BACHELOR OF SCIENCE IN BIOMANUFACTURING

The bachelor of science in Biomanufacturing (BS in Biomanufacturing) degree program will develop the skills, abilities, and knowledge students need to work in the unique environment of biological manufacturing. It will prepare students for employment in technical or quality positions in the manufacturing sector of the biotechnology industry, which includes biotherapeutics, diagnostics, supplies and services, and industrial products. Students will gain knowledge in biology, chemistry, engineering, statistics, quality, regulatory affairs, and business. Students will use biomanufacturing laboratory facilities to gain process development skills.

Admission to the BS degree in Biomanufacturing (https://www.moorparkcollege.edu/program/biomanufacturing/) is by application based on a multi-criteria selection process.

Bachelor of Science in Biomanufacturing

The Biomanufacturing Bachelor's degree program at Moorpark College develops students' skills, abilities, and knowledge to work in the unique biological manufacturing environment. The full-time program prepares students for employment in technical or quality positions in the manufacturing sector of the biotechnology industry, which includes biotherapeutics, diagnostics, supplies and services, and industrial products.

To earn a Bachelor in Science degree in Biomanufacturing, students must complete the lower division general education (Cal-GETC), upper-division GE, major requirements, and/or elective units for a total minimum of 120 semester units.

Course ID	Title	Units/ Hours
Required Major Courses		
BIOL M02A or BIOL M02AH	General Biology I Honors: General Biology I	5
CHEM M01A or CHEM M01AH	General Chemistry I Honors: General Chemistry I	5
CHEM M01B	General Chemistry II	5
MICR M01	General Microbiology	5
STAT C1000 or STAT C1000H	Introduction to Statistics Introduction to Statistics - Honors	4
BIOT M10/BIOL M13	Introduction to Biotechnology and Molecular Biology	4
BIOT M02A/ BIOL M12A	Environmental Control and Process Support	2
BIOT M02B/ BIOL M12B	Manufacturing: Quality Control and Validation	2
BIOT M02C/ BIOL M12C	Manufacturing: Cell Culture and Microbial Fermentation	3
BIOT M02D/ BIOL M12D	Bioprocessing: Recovery and Purification	2
BIOT M02E/ BIOL M12E	Business & Government Regulation	2
BIOT M301	Biomanufacturing Process Sciences and Engineering Principles	5
BIOT M302	Design of Experiments for Biomanufacturing	4
BIOT M303	Design of Biomanufacturing Facilities, Critical Utilities, Processes, and Equipment	4
BIOT M304	Bioprocess Monitoring and Control	5
BIOT M307	Advanced Topics in Quality Assurance and Regulatory Affairs	4
BIOT M405	Cell and Gene Therapy Manufacturing Technologies	3
BIOT M406	Supply Chain and Enterprise Resource Planning	3
BIOT M408	Six Sigma and Lean Manufacturing	4
BIOT M409	Methods in Quality Improvements, Investigations, and Audits	4
BIOT M410	Emerging Trends in Biomanufacturing Quality	3
BUS M400	Project Management	3
ENGL M300	Technical Writing	3
PHIL M400	Ethics in the Age of Emerging Technology	3
Total Required Major Units		**87**

Course ID	Title	Units/ Hours
Total Units for Major		**87**
General Education (Cal-GETC) Pattern		**34**
Double-Counted Units		10
Elective Units		9
Total Units for the BS Degree		**120**

Year 1

Fall Semester		**Units/Hours**
BIOT M02A/BIOL M12A	Environmental Control and Process Support	2
BIOT M10/BIOL M13	Introduction to Biotechnology and Molecular Biology	4
CHEM M01A or CHEM M01AH	General Chemistry I or Honors: General Chemistry I	5
	Units/Hours	**11**
Spring Semester		
BIOL M02A or BIOL M02AH	General Biology I or Honors: General Biology I	5
BIOT M02B/BIOL M12B	Manufacturing: Quality Control and Validation	2
CHEM M01B	General Chemistry II	5
STAT C1000 or STAT C1000H	Introduction to Statistics or Introduction to Statistics - Honors	4
	Units/Hours	**16**

