BIOL 3302 Molecular Genetics and Evolution (4 credit hours)

Elmira College

SPRING 2025

Required Text:

1. James D. Watson et al. (2016), ***Molecular Biology of the Gene***, 7th Edition, Pearson Education.
2. D. Peter Snustad and Michael J. Simmons (2016), ***Principles of Genetics***, 7th Edition, Wiley.

Pre-requisites: BIOL 1450 Introduction to Cell and Molecular Biology

Course Description

This course is designed to provide students with an exploration of the chromosomal and molecular basis of gene transmission and function. It covers strategies for constructing genetic and physical maps of genes and genomes, as well as methods for isolating specific genes. The course also examines regulatory mechanisms for gene expression in both prokaryotic and eukaryotic organisms through various examples. Additionally, it introduces key concepts in genetic analysis, including principles of heredity, mutation, and recombination. Students will gain hands-on experience through laboratory exercises, reinforcing their understanding of theoretical concepts. By integrating lectures, discussions, and practical applications, the course aims to equip students with a comprehensive understanding of molecular genetics. Students are expected to have a foundational background in biology to fully engage with and apply the concepts discussed in the course.

Course Objectives and Goals

- Understand the chromosomal and molecular mechanisms underlying gene transmission and function.
- Apply strategies for isolating specific genes using modern molecular techniques.
- Analyze and compare regulatory mechanisms of gene expression in prokaryotic and eukaryotic systems.
- Evaluate the role of genetic mutations and recombination in heredity and evolution.
- Apply foundational knowledge of biology to solve problems in genetics and molecular biology.

Evaluation of Performance

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

4 Assignments	20%
2 Quizzes	15%
6 Labs and Reports	15%
Project and Presentation	10%
Midterm Exam	15%

Final Exam	25%
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
Introduction to Molecular Genetics	Chapter 1	
Basic Concepts of Genetics	Chapter 2	Lab and Report #1
DNA Structure and Function	Chapter 3	Assignment#1
DNA Replication and Repair	Chapter 4	
RNA Structure and Function	Chapter 5	Lab and Report #2
Transcription and RNA Processing	Chapter 6	Quiz 1
Translation and Protein Synthesis	Chapter 7	Assignment#2
Gene Regulation in Prokaryotes	Chapter 8	Lab and Report #3
Gene Regulation in Eukaryotes	Chapter 9	
Mutations and Genetic Variation	Chapter 10	Midterm Exam
Recombination and Genetic Mapping	Chapter 11	Lab and Report #4
Epigenetics and Gene Silencing	Chapter 12	
Genomics and Bioinformatics	Chapter 13	Assignment#3
Developmental Genetics	Chapter 14	Lab and Report #5
Genetic Engineering and CRISPR	Chapter 15	Quiz2
Population Genetics and Evolution	Chapter 16	
Quantitative and Behavioral Genetics	Chapter 17	Assignment#4

Cancer Genetics and Oncogenes	Chapter 18	Lab and Report #6
Systems Biology and Gene Networks	Chapter 19	
Ethical and Social Implications of Genetics	Chapter 20	Project and Presentation
Current Topics in Molecular Genetics	Chapter 21	Final Exam