

# Virginia Western Community College

## BIO 206

### Cell Biology

#### **Prerequisites**

One year of college biology or one year of college chemistry.

#### **Course Description**

Introduces the ultrastructure and functions of cells. Emphasizes cell metabolism, cell division, and control of gene expression. Topics covered include: cellular metabolism, structure and function of cellular membranes, organelle function, cell communication and signal transduction, nature and control of the gene, cell cycle regulation and cancer development, and Immunology. The laboratory component of this course will be used to reinforce concepts learned in the classroom, and will offer students the opportunity to carry out inquiry-based, authentic research on novel bacteriophage viruses as part of the Howard Hughes Medical Institute SEA-PHAGES program. Students will use a bioinformatics tool to characterize and classify novel phages they discover, as well as employ other techniques used in current cell biology research.

**Semester Credits: 4**

**Lecture Hours: 3**

**Laboratory/Recitation Hours: 3**

#### **Required Materials**

##### **Textbook:**

Essential Cell Biology. Alberts, et al. 4th edition. Garland Science Publishing. ISBN: 9780815344544

#### **Course Outcomes**

**At the completion of this course, the student should be able to:**

- Demonstrate an understanding of the molecular structure and function of cells
- Develop an appreciation of the evolutionary theory as a unifying principle of Biology
- Understand the relationship between cellular structure and human disease
- Perform a variety of lab techniques
- Design experiments and employ appropriate techniques to solve biological problems
- Communicate scientific data effectively orally and in writing
- Design and conduct experiments following the scientific method
- Critically read, understand, review and communicate scientific literature
- Write scientific papers in proper scientific format and discuss their meaning

## Teaching Methods

This course is traditionally team taught with as many as five instructors delivering both lecture and laboratory material. The amount of instructional time allocated to each topic can vary from instructor to instructor according to their expertise and interest, but all points are covered.

## Topical Description

### Chapter 1: Introduction to Cell Biology

- Basic Properties of Cells
- Prokaryotic and Eukaryotic cells
- Model organisms

### Chapter 5: DNA and Chromosomes

- Structure and function of DNA
- Eukaryotic chromosomes
- Regulation of chromosome structure

### Chapter 6: DNA Replication, Repair and Recombination

- DNA replication
- Repair
- Recombination and mobile genetic elements

### Chapter 7: Gene Expression

- Transcription
- Translation

### Chapter 8: Control of Gene Expression

- Overview
- Transcriptional switches
- Post transcriptional control

### Chapters 2 and 4: Proteins

#### Chapter 2:

- Amino acid structure and characteristics

#### Chapter 4:

- Shape and structure of proteins
- How proteins work
- Control and study of proteins

### Chapter 11: Membrane Structure

- The lipid bilayer
- Membrane proteins

Chapter 12: Membrane Transport

- General principles
- Transporters
- Ion channels
  - Membrane potential
  - Signaling in nerve cells

Chapter 16: Cell Communication

- General principles
- G protein coupled receptors
- Enzyme coupled receptors

Chapter 17: Cytoskeleton

- Intermediate filaments
- Microtubules
- Actin filaments

Chapter 18: Cell Division

- Overview of the Eukaryotic cell cycle
- S phase
- M phase
- Mitosis
- Cytokinesis
- Control of cell number

Chapter 20: Cellular Communities

- Cancer biology

Suggested Laboratory Sessions

- Introduction to laboratory safety
- Pipetting
- The scientific method and statistics
- Solution preparation
- Column chromatography
- Multi-week experiments utilizing the scientific method and current applicable molecular techniques.  
Techniques employed may include, but are not limited to:
  - Polymerase chain reaction
  - Agarose gel electrophoresis
  - Acrylamide gel electrophoresis
  - Western blot analysis
  - Protein extraction from fish muscles
  - DNA and RNA extraction
  - Bioinformatics
    - Protein and DNA sequence analysis

**Notes to Instructors**

1. Departmental policy dictates that instructors do not allow students to keep tests.
2. A comprehensive final exam counting 15%-20% of the total grade will be given at the end of the semester.
3. The syllabus should state what the course grade will be based on, such as tests, quizzes, a comprehensive final exam, and any other assignments made by the instructor.
4. The VWCC Biology Department uses a 10-point grading scale.
5. Comprehensive study of the listed topics is beyond the reasonable expectations of a 15-week Biology 101 course. It is up to the discretion of the instructor to choose which topics are more detailed but each topic should be adequately covered.