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1. Overview of the Program

The Biomedical Engineering graduate program at Binghamton University prepares graduate engineers for leadership positions at biomedical research, education and entrepreneurship and for success in a global environment. Our distinguished faculty includes internationally renowned researchers in biomedical engineering. Students will have opportunities to interact with faculty to pursue cutting-edge biomedical engineering research. They will learn and develop professional skills to advance their careers and to become leaders in the field of engineering, biology, medicine, and business. The program places strong emphasis on inter- and transdisciplinary approaches for teaching and learning, and offers ample opportunities for students to design and implement innovative ideas and technologies in a dynamic, enriched, cutting-edge environment. Graduates will have diverse career opportunities in academia, industry and business, working to improve human health and well-being through scientific and technological innovations.

The Department offers the following degree programs in Biomedical Engineering:

**Master of Science in Biomedical Engineering**

The master’s degree program prepares students for careers in the biotechnology industry and medical/healthcare centers or providers of medical/healthcare technology.

*Non-thesis option (typical time to degree: 1.5 years)*

- 30+ credits of coursework, *including* 3+ credits for a final project

*Thesis option (typical time to degree: 1.5~2.5 years)*

- 24+ credits of coursework
- 6+ credits of thesis research
- Submission and oral defense of thesis

**Doctor of Philosophy in Biomedical Engineering**

The doctoral degree program helps students develop advanced knowledge and skills, preparing them for academic or industry careers related to translational biomedical science and engineering, as well as the background necessary to pursue an entrepreneurial role in biomedical/healthcare technology (typical time to degree: 5 years beyond bachelor degree).

- Forming a Guidance Committee
- Developing and fulfilling a Plan of Study that should include:
  - 24+ credits of coursework beyond Bachelor’s degree
  - Dissertation research
  - Teaching experience
- Passing written and oral comprehensive examination
• Submission and oral defense of dissertation proposal
• Submission and oral defense of dissertation

Detailed requirements are to be specified in the student’s Plan of Study that needs to be approved by the student’s Guidance Committee, the Graduate Program Director and the Department Chair.
2. Admission & Degree Requirements

Admission Requirements
The admission requirements for students with a Bachelor’s or Master’s degree in engineering or a related discipline are a GPA of 3.0 or greater, and for international students, a minimum TOEFL score of 550 (paper-based) or 80 (internet-based) or a minimum IELTS score of 6.5. For PhD applicants, a Biomedical Engineering faculty member must agree to serve as a principal advisor to the prospective student. Details concerning admission for both international and domestic students are provided in the Graduate School’s website: http://www2.binghamton.edu/grad-school/prospective-students/

Upon approval of the Graduate School, students that do not satisfy the GPA requirements may be conditionally admitted to the Biomedical Engineering program if there is sufficient evidence to indicate that the student can successfully satisfy the degree requirements. In these cases the Biomedical Engineering Graduate Studies Committee may specify that the student obtain a stated minimum grade on certain specified courses during the first semester of study. See the BU Graduate School Manual for more details: http://www2.binghamton.edu/grad-school/manual/admissions.html#type-of-admission

University-wide Degree Requirements
- Maintenance of at least a “B” (3.0) average in coursework grades
- At least 24 credit hours in residence at Binghamton University
  - Courses and independent studies DO count for this requirement.
  - Research and teaching credits DO NOT count for this requirement.
- Maintain continuous registration until the degree is conferred
- Full-time registration status (applicable to TA/RA/GA and international students)
  - 12 credits in year 1
  - 9 credits in year 2+
  - Only 1 research credit required once students have completed all coursework
    - MS students should submit the “Full-time certification” form: For funded students: http://www2.binghamton.edu/grad-school/files/forms/Full_Time_Certification_Form_for_FUNDED_Students.pdf For non-funded students: http://www2.binghamton.edu/grad-school/files/forms/Full-Time_Certification_Form_for_Non-Funded_Students.pdf
    - PhD students will also need to pass a comprehensive examination and submit the “Admission to Candidacy” form:
Master of Science in Biomedical Engineering: Non-thesis Option
Complete at least 30 credits of graduate study that consists of:

- Required core courses listed in the University Bulletin
- Department-approved electives and/or independent study
- 3 or more credits of termination project, including submission of a final project paper to the Department

Master of Science in Biomedical Engineering: Thesis Option
Complete at least 30 credits of graduate study that consists of:

- Required core courses listed in the University Bulletin
- Department-approved electives and/or independent study
- 6 or more credits of thesis research supervised by a BME faculty advisor and a thesis committee made of at least three BU faculty members including the advisor
- Submission of a master's thesis with oral defense

Doctor of Philosophy in Biomedical Engineering
Doctoral degree (for students with Bachelor’s degree only)
Complete graduate study that includes:

- Required core courses listed in the University Bulletin
- Department-approved electives and/or independent study
- Total number of credits for coursework should be at least 24 to satisfy the University’s residency requirement.
- At least one course should be at 600-level.
- Dissertation research
- These requirements are adjustable. A Plan of Study will be discussed and determined by Guidance Committee based on the student’s background and specialty. The Plan of Study must be reviewed and approved by the student’s Guidance Committee, the Graduate Program Director and the Department Chair.

