

BU BME Department

*Graduate Student Handbook for
PhD Candidates*

Fall 2023

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Overview of PhD Program Timeline

Typical progress through the BME PhD degree follows the timeline described below.

- Course requirements should be completed as early as possible, typically within the first two years.
- It is highly recommended that the math requirement be completed during the first academic year.
- Students complete the required rotation system in the first academic year before choosing a lab to join.
- The Oral Qualifier Exam is taken in early summer (usually June) following the first academic year.
- Students form an Advisory Committee at the end of their second year (by August 31).
- Students typically perform their required teaching practicum in the second and third year, one semester each year.
- The Prospectus Defense should be presented by the end of the sixth semester from matriculation.
- Advisory Committee meetings must occur at least once every 12 months for students in the third year and above.
- The culmination of the PhD is the dissertation, which consists of both a written document and an oral defense.

Note that special cases where timelines may deviate from this are described in detail in this handbook.

	Year 1			2			3			4			5			6		
	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp	Su	Fa	Sp	Su
Fulfill Course Requirements	█	█	█	█	█													
Fulfill Math Requirement	█	█																
Laboratory Rotations	█	█																
Oral Qualifying Exam (Quals)			█															
Teaching Practicum (TA)				█	█		█	█										
Advisory Committee Formed						█												
Prospectus Defense								█										
Annual Committee Meetings											█			█				
Written Dissertation & Defense																		█

Summary of Course Requirements for BME PhD Candidates

Post-BS PhD Students (Post-Bachelor's)

- **BE 790 Biomedical Engineering Seminar**
- **BE 791 Biomedical Engineering Laboratory Rotations** (Students will register for 1 credit in the fall semester and 2 credits in the spring semester – one credit per rotation)
- **BE 792 Literature Review** (spring semester of the first year, 2 credits)
- **BE 605 Molecular Bioengineering** (fall semester of the first year, 4 credits)
If a student has prior coursework that they feel overlaps substantially with the material, they can discuss with the instructor the possibility of waiving this course requirement. Waivers must be approved by the Associate Chair for Graduate Programs using the [BME Petition Form](#).
- **BE 606 Quantitative Physiology for Engineers** (spring semester of the first year, 4 credits)
If a student has prior coursework that they feel overlaps substantially with the material, they can discuss with the instructor the possibility of waiving this course requirement. Waivers must be approved by the Associate Chair for Graduate Programs using the [BME Petition Form](#).
- **Three Graduate-Level BME Electives**
- **Two Graduate-Level Technical Electives** Technical electives are highly quantitative courses in engineering (additional BME coursework is acceptable), computer science, math, physics, or related areas.
Note: Courses related to product development or management do not qualify as technical electives. See note below about other exceptions. If in doubt about a course, students should consult with the Assistant Director, Academic Programs.
- **Math Requirement** (B+ or better required, selected from approved list included in handbook and available online). It is strongly recommended that this be completed during the first academic year. Both passing the Oral Qualifier Exam and satisfying the math requirement are required in order to achieve PhD candidacy.
- **Teaching Practicum (BE 801 and BE 802)** All PhD students are required to teach two semesters. Typically, the first teaching assignment (BE 801) is during the second year and the second assignment (BE 802) is during the third year. BE 801 and BE 802 each count for 4 credits.
Note: It is the department's very strong recommendation that students not register for additional coursework while engaged in teaching or take at most one additional class. This does not include BE 900/991 credits!
- **BE 900 (Pre-Prospectus)/991 (Post-Prospectus) Research** (minimum of 12 credits)
- If approved by the student's advisor, additional courses that do not necessarily satisfy a program requirement but would be beneficial to the student's research or career goals are allowed.

Post-Bachelor's PhD students must complete a required minimum total of **64 credits** (formal courses plus research credits) prior to graduation, earning at least 56 credits at BU.

Post-MS PhD Students (Post-Master's)

- **BE 790 Biomedical Engineering Seminar**
- **BE 791 Biomedical Engineering Laboratory Rotations** (Students will register for 1 credit in the fall semester and 2 credits in the spring semester – one credit per rotation)
- **BE 792 Literature Review** (spring semester of the first year, 2 credits)
- **BE 605 Molecular Bioengineering** (fall semester of the first year, 4 credits)
If a student has prior coursework that they feel overlaps substantially with the material, they can discuss with the instructor the possibility of waiving this course requirement. Waivers must be approved by the Associate Chair for Graduate Programs using the [BME Petition Form](#).

- **BE 606 *Quantitative Physiology for Engineers*** (spring semester of the first year, 4 credits)
If a student has prior coursework that they feel overlaps substantially with the material, they can discuss with the instructor the possibility of waiving this course requirement. Waivers must be approved by the Associate Chair for Graduate Programs using the [BME Petition Form](#).
- **One Graduate-Level BME Elective**
- **One Graduate-Level Technical Elective** Technical electives are highly quantitative courses in engineering (additional BME coursework is acceptable), computer science, math, physics, or related areas.
Note: Courses related to product development or management do not qualify as technical electives. See note below about other exceptions. If in doubt about a course, students should consult with the Assistant Director, Academic Programs.
- **Math Requirement** (B+ or better required, selected from approved list included in handbook and available online). It is strongly recommended that this be completed during the first academic year. Both passing the Oral Qualifier Exam and satisfying the math requirement are required in order to achieve PhD candidacy.
- **Teaching Practicum (BE 801 and BE 802)** All PhD students are required to teach two semesters. Typically, the first teaching assignment (BE 801) is during the second year and the second assignment (BE 802) is during the third year. BE 801 and BE 802 each count for 4 credits.
Note: It is the department's very strong recommendation that students not register for additional coursework while engaged in teaching or take at most one additional class. This does not include BE 900/991 credits!
- **BE 900 (Pre-Prospectus)/991 (Post-Prospectus) Research** (minimum of 4 credits)
- If approved by the student's advisor, additional courses that do not necessarily satisfy a program requirement but would be beneficial to the student's research or career goals are allowed.

