

Biotechnology

"Biotechnology is a promising young field that is predicted to be one of the pivotal forces of the 21st Century. Today it is saving lives through the development of breakthrough drugs and improving the quality of life with new agricultural and environmental products."

Biotechnology Industry

Organization

Career Opportunities

Aseptic Fill Assistants	Assay Analysts
Aseptic Fill Technicians	Instrumentation/Calibration Tech.
Manufacturing Technicians	Cell Culture & Fermentation Assistant
Purification Technicians	Cell Culture & Fermentation Tech.
Documentation Clerks	Quality Control Inspectors
Validation Technicians	

Division - Science/Math/Engineering

Dean - Floyd Martin, Division Phone 378-1459

Faculty

Full-Time	Counselors
Maureen Harrigan	Frank Bianchino
	Mary Martin
	Danita R. Redd

■ Biotechnology

Occupational

Associate in Science Degree Certificate of Achievement

Biotechnology is a rapidly growing industry with projections for continued growth and exciting opportunities for employment. The Biotechnology Training Program at Moorpark College was designed by members of local industry (Baxter Healthcare Corporation and AMGEN) to provide students with unsurpassed technical experiences and training in manufacturing biotechnology. This curriculum focuses on the technologies and processes utilized by the Manufacturing component of the Biotechnology industry. Through a combination of basic science courses and laboratory instruction, students will acquire the skills and competencies needed for high level performance within this industry. Students have an option to receive a Certificate of Achievement in Biotechnology upon completion of the core courses or an Associate in Science Degree in Biotechnology if general education requirements are also fulfilled.

Preparation for the major:

- Mathematics - two years high school algebra or Math 1 and 3.
- Chemistry - Students choosing Chem 1A/1B option need one year high school chemistry or Chem 12.
- English - English 1A

Biotechnology students are strongly encouraged to take advantage of summer school class offerings.

Required Courses:	Units
Chem 12/13.....Introductory Chemistry I/II	10
or	
Chem 1A/1B.....General Chemistry I/II.....	12
Cis 28.....Microsoft Office Professional	3
Math 15.....Introductory Statistics	5
Engl 11.....Report and Technical Writing	3
Bio 2A.....General Biology I.....	4
Micro 1.....Principles of Microbiology	5
Phys 1.....Human Physiology	5
Biotech 1.....Introduction to Biotechnology	5
Biotech 2A.....Plant Design	1
Biotech 2B.....Process Support	1
Biotech 2C.....Manufacturing Technology: Cell Culture, Microbial	1
.....Fermentation	1

Biotech 2D..... Manufacturing Technology: Recovery, Purification.....	1
Biotech 2E..... Manufacturing Technology: Formulation, Fillings, Packaging	1
Biotech 2F..... Quality Control: Applied Analytical Methods	1
Biotech 2G..... Environmental Control	1
Biotech 2H..... Validation.....	1
Total minimum units required in major area --	48 or 50

Recommended Course: Physics 1

Students desiring an A.S. Degree in Biotechnology must also complete general education requirements.

Chem 1A and Chem 1B should be taken by students planning to transfer.

Suggested Course Sequence:

First Semester	Third Semester
Chem 12 or Chem 1A.....5 or 6	Micro 1.....5
Cis 28.....3	Biotech 1.....5
Math 15.....5	
	10
	13/14

Second Semester

Chem 13 or Chem 1B.....5 or 6
Engl 11.....3
Bio 2A.....4
12/13

Fourth Semester

Biotech 2A.....1
Biotech 2B.....1
Biotech 2C.....1
Biotech 2D.....1
Biotech 2E.....1
Biotech 2F.....1
Biotech 2G.....1
Biotech 2H.....1
Phys 1.....5

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See Degree Requirements and Transfer Information section for General Education requirements.

Biotechnology Courses

BIOTECH 1 -- 5 Units

Introduction to Biotechnology

Prerequisites: CHEM 13 or CHEM 1B, BIOL 2A, MATH 15

Class Hours: 3 lecture, 6 laboratory

This course provides an introduction and overview of biotechnology. The focus will include lab safety, solution preparation, documentation, nucleic acid isolation, recombinant DNA techniques, electrophoresis, immunochemistry, techniques in tissue culture, protein isolation and purification, and the components and operations of an industrial biotechnology plant. *Applies to Associate Degree.*