Fulfill a Plan of Study.
Submit annual progress reports to Guidance Committee.
Optionally submit a Master’s thesis, with oral defense.
Pass a comprehensive examination that consists of written and oral parts.
Demonstrate an ability to teach.
Submit and defend a thesis proposal (prospectus and colloquium).
Submit and defend a dissertation.
| Doctoral degree (for students who obtained Master’s degree in BME at BU and moved on to its PhD program) | Complete graduate study that includes dissertation research and other credits.  
- At least one course should be at 600-level.  
- A Plan of Study will be discussed and determined by Guidance Committee based on the student’s background and specialty. The Plan of Study must be reviewed and approved by the student’s Guidance Committee, the Graduate Program Director and the Department Chair.  
Fulfill a Plan of Study.  
Submit annual progress reports to Guidance Committee.  
Pass a comprehensive examination that consists of written and oral parts.  
Demonstrate an ability to teach.  
Submit and defend a thesis proposal (prospectus and colloquium).  
Submit and defend a dissertation. |
|---|---|
| Doctoral degree (for students who obtained Master's degree elsewhere and enrolled in BU's PhD program, or students who obtained BME or other Master's degree at BU and then had a blank time before enrolling in BU's BME PhD program) | Complete 24 or more credits of graduate study that consists of:  
- 24 credits of coursework (core courses, electives, and/or independent study) to satisfy the University's residency requirement  
- At least one course should be at 600-level.  
- A Plan of Study will be discussed and determined by Guidance Committee based on the student’s background and specialty. The Plan of Study must be reviewed and approved by the student’s Guidance Committee, the Graduate Program Director and the Department Chair.  
Fulfill a Plan of Study.  
Submit annual progress reports to Guidance Committee.  
Pass a comprehensive examination that consists of written and oral parts.  
Demonstrate an ability to teach.  
Submit and defend a thesis proposal (prospectus and colloquium).  
Submit and defend a dissertation. |

**Department-Approved Elective Courses**

- BME 515 Complexity in Biological Systems
- BME 523 Dynamics of Complex Networks
- BME 524 Graduate Seminar in Complex Systems Science
- BME 532X Bioelectromagnetics
- BME 540 Bioinformatics: Concepts and Applications
- BME 550 Intellectual Property Law in Biomedicine
- BME 555 Innovation and Entrepreneurship
- BME 556 Technology Venture Creation
- More courses TBA
3. Detailed Steps for PhD Students

Selection of Principal Advisor
The student/advisor selection procedure begins with the department’s admission requirement that a professor be available and willing to work with the prospective student. The name of the principal advisor is provided to the Graduate School at the same time that admission to the department’s graduate program is granted. Therefore, it is suggested that prior to applying, all prospective students contact faculty members with whom they share mutual research interest. It is essential that the prospective student and the potential principal advisor have open, honest discussions concerning the expectations of each relative to the other before a final selection is made.

Circumstances may arise in which the principal advisor has not been selected prior to admission to the department’s graduate program. In such cases, the Department Chair will serve as the student’s principal advisor until a permanent principal advisor is selected. This should occur no later than the end of the first semester of graduate study and, in most situations, it is expected that the selection process will be made early in the first semester.

Remember, however, that the selection process is mutual; that is, the professor also chooses the students with whom he or she wishes to work. In addition, the interest of the principal advisor is, by necessity, often driven by research contracts. Thus, the research area chosen by the student is expected to fit into the overall research program of the advisor. If the student wishes to change principal advisors, the request should be made both orally and in written form to the Graduate Program Director and the Department Chair for approval. The Graduate Program Director and the Department Chair will consult with all parties involved before establishing the conditions, if any, under which the change may be made. Similarly, the student should consult with the Graduate Program Director and the Department Chair in situations where his or her principal advisor is unable to continue to serve in that capacity.