Post-Master's PhD students must complete a required minimum total of **32 credits** (comprised of formal courses plus research course credits) at BU.

MD/PhD Students

- **BE 790 *Biomedical Engineering Seminar***
- **BE 791 *Biomedical Engineering Laboratory Rotations*** (Students will register for 1 credit in the fall semester and 2 credits in the spring semester – one credit per rotation)
- **BE 792 *Literature Review*** (spring semester of the first year, 2 credits)
- **BE 605 *Molecular Bioengineering*** (fall semester of the first year, 4 credits)
If a student has prior coursework that they feel overlaps substantially with the material, they can discuss with the instructor the possibility of waiving this course requirement. Waivers must be approved by the Associate Chair for Graduate Programs using the [BME Petition Form](#).
- **BE 606 *Quantitative Physiology for Engineers*** (spring semester of the first year, 4 credits)
If a student has prior coursework that they feel overlaps substantially with the material, they can discuss with the instructor the possibility of waiving this course requirement. Waivers must be approved by the Associate Chair for Graduate Programs using the [BME Petition Form](#).
- **One Graduate-Level BME Elective**
- **Two Graduate-Level Technical Electives** Technical electives are highly quantitative courses in engineering (additional BME coursework is acceptable), computer science, math, physics, or related areas.
Note: Courses related to product development or management do not qualify as technical electives. See note below about other exceptions. If in doubt about a course, students should consult with the Assistant Director, Academic Programs.
- **Math Requirement** (B+ or better required, selected from approved list included in handbook and available online). It is strongly recommended that this be completed during the first academic year. Both passing the Oral Qualifier Exam and satisfying the math requirement are required in order to achieve PhD candidacy.
- **Teaching Practicum (BE 801 and BE 802)** All PhD students are required to teach two semesters. Typically, the

first teaching assignment (BE 801) is during the second year and the second assignment (BE 802) is during the third year. BE 801 and BE 802 each count for 4 credits.

Note: It is the department's very strong recommendation that students not register for additional coursework while engaged in teaching or take at most one additional class. This does not include BE 900/991 credits!

- **BE 900 (Pre-Prospectus)/991 (Post-Prospectus) Research** (4 credits)
- If approved by the student's advisor, additional courses that do not necessarily satisfy a program requirement but would be beneficial to the student's research or career goals are allowed.

MD/PhD students have course requirements that are a hybrid between those of Post-BS and Post-MS PhDs. Students must complete a required minimum total of **48 credits** (comprised of formal courses plus research course credits) prior to receiving the PhD degree.

Coursework in Relation to the Oral Qualifier Exam

First year students should familiarize themselves with the topic areas (see page 14) prior to selecting coursework. Although the exam does not focus on specific courses, taking graduate-level coursework in areas that are relevant for the qualifying exam topics can be helpful.

Required Teaching Practicums for All PhD Students

BE 801 and BE 802 Teaching Practicum I and II (4 credits each) All PhD students assigned to teach for the first time are required to register for BE 801 during the semester of their formal teaching assignment. During the second assignment, students must register for BE 802. It is the department's very strong recommendation that students not register for additional coursework while engaged in teaching or take at most one additional class. This does not include BE 900/991 credits!

Credit for Courses Taken Elsewhere

Students may "place out" of required courses (but not electives, BE 792, BE 801, BE 802, BE 900 or BE 991), if they have taken equivalent courses elsewhere at the graduate level, as long as those courses were not used to meet the requirements of an undergraduate or previous degree. For example, students who have taken a graduate-level physiology course may receive permission to waive BE 606. Students with extensive experience in quantitative molecular biology may receive permission to waive BE 605. This permission must be granted by submitting a [BME Petition Form](#) BEFORE the end of the ADD/DROP period. **Though students may have specific course requirements waived, this does not alter the total number of credits a student must earn at Boston University (56 or more for Post-BS PhD students, 32 for Post-MS PhD students) to meet the degree requirements.**

Courses that Fulfill the BME Math Requirement

Students must complete one 4-credit or two 2-credit math courses (BE 601-604) from the list below and pass with a B+ or higher. Students may petition for a different course (500-level or higher) to satisfy the math requirement.

- ENG BE 601 Linear Algebra
- ENG BE 602 Ordinary Differential Equations

- ENG BE 603 Partial Differential Equations
- ENG BE 604 Statistics and Numerical Methods

NOTE: If students take courses from the BE 601-604 series they must take BE 601 and then either BE 602, BE 603, or BE 604 to satisfy the Math Requirement. Rudimentary programming skills are necessary for these modules.

- ENG BE 567 Nonlinear Systems in Biomedical Engineering
- ENG BE 747 Advanced Signals and Systems Analysis for Biomedical Engineering
- ENG EC 505 Stochastic Processes
- ENG EK 501 Mathematical Methods I: Linear Algebra and Complex Analysis
- CAS MA 561 Methods of Applied Mathematics I
- CAS MA 565 Mathematical Models in the Life Sciences
- CAS MA 579 Numerical Methods for Biological Sciences
- CAS MA 581 Probability
- CAS MA 582 Mathematical Statistics
- CAS MA 583 Introduction to Stochastic Processes
- CAS MA 588 Nonparametric Statistics
- CAS MA 684 Applied Multiple Regression and Multivariable Methods
- CAS PY 501 Mathematical Physics
- ENG ME 566 Advanced Engineering Mathematics
- GRS MA 681 Accelerated Introduction to Statistical Methods for Quantitative Research

Technical Elective Exceptions

Technical electives are highly quantitative courses in engineering (additional BME coursework is acceptable), computer science, math, physics, or related areas.