Year 2

Fall Semester		
BIOT M02C/BIOL M12C	Manufacturing: Cell Culture and Microbial Fermentation	3
MICR M01	General Microbiology	5
	Units/Hours	**8**
Spring Semester		
BIOT M02D/BIOL M12D	Bioprocessing: Recovery and Purification	2
BIOT M02E/BIOL M12E	Business & Government Regulation	2
	Units/Hours	**4**

Year 3

Fall Semester		
BIOT M301	Biomanufacturing Process Sciences and Engineering Principles	5
BIOT M307	Advanced Topics in Quality Assurance and Regulatory Affairs	4

ENGL M300	Technical Writing	3
	Units/Hours	**12**
Spring Semester		
BIOT M302	Design of Experiments for Biomanufacturing	4
BIOT M303	Design of Biomanufacturing Facilities, Critical Utilities, Processes, and Equipment	4
BIOT M304	Bioprocess Monitoring and Control	5
	Units/Hours	**13**
Year 4		
Fall Semester		
BIOT M405	Cell and Gene Therapy Manufacturing Technologies	3
BIOT M406	Supply Chain and Enterprise Resource Planning	3
BIOT M408	Six Sigma and Lean Manufacturing	4
PHIL M400	Ethics in the Age of Emerging Technology	3
	Units/Hours	**13**
Spring Semester		
BIOT M409	Methods in Quality Improvements, Investigations, and Audits	4
BIOT M410	Emerging Trends in Biomanufacturing Quality	3
BUS M400	Project Management	3
	Units/Hours	**10**
	Total Units/Hours	**87**

Upon successful completion of this program, students will be able to:

- Analyze two different biomanufacturing processes, including the technical, financial, and environmental impact of the two options as well as the identification of the benefits and disadvantages of each.
- Perform an investigation that requires analysis of an Out of Specification (OOS) deviation that occurred during a production step in the manufacture of a pharmaceutical protein.
- Demonstrate the ability to apply Quality by Design (QbD) principles as adopted by the U.S. Food and Drug Administration (FDA) to design a robust, stable, and controlled manufacturing process for a protein pharmaceutical that can be carried out under current Good Manufacturing Practices (cGMPs).
- Produce a written Corrective Action Preventative Action report in a format standard to the industry. The report will include evidence to justify their conclusions and action plan.
- Produce a professional report and presentation representing their opinion regarding the advantages of selecting a specific biomanufacturing process.
- Perform a criticality assessment with a quality risk assessment approach to determine the Critical Process Parameters (CPPs) that would need to be monitored and controlled.

Graduation Application Procedure

1. Students must file a petition for a degree.
2. District Colleges offer three graduation dates: fall semester, spring semester, and summer term.
3. Graduation ceremonies are conducted at the end of the spring semester.
4. Graduation petition deadline dates are locally announced at each District College.

Academic Year

The fall semester is the first term of an academic year. A summer term, whether one or more sessions, constitutes the last term of an academic year.

Catalog Rights/Continuous Enrollment

A student remaining in continuous enrollment at one or more of the colleges of the Ventura County Community College District (VCCCD) or at any other institutionally accredited college or university, may meet the VCCCD graduation requirements in effect at the time of their entering or at any time thereafter. This applies only to graduation requirements and not to policies, procedures, or other regulations. Catalog rights/continuous enrollment are defined as attendance in at least one term each calendar year. Any academic record symbol entered on a transcript (A-F, CRE, P, NP, SP, I, IP, RD, W, MW, EW and prior to fall 2009: CR and NC) shall constitute enrollment or attendance.

A student who has not maintained continuous enrollment is considered to be under new requirements when returning unless the student is granted a petition/waiver for extenuating circumstances. This petition must be initiated by the student through a college counselor and approved by the appropriate dean or designee.

Students should be made aware that other governing agencies may impose more restrictive limitations concerning the definitions of continuous enrollment or continuous attendance. Some agencies define continuous enrollment as remaining in attendance both fall and spring semesters. Some will not accept selected academic record symbols (such as Ws). Those who may be affected by more restrictive guidelines include students receiving financial aid, veterans and international students.

