# *Industrial Biotechnology*

*Math & Science Division*

## 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.

## Required Courses

| | Units |
|---|---|
| BIOT 051—Principles of Biotechnology | 3 |
| BIOT 052—Business & 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 units) OR BIO 002—Principles of Cell and Molecular Biology (5 units) | 4-5 |
| CHEM 010—Intermediate Chemistry (4 units) OR CHEM 001—General Chemistry (5 units) | 4-5 |
| | 22-24 |

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

**BIOT 051** **3 Units**

**Principles of Biotechnology**
***Prerequisite: BIO 014 or BIO 002 or BIOT 160. Course Advisories: SCC minimum English and Math standards.*** 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 Advisories: 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**
***Prerequisites: BIO 014 or BIO 002 or BIOT 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 and six hours lab weekly.***

**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 weekly.***

**BIOT 160** **4 Units**

**Basic Concepts/Methods in Biotechnology**
***Prerequisite: Math 104 or Math 114. Course Advisories: SCC minimum English and Math standards.*** 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 this field. 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. ***Two hours lecture and six hours lab weekly.***