BIOTECH 2A -- 1 Unit

Plant Design

Prerequisites: BIOTECH 1, MICRO 1

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course one of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. Topics to be covered include General Building Design, Water Systems, HVAC, Utilities, Instrumentations, Process Control systems and External Environmental Effects. *Applies to Associate Degree*

**BIOTECH 2B -- 1 Unit
Process Support**

Prerequisite: BIOTECH 2A

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course two of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. Topics to be covered include Small Parts and Labware Preparation, Labware Washing, theory/Use of Autoclaves, CIP, SIP, Validation Testing, Preventive Maintenance, Facilities Sanitization, Raw Materials Logistics and Inventory Control. *Applies to Associate Degree.*

**BIOTECH 2C -- 1 Unit
Manufacturing Technology: Cell Culture, Microbial
Fermentation**

Prerequisite: BIOTECH 2B

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course three of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. Topics to be covered include Recombinant Proteins and Expression Systems, Host Selection, Criteria governing selection for Large Scale, Scaleup Process, Mammalian and Microbial Systems, Cell Physiology/Metabolism, Cell Culture Techniques, Bioreactors, Fermentation, Protein Synthesis Induction, Media Considerations, Environmental Requirements, Testing, Monitoring, and Control, Fermentor Design and Trouble Shooting. *Applies to Associate Degree.*

**BIOTECH 2D-- 1 Unit
Manufacturing Technology: Recovery, Purification**

Prerequisite: BIOTECH 2C

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course four of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. Topics to be covered include Principles of Protein Separations, Filtration, Tangential Flow Filtration, clarification, UF/DF, Sterile Filtration, Centrifugation, Cell break, Chromatography, Process Design, Scaleup and Optimization, Contaminants, validation/Scaledown, Protein Refolding and Buffers. *Applies to Associate Degree.*

**BIOTECH 2E-- 1 Unit
Manufacturing Technology: Formulation, Filling, Packaging**

Prerequisite: BIOTECH 2D

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course five of eight sequential modules designed to provide instruction in the manufacturing component of the Aseptic Processing, Formulation, Dilutions, Potency Targeting, Sterile Filtration, filtration Dynamics, Aseptic Processing, Regulatory Agency Guidelines, Personnel Monitoring, Contamination Control, Filling, Lyophilization, Labeling and Packaging, Batch Records, Quality Parameters, Complaints/Recall. *Applies to Associate Degree.*

**BIOTECH 2F-- 1 Unit
Quality Control: Applied Analytical Methods**

Prerequisite: BIOTECH 2E

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course six of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. Topics to be covered include PAGE, Immunoblots, Potency Assays, ELISA, HPLC, Excipient Assays, Residual/Contaminant Assays, Assay Validation, Raw Material Testing, In Process Testing, Final Product Testing, Reporting of Result and Retesting. *Applies to Associate Degree.*

**BIOTECH 2G-- 1 Unit
Environmental Control**

Prerequisite: BIOTECH 2F

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course seven of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. Topics to be covered include Open vs. closed Systems, Tanks and Lines, Gowning, Aseptic Technique, Monitoring Techniques, Monitoring of Utilities, viable vs. Non-viable Particulates, Excursion Investigations, Bacterial Identification, Mycoplasma Identification and Microbiology Review. *Applies to Associate Degree.*

**BIOTECH 2H-- 1 Unit
Validation**

Prerequisite: BIOTECH 2G

Class Hours: 4 lecture, 12 laboratory for 2 weeks

Course eight of eight sequential modules designed to provide intensive instruction in the manufacturing component of the Biotechnology industry. topics to be covered include Installation Qualification, Operational Qualification, Performance Qualification, Process Qualification, Computer Validation, Cleaning Validation, Sterilizing Filter Validation, SPC and Continuous Process Validation. *Applies to Associate Degree.*

**BIOTECH 80 -- 1 - 4 Units
Internship in Biotechnology**

Prerequisite: Student must have completed a minimum of one course or be enrolled in one course in the discipline, and have instructor approval (Title V, Sec. 55254)

Class Hours: 5 - 20 laboratory

These courses extend classroom activities to a supervised, on-the-job learning experience which is directly connected to the student's educational or occupational goal. The student will be under the direct supervision of a college faculty supervisor and an industrial supervisor. Participants are required to attend an orientation to internship program requirements and workplace habits, complete a pre-internship consultation with the faculty supervisor and complete 6 additional hours of career development seminars. The student will be provided with written evaluations by the industrial supervisor and the faculty supervisor. May be taken four (4) times for credit. *Applies to Associate Degree. Transfer credit: CSU, credit limitations.*