

Graduate Studies Handbook

Department of Biomedical Engineering

Hajim School of Engineering & Applied Sciences
University of Rochester



UNIVERSITY *of*
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I. PHD PROGRAM

A. Program Objective

Biomedical engineers use engineering to solve problems in biology or medicine with the goal of improving human health. With guidance from a research mentor, classroom instructors, and other faculty advisors, each PhD student will help define a domain of biomedical engineering and become one of the world's experts in that domain. It is the expectation of the faculty that at the time of a thesis defense, each student will demonstrate the ability to identify problems in biology and/or medicine, to devise and execute unique solutions, and to explain both the problem and solution in the clearest terms. It is also our expectation that graduates of the program will enjoy careers in academia or industry marked by professionalism, leadership, and many notable contributions to their field.

B. Curricular Overview

The curricular component of the PhD program is designed to span two years with a transition from more general coursework in the first year to thesis-specific courses in the second year. While students entering the PhD program will have identified a general area of interest, each will be given an opportunity to explore the range of opportunities at Rochester before committing to a research laboratory at the end of the second semester of study. A seminar series and a laboratory rotations course, which together span both semesters of the first year, are important ways for students to conduct this exploration.

Because it is the ability to apply engineering and physics principles to topics in biology and medicine that defines the biomedical engineer, the PhD program requires that students take a least *two* Advanced BME courses that provide in-depth examples of such application. *An Advanced BME course is a specialized graduate course (>200-level) in which students apply the principles of engineering, physics or advanced mathematics to solve problems in biology or medicine.* This group includes several 4-credit BME courses and a smaller menu of 2-credit courses. These courses can be on specialized topics, but may be chosen for exploration or as a part of preparation for thesis research. To ensure the depth of training required for problem solving in doctoral research, the program requires that students also choose relevant courses in biology, engineering, and statistics from pre-approved lists.

The curricular preparation for research concludes with a course in proposal writing taken at the end of the second year of study. In this course, students consult with their thesis advisor and work with the course instructor to write a draft proposal for doctoral research. An updated version of this proposal will be presented as part of the official PhD qualifying exam in the fall of the same calendar year (see below).

C. Credit Requirements

Full-time students need to register for at least 9 credits every semester they are in the program. If dropping a course (prior to the add/drop deadline) takes a student below 9 credits, another course must be added so that the student remains at or above 9 credits. **Once the add/drop deadline has passed, a student may not withdraw from a class if doing so takes the student below 9 credits.** The add/drop deadline can be found on the AS&E academic calendar and is typically communicated by the registrar every semester.

It is strongly recommended that PhD students complete 30 credit hours by the end of their 1st year in the program. For a doctoral degree, the University requires completion of exactly 90 credit hours. **PhD students may not exceed 90 credits of coursework, as doing so will incur costs that must be paid by the student, the student's advisor, or the department.** The number of non-research course credits needed to meet the minimum BME PhD requirements is 41. The remaining 49 credits, if not earned through additional coursework, will be earned as research credits under *BME 595: PhD Research*. Once exactly 90 credits are earned, students must continue to register, but should do so under one of the non-credit dissertation courses (*BME 997: Doctoral Dissertation* or *BME 999: Doctoral Dissertation*). In general, students should register for *BME 997* prior to starting their 5th year of graduate study and *BME 999* afterwards. Students should consult with the Program Director and Program Coordinator for more information.

The following summarizes the curricular requirements for the PhD degree:

BME Core (14 Credits)

8 credits of *Advanced BME* (list below)

BME 402: Research Methods (2 credit), not required for MD/PhD students

BME 496: Weekly BME Seminar (0 credits, required every semester)

BME 589: Proposals Writing (2 credits)

BME 593: Lab Rotations (2 credits)

Additional Requirements (27 Credits)