The following courses, although offered by the College of Engineering, do **not** meet the requirement of a technical elective: BE 795, BF 510, ME 502, ME 517, ME 518, ME 525, ME 550, ME 583, ME 584, ME 703 and EK 731. SI 839, SI 852, SI 855, SI 871 and PH 825 also do not qualify as a technical elective.

Technical electives do not have to be taken within the College of Engineering; appropriately quantitative and rigorous courses offered through other BU Colleges may be approved using the [BME Petition Form](#).

Auditing Courses

An auditor is a student who attends a class to acquire knowledge but not to earn credits or a grade. Audited courses do not count toward completing degree requirements. An auditor may not change his or her status after the fifth week of classes for standard courses. Auditors must attend classes regularly, complete assigned reading, and participate in discussions, but they are excused from examinations.

Auditors are admitted to a course on a space-available basis and with the approval of the instructor. Auditors are subject to the full tuition and fees of the course.

PhD students who have completed all departmental course requirements are entitled to audit one course each semester. Students may not audit ENG 900-level, language, physical education, studio or laboratory courses.

Courses Beyond Degree Requirements

Students may take additional courses beyond those required for the degree but which are relevant to their research and/or career goals with approval from their advisor(s) and Assistant Director, Academic Programs.

Satisfactory Academic Progress Requirement for PhD Students

The College of Engineering is committed to five full years of financial support for graduate students in the College of Engineering PhD program who maintain [Satisfactory Academic Progress](#) and are in Good Standing in the program. This support will be in the form of Teaching Fellowships, Doctoral Research Fellowships or Graduate Fellowships. Funding beyond five years is generally provided (but not guaranteed) to students who are working productively toward the PhD degree. The following achievements are required to maintain Satisfactory Academic Progress and be in Good Standing in the program:

- Students must complete the required coursework with a B average (GPA of 3.0) or better and pass the Oral Qualifier Exam within the allotted time frames.
- Students are required to find a research home and funding no later than 12 months after beginning the program.
- Students are required to complete a Prospectus, annual Advisory Committee meetings, and a Dissertation following the time frames described in this handbook.

The inability to find a faculty member willing to serve as a research supervisor by the end of 12 months and with funding is initially interpreted as not making satisfactory progress toward the PhD degree, which is required for Good Standing in the program. In rare cases, after the first 12 months a student is able to identify a faculty member willing to serve as a research supervisor but neither the faculty nor the student is able secure extramural funding for the second year. In such a case, this student can petition and request one additional year of funding from departmental resources. Such a request will need to convey to the department Chair that the student has found a research advisor willing to supervise the student and that the advisor and/or student have a concrete plan to secure extramural funding sources following the additional year. Decisions to support this request are at the discretion of the department Chair. If no such funding has emerged after the second year, the student will be deemed as not making satisfactory academic progress and the individual may not be permitted to complete their PhD studies.

After joining a laboratory in accordance with the conditions above, students register for research credits each semester and summer they work in that laboratory. If the supervisor feels the student is not making satisfactory progress, the supervisor will provide a four month warning letter (equivalent to a semester or summer). If the progress remains unsatisfactory, the faculty will dismiss the student from their laboratory. The student must then either find an alternative funding source from an individual faculty member or leave the program. After dismissal, the student has one summer or academic semester to find alternative support. During this period, the department is under no obligation to find support for the student but may choose to do so, at the discretion of the department/program leadership.

After the first year, the preponderance of funding arises from extramural sources such as fellowships, training grants and research funding from grants of individual faculty. After securing a funded research home, the department guarantees continued funding through the fifth year. Typically, this funding will derive from extramural sources. If bridge resources are required from the department, the department can require that the student be a teaching fellow for the time they are being supported (service appointment). Students may not serve as teaching fellows for other departments or programs without written permission from the Associate Chair for Graduate Programs.

Regular communication with department staff, leadership, and the academic or research advisor is important for maintaining Good Standing in the program. In extreme cases, lack of communication may result in dismissal from the program.

Any egregious violation of academic or research ethics may result in immediate dismissal from the program at any stage with no opportunity for re-admission.

Academic Standards

The requirements for remaining in academic good standing are detailed in the [College of Engineering Graduate Policy](#).

College of Engineering GPA Requirement for Awarding Graduate Degrees

Doctoral students must complete all degree program requirements and earn a cumulative grade point average of at least 3.0 to be awarded a degree. The cumulative grade point average includes all coursework taken after matriculation and all courses completed prior to matriculation submitted in fulfillment of degree requirements.

Finding a Research Home

Required Rotation System

All PhD students are required to participate in laboratory rotations and enroll in BE 791 *PhD Biomedical Engineering Laboratory Rotation* during their first academic year. During these rotations (typically three), students will become familiar with research activity within departmental laboratories. These rotations will then help students identify the laboratory in which they will perform their research. Participants in an NIH Training Program like QBP have different rotation requirements which will be communicated to trainees directly.

- All PhD students must register for BE 791 in their first and second semesters of matriculation in BME. Students will register for one credit in the fall and two credits in the spring semester, for a total of three. (1 credit = 1 rotation) The course is graded Pass/Fail.
- Rotations generally last 8 weeks. If students are unable to complete two rotations in their second semester and/or do not meet the end of April deadline to join a lab, they must request permission from the Associate Chair for Graduate Programs and the Assistant Director, Academic Programs to rotate over the summer.
- To perform a rotation with a faculty member who does not have a primary or secondary appointment in BME, students must petition and receive permission using the [BME Petition Form](#).
- Students who matriculate into the BME PhD program funded by an external fellowship are not exempt from participation in the rotation system. However, students who matriculate as Doctoral Research Fellows may be allowed to petition out of BE 791. If a student finds a permanent lab position after their second rotation, they can petition for a waiver of the third rotation.

