

# Virginia Western Community College

## BIO 250

### Biotechnology Research Methods and Skills

#### Course Description

Provides students with knowledge and advanced laboratory skills needed for employment in the biotechnology industry. Focuses on use of basic and specialized lab equipment and techniques such as solution chemistry, cell culture, DNA extraction and analysis, and protein extraction and analysis. Emphasis in on lab safety, documentation, quality control, and use of SOPs.

Lecture 1 hour, Laboratory 6 hours per week. Total 7 hours per week.

3 credits

#### Required Materials

Basic Laboratory Methods for Biotechnology: textbook and laboratory reference

Author: Lisa A. Seidman, Cynthia J. Moore, Jeanette Mowery

Edition: 3rd

ISBN: 9780429282799

Publisher: CRC Press

Basic Laboratory Calculations for Biotechnology

Author: Lisa A. Seidman

Edition: 2<sup>nd</sup> ed

ISBN:9780367244804

Publisher: CRC Press

Carbon Copy Laboratory notebook

#### General Course Purpose

The purpose of this course is to provide students with lab skills in order to prepare them to pursue entry-level, technical-level, or professional-level careers in bioscience and biotechnology. This course will focus on providing students with a set of basic biotechnology labs skills such as documentation, quality assurance/quality control (QA/QC) and good laboratory practices (GLPs). Students will also learn concepts of experimental design and analysis, cell culture, bio-manufacturing, immunology, protein analysis, DNA techniques (i.e. genetic engineering, polymerase chain reaction, DNA sequencing, and forensic analyses), and bioinformatics.

#### Course Prerequisites/Corequisites

Students are expected to have completed [BIO 101](#). Co-requisite is [BIO 253](#) Biotechnology Concepts must either be taken previously or concurrent with enrollment in this course.

## **Course Objectives**

- Maintain proper documentation of lab protocols and experiments via the use of laboratory notebooks and standard operating procedures (SOPs).
- Use material data safety sheets to understand chemical compounds including their proper storage, handling, and risks.
- Detail the process by which experiments are performed in biotechnology, including the application of the scientific method, experimental design, and data analysis.
- Utilize aseptic techniques when isolating and maintaining cell cultures.
- Make microbiological media.
- Effectively use microscopes.
- Perform the calculations for and carry out the execution of solution chemistry in the laboratory.
- Extract and analyze DNA and proteins from cells.
- Describe the process by which potential biotechnology products are investigated.
- Use a spectrophotometer.
- Determine the pH of different solutions.
- Grow batch cultures of microorganisms.
- Use dialysis and column chromatography to concentrate and isolate proteins of interest.
- Grow and maintain plant cultures used for biotechnology applications.
- Perform techniques used to manipulate and study DNA and Proteins.
- Perform basic immunology assays such as the Enzyme-Linked ImmunoSorbent Assay (ELISA).
- Obtain information on DNA and protein structure and function using web-based bioinformatics resources.

## **Major Topics to be Included**

- Documentation
- Lab safety
- Experimental design and analysis
- Aseptic technique and cell culture
- Solution preparation and dilution, including media preparation
- DNA extraction and analysis through gel electrophoresis
- Protein isolation and analysis
- Assay development and spectroscopy
- Recombinant protein production (i.e. genetic engineering and cloning)
- Protein product purification and analysis
- Plant breeding and cloning
- Obtaining molecules of pharmaceutical interest
- An introduction to advanced DNA methods (i.e. PCR, DNA sequencing, DNA typing, Southern blots)
- An introduction to advanced protein studies (ELISA and western blots)
- Bioinformatics