Guidance Committee
Each student’s program is guided by a principal advisor and a Guidance Committee. Their purpose is to give continuity of direction and counsel and provide intellectual stimulation from the earliest days of residency through the completion of the doctorate. The principal advisor, in consultation with the student, selects the Guidance Committee, subject to review and approval by the Graduate Program Director and the Department Chair. Once the Guidance Committee has been selected, the Principal Advisor/Guidance Committee form must be submitted to the Graduate Program Director, the Department Chair and the Graduate School. The form is available from the Watson Student Advising website: http://www2.binghamton.edu/watson/student-services/advising/graduate/grad-forms.html
The Guidance Committee provides advice to the student and specifically sets requirements within the graduate program, the Graduate School, and University regulations, which the student must meet in pursuit of the doctorate. The student has the responsibility of interacting with the Guidance Committee and keeping them informed of his or her progress. The Guidance Committee has a minimum of four members. The principal advisor serves as the Chair of the Committee. At least two Committee members must be selected from the Biomedical Engineering graduate program, and at least two departments must be represented within the Committee.

All decisions of the Guidance Committee are made by majority vote. The principal advisor is responsible for transmitting Guidance Committee decisions to the Graduate Program Director and the Watson School Graduate Studies Committee.

In addition to advising and program planning, the Guidance Committee is also involved with the development and administration of the comprehensive exam.

The Guidance Committee must be kept at its full complement throughout the graduate career of the individual student. In the event of a vacancy on the Committee (occasioned by resignation, faculty leave, or inability to serve), an appropriate replacement must be made prior to the making of any Committee decision. In the case of resignation, the principal advisor must submit a new Principal Advisor/Guidance Committee form to add a new member.

**Plan of Study**

Procedures for developing a plan of study are much like those presented earlier. During the first semester, the student should consult with the principal advisor and the Guidance Committee and develop a plan of study that should describe:

- Major Area of Research (Description of research area. Typically 2-3 paragraphs.)
- Relevant Prior Graduate Coursework (Prior coursework to be used toward PhD degree. List course names and number of credits for each.)
- Course Requirements to be Completed (Current and future coursework to be used toward PhD degree. List course names and number of credits for each.)
- Comprehensive Examination (Brief description of areas in which the student is to be examined, and the form the examination will take.)
- Reading List (List of books and/or other publications to be used to prepare for the Comprehensive Examination, with titles and authors. The nature and specifics of this list are dependent on the department and guidance committee.)
- Teaching Requirement (Description of how teaching proficiency requirement will be met.)
- Progress Evaluation Procedures (Describe periodic evaluation for meeting the goals of the learning contract.)
- Colloquium and Prospectus (Brief description of how and when the colloquium and prospectus requirements will be met.)
A sample format of a Plan of Study (called “Learning Contract” in other Departments) is available from the Watson Student Advising website mentioned above.

The Plan of Study must be approved by the student’s Guidance Committee, who will in turn submit the plan to the Graduate Program Director for review and placement in the student’s records.

Coursework should be related to the dissertation problem area and aid in developing a thorough understanding of the basic concepts pertinent to the thesis problem. Changes to the plan are subject to approval by the principal advisor and the Guidance Committee. The Plan of Study is to be completed during the first semester of graduate study and is considered to be the mutual responsibility of the student and the principal advisor.

Comprehensive Examination

The written and oral comprehensive examinations measure a candidate’s potential competency in his or her area of specialization sufficient to understand and advance the current state of the art research. After completing approximately one-two years of graduate study (no later than three years after the admission to the BME PhD program), the prospective candidate should take the comprehensive examination. The exam will be developed and administered by the student’s Guidance Committee. The format of the exam will be determined by the Guidance Committee. Students may retake a failed comprehensive exam once, contingent upon approval of the student’s Guidance Committee, the Graduate Program Director and the Department Chair. A student who fails the comprehensive examination twice will be terminated from the program. Under no circumstances will a student be allowed to take the comprehensive examination more than twice. Upon satisfactorily completing these examinations and approval of the Guidance Committee, the student will be admitted to candidacy and proceed toward completion of the remaining requirements for the degree.

Dissertation Committee

Immediately after the student passes the comprehensive examination, the student and the principal advisor form a Dissertation Committee. The members of this Committee can be different from the student’s Guidance Committee. The Dissertation Committee has direct charge of all matters pertaining to the student’s dissertation. The composition of this Committee is as follows:

- At least four faculty members with the formal rank of assistant, associate or full professor in an academic department offering advanced degrees. The principal advisor usually serves as the Committee Chair. At least two members must be selected from the Biomedical Engineering program, and at least two departments must be represented within the Committee.
- An outside examiner will be appointed by the Graduate School to the student’s Dissertation Committee prior to the final defense of the dissertation. The outside examiner’s function on the Committee is to render an independent judgment and
to assure that the dissertation satisfies Graduate School standards. There must NOT be any conflict-of-interest between the outside examiner and the student or the principal advisor. See below for more details:
http://www2.binghamton.edu/grad-school/manual/policies-doctoral.html#205
To request an appointment of an outside examiner, the principal advisor is to submit the following form:
http://www2.binghamton.edu/grad-school/files/Nomination_of_Outside_Examiner_Form.pdf
The expertise of the Dissertation Committee members should encompass the body of knowledge necessary for completion of the student’s dissertation research. The members of the Committee must be approved by the Graduate Program Director and the Department Chair.

