

# M.S. in Biomedical Engineering

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## Degree Requirements

The MS BME program is flexible and customizable to a student's goals. Our program allows individuals with degrees in biomedical engineering to focus on a specialized area to a much greater degree than could be done in their undergraduate studies. It also allows those with science backgrounds in other fields to acquire knowledge and skills that will enable them to join this growing field. All applicants must have had courses in scientific computer programming, calculus, differential equations, statistics, and physiology. Students missing these requirements can be conditionally admitted with a requirement to take undergraduate bridge courses, which are in addition to the 30-credit graduation requirement.

The master's program consists of 30 credits. There are two program options: 24 course credits and 6 credits of master's thesis or 30 course credits not to include a master's thesis. Students should consult with the Program Advisor before registering for courses to ensure they meet degree requirements. As a requirement for graduation, students must achieve a 3.0 cumulative GPA in graduate-level classes, not including the master's thesis. Courses at the 500-or-below level are not acceptable for credit toward a graduate degree in biomedical engineering.

## Program Requirements

Applicants with a background in life science or related degrees, such as biology, biochemistry, or physical therapy, are required to register for bridge courses in their first semester before taking graduate-level BME courses. At the discretion of the department, students who have taken courses equivalent to these may have their bridge programs reduced accordingly. They must attain a grade of B or better in each course. The following courses are required:

### Thesis Option

For students taking the MS Thesis Option, two semesters of thesis count as two courses.

Code	Title	Credits
Courses selected from list of BME courses (see below for complete list)		18
One graduate course in physiology or equivalent		3
One graduate course in experimental design, statistics, or clinical studies		3
BME 701 Master's Thesis		6
BME 791	Graduate Seminar (required for two semesters)	0
Total Credits		30

### Non-Thesis Option

Code	Title	Credits
Courses selected from list of BME courses (see below for complete list)		24
One graduate course in physiology or equivalent		3
One graduate course in experimental design, statistics or clinical studies		3
BME 791	Graduate Seminar (required for two semesters)	0
Total Credits		30

## MS Curriculum Mandatory Courses

1. Admitted students who have not previously taken an upper level physiology course will be required to take BME 669 Engineering Physiology or BME 652 Cellular and Molecular Tissue Engineering or BME 650 Clinical Physiology & Neurophy or an equivalent course as one of their required graduate courses. Subject to graduate advisor's approval, this course could be waived if the student can demonstrate an equivalent background in their transcript.

2. In addition, Students must meet a statistics requirement. They may choose one course from the following preapproved statistics courses: MATH 660 Introduction to statistical Computing with SAS and R, MATH 661 Applied Statistics, MATH 663 Introduction to Biostatistics, IE 604 Advanced Engineering Statistics.

## MS Curriculum Courses

Code	Title	Credits
BME 651	Principles of Tissue Engineering	3
BME 653	Micro/Nanotechnologies for Interfacing Live Cells	3
BME 654	Cardiovascular Mechanic	3
BME 655	Advanced Characterization of Biomaterials	3

BME 656	Research Skills in Stem Cell	3
BME 661	Neural Engineering	3
BME 667	Bio-Control Systems	3
BME 668	Medical Imaging Systems	3
BME 670	Introduction to Biomechanical Engineering	3
BME 671	Biomechanics of Human Structure and Motion	3
BME 672	Biomaterials	3
BME 673	Biorobotics	3
BME 674	Principles of Neuromuscular Engineering	3
BME 675	Computer Methods in Biomedical Engineering	3
BME 676	Computational Biomechanics	3
BME 677	CAD for Biomechanics and Biomaterials	3
BME 678	Design of Orthopedic Implants	3
BME 679	Advanced Design of Orthopedic Implants	3
BME 680	BioMEMS Design and Applications	3
BME 681	Cellular Mechanobiology	3
BME 682	System Mgmt for Medical Device	3
BME 684	Medical Device Development	3
BME 686	Intro. to Instrumentation for Physiomeasurements	3
BME 687	Design of Medical Instrumentation	3
BME 688	Virtual Biomedical Instrument	3
BME 700B	Master's Project	3

Students may take one course outside the department to replace one BME course.

### Seminars

M.S. students must register for a 0-credit graduate seminar in at least two semesters, though these seminars do not contribute to the 30-credit requirement for graduation. Despite not being additive to credit requirements, participation is mandatory for graduation. These seminars typically feature guest speakers and presentations by NJIT graduate students. The Department also maintains lists of seminars in other departments and neighboring institutions that are interested in biomedical engineering. However, full-time employed graduate students can request a waiver for this requirement.

### Thesis Requirement:

The Thesis Option requires a six (6) credit thesis. Because biomedical engineering exists at the intersection of several traditional engineering and computing fields, and the biological and medical sciences, the thesis demonstrates the student's ability to define a problem, plan two semesters of independent work in an interdisciplinary environment, and execute a research and/or design that meets NJIT's standards for a Masters Thesis. The thesis document conforms to the format of the Office of Graduate Studies and is evaluated by a committee of three members, two of whom must be from the NJIT biomedical faculty. External members from industry, medicine or other universities are encouraged. An oral defense before the committee and the departmental community is also required. All NJIT theses are archived in the University Library and are available via the Library's website. Thesis topics are selected by the student in consultation with faculty and other potential advisors. Thesis content can include a research study, the development/ design of new technology including software, or the design, execution and evaluation of an experiment. A thesis may be conducted in an NJIT laboratory or in another institutional or industrial facility. The individual nature of the work must be clearly identifiable, as should its novelty and importance to biomedical engineering. In cases where the intellectual property of an industrial sponsor may be in conflict with the public presentation of the thesis or its availability through the NJIT Library, special arrangements can be made by the M.S. Program Director to protect the firm's property.