

# BIOMEDICAL ENGINEERING (MS)

Department Website (<https://engineering.nyu.edu/academics/programs/biomedical-engineering-ms/>)

NYSED: 08793 HEGIS: 0905.00 CIP: 14.0501

## Program Description

Biomedical engineering, a multi-disciplinary field, is behind some of the most important medical breakthroughs today. Working closely together, engineers, scientists, mathematicians, and physicians have developed artificial organs, internal and external prosthetics, multiple imaging modalities, and diagnostic and therapeutic devices. Biomedical engineering has significantly contributed to improved health care and quality of life.

The MS program in Biomedical Engineering merges coursework from Tandon's engineering departments along with research opportunities with biomedical engineering faculty from across NYU to create a degree path that matches a student's BME career objectives.

## Admissions

The BME MS program will consider applications for admission from students with a BS/BA or a more advanced degree in biomedical, chemical, mechanical, or electrical engineering; computer engineering or science; physics; mathematics, chemistry; or biological sciences. We also consider applications from students with medical, dental, nursing and legal degrees.

The program requires that all applicants must have taken two semesters of college-level calculus and two semesters of calculus-based physics. It further highly recommends that each student's undergraduate preparation include the following sequence of math and science courses:

- 1 semester of linear algebra
- 1 semester of ordinary differential equations
- 1 semester of multivariable calculus
- 2 semesters of biology with labs
- 2 semesters of general chemistry with labs

For those feeling interests in the biomaterials and tissue engineering studies, additional background in organic chemistry and biochemistry is desirable. For those feeling interests in the bioinstrumentation of medical imaging studies, additional advanced mathematics courses, e.g. complex variables, partial differential equations are recommended. Though not required, exposure to CAD/FEA, Matlab, C++ /Python computer programming experience is highly desirable.

For International Students:

Applications can only be considered from international students who have completed all of the undergraduate math and science courses listed above.

For Domestic Students:

Applicants pursuing a career change and lacking some of the undergraduate courses listed above may be admitted conditionally if they present a strong record of achievement in their undergraduate field of study and agree to enroll in the missing undergraduate courses to raise their level of knowledge so that they are better prepared for the analytically rigorous coursework that is part of the BME MS program. Such undergraduate courses do not count toward the MS degree's credit requirements.

## Program Requirements

The program requires the completion of 30 credits, comprised of the following:

Course	Title	Credits
<b>Core Requirements</b>		
BE-GY 6103	ANATOMY, PHYSIOLOGY, & BIOPHYSICS I	3
BE-GY 6473	APPLIED MATHEMATICS AND STATISTICS FOR BIOMEDICAL ENGINEERING	3
BE-GY 6503	BIOMEDICAL INSTRUMENTATION	3
or BE-GY 6783	BIOMECHANICS FOR BIOMEDICAL ENGINEERS	
<b>Electives</b>		
Select 12 to 15 credits of the following: <sup>1</sup>		12-15
BE-GY 6113	ANATOMY, PHYSIOLOGY, & BIOPHYSICS II	
BE-GY 6203	Biomedical Imaging I	
BE-GY 6303	Bio-optics	
BE-GY 6353	Special Topics in Biomedical Engineering	
BE-GY 6403	Digital Signal Processing I	
BE-GY 6453	Probability and Stochastic Processes	
BE-GY 6513	BIOMEDICAL DEVICE DESIGN AND DEVELOPMENT	
BE-GY 6523	BIOMEMS AND MICROFLUIDICS	
BE-GY 6723	Natural Polymers and Materials	
BE-GY 6763	REHABILITATION ENGINEERING	
BE-GY 6803	Biomaterials: Engineering Principles and Design Consideration	
BE-GY 9443	Tissue Engineering	
BE-GY 9453	ENGINEERING TISSUE REGENERATION	
<b>Research Credit/Experiential Learning</b>		
Select at least 6-9 credits from the following: <sup>2</sup>		6-9
BE-GY 871X	Guided Studies in Biomedical Engineering	
BE-GY 873X	Research in Biomedical Engineering	
BE-GY 997X	MS THESIS IN BIOMEDICAL ENGINEERING	
CP-GY 9911	Internship for MS I	
CP-GY 9921	Internship for MS II	
<b>Required Colloquium and Seminar</b>		
BE-GY 9730	Colloquium in Biomedical Engineering	0
BE-GY 9740	Seminar in Biomedical Engineering	0
<b>Total Credits</b>		<b>30</b>

<sup>1</sup>

With adviser approval, other BE-GY courses not on this list may count towards electives. With adviser approval, up to 6 credits can be from related courses in other departments.

