

## Common Course Outline for: BIOL 2207 Cell Biology

### A. Course Description

1. Number of credits: 4
2. Lecture hours per week: 3  
Lab hours per week: 3
3. Prerequisites: BIOL 1502 (C or higher)
4. Co-requisites: None
5. MnTC Goal: 3

This course is designed for students majoring in biology. Students will explore major concepts in cell biology including eukaryotic cell structure and function, the cellular use of biomolecules, membranes, signal transduction, motility, and the extracellular matrix. Students will engage in techniques appropriate to the study of cells and cellular processes and gain experience in experimental design, data analysis and interpretation, and the communication of results. This course meets a requirement for the Biology (Minnesota State Transfer Pathway) AS-P degree. It is strongly recommended that students have successfully completed (C or higher) BIOL 2205, before enrolling in this course. Lecture 3 hours per week. Lab 3 hours per week.

### B. Date last revised: August 2020

### C. Outline of Major Content Areas

**Lecture:** Subtopics listed under each main topic may vary due to recent developments in the field and current events.

1. Introduction to cell biology
2. Microscopy
  - a. Light microscopy techniques
  - b. Electron microscopy techniques
3. Cell fractionation and centrifugation
4. Biomolecules
5. Bioenergetics
6. Cell structure
7. Membrane structure
8. Plasma membrane physiology
  - a. Transport
  - b. Signal transduction and intracellular signaling
  - c. Motility
  - d. Cell recognition
9. Cytoplasmic physiology
  - a. Endomembrane system

- i. Endoplasmic reticulum
    - ii. Golgi
    - iii. Lysosomes
  - b. Metabolism and energy conversions
    - i. Cytosol
    - ii. Mitochondrion
    - iii. Chloroplast
    - iv. Peroxisome
  - c. Biomolecule trafficking and cytoskeleton
- 10. Intercellular and extracellular interactions
  - a. Extracellular matrix
  - b. Adhesion
  - c. Tissue formation
- 11. Cell Cycle
  - a. Characteristics of cancer cells
- 12. Current issues in cell biology
  - a. Impact of cell biology on medicine, agriculture, and biotechnology
  - b. Cell biology and society

**Laboratory:** Students will actively participate in lab by applying the scientific process to studies related to:

1. Spectroscopic measurement of protein concentration
2. Differential cell staining
3. Light microscopy, including fluorescent microscopy, and scanning electron microscopy
4. Cell and tissue culture
5. Enzyme kinetics
6. pH and buffers
7. Cell fractionation
8. Centrifugation of cells and cell components
9. Investigative project

#### **D. Course Learning Outcomes**

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

1. Explain and apply fundamental concepts found in Principles of Biology I by explaining cellular life in terms of the biomolecules used by cells. (2a, 2c, 3a)
2. Understand the underlying molecular and cellular mechanisms of cellular structure and function. (2b, 2c, 3a)
3. Use critical thinking skills to understand, evaluate, and analyze processes of membrane structure and function, trafficking of molecules, the endomembrane system, signal transduction pathways, extracellular matrix, and the cell's cytoskeleton/motility. (2a, 2c, 3a)
4. Formulate a hypothesis, and conduct and analyze an experiment. (2b, 2d, 3b)
5. Organize, draft, edit, and revise formal scientific writing. (2b, 2d, 3c)
6. Read, interpret, incorporate, and cite information and ideas from primary literature into writing. (2c, 2d, 3c, 3d)

7. Utilize and understand the application of selected biotechnologies. (2a, 2d, 3a)
8. Analyze classic experiments that contributed to our current knowledge of cell biology. (2c, 2d, 3d)
9. Explain and illustrate the role that cell biology and its applications play in medicine, agriculture, biotechnology, and social issues. (3a, 3d)
10. Identify, summarize, and critique key debates and arguments about current societal, ethical, and political issues that are relevant to cell biology such as organismal cloning and stem cell research. (2b, 2d, 3d)

#### **E. Methods for Assessing Student Learning**

A variety of evaluation and assessments methods will be used including, but not limited to, the following:

1. Examinations (multiple choice, true-false, fill-in-the-blank, matching, short answer and critical thinking questions)
2. Writing assignments
3. Quizzes
4. Graphing exercises
5. Work sheets
6. Individual oral quizzing on laboratory activities.
7. Term papers
8. Oral presentations
9. Laboratory reports, including formal scientific writing
10. A final comprehensive exam

#### **F. Special Information**

The laboratory portion of the course is delivered in the Biology Learning Center (BLC). The BLC has its own set of operating policies and procedures. An instructor will include the most recent version of the Departmental and Biology Learning Center Policies in the course syllabus.

One or more labs require the use of Biosafety Level 2 standards.