Biomanufacturing (Minor)

The Minor in Biomanufacturing is intended to provide new graduates with the knowledge base and hands-on skills that will prepare them to quickly contribute to a cGMP biomanufacturing operation in significant ways and should reduce the time needed for on-the-job training in those operations. Interested students should contact the representatives listed below.

Administration of the Minor in Biomanufacturing

The BTEC staff will hold primary responsibility for administration of the Minor in Biomanufacturing Information about the Minor and application materials will be handled by an Administrative Assistant and the Assistant Director for Student Coordination will be the primary contact and academic advisor for the students who elect to enroll in the Minor.

Contacts

For additional information about the Minor in Biomanufacturing contact:

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SIS Code: 14BTECM

Plan Requirements

Requirements for the undergraduate Minor in Biomanufacturing include a **minimum of 15 credit hours** as specified below. All courses must be completed with a grade of “C-” or higher.

Prerequisite Courses to Enter the Minor: All students must complete both CH 101 Chemistry - A Molecular Science and BIO 183 Introductory Biology: Cellular and Molecular Biology.

Additional prerequisite courses in CH 221 Organic Chemistry I and CH 223 Organic Chemistry II will be required to complete the minor. Courses must be completed with a grade of C- or better.

Code	Title	Hours
Required Courses		
Introductory Seminar:		**1**
BEC 220	Introduction to Drug Development and Careers in Biomanufacturing	
Basic Microbiology Laboratory Course:		**1-4**
Select one of the following:		
BEC 425	Molecular Biology for Biomanufacturing	
BIT 410	Manipulation of Recombinant DNA	
MB 352	General Microbiology Laboratory	
or MB 354	Inquiry-Guided Microbiology Lab	
Base Biomanufacturing Sequence:		**4**
BEC/CHE 463	Fermentation of Recombinant Microorganisms	
BEC 330	Principles and Applications of Bioseparations	
Biomanufacturing Specialization:		**4**
Select one specialization area:		
Upstream Operations:		
BEC 426 & BEC 480	Upstream Biomanufacturing Laboratory and cGMP Fermentation Operations	
Downstream Operations:		
BEC 436 & BEC 485	Introduction to Downstream Process Development and cGMP Downstream Operations	
Elective Courses:		**5**
Select 5 credits of the following:		
Any 4** or 5** Level BEC course		
BEC/BBS 426	Upstream Biomanufacturing Laboratory	
BEC 436	Introduction to Downstream Process Development	
BEC 445	Cell Line Development for Biomanufacturing	
BEC/CHE 448	Bioreactor Design	
BEC/CHE 462	Fundamentals of Bio-Nanotechnology	
BEC 475	Global Regulatory Affairs for Medical Products	
BEC 480	cGMP Fermentation Operations	
BEC/BME 483		
BEC 485	cGMP Downstream Operations	
BEC/CHE 488	Animal Cell Culture Engineering	
BEC 495	Special Topics in Biomanufacturing	
BEC 497	Biomanufacturing Research Projects	
BEC 515	Biopharmaceutical Product Characterization Techniques	
BAE 425	Industrial Microbiology and Bioprocessing	
BCH 351	General Biochemistry	
or BCH 451	Principles of Biochemistry	
BIT 410	Manipulation of Recombinant DNA	
BIT 466	Animal Cell Culture Techniques	
GN 311	Principles of Genetics	
MB 455	Microbial Biotechnology	
Total Hours		**15-18**