GROSSMONT COLLEGE

COURSE OUTLINE OF RECORD

Curriculum Committee Approval: 05/18/2021

GCCCD Governing Board Approval: 06/15/2021

BIOLOGY 113 – INTRODUCTION TO THE BIOTECHNOLOGY LAB

1. Course Number Course Title Semester Units

BIO 113 Introduction to the Biotechnology Lab 2

Semester Hours

2 hours lecture: 32-36 hours 64-72 outside of class hours 1 hour lab: 16-18 hours

112-126 total hours

2. Course Prerequisites

None

Corequisite

None

Recommended Preparation

None

3. Catalog Description

This course examines biology laboratory technology as it relates to the field of Biotechnology. The class addresses skills and techniques common to the biotechnology industry including measuring activity and quantity of proteins, growth and manipulation of bacteria, genetic engineering, polymerase chain reaction and antibody methods. In addition to hands-on skills, the course will provide context for how and why these techniques are used in the industry. The course also includes activities in team-building and proper lab behaviors. This course enhances the laboratory skills of students wishing to be employed by the biotechnology industry.

4. Course Objectives

The student will:

a. Describe the biotechnology industry and the role of laboratory personnel in research and development or manufacturing.

b. Define the roles of Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), and laboratory safety in the biotechnology industry.

c. Measure volumes, weights and pH accurately using appropriate instruments and the metric system.

d. Analyze in written and oral format experimental outcomes using graphs where appropriate.

e. Analyze and measure protein quantity and quality with appropriate instrumentation.

f. List the steps of the ELISA protocol and examine its use in medical diagnosis disease (e.g., AIDS and pregnancy).

g. Analyze DNA with electrophoresis and Polymerase Chain Reaction (PCR).

h. Describe the use of protein analysis, DNA technology and antibodies in the biotechnology industry.

i. Explain the role of genetic engineering in biotechnology.

j. Learn and practice team-building and proper lab behaviors

5. Instructional Facilities

a. Biological teaching laboratory equipped with running water, gas, vacuum, air, and electrical outlets; with storage space for plant and animal specimens.

b. Special requirements: compound and dissecting microscopes, student spectrophotometers, refrigerator, water baths, incubators, electrophoresis equipment, and other related biotechnology equipment.

6. Special Materials Required of Student

None

7. Course Content

a. Biotechnology Industry Overview

1) Biotechnology jobs and the drug discovery industry

2) Good Manufacturing Processes (GMP)

3) Good Laboratory Practices (GLP).

b. Skills Common to Entry Level Positions in Biotechnology

1) The metric system

2) Lab safety guidelines

3) Laboratory measurement (microscope, pH meter)

4) Basic lab theory as Applied in Biotechnology

a) Controls

b) Experimental outcomes

c) Organizing and presenting data

c. Protein techniques in Biotechnology

1) Proteins as Biotechnology Products

2) Protein assays as used in Quality Control

3) Enzyme assays as used in Quality Control

4) Protein electrophoresis as used in Product Purification

d. Nucleic acid techniques as Used in Biotechnology Research

1) Nucleic Acids and Genetic Engineering Theory

2) Basic bacteriology and microscopy in Quality Control

3) DNA Analysis by Gel Electrophoresis

4) Polymerase Chain Reaction

e. Antibody techniques

1). Antibodies as Biotechnology Products

2) ELISA assay for Therapeutic Products

3) Antibody Diagnostics (e.g. Home Pregnancy Test)

f. Team-building exercises

g. Proper Lab Behaviors

8. Method of Instruction

1. Lecture
2. Computer Assisted Instruction
3. Collaborative Learning
4. Laboratory

9. Methods of Evaluating Student Performance

Laboratory performance (pipetting skills, ability to make solutions)

1. Performance-based assessments of the student’s ability to follow a written protocol and explain deviations from the protocol
2. Prepare graphs (written) and analyze (oral and written) those graphs
3. Written reports that apply the theory of Good Laboratory Practices
4. Written reports demonstrating a student’s ability to draw conclusions from laboratory observations.
5. Critical thinking assignments are required and may include, but are not limited to, the following:
6. Assessing the importance of controls in an experimental situation
7. Preparing and presenting data in a graphical format

Relating cell biology to modern issues (e.g. stem cells).

1. Written exams/tests including a final assessment

10. Outside Class Assignments

1. Reading Assignments:
2. Assigned textbook readings
3. Articles that relate to biotechnology in newspapers and magazines
4. Current reports on the Human Genome Project
5. Published articles in *Scientific American* magazine
6. Writing Assignments:
7. Laboratory reports on protein assay, transformation, and ELISA

2) Laboratory workbook assignments.

c. Field trips to local biotechnology industries

11. Representative Text(s)

a. Representative Text(s):

Slivka, Sandra R., *Introduction to the Biotechnology Laboratory.* Copyright Southern CA Biotech Center @ Miramar College, Published by the Southern CA Biotech Center at Miramar College, 2020.

b. Supplementary texts and workbooks:

None

Addendum: Student Learning Outcomes

Upon completion of this course, our students will be able to do the following:

1. Collect and analyze data from ELISA assay.
2. Collect, prepare and analyze data from a PCR DNA amplification
3. Perform analytical tests to detect ions in water samples.