

Glendale College

Course Outline of Record Report

Course ID 010547
Revision - May 2023

BIOL140 : Introduction to Biotechnology

General Information

Author:	<ul style="list-style-type: none"> Francien Rohrbacher
Course Code (CB01) :	BIOL140
Course Title (CB02) :	Introduction to Biotechnology
Department:	BIOL
Proposal Start:	Fall 2023
TOP Code (CB03) :	(0403.00) Microbiology
CIP Code:	(26.0502) Microbiology, General.
SAM Code (CB09) :	Clearly Occupational
Distance Education Approved:	Yes
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000624420
Curriculum Committee Approval Date:	05/24/2023
Board of Trustees Approval Date:	07/18/2023
Last Cyclical Review Date:	02/01/2021
Course Description and Course Note:	<p>BIOL 140 is a general introduction of biology as it relates to the field of biotechnology. Topics include the fundamental chemical processes common in prokaryotic and eukaryotic biology, chemistry of bio-molecules (proteins, enzymes, nucleic acids and lipids), cellular and molecular biology, basic immunology, and classical and molecular genetics with an emphasis on gene expression and genetic engineering. Lecture content also includes the history, business and ethics of biotechnology. The laboratory addresses basic skills and techniques common to the biotechnology industry. Laboratory topics include the measurement of activity and quantity of proteins, growth and manipulation of bacteria, genetic engineering and antibody methods. This course is intended for, but not limited to, students majoring in biotechnology and as a general education option for all students, including non-majors.</p>
Justification:	Transferability/C-ID Change
Academic Career:	<ul style="list-style-type: none"> Credit

Academic Senate Discipline

Primary Discipline:	<ul style="list-style-type: none"> Biological Sciences
Alternate Discipline:	<ul style="list-style-type: none"> Biotechnology
Alternate Discipline:	No value

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

Allow Students to Gain Credit by Exam/Challenge

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Not applicable.

Grading Basis

- Grade Only

Course Support Course Status (CB26)

Course is not a support course

Transferability & Gen. Ed. Options

General Education Status (CB25)

Not Applicable

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

IGETC Area	Area	Status	Approval Date	Comparable Course
5C-Science Laboratory	Science Laboratory	Approved	08/28/2023	No Comparable Course defined.
5B-Biological Science	Biological Science	Approved	08/29/2022	

CSU GE-Breadth Area	Area	Status	Approval Date	Comparable Course
B2-Life Science	Life Science	Approved	08/29/2022	No Comparable Course defined.
B3-Laboratory Activity	Laboratory Activity	Approved	08/28/2023	

C-ID	Area	Status	Approval Date	Comparable Course
BIOT	Biotechnology	Approved	08/30/2021	BIOT 101 B X - Introductory Biotechnology with Laboratory

Units and Hours

Summary

Minimum Credit Units (CB07)	4
Maximum Credit Units (CB06)	4
Total Course In-Class (Contact) Hours	108
Total Course Out-of-Class Hours	108
Total Student Learning Hours	216

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

Funding Agency Category (CB23)

This course was primarily developed using Economic Development funds.

Cooperative Work Experience Education Status (CB10)

Variable Credit Course

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	3	6
Laboratory Hours	3	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	54
Studio	0
Total	108
Course Out-of-Class Hours	
Lecture	108
Laboratory	0
Studio	0
Total	108

Time Commitment Notes for Students

No value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Advisory

MATH100 - College Algebra

Objectives

- Analyze the following functions: polynomial, rational, radical, absolute value, exponential and logarithmic (including definitions, evaluation, and domain and range);
- graph functions, including asymptotic behavior, intercepts, vertices and transformations;
- perform operations on functions;
- solve equations including: linear, polynomial, radical, rational, absolute value, exponential and logarithmic;
- model and solve STEM application problems;

AND

Advisory

ENGL101 - Introduction to College Reading and Composition

Objectives

- Read, analyze, and evaluate a variety of primarily non-fiction readings for content, context, and rhetorical merit with consideration of tone, audience, and purpose;
- write timed, in-class essays exhibiting acceptable college-level control of mechanics, organization, development, and coherence;
- integrate the ideas of others through paraphrasing, summarizing, and quoting without plagiarism;
- find, evaluate, analyze, and interpret primary and secondary sources, incorporating them into written essays using appropriate documentation format;
- proofread and edit essays for presentation so they exhibit no disruptive errors in English grammar, usage, or punctuation.

