Subject:	BIOL
Course Number:	77
Descriptive Title:	Biotechnology A: Basic Lab Skills
Division:	Natural Sciences
Department:	Biology
Course Disciplines:	Biology, Biotechnology
Catalog Description:	This course provides an introduction to the fundamental skills necessary for any biotechnology laboratory. Skills include maintenance of an industry standard notebook and preparation and sterilization of solutions, reagents, and media. Topics also incude utilization of a good aseptic technique, proper use and maintenance of laboratory equipment, adherence to quality control protocols, and laboratory safety regulations.
Prerequisite:	None
Co-requisite:	None
Recommended Preparation:	Beginning algebra or higher or placement by appropriate assessment
Enrollment Limitation:	None
Hours Lecture (per week):	3
Hours Laboratory (per week):	3
Outside Study Hours:	6
Total Course Hours:	108
Course Units:	4
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	Fall 2023
Transfer UC:	Yes
Effective Date:	Pending
General Education ECC:	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	
Term:	
Other:	

Student Learning Outcomes:	1. **SLO #1 Knowledge:** Demonstrate the knowledge of fundamental biological techniques. 2. **SLO #2 Scientific Communication:** Demonstrate a proficiency in the techniques used for scientific analysis, documentation, and communication in a laboratory and industrial setting. 3. **SLO #3 Career Proficiency:** Students will demonstrate the knowledge of industrial applications and ethical considerations in biotechnology.
Course Objectives:	1. Select proper procedures when performing basic laboratory activities to ensure safety and compliance with standard operating procedures employed in industry. 2. Appraise hazardous materials encountered in the biotechnology laboratory setting. 3. Create and maintain an industry-standard notebook. Maintain proper records for hazardous material storage and disposal. Create accurate records and logs for laboratory equipment and materials. 4. Mix accurate solutions, buffers, and reagents. 5. Choose the correct basic laboratory math calculations to arrive at the proper formulation for the solution, buffer, or reagent. Employ basic math calculations to solve common laboratory problems. 6. Choose the proper methods of aseptic technique. Properly employ the methods needed to decontaminate materials used in the laboratory. 7. Evaluate various equipment, methods, and materials used to decontaminate and sterilize laboratory materials. 8. Create accurate charts and graphs of laboratory-generated data. Interpret data displayed in chart or graph format. 9. Choose the proper methods to label, organize and maintain your inventory. Validate and use laboratory equipment and materials.
Major Topics:	**I. Lab Safety and Standard Procedures (Lecture, 9 hours)** A. Personal protective equipment B. Laboratory hazards C. Appropriate documentation procedures D. Standard operating procedures (SOPs) E. Current good laboratory practices (cGLPs) F. International Organization of Standardizations (ISOs) G. Material Safety Data Sheets (MSDS/SDS) H. Globally Harmonized System of Classification and Labeling of Chemicals (GHS) **II. The Laboratory Notebook and Record Keeping (Lecture, 10 hours)** A. The laboratory notebook as a legal document B. Proper and improper documentation procedures C. Equipment logs D. Environmental charting **III. Solutions, Buffers, and Reagents (Lecture, 9 hours)** A. pH calculations and measurements B. Molecular weights, molarity percent, parts ratios, and dilutions for solution preparation

C. Proper decontamination and disposal of used materials especially bacteriological waste

IV. Aseptic techniques and decontamination (Lecture, 10 hours)

A. Maintaining sterility and avoiding contamination of materials and your person
B. Proper use of the autoclave to achieve sterility and decontamination
C. Proper decontamination and disposal of used materials especially bacteriological waste

V. Basic Laboratory Math (Lecture, 10 hours)

A. Metric units and conversions
B. Molarity
C. Percentages
D. Parts ratios
E. Dilutions
F. pH calculations
G. Appropriate graph and chart construction and interpretations
H. Significant figures

A. Scientific notation

J. Accuracy and precision

VI. Inventory and Supplies (Lecture, 6 hours)

A. Types of inventory systems
B. Performing an inventory
C. Proper and improper labeling

A minimum of 80% of lab hours involve hands-on activities.

