RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

BIOL 245 CELLULAR AND MOLECULAR BIOLOGY

I. Basic Course Information

A. Cellular and Molecular Biology, BIOL-245

B. Modified Course

C. Date of Proposal: Semester: Fall Year: 2024

D. Effective Term: Fall 2025

E. Sponsoring Department: Science & Engineering

F. Semester Credit Hours: 4

G. Weekly Contact Hours: 6
Lecture: 3
Laboratory: 3
Out-of-class student work per week: 7.5

H. X Prerequisite (s): General Biology I (BIOL-101), General Chemistry I (CHEM-103)

I. Additional Fees: none

II. Catalog Description

Prerequisites: General Biology I (BIOL-101) and General Chemistry I (CHEM-103)

This lecture and laboratory course provide an overview of the structure and function of cells and molecular genetic processes. Topics include cellular metabolism, membrane function, genome structure, gene expression, DNA replication and repair, cellular communication, and cancer biology. Laboratory stresses techniques in recombinant DNA, protein characterization, and cell culture. The laboratory is designed as a course undergraduate research experience (CURE) whereby students conduct authentic research in areas such as cancer biology.

III. Statement of Course Need

A. This course is a 200-level Biology course, one of the two required for the Biology track in the Biological Sciences AS degree program.

B. In the laboratory portion of the course, students will utilize molecular and cell culture techniques essential for gene expression analysis.

C. This course generally transfers as a program requirement and/or a free elective dependent on the transfer institution.

IV. Place of Course in College Curriculum

A. Free elective

B. This course does not satisfy a general education requirement.

C. This course meets a program elective for Biology track in the Biological Sciences AS degree program as a 200-level Biology course.

D. Course transferability; for New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities go to their individual websites.

V. Outline of Course Content

A. Introduction to Cells

B. Biochemistry
   1. Chemical bonding
   2. Macromolecules
   3. Energy

C. Protein Structure and Function
   1. Protein Structure
   2. Protein folding
   3. Enzymes

D. Molecular Genetic mechanisms
   1. Structure of nucleic acids
   2. Transcription, translation, and protein synthesis
   3. Control of gene expression
   4. DNA replication
   5. Molecular structure of genes and chromosomes

E. Biomembranes and Cell Architecture
   1. Components and function
   2. Membrane transport

F. Molecular Genetic Techniques and Genomics
   1. DNA cloning
   2. Analysis of gene structure and expression

G. Cell cycle and cell growth control
   1. Cell signaling
   2. Checkpoints

3. Cell cycle control
4. Cancer

VI.

A. <u>Course Learning Outcomes:</u>

At the completion of this course, students will be able to:

1. Demonstrate an informed understanding of the fundamental concepts in biological sciences and apply those biological concepts to real-world societal issues (GE-3).
2. Employ scientific methodologies to develop predictions, interpret experimental data, and form conclusions. (GE 3*)
3. Communicate scientific information clearly and logically in both oral and written forms of scientific communication. (GE 1*)
4. Design and conduct a semester-long research project using techniques commonly used in cell biology research (GE-3)*.
5. Construct graphs and charts, interpret them, and draw appropriate conclusions (GE2*)

(* Embedded critical thinking)

B. <u>Assessment Instruments</u>

Given the outcomes described above, the following assessment methods may be used:

1. Production of lab reports
2. Analysis of scientific data
3. Analysis of primary literature
4. Group lab work/projects
5. Development of cell biology teaching materials (Cell Blocks)
6. Micropublications
7. Science communication publications

VII. Grade Determinants

A. Analysis of scientific literature and data
B. Readiness assurance quizzes
C. Individual/group projects in or out of class
D. Laboratory activities
E. Laboratory notebooks and reports

Given the goals and outcomes described above, LIST the primary formats, modes, and methods for teaching and learning that may be used in the course:

A. lecture/discussion
B. small-group work
C. computer-assisted instruction
D. laboratory
E. student presentations

F. student collaboration
G. independent study

VIII. Texts and Materials

A. suggested textbook
B. primary sources
C. web sources

Sample of specific text that may be featured:
Karp, G. (2013) *Cell and Molecular Biology: Concepts and Experiments, 7th Ed.* John Wiley and Sons, Inc.

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date textbook information.)

IX. Resources

Students may need to use library databases, and other library resources and/or computers for research assignments. What additional resources will be needed? List the resource:

A. Library
B. Computers with internet access
C. Laboratory

X. Check One: ☐Honors Course ☐Honors Options ☒ N/A

Definition: According to the Honors Council, an Honors course is one that enriches and challenges students beyond a course's regular scope and curriculum. An Honors course will offer a sophisticated use of research, introduce intellectually stimulating readings and critical perspectives, promote a higher level of critical discussion and written work, and encourage independent study projects, at the option of the instructor.

The content of an honors course should be the same as the standard course; the difference is the mode of learning/pedagogy/instruction. Please list how the course is different. For example: the difference may include additional content, text, materials, assessment instruments, and grade determinants.