

Biotechnology

Industrial Biotechnology

Program Description

This program prepares graduates to work in the biotechnology industry as production technicians. A production technician operates and maintains the equipment used to manufacture protein pharmaceutical products. Students will grow bacterial, yeast, and mammalian cells and recover the proteins that they produce. They will follow good manufacturing practices by maintaining records in order to comply with quality assurance procedures and government regulations. Students in the program must be able to adjust their time to a flexible schedule.

Certificate of Achievement and Associate in Science Degree

The Certificate of Achievement can be obtained upon completion of the 22-24-unit major with a grade of C (2.0) or better in each course. The Associate in Science Degree can be obtained upon completion of 60 units, including the major, general education requirements and electives. All courses in the major must be completed with a grade of C or better or a P if the course is taken on a Pass/No Pass basis.

Program Outcomes

Students who complete the Certificate of Achievement/Associate Degree will be able to:

1. A successful student should understand the structure and function of protein pharmaceuticals and evaluate which protein properties a production facility can exploit to purify a particular protein from other cellular components.
2. In preparation for working at a biotechnology company, a successful student should be able to construct a pathway analyzing how a drug or biologic is produced by genetically engineered cells and subsequently purified.

REQUIRED COURSES	Units
BIOT 051 Principles of Biotechnology	3
BIOT 052 Business and Regulatory Practices in Biotechnology	3
BIOT 062 Cell Culture and Protein Recovery	4
BIOT 063 Biotechnology Instrumentation: Quality Control & Genetic Engineering	4
BIO 014 Principles of Microbiology	4
OR	
BIO 002 Principles of Cell and Molecular Biology	5
CHEM 010 Intermediate Chemistry	4
OR	
CHEM 001 General Chemistry	5
Total Units	22 – 24

NOTE: Prior knowledge and use of computers is advised, including word processing, spreadsheets, and databases.

Biotechnology

Applied Biotechnology

Certificate of Achievement

A Certificate of Achievement can be obtained by completion of the 18-unit major with a grade of C or better or a P if the course is taken on a Pass/No Pass basis in each course.

Program Outcomes

Students who complete the Certificate of Achievement will be able to:

1. A successful student should understand the structure and function of protein pharmaceuticals and evaluate which protein properties a production facility can exploit to purify a particular protein from other cellular components.
2. In preparation for working at a biotechnology company, a successful student should be able to construct a pathway analyzing how a drug or biologic is produced by genetically engineered cells and subsequently purified.

REQUIRED COURSES	Units
BIOT 051 Principles of Biotechnology	3
BIOT 052 Business and Regulatory Practices in Biotechnology	3
BIOT 062 Cell Culture and Protein Recovery	4
BIOT 063 Biotechnology Instrumentation: Quality Control & Genetic Engineering	4
BIOT 160 Basic Concepts/Methods in Biotechnology ...	4
Total Units	18

Note: Prior knowledge and use of computers is advised, including word processing, spreadsheets, and databases.

Industrial & Applied Biotechnology

BIOT 051 **3 Units**
Principles of Biotechnology
Prerequisite: BIO 014 or BIO 002 or BIOT 160. *Course Advisory:* SCC minimum Math standard and Eligibility for ENGL 001. This course covers topics important in the development, production, recovery, and analysis of products produced by biotechnology. The course traces the path of a drug or biologic from the cell through the production facility, the final processing, and into the human body. It discusses the growth characteristics of the organisms used to produce pharmaceutical proteins, the techniques used in product recovery, and the techniques used in product analysis. *Three hours lecture.*

BIOT 052 **3 Units**
Business and Regulatory Practices in Biotechnology
Course Advisory: Eligibility for ENGL 001; SCC minimum Math standard. Examines how basic business principles and sound manufacturing procedures assure the quality and safety of a product as the manufacturing team moves a product down the biotechnology production pipeline. It explores the role of governmental oversight and regulation during the discovery, development, and manufacturing of new products produced by biotechnology. *Three hours lecture.*

BIOT 062 **4 Units**
Cell Culture and Protein Recovery
Prerequisite: BIOSC 014 or BIOSC 002 or BIOTCH 160. *Course Advisory:* Eligibility for ENGL 001. This laboratory course teaches the skills needed to serve as a technician in biotechnology production. Students grow and monitor bacterial, yeast, and mammalian cells 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. Students then recover and purify proteins produced by those cell cultures. They recover and purify proteins using centrifugation, ultrafiltration, and chromatography techniques. The course emphasizes the use of current Good Manufacturing Practices (cGMP), and students gain experience following Standard Operating Procedures (SOP). *Two hours lecture, six hours lab.*

Biotechnology

BIOT 063

4 Units

Biotechnology Instrumentation:

Quality Control & Genetic Engineering

Prerequisite: BIO 014 or BIO 002 or BIOT 160. *Course Advisory:* Eligibility for ENGL 001. Familiarizes students with small scale laboratory practices, both those used in a research laboratory and those used by a quality control department in industry, to analyze the quality of a cell culture process and the purity of protein products produced by cells in culture. The course emphasizes the use of Good Laboratory Practices (GLP) in these analyses. Students will gain experience in techniques used to analyze nucleic acids and in the genetic engineering of cells. They will also gain experience with the common assays used in Quality Control including electrophoresis, High Performance Liquid Chromatography (HPLC), Enzyme Linked Immunosorbant Assay (ELISA), and Polymerase Chain Reaction (PCR) to test products generated using cell culture. *Two hours lecture and six hours lab.*

BIOT 160

4 Units

Basic Concepts/Methods in Biotechnology

Prerequisite: MATH 104 or MATH 114 or equivalent.

Course Advisory: SCC minimum English and Math standards. **NOTE: Not open to students who have completed CHEM 001, CHEM 010, BIO 002, BIO 014, or equivalent.** This course is not designed for students intending to transfer. This course is not designed for students intending to transfer. This course serves as a prerequisite to Solano College's biotechnology courses by giving students knowledge of the basic concepts in biology and chemistry used in biotechnology while also developing the basic laboratory skills required to succeed in the field. *Two hours lecture, six hours lab.*