AND**Advisory**

CHEM110 - Elements Of General Chemistry

Objectives

- perform laboratory experiments correctly using appropriate techniques and safety procedures;

OR**Advisory**

CHEM120 - Fundamentals Of College Chemistry (Inorganic)

Objectives

- Identify and describe basic chemical data, rules, and laws

Entry Standards

Entry Standards

No value

Specifications**Methods of Instruction**

Methods of Instruction	Lecture
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Methods of Instruction	Laboratory
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Methods of Instruction	Discussion
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Methods of Instruction	Multimedia
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Methods of Instruction	Collaborative Learning			
Methods of Instruction	Demonstrations			
Methods of Instruction	Field Activities (Trips)			
Methods of Instruction	Guest Speakers			
Methods of Instruction	Presentations			
Out of Class Assignments				
<ul style="list-style-type: none"> • Field trip • Reading assigned chapters in course textbook(s), laboratory manual, and/or relevant scientific articles • Maintaining lab notebook that contains laboratory protocols (e.g. a written protocol that includes the title, purpose, materials needed, procedures, and expected results) • Homework assignment aimed at explaining and understanding major concept (e.g. problem solving on concept of protein synthesis, metabolism, and DNA replication) • Pre-lab quizzes 				
Methods of Evaluation	Rationale			
Presentation (group or individual)	Class presentation on relevant topics in biotechnology.			
Activity (answering journal prompt, group activity)	Regular class and laboratory activities, experiments related to course topics.			
Writing Assignment	Writing assignments that assess the ability to apply the theory of Good Laboratory Practices to reports and lab notebooks.			
Activity (answering journal prompt, group activity)	Laboratory practica that assess the ability to prepare and analyze graphs, follow a protocol, demonstrate basic lab skills and workplace competency, and explain deviations from the protocol.			
Exam/Quiz/Test	In class objective written examinations and quizzes that test for definitions and application of major biological concepts.			
Textbook Rationale				
No Value				
Textbooks				
Author	Title	Publisher	Date	ISBN
Thienman, Willian J.	Introduction to Biotechnology	Pearson	2018	978-0134650197

Simon, Eric J	Campbell Essential Biology	Pearson	2018	978-0134812946
Simon, Eric J.	Campbell Essential Biology with Physiology	Pearson	2018	321602072
Seidman, Lisa A.	. Basic Laboratory Methods for Biotechnology	Pearson	2009	9780321570147

Other Instructional Materials (i.e. OER, handouts)

Description	Introduction to Biotechnology
Author	Orange County Biotechnology Education Collaborative
Citation	No value
Online Resource(s)	No value

Learning Outcomes and Objectives

Course Objectives

List the morphologic and chemical differences between prokaryotic and eukaryotic cells

Define and distinguish among atoms, molecules, compounds, chemical bonds, mechanisms of chemical bond formation, and components of biological molecules

Construct the flow diagram of gene expression from DNA to protein

Translate the triplet code of DNA into primary protein structure

Assess the role of basic Mendelian genetics

Compare and contrast current applications of biotechnology to the areas of medicine, agriculture, diagnostics, and the environment

Explain evolution from a genetic perspective

Evaluate a recent development in the field of biotechnology from an ethical perspective

Demonstrate pipetting skills

Explain the importance of Good Laboratory Practices and record keeping

Explain how an antibody-based assay works (e.g. ELISA)

Perform bacterial transformation

Use of aseptic techniques in lab procedures, such as handling of bacteria, microbiology and molecular biology work.

Demonstrate proficiency in basic molecular techniques (e.g. DNA and protein analysis techniques)

Identify parts of a microscope

Use a microscope to view specimens

Employ a lab protocol and explain deviations from the protocol

SLOs

Analyze the differences between eukaryote and prokaryote cell structures and the importance of the four biomolecules.

Expected Outcome Performance: 70.0

BIOL
Core PLOs Prepare for a career in Biology by completing the AS degree in Biological Science (or AS-T in Biology) and/or being accepted for transfer to a 4-year university program in biology or a related field.

ILOs
General Education
analyze, interpret, and present research evidence
apply reasoning to evaluate hypotheses and theories
examine causality or associations between or among variables of the natural world

Apply the concepts of genetics and gene expression to applications in biotechnology and biomanufacturing.

