from others as they strive toward achieving a common goal

Potential Topics Covered:

Biological Molecules and their Properties

1. Water

2. Lipids
3. Carbohydrates
4. nucleic acids; tRNA, rRNA, mRNA, DNA and their properites
5. protein; structures and properties of amino acids, peptide bond

Protein Structure, Function and Modifications

1. protein folding, hydrophobocity
2. functional classes of proteins
3. posttranslational protein modifications
4. proteasomal degradation

Basic Enzymology

1. free energy
2. catalysis
3. basic kinetics

Plasma Membran:e Structure and Function

1. structure and properties
2. transport across PM
3. electrical properties

Mitcohondrion: Structure and Function and Basic Metabolism

1. glycolysis (cytoplasm)
2. TCA cycle
3. oxidation-reduction, electron transport
4. proton-motive force and ATP synthesis

Protein Synthesis, Trafficking, Secretion

1. ER, Golgi, endosomes, lysozome
2. protein trafficking to organelles
3. endocytosis

Extracellular Matrix, Cell Adhesion

1. ECM components and function
2. types of junctions between cells; junction functions

Cytoskeleton

1. actin, tubulin, and myosin containing structures and their function
2. cell movements
3. cell motility

Nucleus: Structure and Function

1. chromosome structure and function (centromeres, telomeres, eu/heterochromatin)
2. chromatin

Cell Cycle Regulation

1. mitotic cell cycle
2. factors regulating progression through cell cycle

Cell Signaling

1. general components of signaling pathways
2. endocrine vs. paracrine signaling
3. major extracellular signaling pathways
4. apoptosis

Additional Information and Resources

This course explores the molecular basis of cell structure, organization, and function. Topics include genetic mechanisms (DNA replication, repair, and recombination, genome organization, and regulation of gene expression), internal cellular organization and activity (the cytoskeleton, membrane structure/function, cytoplasmic organelles, sorting to intracellular compartments, vesicular trafficking, and intracellular communication), cell growth and reproduction (the cell cycle and cell division), and cells in the context of the organism (cell junctions and adhesion, extracellular matrix, cell motility, and cell-cell signaling). An emphasis will be placed on experimental methods and strategies applied to molecular and cell biological investigations. Text and lecture materials will be supplemented with readings from the current literature, and significant class time will be allotted to discussions.