BIOTECHNOLOGY, MS

Program Director

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Faculty

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Program Description

The Biotechnology MS program is designed to create a strong scientific workforce by providing students with advanced training appropriate for jobs in academia, government, or the private sector. This three-semester, non-thesis academic and laboratory master's-level training program prepares students for careers in biotechnology research, industry or management, while also offering excellent preparation for further training in graduate school or professional doctoral programs.

Advisory Board

The Biotechnology MS program includes external collaboration in the form of an Advisory Board made up of five academic and industry professionals who will meet yearly with faculty to provide guidance and insight into emerging trends in the field. This will ensure that the program develops and maintains relevant student competencies and produces competitive applicants for future employment. The Advisory Board will also hold periodic panels with students in the program, providing contacts, insights, advice, and information for career development.

Student Learning Outcomes

Upon completing the program, students will be able to:

1. Evaluate the extent to which Biotechnology research and businesses meet contemporary standards of ethical, inclusive and equitable practices.
2. Formulate research questions and develop solutions to current problems in Biotechnology using a multidisciplinary approach.
3. Use a variety of laboratory techniques in the design, implementation and analysis of experiments that address problems in Biotechnology.
4. Critically evaluate scientific literature in the context of current, real-world applications in multiple areas of Biotechnology.
5. Develop professional networking, leadership, communication and collaborative skills appropriate for professional-level employment in Biotechnology research and/or industry.

Biotechnology MS Program Requirements

Code	Title	Credits
Gateway Courses		
All students must complete the following seven required lecture and laboratory courses, which will provide solid groundwork in advanced principles from three different areas of biotechnology-biological sciences, business management, and industrial biotechnology:		
BIO 602	Ethical Issues in Biology and Biotechnology	3
BIO 649	Biotechnology Lab	3
BIO 663	Molecular Biotechnology	4
BIO 664	Applied Biotechnology	4
BIO 667	Advances in Biotechnology Research & Ideas	3
BIO 674	Experimental Design & Interpretation	3
EEE 620	Foundations of Entrepreneurship	3
EEE 630	Entrepreneurship in Engineering and Science	3
Biotechnology Tracks		
In addition to completing the seven required gateway courses, students will personalize their remaining curriculum by choosing to pursue one of the four following biotechnology tracks, and completing an additional 15 credits:		15
General Biotechnology Track		
BioBusiness Track		
BioMedical Sciences Track		
Industrial Biotechnology Track		

Elective Courses (15 Credits)

In addition, elective courses allow each student's program to be individually structured to provide maximum flexibility in choice of coursework. The rich variety of available biotechnology course offerings spans three different colleges at Syracuse University:

- College of Arts and Sciences (https://artsandsciences.syracuse.edu/)
- Martin J. Whitman School of Management (https://whitman.syracuse.edu/)
- College of Engineering and Computer Science (https://ecs.syracuse.edu/academics/biomedical-and-chemical-engineering/)

General Biotechnology Track (15 Credits)

Students select at least 15 credits of elective courses from the course list for any of the three tracks (i.e., BioBusiness, BioMedical Sciences, or Industrial Biotechnology), including at least 3 credits from each of the three track disciplines:

- BioBusiness (EEE, MBC, or SCM courses)
- BioMedical Sciences (BCM, BIO, or CHE courses)
- Industrial Biotechnology (BEN courses)

BioBusiness Track (15 Credits)

Select at least 3 elective courses from the following list and one elective course from the Industrial Biotechnology Track and one elective course from the BioMedical Sciences Track.

Code	Title	Credits
EEE 600	Selected Topics	1-6
EEE 651	Finance for Emerging Enterprises	3
EEE 640	Social Entrepreneurship	3
EEE 644	Dilemmas and Debates in Entrepreneurship	3
EEE 682	Entrepreneurial Marketing	3
MBC 600	Selected Topics	1-6
MBC 601	Economic Foundations of Business	1.5
MBC 609	Accounting for Managerial Decisions	1.5
MBC 610	Opportunity Recognition and Ideation	1.5
MBC 631	Financial Accounting	3
MBC 635	Operations and Supply Chain Management	3
MBC 636	Marketing Management	3
MBC 645	Strategic Management	3
SCM 600	Selected Topics	1-6
SCM 651	Business Analytics	3
SCM 656	Project Management	3

BioMedical Sciences Track (15 Credits)

Select at least 3 elective courses from the following list and one elective course from the BioBusiness Track and one elective course from the Industrial Biotechnology Track.

Code	Title	Credits
BCM 678	Perspectives in Biochemistry	3
BIO 501	Biology of Cancer	3
BIO 503	Developmental Biology	3
BIO 600	Selected Topics	1-6
BIO 608	Quantitative Methods for Life Scientists	0-3
BIO 610	Graduate Research Laboratory	1-3
BIO 614	Brain & Behavioral Plasticity	3
BIO 616	Biology of Aging	3
BIO 630	Genetics Laboratory	3
BIO 636	Pharmacology of Substance Abuse	3
BIO 640	Applied Genomics	3
BIO 644	Seminar in Neurotoxicology	3
BIO 646	Epigenetics of Health & Disease	3
BIO 652	Neurodegenerative Disease	3
BIO 656	Seminar in Human Disease Genomics	3
BIO 657	Principles of Human Toxicology	3
BIO 659	Plants & People	3
BIO 662	Molecular Genetics	3
BIO 665	Molecular Biology Laboratory	3
BIO 668	Microbiomes in Biotechnology and Medicine	3
BIO 671	Cell and Developmental Biology Laboratory	3
BIO 677	Personalized Medicine	3
BIO 679	Mind the Gap: Inclusion, Diversity, Equity and Accessibility in STEM	3
CHE 614	Introduction to Medicinal Chemistry	3

No more than 3 credits for BIO 610 Graduate Research Laboratory can be counted towards the degree. No more than 6 credits total of BIO 610 Graduate Research Laboratory and BIO 670 Experience Credit can be counted towards the degree.

Industrial Biotechnology Track (15 Credits)

Select at least 3 elective courses from the following list and one elective course from the BioBusiness Track and one elective course from the BioMedical Track.

Code	Title	Credits
BEN 500	Selected Topics	1-6
BEN 521	Stem Cell Engineering	3
BEN 541	Principles of Tissue Engineering	3
BEN 568	Biomaterials & Medical Devices	3
BEN 600	Selected Topics	1-6
BEN 621	Biochemical Engineering	3
BEN 633	Drug Delivery	3
BEN 635	Physical Cell Biology	3
BEN 662	Biofuels, Bioproducts, and Biorefining	3
BIO 670	Experience Credit	1-6