BIOT M10: INTRODUCTION TO BIOTECHNOLOGY

Originator
skarkare

Co-Contributor(s)

Name(s)
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College
Moorpark College

Attach Support Documentation (as needed)
BIOT Labor Market Information 032718.docx
Biotech Job Postings South Central Region Sept 2017- Aug 2018.xlsx
Biotech LMI data South Central Region 2017-22.xlsx

Discipline (CB01A)
BIOT - Biotechnology

Course Number (CB01B)
M10

Course Title (CB02)
Introduction to Biotechnology

Banner/Short Title
Introduction to Biotechnology

Credit Type
Credit

Start Term
Fall 2020

Co-listed (Same-as) Course(s)
BIOL M13

Taxonomy of Programs (TOP) Code (CB03)

0430.00 - *Biotechnology and Biomedical Technology

SAM Priority Code (CB09)

C - Clearly Occupational

Control Number

CCC000452376

Primary Minimum Qualification

BIOLOGICAL SCIENCES

Department

Biology/Zoology (1021)

Division

MC EATM, Life & Health Sci

Formerly
BIOT M01A

Catalog Course Description

Examines the role of molecular biology in the manufacturing of commercial pharmaceutical and agricultural products. Introduces basic biotechnology laboratory skills, including documentation, safety, and solution and buffer preparation. Develops student proficiency in aseptic techniques, spectrophotometry, molecular biology techniques, and electrophoresis.

Taxonomy of Programs (TOP) Code (CB03)

0430.00 - *Biotechnology and Biomedical Technology

Course Credit Status (CB04)

D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)

A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)

N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)

C - Clearly Occupational

Course Cooperative Work Experience Education Status (CB10)

N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)

Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)

N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)

Y - Not Applicable

Course Noncredit Category (CB22)

Y - Credit Course

Funding Agency Category (CB23)

Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)

1 - Program Applicable

General Education Status (CB25)

Y - Not Applicable

Support Course Status (CB26)

N - Course is not a support course

Field trips

Will not be required

Grading method

Letter Graded

Alternate grading methods

Student Option- Letter/Pass
Pass/No Pass Grading

Does this course require an instructional materials fee?

No

Repeatable for Credit

No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
52.5
Maximum Contact/In-Class Lecture Hours
52.5

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
52.5
Maximum Contact/In-Class Laboratory Hours
52.5

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
105
Total Maximum Contact/In-Class Hours
105

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
105
Maximum Outside-of-Class Hours
105

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
210
Total Maximum Student Learning Hours
210

Minimum Units (CB07)
4
Maximum Units (CB06)
4

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	discern between relevant versus irrelevant evidence to evaluate a scientific question.
2	formulate an appropriate hypothesis to explain provided and/or acquired observations.
3	distinguish between experiments to determine which ones lead to an appropriate conclusion based on provided and/or acquired scientific data.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	explain, identify, and demonstrate the use of standard laboratory equipment including spectrophotometers, centrifuges, balances, pH meters, micropipettes, and power supplies.
2	demonstrate/explain the importance of maintaining an accurate laboratory notebook.
3	write and follow laboratory protocols.
4	explain basic DNA replication and its application in molecular biological techniques.
5	perform calculations for solution preparation.
6	prepare solutions (molarity, percent, serial dilutions, pH and buffers).
7	describe basic cell types and structures.
8	explain the structure/function of cells and how they are utilized for molecular biology.
9	discuss/describe differences between prokaryotes and eukaryotes.
10	explain the necessity of maintaining sterile solutions and media and demonstrate aseptic technique in growing pure cultures.
11	explain and demonstrate validation of sterility.
12	generate a bacterial growth curve using spectrophotometry for optical density (O.D.) determination.
13	describe/demonstrate various types of chromatography (ion exchange, size-exclusion, affinity chromatography).
14	describe/demonstrate protein activity assays and total protein concentration assays.
15	describe/demonstrate the use of electrophoresis to analyze proteins.
16	describe the biology and process of cloning.
17	describe the four fundamental biological macromolecules and their functions.
18	describe the processes in molecular inheritance and gene expression.
19	discuss the impact of genetic engineering on our ability to prevent and treat disease.
20	describe the basic techniques and molecular tools used in DNA recombinant work.
21	discuss the significance and application of plant genetic engineering to our world.
22	discuss the significance and applications of animal bioengineering.
23	describe the contribution of DNA technology to forensic science.
24	debate the ethics of recombinant DNA technology in society.

Course Content

Lecture/Course Content

1. **(10%) Molecular Biology and Biotechnology Overview**
   a. History of biotechnology
   b. Type of biotechnology industry
   c. Biotechnology products
2. **(5%) Documentation**
   a. Laboratory notebooks
   b. Standard operating procedure
3. **(10%) Laboratory Safety**
   a. Chemical safety
   b. Personal protection
   c. Electric safety
   d. Risk assessment
4. **(10%) Chemistry**

   a. Solutions, volume, mass, molarity, pH and buffers
   b. Measurement, metric, exponents, logarithims
   c. Serial dilutions
5. **(15%) Protein Chemistry**
   a. Structure and function
   b. Macromolecules
6. **(15%) Cell Biology**
   a. Structure and function
   b. Identification of cell types
   c. Cloninig and reproduction
7. **(15%) Microbial Techniques**
   a. Identification of micro-organism
   b. Aseptic technique
   c. Preparing liquid and solid media
   d. Grow pure cultures of bacteria cells
   e. Calibrate growth curve to optical density
   f. Serial dilution
8. **(10%) Molecular Biology**
   a. History of DNA
   b. DNA structure and function
   c. Isolating DNA and manipulating DNA
   d. Protein synthesis
9. **(10%) Spectrophotometry**
   a. Electromagnetic radiation
   b. Absorption and action spectra
   c. Solution and dilutions
   d. Calibration curves
   e. Application of Beer's Law
   f. Determination of unknowns