Grades for BE 791 (Pass/Fail only) will be submitted after receipt of 1) a brief summary of the rotation provided by the student and 2) a brief review of the student's participation by the faculty member. These two items must be submitted via email to the Assistant Director, Academic Programs.

Research Opportunities

Most students choose to do their research with a faculty member from the BME Department or affiliated research centers (Biological Design Center, Biomolecular Engineering Research Center, Center for Multiscale and Translational Mechanobiology, Nanotechnology Innovation Center, Neurophotonics Center, NSF Engineering Research Center in Cellular Metamaterials, Photonics Center, Precision Diagnostics Center). Further information can be found on their respective websites.

Faculty, scientists or researchers (holding a PhD or MD) within or outside of the University can be approved using the [PhD Supervisor Approval Form](#) to be a student's principal research advisor if they have an active research collaboration with a primary BME faculty member who will agree to be the student's research co-advisor. This form should be submitted as soon as the co-advisors are identified. For research advisors outside of Boston University, this is consistent with the [policy for dissertation work outside of Boston University](#).

Research Project

A major requirement for the PhD degree is a research-based dissertation. Each student is responsible for finding a research project, conducting scientific studies under the guidance of an approved faculty member, presenting the Prospectus and results to the general scientific community in a public defense and submitting a dissertation.

Academic vs. Research Advisors

All incoming PhD students are advised by the Associate Chair for Graduate Programs unless otherwise specified. The student's academic advisor can provide general information/guidance and help the student to complete their course registration for the first year.

For PhD students, the research advisor also serves as the student's academic advisor. However, if a PhD Supervisor Approval Form was required (see above), the BME co-advisor serves as the academic advisor.

Finding a Research Advisor and Project

Occasionally students enter the program with a specific research advisor in mind and may even plan to work on a specific project. The majority of students, however, will utilize the first two semesters to determine what their specific interests are in the field of biomedical engineering and identify the opportunities for funding in potential labs. PhD students typically connect with their research advisors through the lab rotation mechanism. In general, the procedure involves three steps: (1) doing rotations and deciding upon a research area; (2) joining a specific lab; and (3) developing a dissertation research project. All three rotations should be completed by the end of the academic year (exception for QBP fellows who require a fourth rotation – this will be discussed directly with trainees).

Doctoral research fellow positions should begin May 1, in the second semester following matriculation.

Students can gain information about steps (1) and (2) through coursework, mandatory attendance of the BE 790 seminar during the fall semester, informal discussions with faculty and, most importantly, the lab rotations. Another valuable way of learning more about specific research opportunities is to speak with other graduate students who are currently working in the department's various labs. The best measure for learning about working in a specific lab is to make an appointment to speak with the faculty member in charge of a lab you are interested in. Some useful questions to ask are:

- What projects are currently going on and what projects are planned for the near future?
- What background is required to work in the lab?
- Is there the possibility of funds for a new graduate student?
- What expectations does the faculty member have of graduate students?
- If the potential advisor has been at BU for at least a few years, does he/she have a strong history of training students in a timely manner? Have his/her students generally been successful?
- Are there any opportunities for collaboration with other faculty or labs?

Once a student finds a research opportunity and has the consent of a faculty member to be his/her advisor, the process of developing a research project begins.

Off-Campus Research

PhD research is usually carried out in laboratories and centers of BME faculty located on campus. In cases of non-BU advisors (see previous section regarding required approval and the [policy on dissertation work outside of the University](#)) the research is often performed off-campus, in the lab of the principal research advisor. There may be specific issues that arise due to intellectual property and other conflicts of interest, which must be addressed prior to starting the work. Also, in the case of a non-BU advisor, typically, the funding to pay the student's stipend is transferred through the mechanism of a sub-contract or billing agreement from the advisor's institution to BU.

Invention and Copyright Agreements

Students who receive support from sponsored research programs or who make significant use of University funds and facilities are required to sign the BU Intellectual Property Policy Agreement. They should seek counsel with their faculty advisor about this policy. A signed agreement form is required through PolicyTech before a student can be paid.

Advisory Committee

The Advisory Committee is a group of faculty, including the student's research advisor(s), who provides input and support to the PhD candidate.

The Advisory Committee Chair is responsible for running the Prospectus Defense and the Dissertation Defense. In addition, the candidate will meet annually with the Advisory Committee, starting in the third year of the program.

Timeline for Forming the Advisory Committee

PhD candidates are required to form an Advisory Committee by the end of their second year (August 31). The [Advisory Committee Approval Form](#) must be submitted to the Assistant Director, Academic Programs for approval by this date.

Typically, the first meeting of the Advisory Committee is the Prospectus Defense, with annual meetings thereafter. In the rare case that a student's Prospectus Defense is delayed beyond the third year, the student must have an Advisory Committee meeting in the third year.

Advisory Committee Membership

Membership of Advisory Committee

The Advisory Committee must consist of at least four (4) members:

- At least two members must be from the primary BME faculty (tenured or tenure-track).
- If only two members are from the BME primary faculty, another member must have a primary appointment within the College of Engineering (BME Affiliated faculty, BME Research faculty or BME Research Associates with a PhD and sufficient experience can fill this role).
 - **NOTE:** If the committee includes three members from the primary BME faculty, then no one from this category is required.
- One member must be from a different department or institution.