Expected Outcome Performance: 70.0

BIOL
Core PLOs Demonstrate correct use of basic biology laboratory equipment, and critically examine and interpret biological data.
Prepare for a career in Biology by completing the AS degree in Biological Science (or AS-T in Biology) and/or being accepted for transfer to a 4-year university program in biology or a related field.

ILOs
General
Education

apply reasoning to evaluate hypotheses and theories

examine causality or associations between or among variables of the natural world

Demonstrate basic laboratory and safety skill, good Laboratory Practices as defined by industry standards, and record keeping.

Expected Outcome Performance: 70.0

<i>BIOL</i> Core PLOs	Demonstrate correct use of basic biology laboratory equipment, and critically examine and interpret biological data.
	Prepare for a career in Biology by completing the AS degree in Biological Science (or AS-T in Biology) and/or being accepted for transfer to a 4-year university program in biology or a related field.

<i>ILOs</i> General Education	apply reasoning to evaluate hypotheses and theories
	examine causality or associations between or among variables of the natural world

Demonstrate basic molecular biology techniques in protein, antibodies, and DNA analysis pertaining to biotechnology.

Expected Outcome Performance: 70.0

<i>BIOL</i> Core PLOs	Prepare for a career in Biology by completing the AS degree in Biological Science (or AS-T in Biology) and/or being accepted for transfer to a 4-year university program in biology or a related field.
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<i>ILOs</i> General Education	apply reasoning to evaluate hypotheses and theories
	examine causality or associations between or among variables of the natural world

Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No Value

Is this proposal submitted in response to learning outcomes assessment data?

No Value

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Overview of biotechnology (7 Hours)

- History of biotechnology
- GMOS and ethical aspects of biotechnology (e.g. gene manipulation)
- Careers in biotechnology

Techniques in biotechnology (6 Hours)

- Cloning, recombinant DNA technology
- PCR (polymerase chain reaction)
- Gel electrophoresis
- Enzymes

Applications (2 Hours)

- Medicine
- Agriculture
- Diagnostics
- Environment/Energy
- Fuels

Biomolecules and atomic structure (6 Hours)

- Atoms
- Molecules
- Compounds
- Mechanisms of chemical bond formation
- Biomolecule structures and features: carbohydrates, lipids, proteins, nucleic acids

Cell biology (prokaryotic/eukaryotic) (6 Hours)

- Morphologic differences
- Differences in DNA
- Differences in gene expression

Double-stranded DNA molecule (5 Hours)

- Alpha-helix
- DNA replication
- Meiosis and mitosis

Gene expression and the genetic code (7 Hours)

- Transcription from DNA to mRNA
- Translation from mRNA to a protein

Basic Mendelian genetics including inheritance of traits (4.5 Hours)

- Dominant and recessive traits
- Inheritance of traits
- Autosomal and sex-linked disorders

Evolution from the genetic perspective (3 Hours)**Basic physiology such as (3 Hours)**

- Homeostasis
- The immune system

Introduction to Energy/Metabolism (4.5 Hours)

- Photosynthesis
- Cellular respiration

Total Hours: 54**Laboratory/Studio Content****Introduction to biotechnology and laboratory (3 Hours)**

- Good manufacturing practices (aseptic and sterile techniques)
- Introduction to laboratory equipment and laboratory safety

Protein techniques (5 Hours)

- Protein assays
- Introduction to enzymes

DNA techniques (7 Hours)

- DNA electrophoresis
- Bacterial transformation
- Isolation of plasmid DNA/restriction digestion

Antibody methods (3 Hours)

- ELISA assay
- Home pregnancy test

Microbiology techniques (8 Hours)

- Streaking bacteria
- Use of microscope
- Streaking bacteria
- Gram staining

Basic lab skills (8 Hours)

- Laboratory measurements (including accuracy versus precision)
- The pH meter, working safely with acids and bases
- Pipetting skills

Basic lab skills (6 Hours)

- Good Laboratory Practices (record keeping, following protocols)
- Laboratory notebook documentation

Basic lab skills (8 Hours)

- Lab safety guidelines
- Aseptic and sterile techniques
- Disposal of hazardous materials, use of MSDS (Material Safety Data Sheets)

Basic lab skills (6 Hours)

- The metric system
- Graphs

Total Hours: 54