

Biomanufacturing (MS)

Degree Requirements

Students may choose from the degree tracks below to complete coursework within a focus area.

Degrees earned will be distributed as: "Master of Science in Biomanufacturing" without focus area track specifications.

Code	Title	Hours
Core Courses		22
BEC 575	Global Regulatory Affairs for Medical Products	
BEC 577	Advanced Biomanufacturing and Biocatalysis	
BEC 590	Industry Practicum in Biomanufacturing (two semesters)	
BEC 601	Biomanufacturing Seminar (two semesters) ¹	
BEC 620	Leadership and Preparation for Industry Internship in Biomanufacturing	
ST 511	Statistical Methods For Researchers I	
BEC 669	Biomanufacturing Research Projects ²	
BEC 515	Biopharmaceutical Product Characterization Techniques	
or BEC 588 Animal Cell Culture Engineering		
Focus Area Track		6
Select courses from a category listed under "Focus Area Track Courses" below		
Professional Courses		6
BUS 554	Project Management	
Select one of the following courses:		
MBA 585	Current Topics in BioSciences Management	
MBA 586	Legal, Regulatory and Ethical Issues in Life Science Industries	
MBA 590	Special Topics In Business Management	
MIE 501	Strategic Management Foundations	
COM 563	Public Relations Theory	
COM 598	Special Topics In Communication (Intro to Science Communication: Theory/Practice)	
Elective Courses		3
Select three credit hours from "Elective Courses" listed below each focus area category		
Total Hours		37

¹ BEC 601 must be repeated twice for a total of two credit hours.

² BEC 669 must be repeated twice for a total of four credit hours.

Focus Area Tracks

Upstream Track

Code	Title	Hours
CHE 563	Fermentation of Recombinant Microorganisms	2
BBS 526	Upstream Biomanufacturing Laboratory	2
BEC 580	cGMP Fermentation Operations	2
Total Hours		6

Elective Courses

Code	Title	Hours
Select three credits of the following courses:		3
BEC 525	Molecular Biology for Biomanufacturing	2
BEC 545	Cell Line Development for Biomanufacturing	2
BEC 532	Foundations of Downstream Processing and Formulation	2
BEC 536	Introduction to Downstream Process Development	2
BEC 585	cGMP Downstream Operations	2
BEC 595	Special Topics in Biomanufacturing	1-6
BIT 501	Ethical Issues in Biotechnology	1
BEC 669	Biomanufacturing Research Projects	1-4
BIT 510	Core Technologies in Molecular and Cellular Biology	4
BIT 566	Animal Cell Culture Techniques	2

Downstream Track

Code	Title	Hours
BEC 532	Foundations of Downstream Processing and Formulation	2
BEC 536	Introduction to Downstream Process Development	2
BEC 585	cGMP Downstream Operations	2
Total Hours		6

Elective Courses

Code	Title	Hours
Select three credits of the following courses:		3
BEC 525	Molecular Biology for Biomanufacturing	2
BEC 545	Cell Line Development for Biomanufacturing	2
CHE 563	Fermentation of Recombinant Microorganisms	2
BBS 526	Upstream Biomanufacturing Laboratory	2
BEC 580	cGMP Fermentation Operations	2
BEC 595	Special Topics in Biomanufacturing	1-6
BIT 501	Ethical Issues in Biotechnology	1
BEC 669	Biomanufacturing Research Projects	1-4
BIT 510	Core Technologies in Molecular and Cellular Biology	4
BIT 566	Animal Cell Culture Techniques	2

Accelerated Bachelor's/Master's Degree Requirements

The Accelerated Bachelors/Master's (ABM) degree program allows exceptional undergraduate students at NC State an opportunity to complete the requirements for both the Bachelor's and Master's degrees at an accelerated pace. These undergraduate students may double count up to 12 credits and obtain a non-thesis Master's degree in the same field within 12 months of completing the Bachelor's degree, or obtain a thesis-based Master's degree in the same field within 18 months of completing the Bachelor's degree.

This degree program also provides an opportunity for the Directors of Graduate Programs (DGPs) at NC State to recruit rising juniors in their major to their graduate programs. However, permission to pursue an ABM degree program does not guarantee admission to the Graduate

School. Admission is contingent on meeting eligibility requirements at the time of entering the graduate program.

Faculty

Full Professors

Ruben G. Carbonell

Amy Michele Grunden

Harold Henry Lamb

Paul Edward Mozdziak

Balaji M. Rao

Heike Inge Ada Sederoff

John Douglas Sheppard

Associate Professors

Paul T. Hamilton

Gavin John Williams

Assistant Professor

Stefano Menegatti

Practice/Research/Teaching Professors

Kirill Efimenko

Gary Louis Gilleskie

Imara Yasmin Perera

John H. van Zanten

Emeritus Faculty

Michael Carl Flickinger

Instructors

Gregory Kale Buhrman

Hayley Flores

Sara Siegel