

Microbial Biotechnology (MR)

Master of Microbial Biotechnology Degree Requirements

Code	Title	Hours
MMB Core Courses		15
MB 585	Biotechnology Industry Practicum I (This previously was taken 3 times. However, we have split this into three courses, MB 585, 586, 587. These build and should be distinct.)	
MB 586	Biotechnology Industry Practicum II	
MB 587	Biotechnology Industry Practicum III	
MB 589	Master of Microbial Biotechnology Capstone	
MB 620	Special Problems	
Life Science Foundational Course		3
Students must select 3 credit hours from the list below		
BCH 553	Biochemistry of Gene Expression	
GN 521	Molecular Genetics	
MB 555	Microbial Biotechnology	
MB 588	Microbiome Analysis	
MB 714	Microbial Metabolic Regulation	
PB 580	Introduction to Plant Biotechnology	
STEM Foundational Electives ¹		6
Students must take 6 credits from the STEM Foundational Electives below		
Applied Science Foundational Courses		4
Students can select option 1 or option 2 below		
Option 1		
BEC 525 & BEC 545	Molecular Biology for Biomanufacturing and Cell Line Development for Biomanufacturing	
Option 2		
BIT 510	Core Technologies in Molecular and Cellular Biology	
Applied Science Electives		4-6
Students must select 4 - 6 credits from the Applied Science Electives below		
Business Core Course		3
MBA 585	Current Topics in BioSciences Management	
MBA Electives ²		6
Students must select 6 credits from the list below		
BUS 554	Project Management	
MBA 518	Enterprise Risk Management	
MBA 541	Supply Management	
MBA 545	Decision Making under Uncertainty	
MBA 555	Product Design and Development	
MBA 559	Business Analytics Practicum	
MBA 561	Consumer Behavior	
MBA 562	Research Methods In Marketing	
MBA 570	Opportunity Evaluation and Value Creation	
MBA 572	Venture Opportunity Analytics	

MBA 576	Technology Entrepreneurship and Commercialization I	
MBA 577	Technology Entrepreneurship and Commercialization II	
MBA 582	B Corp Clinic Sustainability Practicum	
MBA 586	Legal, Regulatory and Ethical Issues in Life Science Industries	
MBA 590	Special Topics In Business Management (by permission of MMB advisor)	
Total Hours		41-43

- ¹ Other relevant graduate STEM courses may be taken by permission of MMB advisor. Students pursuing the MMB/MBA dual degree may substitute 3 MBA credits in this category.
- ² Students planning to enroll in the dual MMB/MBA Program may take an additional MBA course in lieu of one STEM Foundational Elective. Other relevant MBA courses may be taken by permission of MMB Advisor and MBA advisor.

STEM Foundational Electives

Code	Title	Hours
Select 6 credits from the list below		
Biological and Agricultural Engineering (BAE)		
BAE 525	Industrial Microbiology and Bioprocessing	
BAE 528	Biomass to Renewable Energy Processes	
Biochemistry (BCH)		
BCH 553	Biochemistry of Gene Expression	
BCH 555	Proteins and Molecular Mechanisms	
BCH 571	Regulation of Metabolism	
BCH 701	Macromolecular Structure	
BCH 703	Macromolecular Synthesis and Regulation	
BCH 705	Molecular Biology Of the Cell	
Food Science (FS)		
FS 502	Chemistry of Food and Bioprocessed Materials	
FS 553	Food Laws and Regulations	
Genetics (GN)		
GN 521	Molecular Genetics	
GN 541	Human and Biomedical Genetics	
Microbiology (MB)		
MB 501	Biology of Plant Pathogens	
MB 505	Food Microbiology	
MB 532	Soil Microbiology	
MB 535	Bacterial Pathogenesis	
MB 555	Microbial Biotechnology	
MB 588	Microbiome Analysis	
MB 714	Microbial Metabolic Regulation	
MB 718	Introductory Virology	
MB 725	Fermentation Microbiology	
MB 751	Immunology	
Plant Biology (PB)		
PB 580	Introduction to Plant Biotechnology	
Statistics (ST)		

ST 513	Statistics for Management and Social Sciences I
ST 514	Statistics For Management and Social Sciences II
ST 554	Analysis of Big Data
ST 555	Statistical Programming I
ST 556	Statistical Programming II

Applied Science Electives

Code	Title	Hours
Biotechnology (BIT)		
BIT 564	Protein Purification	
BIT 571	RNA Interference and Model Organisms	
BIT 573	Protein Interactions	
BIT 574	Plant Genetic Engineering	
BIT 577	Metagenomics	
BIT 579	High-Throughput Discovery	
BIT 580	Yeast Metabolic Engineering	
BIT 582	Virus Biotechnology: Pathogens to Therapeutics	
BIT 595	Special Topics (by permission of MMB advisor)	
BEC 515	Biopharmaceutical Product Characterization Techniques	
BEC 526	Upstream Biomanufacturing Laboratory	
BEC 532	Foundations of Downstream Processing and Formulation	
BEC 536	Introduction to Downstream Process Development	
BEC 548	Bioreactor Design	
BEC 562	Fundamentals of Bio-Nanotechnology	
BEC 563	Fermentation of Recombinant Microorganisms	
BEC 575	Global Regulatory Affairs for Medical Products	
BEC 577	Advanced Biomanufacturing and Biocatalysis	
BEC 580	cGMP Fermentation Operations	
BEC 585	cGMP Downstream Operations	
BEC 588	Animal Cell Culture Engineering	
BEC 595	Special Topics in Biomanufacturing	
BEC 595	Special Topics in Biomanufacturing (by permission of MMB advisor)	
MB 520	Fundamentals of Microbial Cell Biotransformations	
ST 555	Statistical Programming I	
ST 556	Statistical Programming II	

Up to 2 Applied Science Elective credits may be taken from the below list

DSA 405	Data Wrangling and Web Scraping
DSA 406	Exploratory Data Analysis for Big Data
DSA 495	Special Topics in Data Science
DSA 595	Graduate Special Topics in Data Science

* Students may take or audit lower-level DSA courses, but they will not count toward degree. In particular DSA 201 Introduction to R/Python for Data Science may be helpful to take higher-level courses and DSA 202 Introduction to Data Visualization could also be helpful.

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

Jose Bruno-Barcena

Susan Carson

Amy Michele Grunden

Christine Hawkes

Michael Hyman

Associate Professor

Manuel Kleiner

Adjunct Faculty

Jason Caplan