The Chair of the Advisory Committee must be a primary, tenured or tenure-track BME faculty member who is NOT the research advisor or co-advisor.

Advisory Committee membership can be changed over the course of a candidate's PhD, as needed, in consultation with the research advisor. Please notify the Assistant Director, Academic Programs of any modifications and submit an updated [Advisory Committee Approval Form](#).

If a researcher from outside the University serves on an Advisory Committee, a [Special Service Appointment Form](#) must be completed. The completed form and a copy of the person's curriculum vitae, with the Associate Chair for Graduate Programs signature, will then be submitted to the Graduate Programs Office for College-level approval.

Dissertation Defense

The Dissertation Defense requires five (5) readers. Membership requirements are the same as for the Advisory Committee and the fifth member can come from any of the categories listed. The Advisory Committee Chair runs the Dissertation Defense.

Doctor of Philosophy Degree Requirements

All engineering PhD students must adhere to and meet the PhD degree requirements as set forth by the College of Engineering. Additionally, BME PhD students must also meet any specific degree requirements as set forth by the department. The general requirements for all PhD students in BME include:

- Fulfillment of course requirements
- Passing the Oral Qualifier Exam and math requirement
- Prospectus Defense and Responsible Conduct of Research training
- Dissertation Defense

PhD students need to submit a [Program Planning Sheet](#) for approval by their Academic Advisor (typically also their Research Advisor) and the Associate Chair for Graduate Programs. A cumulative grade point average of 3.0 must be maintained and no course with a grade lower than B- can be counted towards the degree.

Oral Qualifier Exam and PhD Candidacy

Oral Qualifier Exam

The Oral Qualifier Exam is taken during the early summer (usually June) following the first academic year in the graduate program. The exam is based on the student's ability to read, understand, critically evaluate and discuss scientific papers in an oral examination format. The goals are as follows:

- Assess the student's command of general core knowledge required for all biomedical engineers.
- Assess the ability of the student to integrate knowledge across disciplines, time scales and length scales. In particular, students should be able to integrate principles of molecular bioengineering and quantitative physiology with various topics of research.
- Assess the quantitative and mathematical skills of the student.
- Assess the ability of the student to verbally communicate ideas and information in a clear, logical and organized fashion.
- Assess the ability of the student to handle questions across a range of topics both within and outside the student's area of interest.
- Assess the ability of the student to critically read and understand scientific publications and to place the results of these publications in the context of the broader Biomedical Engineering field.

Topic Areas

The student selects two topics from the list below. Students should keep these areas in mind when selecting their coursework during the first year.

- Biomaterials & Tissue Engineering (BTE)
- Biomedical Optics & Imaging (BOI)
- Computational Modeling & Data Science (CMDS)
- Mechanobiology & Biomechanics (MB)
- Nanotechnology & Sensing (NS)
- Neural Engineering (NE)
- Systems, Synthetic & Molecular Bioengineering (SSMB)

Expectations of Students

Each student will be questioned by three examiners. In general, examiners will be selected so that there will be one examiner with specific expertise in each of the two topics selected by the student, while the third examiner will be more at arms-length from the topic. Scheduling constraints may result in variations on this general goal. We expect that students will:

- Read, understand, and critically evaluate every assigned paper.
- Be prepared to answer any questions about the methods, results and conclusions of the main paper(s).
- Understand any key scientific concepts necessary to explain and understand the main paper(s). This includes, but is not limited to, concepts covered in the core curriculum, e.g. BE 605 and BE 606.
- Be prepared to derive and/or solve quantitative problems associated with each main paper(s).
- Identify, read, and understand key papers necessary to understand the background and context of the main paper. These background papers are typically included in the citations of the main paper(s).
- Be prepared to discuss alternative approaches and potential follow-up studies.
- Justify all answers with reasoned arguments based on established results and data.

Assessment

Each examiner completes a grade form upon completion of the examination. The grade forms are evaluated by the BME Graduate Committee and Executive Committee. Each student will be assigned a grade of **Pass, Partial Pass or Fail**. In the event that a student fails all or part of the exam, potential outcomes include remedial coursework or an opportunity for a second oral exam on all or part of the material.

Failure of a second attempt at the qualifier exam: There is no automatic recourse for this outcome. The student may apply to transfer to the MS program or MEng program.

PhD Candidacy

Upon successful completion of the Oral Qualifier Exam and satisfying the math requirement, a student becomes formally accepted to PhD candidacy. A PhD candidate has a maximum of five (5) years to complete all degree requirements for graduate studies. If not completed within five years, the student must petition the department for an extension. The petition should include the following material:

- Major reason(s) for delay
- How those delays have been resolved
- Evidence of research progress
- Detailed timeline and evidence that timeline can be adhered to
- Letter of support from advisor that addresses these issues

The Associate Chair for Graduate Programs will determine whether or not a candidate may extend their participation in the PhD program. More than one petition to extend the completion date of degree requirements is rarely approved, so the student should be very sure that they will finish their dissertation by the date they propose on the extension petition.

Prospectus

The Prospectus Defense consists of preparing a written document and giving a public oral presentation followed by questions from the Advisory Committee.

Timing

The Prospectus Defense should be presented by the end of the sixth semester from matriculation (i.e. spring semester of the third year in the program).

Role of the Advisory Committee During the Prospectus

The Advisory Committee Chair runs the Prospectus Defense. The committee is charged with assessing the appropriateness of the research problem and the student's preparation, based on the written proposal and the oral presentation. The Advisory Committee must approve that the Prospectus is at a stage appropriate for scheduling the examination via their signature on the [PhD Prospectus Defense Form](#).

