Biomanufacturing (Certificate) (For Post-Baccalaureate Students)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Certificate in Biomanufacturing provides 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.

Program Coordinator
Pa Nhia Moore
195 BTEC Bldg.
Centennial Campus
Raleigh, NC 27695-7928
919.515.0213
pa_moore@ncsu.edu
website: http://www.btec.ncsu.edu/

Admissions Requirements
Contact the Program Coordinator.

Plan of Study and Registration Information
Contact the Program Coordinator.

Academic Structure
Term Effective: 1/2009
Plan Code: 32BTECCCTU
CIP Code: 26.1201
Description: Undergraduate Certificate in Biomanufacturing
Offered: On-campus format

Plan Requirements
Prerequisite: In order to enroll in the first course in the program, applicants must have earned a bachelor’s level degree, and have completed CH 223 Organic Chemistry II (or equivalent) and either BIO 183 Introductory Biology: Cellular and Molecular Biology (prior to Fall 2007, numbered as BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity). Interested graduates should contact the BTEC Office for Student Coordination at 919-513-2000 for information and application materials.

Requirements for the Post-Baccalaureate Undergraduate Certificate in Biomanufacturing include a minimum of 13 credit hours as specified below. All courses must be completed with a grade of 'C-' or higher:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
<th>Counts towards</th>
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</thead>
<tbody>
<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
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<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>MB 420</td>
<td>Fundamentals of Microbial Cell Biotransformations</td>
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<tr>
<td>BEC 330</td>
<td>Principles and Applications of Bioseparations</td>
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<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<tr>
<td>BEC 436</td>
<td>Introduction to Downstream Process Development</td>
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Select one of the following foci: 4
Upstream Focus:
BBS 426 & BEC 480 Upstream Biomanufacturing Laboratory and cGMP Fermentation Operations

Downstream Focus:
BEC 436 & BEC 485 Introduction to Downstream Process Development and cGMP Downstream Operations

Elective Courses
Select two of the following: 4
BBS 426 Upstream Biomanufacturing Laboratory
BEC 436 Introduction to Downstream Process Development
BEC 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 485 cGMP Downstream Operations
BIT 466 Animal Cell Culture Techniques
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<tbody>
<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
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<tr>
<td>MB 455</td>
<td>Microbial Biotechnology</td>
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Total Hours: 13