

BIOT M02D: BIOPROCESSING: RECOVERY AND PURIFICATION

Originator

achen

College

Moorpark College

Attach Support Documentation (as needed)

BIOT Labor Market Information 032718.docx
 Biotech LMI data South Central Region 2017-22.xlsx
 Biotech Job Postings South Central Region Sept 2017- Aug 2018.xlsx

Discipline (CB01A)

BIOT - Biotechnology

Course Number (CB01B)

M02D

Course Title (CB02)

Bioprocessing: Recovery and Purification

Banner/Short Title

Bioprocess:Recovery & Purif

Credit Type

Credit

Start Term

Fall 2021

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

BIOL M12D

Taxonomy of Programs (TOP) Code (CB03)

0430.00 - *Biotechnology and Biomedical Technology

SAM Priority Code (CB09)

C - Clearly Occupational

Control Number

CCC000452381

Primary Minimum Qualification

BIOLOGICAL SCIENCES

Department

Biology/Zoology (1021)

Division

MC EATM, Life & Health Sci

Catalog Course Description

Provides skills training in industrial biotechnology with emphasis on manufacturing pharmaceuticals. Introduces bioprocessing, recovery, and purification techniques. Focuses on protein separation and purification, chromatography, large-scale recovery, and identification of assays. Reviews skills necessary for a successful job search in the field of biotechnology.

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)

B (Transferable to CSU only)

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

17.5

Maximum Contact/In-Class Lecture Hours

17.5

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

70

Total Maximum Contact/In-Class Hours

790

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class

Minimum Outside-of-Class Hours

35.0

Maximum Outside-of-Class Hours

35.0

Total Student Learning

Total Student Learning

Total Minimum Student Learning Hours

105.0

Total Maximum Student Learning Hours

105.0

Minimum Units (CB07)

2

Maximum Units (CB06)

2

Student Learning Outcomes (CSLOs)

Upon satisfactory completion of the course, students will be able to:

- | | |
|---|--|
| 1 | use chromatography techniques to successfully purify a candidate protein from a mixture of proteins. |
| 2 | use tangential flow filtration to concentrate a batch of proteins. |

Course Objectives

Upon satisfactory completion of the course, students will be able to:

- | | |
|---|---|
| 1 | identify and describe protein purification techniques. |
| 2 | demonstrate competency in terminology and acronyms applicable to recovery and purification. |
| 3 | demonstrate skills and knowledge in use of purification equipment. |
| 4 | apply purification concepts to the production of a therapeutic protein. |
| 5 | describe/demonstrate techniques for isolation of proteins from cells and tissue. |
| 6 | identify and explain the function of process equipment. |
| 7 | demonstrate knowledge of and ability to use materials and supplies in purification processes. |

Course Content**Lecture/Course Content**

1. (8%) Protein Expression
2. (8%) Principles of Protein Separation
3. (7%) Recovery-Centrifugation
4. (7%) Sterile Filtration
5. (7%) Tangential Flow Filtration
6. (7%) Affinity Chromatography
7. (7%) Ion-exchange Chromatography
8. (7%) Principles of Chromatograph Scale-up
9. (7%) Contaminants
10. (7%) Validation/Scaledown
11. (7%) Large Scale Column Packing
12. (7%) Immunassay
13. (7%) Recovery-Cell Disruption
14. (7%) Assay for Identity-SDS-PAGE (Sodium Dodecyl Sulfate Poly-Acrylamide Gel Electrophoresis) Assay

Laboratory or Activity Content

1. (10%) Basic Lab Skills: Lab Notebook, Protocols, Buffer Prep, Protein Concentration
2. (30%) Chromatography
3. (10%) Protein Analysis
4. (20%) Protein Recovery, Folding, and Precipitation
5. (20%) Filtration
6. (10%) Job Search Preparation

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

Computer-aided presentations
Class activities
Class discussions
Case studies
Distance Education
Field trips
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Internet research
Laboratory activities
Lecture
Practica

Describe specific examples of the methods the instructor will use:

- Discuss the principles of protein separation and show students how to perform protein separation and recovery.
- Show students how to different chromatography techniques (for example, affinity chromatography and ion-exchange chromatography).