Written Prospectus

Before undertaking this phase, the student should consult the Boston University Libraries [Guide for Writing Theses & Dissertations](#). The Prospectus should include a signatures page, a statement of the problem to be investigated, its background and significance, methods and approach(es) to be followed for its resolution, preliminary results, anticipated timetable for completion and pertinent bibliography. The format is similar to a typical research proposal. The student must provide a copy of the document to their Advisory Committee two weeks in advance of the scheduled defense.

Prospectus Contents and Goals:

- A separate page listing the proposed title, author's name, research advisor's name and an abstract of approximately 150 words
- Address the anticipated contribution of the work to the body of knowledge and the format may be similar to that of proposals submitted to a Federal Agency (ex. [NIH NRSA F31](#))
- There is a 20 page (single-spaced) limit on the scientific portion of the proposal, which includes tables and figures but does not include the list of references
- Include an up-to-date copy of the student's curriculum vitae (not part of the 20-page limit)

The [PhD Prospectus Defense Form](#) is to be submitted to the Assistant Director, Academic Programs two weeks prior to the defense along with the requested announcement details to be publicized. The student must obtain their Advisory Committee's signatures on this form, which indicates that they have reviewed the document and approve that the examination be held as scheduled. The Assistant Director, Academic Programs will be responsible for publicizing the event. The student or Advisory Committee Chair should submit the completed form back to the Assistant Director, Academic Programs immediately following the Prospectus Defense.

Prospectus Defense

The Advisory Committee Chair should begin by introducing the PhD candidate and the format of the exam. The student's presentation should last approximately 40 minutes. The student should be able to defend their knowledge of the mathematical, physical and analytical tools to be used and how they may relate to other areas

outside of their particular project. During this period, Advisory Committee members or the audience may ask questions. The Chair should guard against digressions and inappropriate questioning during the presentation. Following a reasonable question period, the audience is dismissed. The Advisory Committee may ask additional questions of the candidate. After this, the candidate should be excused and the committee should complete its assessment. At one point during the closed-door session with the Advisory Committee, the Chair will ask the candidate's primary advisor (and co-advisors, if applicable) to step out and the remainder of the committee will check in with the candidate.

Assessment

The Advisory Committee recommends that the student should **Pass, Fail or Conditionally Pass**. A conditional pass includes additional requirements (e.g., an additional written progress report or additional experiments) to be completed no later than one year from the Prospectus Defense. In the case of failure, the committee recommends the appropriate action: a recommendation of failure may include a suggestion that the student re-take the Prospectus Defense examination or that the student be terminated from the PhD program. In the latter case, the student has the option of pursuing an MS degree but must complete all the requirements for that degree.

Scheduling the Prospectus Defense

It is the student's responsibility for scheduling a date, location and time with their Advisory Committee for the examination. [Conference room reservations](#) can be requested via the BME website.

Extension Requests

If a student needs more time to complete the Prospectus Defense, they must submit an extension request to the Associate Chair for Graduate Programs using the [BME Petition Form](#), including indicating a timeline for completion of the Prospectus and reason for the delay. The Associate Chair for Graduate Programs will review the request and determine whether the request is justified and if the timeline is appropriate.

Reporting on Student Progress

The Advisory Committee Chair will complete the Results section on the [PhD Prospectus Defense Form](#). If the student is required to meet certain conditions, those conditions should be listed on a separate sheet and attached to the form. Those conditions should also contain time frames for completion. The Chair then signs the form and forwards it to the Assistant Director, Academic Programs (who will be responsible for submitting to the Associate Chair for Graduate Programs for final approval).

Before the Prospectus Defense ends, the Advisory Committee must indicate on the PhD Prospectus Defense Form the date for the next committee meeting (at least once in the next 12 months) and outline expected milestones. Required revisions to the proposal should be completed satisfactorily before a final Pass grade is given.

Responsible Conduct of Research Requirement

All BME PhD candidates, regardless of funding source, are required to complete the Responsible Conduct of Research (RCR) requirement before they can receive the Post-Prospectus stipend rate increase. Information is available on the University's [Responsible Conduct of Research](#) page. Please note that there will be a policy change effective September 1, 2024 removing the relation between RCR completion and student stipends. And as of Fall 2023, RCR will be transformed into a one-credit, tuition-free course (ENG EK 800) open to all PhD students and postdoctoral scholars.

Master of Science Degree upon Prospectus Completion

All Post-Bachelor's PhD degree students should declare a Master of Science degree when they successfully complete their PhD Prospectus Defense. **This is not automatic** and the student needs to complete an [MS Program Planning Sheet](#) and [apply online for graduation](#).

Course Registration After Satisfying the Prospectus Requirement

After passing the Prospectus Defense, candidates will enroll for eight credits of BE 991 each semester (less if taken in combination with additional coursework) until the total minimum credit requirement is met (64 credits for Post-BS, 32 credits for Post-MS and 48 credits for MD/PhD). Once the student has fulfilled the total minimum credits requirement, they will register for two credits of BE 991 each semester until graduation, including in the summer.

Annual Committee Meetings

Advisory Committee meetings are held at least once every 12 months for students in their third year and higher. The purpose of the Advisory Committee meetings is to 1) provide candidates with input and alternative perspectives on their research, 2) to ensure that candidates are making progress towards their PhD degree, 3) to serve as a resource should issues arise, and 4) to provide additional support (e.g. career advice) that complements that provided by the advisor.

Advisory Committee meetings can take multiple forms. Examples of acceptable interactions include:

- Candidate meets with the full Advisory Committee and presents research progress.
- Candidate meets with a subset of the Advisory Committee and presents research progress, then meets individually with other members at an alternate time.
- Candidate has one-on-one meetings with at least two Advisory Committee members to discuss research progress. As the student will have regular interactions with their Research Advisor, the two meetings should be with other Advisory Committee members.