VII. Lab Safety and Standard Procedures (Lab, 4 hours)

A. Personal protective equipment
B. Laboratory hazards
C. Appropriate documentation procedures
D. Standard operating procedures (SOPs)
E. Current good laboratory practices (cGLPs)
F. International Organization of Standardization (ISOs)
G. Material Safety Data Sheets (MSDS/SDS)
H. Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

VIII. The Laboratory Notebook and Record Keeping (Lab, 8 hours)

A. The laboratory notebook as a legal document
B. Proper and improper documentation procedures
C. Equipment logs
D. Environmental charting
E. pH calculations and measurements

	F. Molecular weights, molarity, percent, parts ratios, and dilutions for solution preparation G. Common laboratory solutions, buffers, and reagents **IX. Solutions, buffers, and reagents (Lab, 8 hours)** A. pH calculations and measurements B. Molecular weights, molarity, percent, parts ratios, and dilutions for solution preparation C. Common laboratory solutions, buffers, and reagents **X. Aseptic Technique and Decontamination (Lab, 10 hours)** A. Maintaining sterility and avoiding contamination of materials and your person B. Proper use of the autoclave to achieve sterility and decontamination C. Proper decontamination and disposal of used materials especially bacteriological waste **XI. Basic Laboratory Math (Lab, 8 hours)** A. Metric units and conversions B. Molarity C. Percentages D. Parts ratios E.Dilutions F. pH calculations G. Appropriate graph and chart construction and interpretations H. Significant figures I. Scientific notation J. Accuracy and precision **XII. Inventory and Supplies (Lab, 4 hours)** A. Types of inventory systems B. Performing an inventory C. Proper and improper labeling **XIII. Use and validation of common laboratory equipment (Lab, 12 hours)** A. Micropipettes B. Electronic analytical balances C. pH meters D. Spectrophotometers
Total Lecture Hours:	54
Total Laboratory Hours:	54
Total Hours:	108

Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	Maintain an industry standard notebook. Include the procedures, observations, relevant thought processes,and data. Analyze the results and develop conclusions.
Critical Thinking Assignment 1:	Work in a group of four students acting as the biotechnology company and the FDA audit. You will have the opportunity to participate in both groups. **Group 1 Biotechnology Group:** Write standard operating procedures (SOPs) based on your assigned biotechnology company. Follow your SOP's guidance to carry out the procedure.
Critical Thinking Assignment 2:	Work in a group of four students acting as the biotechnology company and the FDA audit. You will have the opportunity to participate in both groups. **Group 2 FDA: R**eview the ISO standard that applies to the biotechnology company that you are auditing. Sample data and review the SOPs from the biotechnology company.
Other Evaluation Methods:	Completion, Embedded Questions, Homework Problems, Laboratory Reports, Matching Items, Multiple Choice, Other Exams, Performance Exams, Presentation, Quizzes, Reading Reports, Term or Other Papers, True/False, Written Homework
If Other:	
Instructional Methods:	Demonstration, Discussion, Field trips, Group Activities, Guest Speakers, Lab, Lecture, Multimedia presentations, Role play/simulation
If other:	
Work Outside of Class:	Answer questions, Problem solving activity, Required reading, Skill practice, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	
Up-To-Date Representative Textbooks:	Biotechnology: A Laboratory Skills Course, Kirk Brown, BioRad 2018, ISBN: 978-0-9832396-3-5
Alternative Textbooks:	None
Required Supplementary Readings:	None
Other Required Materials:	Lab coat, safety glasses, and nitrile gloves.
Requisite	
Category	
Requisite course:	None
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	None
Requisite Skill and Matching skill(s): Bold	None

the requisite skill(s). if applicable	
Requisite course:	None
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	None
Requisite Skill:	Beginning algebra or higher or placement by appropriate assessment
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). if applicable	**Students need graphing skills and be able to set up and solve applilcation problems using various types of equations.** Using algebraic methods. Setting up and solving application problems. Identify different types of equations and solve them by applying the appropriate algebraic methods. Applying graphing techniques. Graph equations by applying different graphing techniques.
Enrollment Limitations and Category:	None
Enrollment Limitations Impact:	None
Course Created by:	Mia Dobbs
Date:	12/07/2021
Board Approved:	6/20/2022