There are two options to fulfill the research credit requirement:

1. MS Thesis: BME MS students can take BE-GY 997X MS THESIS IN BIOMEDICAL ENGINEERING for at least 6 credits, at maximum 9 credits in total, which requires the pass of an oral defense in front of the MS thesis committee, and a formal written thesis submitted to the MS thesis committee, BME academic advisor, and NYU Tandon.
2. Guided studies or Research: Instead of the MS thesis, students can take BE-GY 871X Guided Studies in Biomedical Engineering or BE-GY 873X Research in Biomedical Engineering for exactly 6 credits in total, which requires a less formal written report submitted to research advisor and BME academic advisor for each semester. Out of the 6 credits of those experiential learning course, up to 3 credits can be taken as the internship courses, i.e. CP-GY 9911 Internship for MS I and CP-GY 9921 Internship for MS II.

## Interdepartmental Electives

Below are courses from other departments that can count as electives. Students may choose up to 6 credits from the list below. Other courses are possible with adviser approval.

Course	Title	Credits
BT-GY 6063	Immunology: Concepts, Mechanisms and Applications in Biotechnology	3
BT-GY 9433	PROTEIN ENGINEERING	3
ECE-GY 6123	Image and Video Processing	3
ECE-GY 6143	MACHINE LEARNING	3
ECE-GY 6483	Real Time Embedded Systems	3
ROB-GY 6423	INTERACTIVE MEDICAL ROBOTICS	3

## Sample Plan of Study

Course	Title	Credits
<b>1st Semester/Term</b>		
BE-GY 6103	ANATOMY, PHYSIOLOGY, & BIOPHYSICS I	3
BE-GY 6473	APPLIED MATHEMATICS AND STATISTICS FOR BIOMEDICAL ENGINEERING	3
BE-GY 9730	Colloquium in Biomedical Engineering	0
Elective		3
<b>Credits</b>		<b>9</b>
<b>2nd Semester/Term</b>		
BE-GY 6503 or BE-GY 6783	BIOMEDICAL INSTRUMENTATION or BIOMECHANICS FOR BIOMEDICAL ENGINEERS	3
BE-GY 9730	Colloquium in Biomedical Engineering	0
Elective		3
Elective		3
<b>Credits</b>		<b>9</b>
<b>3rd Semester/Term</b>		
BE-GY 871X or BE-GY 997X	Guided Studies in Biomedical Engineering or MS THESIS IN BIOMEDICAL ENGINEERING	3
BE-GY 9730	Colloquium in Biomedical Engineering	0
BE-GY 9740	Seminar in Biomedical Engineering	0
Elective		3
Elective		3
<b>Credits</b>		<b>9</b>
<b>4th Semester/Term</b>		
BE-GY 871X or BE-GY 997X	Guided Studies in Biomedical Engineering or MS THESIS IN BIOMEDICAL ENGINEERING	3
BE-GY 9730	Colloquium in Biomedical Engineering	0

BE-GY 9740	Seminar in Biomedical Engineering	0
<b>Credits</b>		<b>3</b>
<b>Total Credits</b>		<b>30</b>

## Learning Outcomes

Upon successful completion of the program, graduates will:

1. Have established a fundamental understanding of the biological sciences and advanced math principles, and various fields of biomedical engineering key concepts and applications.
2. Be provided with exposure to laboratory and practical research opportunities, and enable them to develop innovative problem solving techniques in the field of biomedical engineering.
3. Have oral and written presentation capabilities for professional preparation and career development.

## Policies

### NYU Policies

University-wide policies can be found on the New York University Policy pages (<https://bulletins.nyu.edu/nyu/policies/>).

### Tandon Policies

Additional academic policies can be found on the Tandon academic policy page (<https://bulletins.nyu.edu/graduate/engineering/academic-policies/>).