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

Course Prerequisites/Corequisites

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

Required Materials

Basic Laboratory Methods for Biotechnology: textbook and laboratory reference
Author: Lisa A. Seidman, Cynthia J. Moore, Jeanette Mowery
Edition: 3rd ed.
ISBN: 9780367244880
Publisher: CRC Press

Basic Laboratory Calculations for Biotechnology
Author: Lisa A. Seidman
Edition: 2nd ed.
ISBN: 9780367244804
Publisher: CRC Press

Carbon Copy Laboratory notebook

General Course Purpose

The purpose of this course is to provide students with laboratory 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 laboratory 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, solution preparation, cell culture, bio- manufacturing, immunology, protein analysis, DNA techniques (i.e. genetic engineering, restriction enzymes, polymerase chain reaction, gel electrophoresis, and DNA sequencing), and bioinformatics.

Course Objectives

- Maintain proper documentation of lab protocols and experiments via the use of laboratory notebooks and standard operating procedures (SOPs).
- Use safety data sheets (SDSs) 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 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)
- An introduction to advanced protein studies (ELISA, SDS-PAGE, and western blots)
- Bioinformatics

ADA Statement (PDF)
Title IX Statement (PDF)