BIOL 4020 ADVANCED CELL BIOLOGY (4 credit hours)

Elmira College

SPRING 2025

Required Text:

Bruce Alberts; Rebecca Heald; Alexander Johnson; (2021). ***Molecular Biology of the Cell*** (7th ed.). W. W. Norton & Company.

Supplemental readings might be included to illustrate or expand on textbook readings.

Pre-requisites: BIOL 2010 Introduction to Genetics.

Course Description

This course is designed to provide a comprehensive exploration of cellular processes, molecular mechanisms, and dynamic interactions within eukaryotic animal cells. Throughout the curriculum, students will explore cell structure, membrane dynamics, intracellular compartments, protein sorting, vesicular traffic, cell communication, cytoskeletal organization, and the molecular events governing the cell cycle, apoptosis, and cancer.

Course Objectives and Goals

- Acquire a thorough understanding of cell structure, membrane dynamics, and essential molecular processes in eukaryotic animal cells.
- Demonstrate mastery in molecular mechanisms, including genetic information processing (replication, transcription, translation), RNA functions, and protein synthesis.
- Gain expertise in dynamic cellular processes such as intracellular vesicular traffic, cytoskeletal dynamics, cell communication, and responses to environmental signals.
- Integrate knowledge of intracellular compartments, protein sorting, organelle assembly, and cellular responses, forming a cohesive understanding of cell biology.
- Develop practical skills through hands-on experiences, preparing students for advanced studies or careers in cell biology research.

Evaluation of Performance

Your grade will be based upon your performance on exams, assignments, and participation.

Assignments	20%
Lab and Lab Reports	40%
Exams	40%
Total	100%

Grades will be assigned as follows:

A	93% and above	B-	80 - 82%	D+	67 - 69%
A-	90 - 92%	C+	77 - 79%	D	63 - 66%
B+	87 - 89%	C	73 - 76%	D-	60 - 62%
B	83 - 86%	C-	70 - 72%	F	59% or below

Withdrawal Policy: Please see Elmira College Bulletin for information on this policy.

Academic Honesty: Please read the section on Academic Honesty in the **Code of Conduct**. Briefly, academic dishonesty includes: cheating, fabrication, facilitating academic dishonesty, and plagiarism. Ask if you have any questions on whether something constitutes as academic dishonesty. All work must be original and new. Past assignments from current or other courses will not be accepted. Academic dishonesty will not be tolerated. It will result in zero on the assignment, and a report will be filed with the school. Continued practice will result in failure of the class. Institutional penalties may also apply with repeated acts of academic honesty.

Student Responsibility:

- It is your responsibility to keep track of assignments and due dates.
- You should ask questions concerning assignments and lectures, if you need any clarifications.
- If you are struggling in class, have concerns, and/or unsure about expectations, please stop by during office hours or make an appointment for another time.

Tentative Schedule of Topics

Topic	Materials	Tasks & Evaluations
Cells, Genomes, and the Diversity of Life	Chapter 1	
Cell Chemistry and Bioenergetics	Chapter 2	
Proteins	Chapter 3	Assignment 1
The Atomic Structure of Proteins	Chapter 4	
Protein Function	Chapter 5	Lab and Lab Report 1
DNA, Chromosomes, and Genomes	Chapter 6	
DNA Replication, Repair, and Recombination	Chapter 7	Assignment 2
How Cells Read the Genome: From DNA to Protein	Chapter 8	
Control of Gene Expression	Chapter 9	Lab and Lab Report 2
Analyzing Cells, Molecules, and Systems	Chapter 10	
Visualizing Cells and Their Molecules	Chapter 11	Exam 1
Membrane Structure	Chapter 12	
Small-Molecule Transport and Electrical Properties of Membranes	Chapter 13	Assignment 3
Intracellular Organization and Protein Sorting	Chapter 14	
Intracellular Membrane Traffic	Chapter 15	Lab and Lab Report 3
Energy Conversion and Metabolic Compartmentation: Mitochondria and Chloroplasts	Chapter 16	
Cell Signaling	Chapter 17	
The Cytoskeleton	Chapter 18	Assignment 4

The Cell Cycle	Chapter 19	Lab and Lab Report 4
Cell Death	Chapter 20	
Cell Junctions and the Extracellular Matrix	Chapter 21	
The Extracellular Matrix of Animals	Chapter 22	Lab and Lab Report 5
Cancer	Chapter 23	Exam 2