Representative Course Assignments

Writing Assignments

1. Document the purpose, materials and methods, procedure, results, and conclusion for the Tangential Flow Filtration experiment in a lab notebook.
2. Write the Standard Operating Procedure (SOP) for purifying a monoclonal antibody from cell culture media using affinity chromatography.
3. Keep log books.
4. Write reports of experimental results.
5. Keep a detailed laboratory notebook.

Critical Thinking Assignments

1. Analyze data obtained from the chromatography column packing experiment to calculate the Height Equivalent of a Theoretical Plate (HETP).
2. Analyze chromatograms obtained from chromatography experiments.
3. Compose a written summary of experiments and data analysis.
4. Solve problem sets.

Reading Assignments

1. Read papers on protein recovery and purification from Bioprocess International magazine.
2. Read the Standard Operating Procedure (SOP) for tangential flow filtration prior to performing the lab.
3. Read current biotechnology papers on bioprocessing, recovery, and purification techniques.

Skills Demonstrations

1. Demonstrate chromatography technique at small scale.
2. Demonstrate skill in analyzing proteins.

Outside Assignments**Representative Outside Assignments**

1. Complete problem sets involving calculation of protein yield and purity from purification processes.
2. Prepare a group presentation on the process for purifying a specific therapeutic drug product (e.g. Epogen manufactured by Amgen).
3. Apply and utilize the CFRs (Code of Federal Regulations).
4. Read assigned writings and industry-specific articles.

Articulation**C-ID Descriptor Number**

BIOT 220BX

Status

Approved

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
Contra Costa College	BIOSC 186	Protein Purification and Analysis	2
Irvine Valley College	BIOT 274	Biotechnology B: Proteins	4
Santa Ana College	BIOL 192	Biotech B: Proteins	1.5

Attach Syllabus

M02D S19 Course Syllabus.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:

S'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****Area F: Ethnic Studies****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

DescriptionMoorpark College and Industry Partners. *Industrial Biotechnology: A Training Manual*. Cengage Learning, 2001.**Resource Type**

Textbook

DescriptionFlickinger, Michael, ed. *Downstream Industrial Biotechnology: Recovery and Purification*. Wiley, 2013.**Library Resources****Assignments requiring library resources**

Using the Library's print and online resources to locate industry-related articles and to research topics for oral presentations.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Use the online library resources to research single-use filtration systems for concentrating protein solutions.

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (51%–99% online)

Hybrid (1%–50% online)

100% 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.

Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular Asynchronous discussion boards will be used to encourage discussion among students where they can compare and contrast/discuss /identify and analyze elements of course outcomes. Other Discussion boards will also be used for Q&A and general class discussion by students and instructor to facilitate student practice in application of recovery and purification in bioprocessing.
E-mail	Questions and answers between students and instructor, class announcements and memos, assignment submissions by students
Other DE (e.g., recorded lectures)	Faculty will use a variety of tools and media integrated within the LMS to help students reach SLO such as: <ul style="list-style-type: none"> o Recorded Lectures, Narrated Slides, Screencasts o Instructor created content o MC Online Library Resources o Canvas Student Groups (Assignments, Discussions) o Websites and Blogs o Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)
Synchronous Dialog (e.g., online chat)	Synchronous online lectures, online chat forums
Video Conferencing	Video-conferenced lectures, discussion forums, office hours

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Examinations

Hybrid (1%–50% online) Modality

- Online
- On campus

Hybrid (51%–99% online) Modality

- Online
- On campus

Primary Minimum Qualification

BIOTECHNOLOGY

Review and Approval Dates

Department Chair

MM/DD/YYYY

Dean

MM/DD/YYYY

Technical Review

MM/DD/YYYY

Curriculum Committee

10/06/2020

DTRW-I

MM/DD/YYYY

Curriculum Committee

MM/DD/YYYY

Board

01/19/2021

CCCCO

MM/DD/YYYY

DOE/accreditation approval date

MM/DD/YYYY