**Teaching Requirements**

In addition to passing the comprehensive examination, the student has to demonstrate his or her ability to teach. The chair of the student’s Dissertation Committee evaluates whether the student is proficient in teaching. This requirement may be met by serving as the teacher of record of an undergraduate course, by serving at least two semesters as a teaching assistant, or by other ways approved by the Graduate Program Director and the Department Chair.

**Admission to Candidacy**

Upon satisfactory completion of all the requirements above (fulfillment of the Plan of Study, passing the comprehensive examination, and satisfying the teaching requirements), the student will be officially admitted to candidacy for the doctorate in biomedical engineering. The student’s Guidance Committee should submit the following form to the Graduate Program Director:
In exceptional cases, with approval of the Graduate Program Director and the Department Chair, some of the requirements may be satisfied by means of previous academic experience, publications or other evidence of competence.

Once the student is admitted to candidacy, his or her status will become All-But-Dissertation (ABD). Two semesters normally elapse between admission to candidacy and the granting of the doctoral degree. The student must complete all the requirements for the degree, including the submission and defense of the dissertation, within 5 years after admission to candidacy.

**Thesis Proposal (Prospectus and Colloquium)**

Within 6 months after being admitted to candidacy, the student should submit a written proposal (“prospectus”) for his or her thesis research to the Dissertation Committee and
present it orally (“colloquium”). This proposal should include and will be evaluated based on:

- Specific aims with hypothesis
- Background and motivation
- Preliminary studies
- Proposed research
- Detailed research plan
- Originality and significance
- Expected outcomes
- Timeline

The colloquium should take place not more than two weeks after the submission of the prospectus.

Depending upon the Dissertation Committee’s evaluation, revisions of the research plan may be requested, conditional approval may be granted pending some modifications, or full approval may be granted. If revisions are requested, the student should correct the thesis proposal and present it again to the Committee. A maximum of one semester is allotted to present a revised proposal.

**Thesis Submission and Defense**

Upon completion of the dissertation research, the student should submit his or her dissertation to the Dissertation Committee for evaluation. It should be submitted to the Committee only when the student’s principal advisor judges that the work is ready for evaluation. The chair of the Committee will inform the outside examiner of the progress and will provide him/her a copy of the dissertation once submitted.

Not later than one month after the submission of the dissertation, the student will defend it orally in an open colloquium setting. It will be open to the general public and should be advertised to the University community at least one week before it takes place. A closed session will follow the oral presentation where the student will be questioned by the Dissertation Committee members.

An evaluation will be handed to the student after the Committee debate in private. The dissertation may be accepted as is, accepted conditionally with required modifications, or rejected. If accepted conditionally with required modifications, the principal advisor will determine the period of time allotted for the modifications. The decision to recommend for a doctoral degree must be made by unanimous votes of the Dissertation Committee.

If the dissertation is rejected, the Graduate Program Director and the Department Chair will study the case and will meet the student and the Dissertation Committee to determine a new course of action, which may include forming a new Dissertation Committee.
Upon satisfactory dissertation defense, the Graduate Program Director will submit a signed copy of the Recommendation of Award of Doctoral Degree to the Watson Student Advising Office. After verification of completion of the graduate study, the Recommendation will be forwarded to the Graduate School.

**Annual Evaluation and Progress Report**

Each year the Department’s Graduate Studies Committee, in consultation with the principal advisor, evaluates the progress of each graduate student with regard to individual performance and accomplishments. Early in the calendar year (usually in January) the student should schedule a time with the Guidance Committee to discuss the state of his or her research. The student needs to submit a graduate student progress report to show the requirements met and the percentages of coursework and research completed. The principal advisor will sign the report, make some comments for the annual evaluation, and write a job description that outlines the responsibilities of the student for the coming year. The Graduate Studies Committee will review the documents and make a report to the Graduate Program Director and the Department Chair.
4. New Students: Things to Do First

Welcome to Binghamton University! There are a number of things you need to do before and upon your arrival. Read the following instructions carefully and meet all the requirements.