In all cases, the candidate should provide a CV and brief update on progress to the full Advisory Committee annually.

Upon completion of the annual Advisory Committee meeting(s), candidates must submit the [Post-Prospectus Committee Meeting Report Form](#) to the Assistant Director, Academic Programs. It is required for all students in their third year and higher.

In most cases, the first meeting of the Advisory Committee will be the Prospectus Defense. However, in the rare case that a student needs to delay their Prospectus past the third year, the student must still hold an Annual Committee meeting in the third year. In this case, all members of the committee must be present for this first meeting and the student must submit a report to the Assistant Director, Academic Programs after the meeting.

Dissertation

Role of the Advisory Committee During the Dissertation Defense

The Advisory Committee Chair runs the Dissertation Defense. Note the additional requirements that the Advisory

Committee have five members for the Dissertation Defense, as described in the Advisory Committee Membership guidelines. Typically, the Chair will be the same individual who served as Chair for the Prospectus Defense. However, if the Chair is changed, please notify the Assistant Director, Academic Programs as soon as the change occurs, or no later than when confirming defense date and details two weeks prior to the scheduled Dissertation Defense.

Written Dissertation

Candidates shall demonstrate their abilities for independent research and scholarship by completing a doctoral dissertation in their field of study. The dissertation will be primarily guided by their research advisor(s), with advice from other members of the Advisory Committee. The dissertation should represent original scientific/engineering contributions that are appropriate for publication in a recognized peer-reviewed journal.

[Guidelines, templates and prep videos](#) are available through the Mugar Library. Although students will have an opportunity to make final revisions after their PhD Dissertation Defense, they should not regard their defense version as a “rough draft”.

Dissertation Defense

The Dissertation Defense is a public presentation of the candidate’s dissertation. The presentation should clearly define the problem, describe the method(s) used to solve the problem, report results and establish significance of the results. The purpose is to ensure that the dissertation constitutes a worthy contribution to knowledge in the candidate’s field and that they have attained sufficient expertise in their field of research specialization.

Scheduling the Dissertation Defense

It is the student’s responsibility for scheduling a date, location and time with their Advisory Committee for the examination. [Conference room reservations](#) can be requested via the BME website.

At least two weeks prior to the Dissertation Defense date, the candidate must submit the [PhD Dissertation Defense Form](#) to the Assistant Director, Academic Programs. Before submitting this form, the candidate must have provided a copy of the dissertation document to their Advisory Committee and obtained their signatures on this form indicating 1) that they have been provided a copy of the dissertation and 2) agree that it is ready to be defended.

Length and Conduct for Dissertation Defense

The Advisory Committee Chair should introduce the candidate and include a brief academic background description. The candidate should restrict the length of the presentation to approximately one hour. During this period, either the Advisory Committee members or audience may ask questions of clarification. The Chair should guard against digression and inappropriate questioning during the presentation. After the presentation, a reasonable period of questioning will follow, and then the audience will be dismissed. The committee may wish at this time to ask additional questions of the candidate. Following this, the candidate should be excused and the committee should complete its assessment.

Assessment

The Advisory Committee is charged with assessing completeness of the research, contribution to knowledge, and the candidate's mastery of their research area, based on the written dissertation and the oral presentation. Vote may be ballot or voice. A unanimous vote is required for a candidate to pass.

It is the Chair's responsibility to call the candidate back after the Advisory Committee has reached a decision. The Chair will advise the student of the committee's decision. At this time the candidate will be advised of any changes that must be made to the final title, abstract or dissertation document, with a deadline provided by the Advisory Committee and according with the College of Engineering's [posted submission deadline](#).

Reporting

The [PhD Dissertation Defense Form](#) must be completed at the examination, with specific indication of whether the title, abstract and dissertation are acceptable as they stand. If ALL are acceptable, the committee should sign the signature pages of the dissertation. If there is some rework to be done, this is to be noted on the PhD Dissertation Defense Form. Advisory Committee members should sign off on the PhD Dissertation Defense Form but will refrain from signing the signatures page of the dissertation until all conditions have been met.

Dissertation Approval and Library Submission

The signatures of the Advisory Committee members on the dissertation signatures page, if not given at the PhD Dissertation Defense itself, will indicate final approval of the title, abstract and dissertation.

The Associate Chair for Graduate Programs gives final approval on the PhD Dissertation Defense form. The student will then follow the [electronic submission guidelines](#) provided by the Mugar Library. The Assistant Director, Academic Programs will provide departmental electronic approval for the student upon receiving a copy of the signatures page which now can be collected via [DocuSign](#).

Financial Information

Stipend Levels

The following is an outline of the Biomedical Engineering Department's policy on stipend levels:

- All incoming PhD students on a fellowship will receive the same monthly stipend at the current base rate.
- Upon fully passing the Oral Qualifier Exam **and** satisfying the math requirement, PhD candidates will receive a stipend increase of 5% above the current base rate.
- Effective September 1, 2024 the College will change the timing and the level of the milestone stipend increase associated with passing the qualifying exam. The stipend increase associated with this milestone will change from 5% to 10%, and will become effective no sooner than the beginning of the beginning of the student's second year (i.e. September 1, 2024 for students entering September 1, 2023), provided the student has also matched with a research mentor. Additionally, the Post-Prospectus milestone stipend increase will be eliminated.
- All current students who have earned the base + 5% stipend level prior to September 1, 2024 will be increased to the base + 10% stipend level on September 1, 2024.

