MiraCosta College

BTEC 221 - BIOPROCESSING: CELL CULTURE AND SCALE-UP

Units Lecture	0.80	**Units Lab**	0.80	**Units Total**	1.50
Total Hrs Lecture	12.00	**Total Hrs Lab**	37.00	**Total Course Hrs**	49.00

COURSE DESCRIPTION

This laboratory course develops the skills and knowledge related to the culture of cells in increasingly larger scales for the production of biological molecules. Students will grow and monitor a variety of cells (bacterial, yeast, and/or mammalian) on a laboratory scale that emulates the large-scale production used in industry. Students will become familiar with the cleaning, sterilization, aseptic inoculation, operation, and monitoring of fermenters and bioreactors. The course emphasizes the use of current Good Manufacturing Practices (cGMP), process control strategies, and students gain experience following Standard Operating Procedures (SOP). Not open to students with credit in BTEC 220.

ENROLLMENT RESTRICTIONS

PREREQUISITES	*COREQUISITES*	*ADVISORIES*
None	None	BTEC 110; BTEC 120; Eligibility for ENGL 100.

OUTLINE OF COURSE CONTENT

The course will address the following topics:

Students will be required to analyze, evaluate, compare, and perform tasks related to the following concepts and techniques. |hrs lec; hrs lab|

I) Principles of cell culture. |5; 14|
A) Basics of cell growth.
1) Bacterial, yeast, and mammalian growth curve characteristics.
2) Requirements for growing and harvesting bacteria and yeast cells.
3) Animal tissue culture.
B) Cell nutrient requirements and media.
1) Media components and batching media.
2) pH control.
3) Dissolved oxygen concentration.
4) Osmolality.
5) Carbon dioxide concentration.
C) Bioreactor parts and characteristics.
D) Culture techniques: batch, fed-batch, and perfusion culture.
E) Research, scale up, and production levels of fermentation.

II) Bioreactor operations.|5 ; 18|
A) Media preparation.
B) Bioreactor cleaning.
C) Sterilization (autoclave theory and operation).
D) Aseptic inoculation.
E) Operation and monitoring.
F) Cell and external media harvesting.

III) Growth analysis and communication of results.|2 ; 4|
A) Cell numbers and density.
B) Communicate results and analysis in written and seminar format.

PERFORMANCE OBJECTIVES

Upon successful completion of this course, students will be able to do the following:

a. Work in teams. The purpose of the team format is to emulate the industrial working environment that promotes a sense of responsibility, self esteem, self management, integrity and honesty, and ability to work in a social setting that emphasizes the following skills:

MiraCosta College

1. Generate new ideas, individually or as a group.
2. Formulate alternative solutions.
3. Develop a plan of action.
4. Interpret data in all formats.
5. Apply principles to solutions of problems.
6. Develop a learning environment.

b. Apply the basic biological concepts that underlie the growth characteristics of bacterial, yeast, and mammalian cells.

c. Select and properly use the appropriate instrumentation required to prepare materials for cell culture.

d. Select and properly use the appropriate instrumentation required to monitor and control cell culture parameters.

e. Apply biochemical concepts to the function of bioreactor components.

f. Grow cells in a bioreactor including media preparation and bioreactor cleaning, sterilization, aseptic inoculation, operation, monitoring, and cell harvesting.

g. Use current Good Manufacturing practices (cGMP) principles by following Standard Operating Procedures (SOP) and keeping records in Batch Production Record (BPR) format.

h. Communicate results and analysis in written and seminar format.