☐ Read the “New Students” section on the Graduate School website.
http://www2.binghamton.edu/grad-school/new-and-current-students/index.html

- Activate BMail account.
  - NOTE: All official communications will be sent only to your BMail address. It is your responsibility to check your BMail account often.
- Activate your computer account.
- Read and accept the Code of Conduct.
- Obtain your BU Student ID card.
- Confirm your enrollment.

☐ Attend required online orientation.
http://www2.binghamton.edu/grad-school/new-and-current-students/new-graduate-students/orientation.html

☐ Attend TA and/or international student orientation (if applicable).
http://www.gradschool.binghamton.edu/ps/orientation/
http://www2.binghamton.edu/isss/orientation/

☐ Fulfill mandatory health requirements.
http://www2.binghamton.edu/health/new-students.html
http://www2.binghamton.edu/health/health-insurance/

- Health insurance is required for all international graduate students.
- Domestic graduate students are not required to purchase health insurance but are strongly recommended to do so.

☐ Register your vehicle and obtain a parking permit (if you drive to campus).
http://www2.binghamton.edu/parking-services/

☐ For Teaching Assistant (TA)/Research Assistant (RA)/Graduate Assistant (GA): Contact Human Resources regarding required forms and health insurance plans.
http://humanresources.binghamton.edu/
☐ Submit “Intake Form” to the Graduate Program Director.

☐ For Thesis-option MS students and PhD students: Identify a primary research advisor within the BME program and form a Guidance Committee.

☐ For PhD students: Work with your Guidance Committee to develop a Plan of Study. PhD students will need to submit the following three forms to the Watson School Student Advising Office through the Graduate Program Director:
  - Principal Advisor/Guidance Committee form
  - Statement of PhD Research Interest form
  - Learning Contract form (this is called “Plan of Study” in the Department of Bioengineering)

These forms are available from: http://www2.binghamton.edu/watson/student-services/advising/graduate/grad-forms.html

☐ Discuss the courses you will take during this upcoming semester with the Graduate Program Director and/or your advisor.

☐ Register to the courses before the semester begins! http://bubrain.binghamton.edu/

☐ For students who will work in lab space: Get required lab safety training. http://www2.binghamton.edu/ehs/lab-safety/

Once you completed required lab safety training, contact Ellen Madison to have your BU ID card programmed to have access to the lab space.

☐ For students who will work on projects (including class projects) that involve human subjects: Get trained and certified to conduct human subject research. http://humansubjects.binghamton.edu/

☐ For international students: Check the ISSS website and follow all regulations. http://isss.binghamton.edu/

☐ For students with disabilities: Contact Services for Students with Disabilities (SSD). http://ssd.binghamton.edu/
5. Other Useful Links

Biomedical Engineering (BME) graduate program
http://www2.binghamton.edu/bioengineering/grad/index.html

Graduate School
http://gradschool.binghamton.edu

Graduate School Manual
http://www2.binghamton.edu/grad-school/manual/

University Bulletin
http://bulletin.binghamton.edu/

Watson School Graduate Advising
http://www2.binghamton.edu/watson/advising/graduate/

Watson School Academic Honesty Code
http://www2.binghamton.edu/watson/about/academic-honesty.html

Information Technology Services
http://its.binghamton.edu/

Watson School MSDN Academic Alliance
http://msdn04.e-academy.com/binghamton_watson

Information for Current Students
http://www2.binghamton.edu/about/current-students.html
6. Department Facilities

Card Access
The Department of Bioengineering is located on the second floor of Biotechnology Building, which is part of the Innovative Technologies Complex (ITC). The Building and the Department area are access restricted (except during normal business hours). If you need access to the Building and the Department, contact Ellen Madison and have your BU ID Card programmed.

Graduate Students’ Office Space
The Department of Bioengineering has limited office spaces for graduate students. They are available for PhD (and some MS) students who work on research projects under the supervision of BME faculty. If you need an office space, first talk to your advisor as some research laboratories have graduate student office space. If your advisor does not have space, submit an office request to the Graduate Program Director. Space allocations are reviewed and updated every semester.

Students who have office spaces will also receive individual mailboxes located in the open student work area (East).

For other students, Pods computers are available in the open student work area (West).

Printing, Photocopying and Scanning
The Department’s printer/scanner/photocopier is to be used for Departmental business only.

Kitchen
The Department has a kitchen with a refrigerator, a microwave, a water cooler, a coffee maker and a small eat-in table and chairs. This kitchen is a shared space used by not only people in our Department but also by others, so you must use the area respectfully and responsibly. Make sure you follow all the instructions posted in the kitchen, and clean up the area after you finish using it.
7. Contacts

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