

Biomanufacturing (Certificate)

The Undergraduate Certificate in Biomanufacturing ("BTEC credential") is designed for both NC State students and for persons from outside the University who wish to gain hands-on experience with, and understanding of, the technology and operational protocols of large-scale cGMP biomanufacturing operations. This knowledge base will prepare Certificate recipients 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. The Certificate educational focus includes gene expression technologies, bioreactors, downstream separation and purification processes, and aseptic processing operations.

Program Coordinator

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Admissions Requirements

Students enrolled at North Carolina State University who are in good academic standing are eligible for admission to this University Certificate program. In addition, non-degree students with evidence of having completed introductory courses in both biology and organic chemistry, or who have consent of the Certificate Program administrator may enroll in the program. Students who complete the undergraduate Minor in Biomanufacturing or the Post Baccalaureate Certificate in Biomanufacturing are not eligible for the Undergraduate Certificate in Biomanufacturing.

Academic Structure

Term Effective: 8/2012
Plan Code: 14BTECCTU, 32BTECCTU
CIP Code: 26.1201
Description: Undergraduate Certificate in Biomanufacturing
Offered: On-campus format

Plan Requirements

Requirements for the Undergraduate Certificate in Biomanufacturing include a minimum of 12 credit hours as specified below. **All courses must be completed with a grade of 'C-' or better.**

Prerequisites: All students must complete CH 101 Chemistry - A Molecular Science, BIO 183 Introductory Biology: Cellular and Molecular Biology, and CH 221 Organic Chemistry I, or have departmental approval of like courses completed. Additional prerequisite courses may be required. Courses must be completed with a grade of C- or better.

| Code | Title | Hours |
|--------------------------|--|----------|
| Required Courses: | | 3 |
| BEC 220 | Introduction to Drug Development and Careers in Biomanufacturing | |
| BEC/CHE 463 | Fermentation of Recombinant Microorganisms | |
| or BEC 330 | Principles and Applications of Bioseparations | |

Biomanufacturing Elective Courses: 4

Select four credits of the following:

| | |
|-------------|--|
| BEC 330 | Principles and Applications of Bioseparations |
| BEC 425 | Molecular Biology for Biomanufacturing |
| BEC/BBS 426 | Upstream Biomanufacturing Laboratory |
| BEC 436 | Introduction to Downstream Process Development |
| BEC 445 | Cell Line Development for Biomanufacturing |
| BEC/CHE 463 | Fermentation of Recombinant Microorganisms |
| BEC 480 | cGMP Fermentation Operations |
| BEC/BME 483 | |
| BEC 485 | cGMP Downstream Operations |
| BEC/CHE 488 | Animal Cell Culture Engineering |
| BEC 497 | Biomanufacturing Research Projects |

Elective Courses: 5

Select five credits of the following:

| | |
|---------------------------------|--|
| Any 4** or 5** Level BEC Course | |
| BEC 425 | Molecular Biology for Biomanufacturing |
| 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/CHE 463 | Fermentation of Recombinant Microorganisms |
| 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 |
| 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 12