Summer Stipends and Tax Withholding

Students will have FICA taxes withheld from their paychecks during the summer (June, July and August). The Student Employment Office notes policy exceptions to be international students who have been present in the United States for less than 5 years. For any questions, please contact seo@bu.edu.

Policies on Outside or Additional Employment

PhD student efforts are expected to be fully directed towards research and coursework. As such, additional employment at Boston University is very limited, and employment outside Boston University is generally not allowed.

Official policy precludes regular longer-term employment with an outside company. Short-term or low volume commitments can be requested using the [BME Petition Form](#) and require approval by both the Advisor and Associate Chair for Graduate Programs. PhD students have the option to pursue either full-time (BE 810 A1) or part-time (BE 811 A1) internships for credit as a mechanism to explore outside opportunities.

Stipend Paychecks

All students are expected to have a US bank account and can receive their paychecks via Direct Deposit.

Missed Paycheck or Overpayment

If a student notices an anomaly in their pay, such as a missed paycheck or an overpayment, they should immediately contact their advisor and request that the advisor's financial administrator look into the issue. If this does not resolve the issue, the student should contact the Assistant Director, Academic Programs promptly.

University Policies and Resources

[Boston University Diversity Statement](#)

[Sick Leave Policy for PhD Students](#)

[Vacation Policy for PhD Students](#)

[Childbirth and Adoption Accommodation for PhD Students](#)

[Policy on Dissertation Work Outside of Boston University](#)

Equal Opportunity and Nondiscrimination

[Complaint Procedures in Cases of Alleged Unlawful Discrimination or Harassment](#)

[Disability Accommodation](#)

[Equal Opportunity/Affirmative Action Policy](#)

[Sexual Misconduct/Title IX Policy](#)

[Student Grievance Procedure in Cases of Alleged Disability Discrimination](#)

If you have questions about the policies above, please contact:

Stacey Herman, Director of Graduate Programs Office at smherman@bu.edu or 617-353-9763.

Mental Health Resources

Graduate students have access to mental health resources through the [Student Health Services Behavioral Medicine Office](#). These services are open to all full-time students, including PhD students. To contact the office, call 617-353-3569. They offer help for issues related to stress, anxiety, depression, sleep concerns, attentional issues, and many other topics. They can also refer you to appropriate specialized providers, if necessary. In addition to individual assistance, they offer programming specific to graduate students, such as a weekly graduate student discussion groups.

Clinicians are available 24/7, for daytime emergency triage and phone consultations, as well as mental health emergencies that occur after the clinic is closed. Call 617-353-3569 anytime, 24/7.

Laboratory Injuries – Coverage for PhD Students

It is important to seek treatment promptly for any laboratory injury or exposure. If the injury or exposure does not require immediate transport for emergency care, PhD students should contact the University's Research Occupational Health Program at 617-414-ROHP (7647), or report to 72 E. Concord St., Evans 825, which is staffed by specially trained nurse practitioners. ROHP provides medical attention and coordinates aftercare at ROHP for laboratory injuries and exposures without any cost to PhD students.

If you have questions about costs related to laboratory injuries and exposures, please contact ROHP by phone (617-358-7647) or email (rohpbu@bu.edu) ROHP. Complete information and procedures for reporting can be found [here](#).

Additional information: [Health and Wellness – Laboratory injuries](#)

Logistical and Contact Information

Graduate Student Offices

The Assistant Director, Academic Programs will notify incoming students regarding their individual office assignments and provide instructions related to applying for swipe access. Research advisors should provide desk space in their labs for Doctoral Research Fellows waiving the rotation system.

BME Graduate Student Lounge

The BME Lounge is located on the second floor of 44 Cummington Mall near the elevator. This room contains graduate student mailboxes. The mailing address is: *Department of Biomedical Engineering, Boston University, 44 Cummington Mall, Boston, MA 02215.*

BME Kitchenette

There is a small kitchenette (including a refrigerator) that is available for faculty, graduate students and staff in ERB 407. A copy machine is available for students.

Getting to the BU Medical School Campus

There is a regular shuttle that travels between Boston University's Charles River campus and the Medical Campus: **Boston University Shuttle (The BUS)**. The Shuttle runs every 10-30 minutes (depending on the day and time). It is free. Call 877-355-1555 to receive recorded information about The BUS service, including current reports of transportation delays and service interruptions. The closest stop to the BME department is at the corner of Blandford St and Commonwealth Ave. [Schedules and real-time bus locations](#) can be found online.

Associate Chair for Graduate Programs

The role of the Associate Chair for Graduate Programs ("Grad Chair") is to handle issues related to BME graduate students. The Grad Chair works in concert with the Assistant Director, Academic Programs and the BME Graduate Committee. The Assistant Director, Academic Programs is knowledgeable about detailed program requirements, timelines, documents and deadlines related to Prospectus and Dissertation Defenses. Inquiries related to these issues should go to them.

The Grad Chair can handle big picture or specific issues that come up in the course of graduate study. Examples of big picture issues would be changes to the qualifying exam structure or course requirements. Specific issues that fall within the Grad Chair's purview include conflicts with a research advisor or committee member and petitions for extensions.

The Grad Chair is also involved in recruiting new doctoral students each year during the Open Houses. In addition, the Grad Chair holds cohort meetings with students, such as a mock qualifying exam for first year PhD students and a meeting with third year PhD students about the Prospectus process.

The BME Graduate Committee works with the Grad Chair on issues related to the BME graduate programs. The Graduate Committee consists of BME primary faculty members and student representatives. The committee oversees course requirements, the qualifying exam process, assessment of qualifying exam performance, and other topics.

Staff Directory

BME Graduate Programs Administration	
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