Double Counting for Credit Course

While a course might satisfy more than one general education requirement of CSU GE, IGETC, or Cal-GETC, it may not be counted more than once for these purposes within the GE areas. A course may be used to satisfy both a general education requirement and a major requirement. A credit course may also be used to satisfy requirements in two (2) or more different majors, whether for a Bachelor's degree, Associate degree, Associate degree for Transfer, Certificate of Achievement, or Proficiency Award. The units, however, may never be counted more than once toward the units required for the bachelor's degree.

Meeting Major and/or General Education Requirements through Credit for Prior Learning (CPL)

Colleges shall apply course credit obtained through CPL towards major and/or general education requirements in the same manner as a course that is taken at the college granting the degree and/or certificate.

Course Substitution for Major and/or General Education Requirements

Occasionally, a student may have difficulty in completing exact major and/or general education requirements as specified in the college catalog due to circumstances of class schedule conflicts, class cancellation, related but nonequivalent coursework taken outside of this college district, or circumstances beyond the control of the student. Under such circumstances, a student may file a Petition for Course Substitution/Petition for Variance for Major and/or General Education Requirements to seek approval from the appropriate college officials to substitute one or more courses in a designated major and/or in general education. The petition forms are available in the Counseling Office/Center.

Reciprocity for CSU GE, IGETC, or Cal-GETC Requirements

Students who are required to complete CSU GE-Breadth, IGETC, or Cal-GETC shall have their courses evaluated for reciprocity according to the rules set forth by either Executive Order (EO) 1065, EO 1100 Revised, or in the most recent version of the IGETC or Cal-GETC Standards.

Reciprocity for Credit for Prior Learning

Colleges shall apply Credit for Prior Learning (CPL) credit completed at other institutionally accredited colleges or universities toward general education, major requirements, or electives in the areas where the student would have received credit at the institution where they were originally taken, or in the area where the college granting the degree places a similar course, or in the area where the course meets the college's GE criteria and objectives, whichever best facilitates the student's degree completion.

Applying Coursework from Other Institutions

Coursework completed at any institution in the United States accredited by one of the following institutional accrediting bodies may be applied towards a bachelor's degree:

- Accrediting Bureau of Health Education Schools (ABHES)
- Accrediting Commission of Career Schools and Colleges (ACCSC)
- Accrediting Commission for Community and Junior Colleges Western Association of Schools and Colleges (ACCJC)
- Accrediting Council for Continuing Education and Training (ACCET)
- Association of Advanced Rabbinical and Talmudic Schools (AARTS)
- Association for Biblical Higher Education Commission on Accreditation (ABHE)
- Association of Institutions of Jewish Studies (AIJS)
- Association of Theological Schools Commission on Accrediting (ATS)
- Council on Occupational Education (COE)
- Distance Education Accrediting Commission (DEAC)
- Higher Learning Commission (HLC)
- Middle States Commission on Higher Education (MSCHE)
- National Accrediting Commission of Career Arts and Sciences (NACCAS)
- New England Commission of Higher Education (NECHE)
- Northwest Commission on Colleges and Universities (NWCCU)
- Southern Association of Colleges and Schools Commission on Colleges (SACSCOC)
- Transnational Association of Christian Colleges and Schools (TRACS)
- WASC Senior College and University Commission (WSCUC)

International Coursework

Coursework from any international institution accredited by one of the above accepted U.S. Institutional Accrediting bodies or evaluated as equivalent to Institutional Accredited institution by one of the member agencies of the National Association of Credential Evaluation Services, may be applied towards a bachelor's degree.

Exceptions to Graduation Requirements

Appeals to the above policy may be submitted to the Chief Instructional Officer or a designee. Exceptions may be granted under extenuating circumstances or when there has not been sufficient opportunity to enroll in required courses.

Reference:

AP 4100B - Graduation Requirements for Baccalaureate Degrees (https://go.boarddocs.com/ca/vcccd/Board.nsf/goto/?open&id=D6YPHE64B00A). Adopted in May 2024.