BIOMEDICAL ENGINEERING, MS

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The Department of Biomedical and Chemical Engineering offers a comprehensive set of graduate programs in biomedical and chemical engineering, including Master's of Science (MS) degrees and Doctor of Philosophy (PhD) degrees. Graduates of these programs work in the medical profession, the biomechanics and bioinstrumentation industries, the chemical engineering industry, the government, and in education.

The graduate program in biomedical engineering provides a wide range of opportunities for advanced study in this interdisciplinary field. This graduate program is linked with and focused on research programs in biomaterials and tissue engineering; biomechanics; orthopedic biomechanics; cardiac bioengineering; and neural engineering. Which degree to consider depends on one's career goals.

Major research laboratories include the Syracuse Biomaterials Institute, the Institute for Human Performance, and laboratories at nearby SUNY Upstate Medical University. Strong collaboration between Upstate Medical University and Syracuse University faculty, students, and staff provides opportunities for bioengineering research in clinical and basic science departments at Upstate, as well as in-depth study at one of the Syracuse University bioengineering research centers.

Student Learning Outcomes

1. Use the principles of science and mathematics to identify, formulate and solve advanced engineering problems
2. Apply both analysis and synthesis in the engineering design process, resulting in designs that meet constraints and specifications, including societal, economic, environmental, and other factors as appropriate to the design
3. Communicate advanced technical contents effectively with a range of audiences through various media
4. Establish goals, plan tasks, meet deadlines, manage risk and uncertainty, and function effectively on teams
5. Demonstrate ethical principles in an engineering context

M.S. in Biomedical Engineering

The Master's of Science (MS) in Biomedical Engineering is a flexible program with three options to help students develop careers in this field. The MS can be a terminal degree or an introduction to research before pursuing the PhD.

There are three options that students can choose. Plan 1 has a minimum requirement of 30 credit hours of graduate study, including 24 credits of coursework plus 6 credits of thesis. A master's thesis must be completed and defended in an oral examination. Plan 2 also has a minimum requirement of 30 credits with at least 27 credits of coursework with both BEN 687 Advanced Bioengineering Design and BEN 996 Masters Project taken in the same semester plus 3 credits of advisor approved electives. Plan 3 is a non-thesis program with cognate field. It requires a total of 36 credits with a minimum of 24 credits of technical coursework and 12 credits of tailored, non-technical concentrations. All three programs are designed to be completed in about two years.

The requirements for the three MS degree options are as follows:

General Requirements

Bridging Coursework

Applicants who do not hold a bachelor's degree in biomedical engineering may be required to complete a number of additional undergraduate engineering courses as corequisites for graduate coursework.

The need for such bridging coursework will be considered on a case by case basis, and applicants will be notified of any such requirements at the time of admission into the program.

Bridging courses if assigned, are usually completed in the first year of study. All assigned bridging coursework must be completed prior to graduation.

Graduate Seminar

Attendance at the BMCE Graduate Seminars is expected of students in all graduate programs.

Limit of 500-Level Credit

Graduate students in Plan 1 or Plan 2 may not count more than 15 credits of 500-level coursework toward the completion of their program of study.

Graduate students in Plan 3 may not count more than 18 credits of 500-level coursework.

Minimum GPA
- Minimum 3.000 GPA for all coursework counted toward the completion of degree; and
- Minimum 2.800 GPA cumulative for all coursework.

Coursework Requirements (Non-Cognate)
30 total credits

Biomedical Engineering Core
- 15 credits of graduate-level biomedical engineering (BEN) coursework

Ethics Requirement
- BEN 602 Ethical Issues in Engineering and Research 3 credit(s)

Electives
- 6 credits of advisor-approved coursework

And choice of:

Thesis (Plan 1)
- BEN 997 Masters Thesis 3 credit(s)
- BEN 991 Introduction to MS Research 3 credit(s)

Or

Advanced Design & Comprehensive Exam (Plan 2)
Both BEN 687 Advanced Bioengineering Design and BEN 996 Masters Project must be taken in the same semester.

- BEN 687 Advanced Bioengineering Design 3 credit(s)
- BEN 996 Masters Project 0 credit(s)

Additional Elective
- 3 additional credits of advisor approved electives

Coursework Requirements (With Cognate)
36 total credits

The cognate will be noted on the student's official transcript.

Biomedical Engineering Core
12 credits of graduate-level biomedical engineering (BEN) courses

Ethics Requirement
- BEN 602 Ethical Issues in Engineering and Research 3 credit(s)

Electives
- 6 credits of advisor-approved coursework

Advanced Design & Comprehensive Exam
Both BEN 687 Advanced Bioengineering Design and BEN 996 Masters Project must be taken in the same semester.

- BEN 687 Advanced Bioengineering Design 3 credit(s)
- BEN 996 Masters Project 0 credit(s)

Cognate (Plan 3)
- 12 credits in a tailored concentration

Tailored Concentrations

1. Engineering Management
2. Technology & Public Policy
3. Technology Transfer & Law

Exit Requirement Overview

Thesis Overview (Plan 1)
Successful completion of the MS degree with thesis requires a written MS thesis and an oral defense.

Proposal
Students interested in pursuing a thesis must first register for BEN 991 Introduction to MS Research and perform their initial thesis research under the supervision of their thesis advisor.

At the conclusion of this course the proposal research will be graded, and the student and advisor will determine whether to continue with the proposed thesis.

If not, BEN 991 Introduction to MS Research may be counted toward degree completion.

If so, the student will register for BEN 997 Masters Thesis, complete any remaining work, and defend their thesis.

Deadlines
Students must submit a Request for Examination Form to the Graduate School at least three full weeks prior to the oral defense.

The thesis document must be delivered to the MS Thesis defense committee at least two weeks prior to the date of the oral defense.

Defense Committee
The MS Thesis defense committee consists of four members:

- The thesis advisor;
- No fewer than two tenure-track members of the BMCE faculty; and
- The Chair of the Oral Examination Committee.

The Chair of the Oral Examination Committee must be a Syracuse University tenured or tenure-track faculty member outside the department and program.

All proposed committee members must be full-time or adjunct faculty members at Syracuse University. Outside committee members (e.g. from SUNY-ESF, Upstate Medical University, etc.) may be allowed by petition.

Additional Requirements
Defenses must comply with Graduate School policy and requirements, including proper formatting.

Comprehensive Exam Overview (Plan 2 and Plan 3)
Successful completion of the MS Project course and the accompanying Oral Comprehensive Examination.

Timing
The MS Project course, BEN 687 Advanced Bioengineering Design, and Comprehensive Exam, BEN 996 Masters Project, are only offered during the fall semester.

Oral Comprehensive Examination
The Oral Comprehensive Examination will be the culminating event of the M.S. Project course. Students will prepare and present the products/

outcomes of their project to the departmental faculty and respond to questions from the faculty.

The examination committee will be composed of at least three department faculty, but all faculty are invited, and the examination will be scheduled to maximize faculty participation.

The examination committee will meet separately to determine if the student has passed the examination, and the student will be informed of the decision.

Students are required to submit an electronic copy of presentation materials to the Department prior to the presentation.