Laboratory or Activity Content

1. (15%) Laboratory safety and good documentaion practices
2. (10%) Laboratory measurements, spectrophotometry
3. (20%) Solutions, dilutions, buffers, and pH
4. (20%) Protein extraction, purification, and assay
5. (15%) Aseptic technique, bacterial culture, and growth
6. (20%) Molecular Biology techniques (e.g., PCR (polymerase chain reaction), gene cloning)

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations
Written expression

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Classroom Discussion
Computational homework
Essay exams
Group projects
Individual projects
Journals
Laboratory activities
Laboratory reports
Objective exams
Oral presentations
Projects
Problem-solving exams
Participation
Quizzes

Reports/Papers/Journals
Reports/papers
Research papers
Skills demonstrations

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
Computer-aided presentations
Collaborative group work
Class activities
Class discussions
Case studies
Distance Education
Demonstrations
Field trips
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Internet research
Laboratory activities
Lecture
Other (specify)

Specify other method of instruction

Technique demonstrations and facilitation of discussion forums.

Describe specific examples of the methods the instructor will use:

- Demonstrate how to prepare an agarose gel in the lab.
- Demonstrate how to perform a restriction digest on DNA.
- Analyze DNA after restriction digest and gel electrophoresis.

Representative Course Assignments

Writing Assignments

1. Document the purpose, materials and methods, procedure, results, and conclusion for DNA restriction analysis lab in a lab notebook.
2. Write flow charts for all laboratory experiments.
3. Write a description of the manufacturing method used for producing recombinant proteins using bacteria.

Critical Thinking Assignments

1. Debate the pros and cons of genetic engineering for genetically modified organisms (GMOs).
2. Analyze the data from the cheese lab to determine if recombinant rennin is more effective for producing cheese than bovine rennin.
3. Conduct analysis and problem solving based on case study in biotechnology lab.

Reading Assignments

1. Read current articles in “Bioprocess International” magazine.
2. Read Federal Drug Administration regulations for pharmaceutical manufacturing – CFR 21 parts 210 and 211.

Skills Demonstrations

1. Demonstrate the ability to use pH meters.
2. Demonstrate the ability to make solutions of different molarities, weight/volume concentrations and % weight/volume solutions.
3. Demonstrate the ability to make dilutions of stock solutions.

Outside Assignments

Representative Outside Assignments

1. Research the manufacturing process of a Biotechnology product and prepare an oral presentation.
2. Complete problem sets, such as molarity and dilution calculations.
3. Complete assigned reading from text and other sources.

Articulation

C-ID Descriptor Number

BIOT 150BX

Status

Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
UC Davis	BIOTECH 1Y	Introduction to Biotechnology	4
UC Santa Cruz	BME 5	Introduction to Biotechnology	5

Comparable Courses within the VCCCD

BIOT V30 - Introductory Biotechnology
BIOT V31 - Applied Biotechnology with Lab

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
SD Miramar College	BIOL 131	Introduction to Biotechnology	4
College of the Canyons	BIOSCI 230	Introduction to Biotechnology	4

Attach Syllabus

BIOTM10 Syllabus Fall 2019 Aug 13.pdf

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable

Yes

CSU Baccalaureate List effective term:

SPRING 2008

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Description
Barnum, Susan. *Biotechnology: An Introduction. 2nd.,* Cengage, 2006.

Resource Type
Textbook

Description
Daugherty, Ellyn. *Biotechnology, Science for the New Millennium.* (Revised), EMC/Paradigm, 2012.

Resource Type
Textbook

Description
Seidman, Lisa, and Cynthia Moore. *Basic Laboratory Methods for Biotechnology.* 2nd., Pearson, 2009.

Resource Type
Textbook

Description
Micklos, David, and Greg Freyer. *DNA Science: A First Course. 2nd.,* Cold Spring Harbor Laboratory, 2003.

Library Resources

Assignments requiring library resources
Using the Library's print and online resources, research paper topics appropriate to the course.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Prepare a presentation on an assigned case study about a biotechnology industry product or process using online trade journals such as Bioprocessing International or Biotechnology Journal.

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (51–99% online)

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

No

Regular Effective/Substantive Contact

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	engage in asynchronous discussion groups on topics related to the ethical issues of genetic engineering
E-mail	submit written assignments via email; assignments such as, but not limited to, dilutions and molarity calculations;
Other DE (e.g., recorded lectures)	computer lab simulations, electronically based assignments, and any typical assignments an instructor may choose to require
Synchronous Dialog (e.g., online chat)	discussions on case studies presented to students

Examinations

Hybrid (51%–99% online) Modality

Online
On campus

Primary Minimum Qualification

BIOTECHNOLOGY

Review and Approval Dates

Department Chair

11/19/2019

Dean

11/19/2019

Technical Review

12/05/2019

Curriculum Committee
01/21/2020

DTRW-I
MM/DD/YYYY

Curriculum Committee
MM/DD/YYYY

Board
MM/DD/YYYY

CCCCO
01/24/2020

Control Number
CCC000452386

DOE/accreditation approval date
MM/DD/YYYY