BIOT M02C: MANUFACTURING: CELL CULTURE AND MICROBIAL FERMENTATION

Originator skarkare

Co-Contributor(s)

Name(s)

Chen, Audrey (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) M02C

Course Title (CB02) Manufacturing: Cell Culture and Microbial Fermentation

Banner/Short Title Cell Culture/Microbial Ferment

Credit Type Credit

Start Term Fall 2020

Co-listed (Same-as) Course(s) BIOL M12C Taxonomy of Programs (TOP) Code (CB03)

0430.00 - *Biotechnology and Biomedical Technology

SAM Priority Code (CB09)

C - Clearly Occupational

Control Number

CCC000452380

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 cell culture and microbial fermentation. Focuses on bacterial techniques, microbial assessment, mammalian cell culture, bioreactor fermentation, and media preparation. Compares small and large industrial scale cell culture.

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 105 Maximum Contact/In-Class Laboratory Hours 105

Total in-Class

Total in-Class Total Minimum Contact/In-Class Hours 122.5 Total Maximum Contact/In-Class Hours 122.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class Minimum Outside-of-Class Hours 35 Maximum Outside-of-Class Hours 35

Total Student Learning

Total Student Learning Total Minimum Student Learning Hours 157.5 Total Maximum Student Learning Hours 157.5 Minimum Units (CB07) 3 Maximum Units (CB06) 3

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:		
1	produce healthy cultured mammalian cells in a spinner flask.		
2	verify and critique the success of cell cultures through high cell count and viability.		
Course Obje	ctives		
	Upon satisfactory completion of the course, students will be able to:		
1	explain the role and significance of cell culture and fermentation in bioprocessing.		
2	demonstrate competency in terminology and acronyms applicable to cell culture and microbial fermentation.		
0	demonstrate skills and knowledge in use of call sulture equipment		

- 3 demonstrate skills and knowledge in use of cell culture equipment.
- 4 apply cell culture concepts to the production of a therapeutic protein.
- 5 demonstrate proficiency in cell culture and microbial fermentation.
- 6 demonstrate proficiency in clean room and aseptic technique.
- 7 demonstrate knowledge of and ability to use materials and supplies in cell culture processes.

Course Content

Lecture/Course Content

- 1. (5%) Basic concepts of microbiology
- 2. (5%) Bacterial identification
- 3. (4%) Aseptic technique
- 4. (5%) Mycoplasma
- 5. (5%) Cell culture media
- 6. (5%) Small scale cell culture
- 7. (5%) Overview of cell culture
- 8. (4%) Cell enumeration
- 9. (5%) Large scale media preparation
- 10. (5%) Spinner flask
- 11. (5%) Bioreactor operation
- 12. (5%) Large scale cell culture
- 13. (5%) Cryopreservation
- 14. (5%) Industry tour
- 15. (4%) Molecular overview
- 16. (4%) Microbial media
- 17. (5%) Microbial fermentation
- 18. (4%) Scale-up fermentation
- 19. (5%) Emerging technologies such as stem cell culture, biofuels and single use equipment
- 20. (5%) Microbial media design and prep
- 21. (5%) Metabolite analysis

Laboratory or Activity Content

- 1. (3%) Basic concepts of microbiology
- 2. (5%) Gram stain, fungal stain
- 3. (3%) Bacterial identification
- 4. (3%) Laminar Air Flow (LAF) use/cleaning
- 5. (3%) Aseptic hood work
- 6. (5%) Mycoplasma identification
- 7. (3%) Polymerase chain reaction, electrophoresis (PCR)
- 8. (3%) Cell culture media preparation
- 9. (3%) Large scale media prep
- 10. (3%) Media and aseptic evaluation
- 11. (3%) Initiate cultures
- 12. (3%) Review microscopy
- 13. (3%) Cell enumeration/viability

- 14. (9%) Media prep/filtration
- 15. (3%) Inoculate bioreactor
- 16. (10%) Maintain culture
- 17. (3%) Cryopreservation of culture
- 18. (3%) Process evaluation
- 19. (3%) Cell culture tour
- 20. (4%) Protein expression/green fluorescent protein (GFP)
- 21. (5%) Microbial media prep
- 22. (5%) Bacterial growth
- 23. (5%) Microbial fermentation
- 24. (4%) Scale-up and data analysis
- 25. (3%) Metabolite analysis

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 Collaborative group work **Class** activities Class discussions Case studies **Demonstrations** Field trips Group discussions Guest speakers Instructor-quided interpretation and analysis Instructor-guided use of technology Internet research Laboratory activities Lecture Practica Small group activities

Describe specific examples of the methods the instructor will use:

- · Discuss the basis of bacterial and mycoplasma identification.
- Demonstrate aspetic hood procedures and cell culture media preparations.
- · Demonstrate proper microscope usage and set-up.

Representative Course Assignments

Writing Assignments

- 1. Document the purpose, materials and methods, procedure, results, and conclusion for the Oxygen Transfer Rate/ Oxygen Uptake Rate experiment in a lab notebook.
- 2. Write a Standard Operating Procedure (SOP) for operating a bioreactor to culture Chinese Hamster Ovary (CHO) cells for producing a recombinant protein.
- 3. Write a summary and analysis of guest lectures or other outside-of-class presentations.
- 4. Keep written logbooks.
- 5. Write reports of experimental results.

Critical Thinking Assignments

- 1. Solve problem sets involving calculations for appropriate inoculum volumes for cell culture passaging.
- 2. Analyze the data from the OTR/OAR experiment to determine the best strategy for enhancing oxygen transfer in shake flasks.
- 3. Perform data evaluation.

Reading Assignments

- 1. Read papers on mammalian cell culture and microbial fermentation from Bioprocess International magazine.
- 2. Read the Standard Operating Procedure (SOP) for cell culture passaging prior to performing the lab.
- 3. Read and learn how to use equipment (for example, pH meter, balance, micropipettes, centrifuges, biosafety cabinets, metabolite analyzers, incubators, etc.).

Skills Demonstrations

- 1. Demonstrate proficiency in aseptic technique.
- 2. Demonstrate proficiency in cell enumeration, metabolite analysis, and other analytical techniques.

Outside Assignments

Representative Outside Assignments

- 1. Prepare a report on Biofuel manufacturing technologies using algae.
- 2. Complete problem sets involving calculation of cell counts from hemacytometer data and prediction of cell concentration as a function of time.
- 3. Plan group presentations.
- 4. Apply and utilize the CFRs (Code of Federal Regulations).

Articulation

C-ID Descriptor Number

BIOT 230X

Status

Aligned

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
American River College	BIOT 312	Biotechnology Laboratory Methods - Microbial and Cell Culture Techniques	2
Irvine Valley College	BIOT 77	Biotechnology: Cell Culture	2

Attach Syllabus

M02C Syllabus Fall 2019.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 Moorpark College and Industry Partners. *Industrial Biotechnology: A Training Manual*. Cengage Learning, 2001.

Resource Type Textbook

Description Hu, Wei-Shou, ed. *Cell Culture Bioprocess Engineering*. Wei-Shou Hu, 2012.

Resource Type

Textbook

Classic Textbook

No

Description

Freshney, R. Ian. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. 7th ed., Wiley-Blackwell, 2016.

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 companies involved in cell therapy and tissue engineering.

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 CCC000426879

DOE/accreditation approval date MM/DD/YYYY