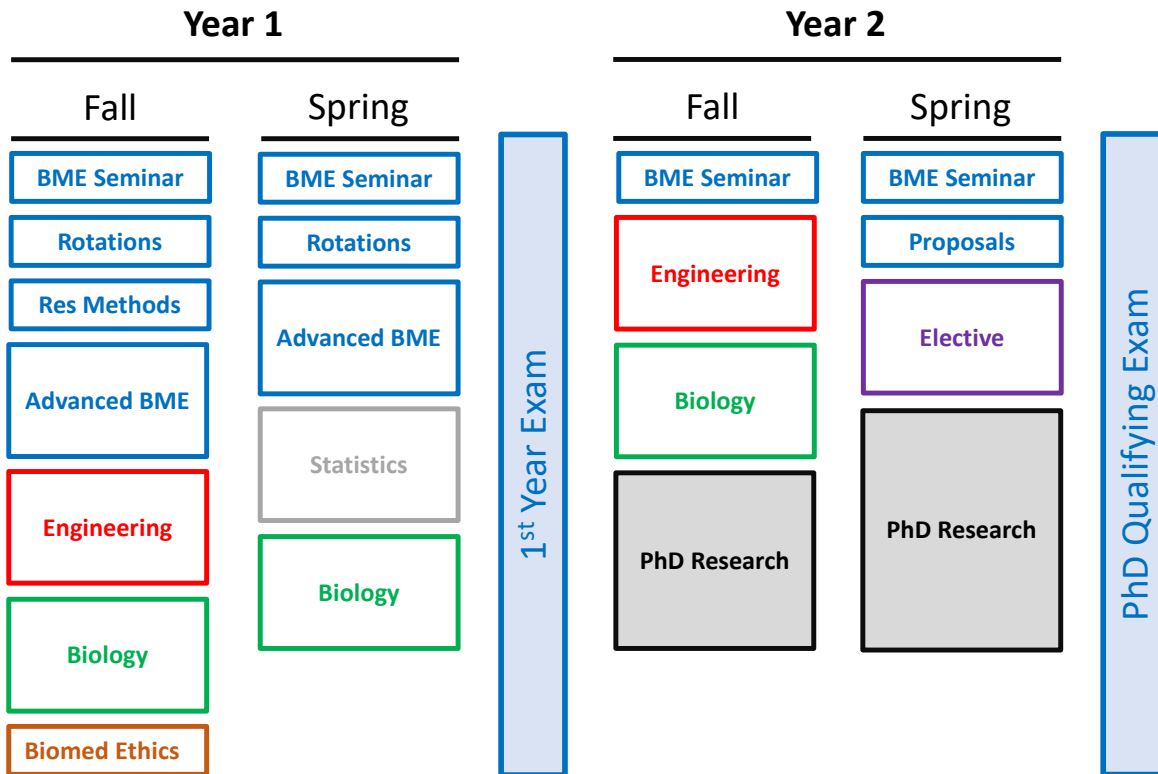
IND 501: Ethics in Research (1 credit)

11 credits of Approved Biology (list below)

8 credits of Approved Engineering (list below)

3 credits of Approved Statistics (list below)

4 elective credits (should be relevant to a career in BME)



Typical schedule of courses for the PhD program. Each semester, full-time students register for 12-16 credits hours except when TAing, in which case only 9 credit hours are required. Students will select Advanced BME, Approved Engineering, Approved Biology, Approved Statistics, and Elective courses to support or supplement their research interests. **Please note that AS&E will only cover the cost of 90 credits required to fulfill PhD requirements.**

D. Detailed Curricular Requirements

BME Core (14 credits)

BME 593 Laboratory Rotations (2 credits over 2 semesters)

As part of the BME Core, students are required to complete three laboratory rotations. Students should contact each of the three faculty members that will supervise the rotations to set up a schedule that will complete three rotations by mid-April of the following year. PhD students who completed a thesis-based MS in the Department of BME at the University of Rochester are only required to complete 2 additional rotations. To meet this schedule, for most students, the first rotation should begin on or around October 1st. Below is the recommended rotation schedule for a first year PhD student.

Rotation Begins:

October 1
January 1
March 1

Rotation Ends:

November 15
February 15
April 15

Evaluation Due:

December 1
March 1
May 1

The duration of each rotation should be approximately 6 weeks. While required activities in different laboratories may vary, a satisfactory rotation generally requires at least 10 hours per week. Exceptional circumstances (such as summer rotations) may allow students to devote more time per week for fewer weeks, but the minimum number of total hours spent working on a single rotation project should never be less than 50. To obtain a satisfactory grade for a rotation, students must meet a performance standard that will include, among other things, proper attendance and participation in lab activities (such as journal clubs, seminars, and lab meetings), completion of experimental tasks agreed upon with the advisor, and appropriate documentation and presentation of data. It is not sufficient for a student to merely shadow another lab member, nor is it reasonable for faculty to expect the successful completion of a specific experimental outcome. Each student must prepare a written report or deliver an oral presentation on the project he/she conducted in the lab. Two credits are awarded at the end of the spring semester for three satisfactory rotations. **Students should not register for BME 593 in the fall term, but must do so in the spring term of their first year.**

At the conclusion of each rotation, a Rotation Evaluation must be completed by the student and rotation mentor. The Rotation Evaluation is sent to the Program Director and Program Coordinator. Rotation Evaluation forms are available from the Program Coordinator. The rotation mentor and student should meet to discuss the evaluation before the form is deposited in the student's file.

BME 589 Writing Proposals in BME (2 credits)

Writing successful research proposals is vital to the livelihood of most PhD-level scientists. The defense of a research proposal is also the basis for the qualifying exam in BME (see below). In BME 589, students will be trained to write an NIH-style research proposal. The student will work with both his/her faculty advisor and the course instructor to devise a document that can be the basis for the qualifying exam and potentially the basis of an actual pre-doctoral fellowship application.

BME 402 Research Methods (2 credits)

This course prepares PhD students to carry out independent research. Research tools, laboratory skills, experimental methods, critical thinking, presentations, and career planning are discussed as are facilities and resources at UR/URMC.

BME 496 Current Research Seminars in BME (0 credits)

Current Research Seminars is a series of talks given by visiting speakers from around the world to present their research findings. Students are required to register for BME 496 Current Research Seminars every semester they are in the program with the exception of the final semester in which they defend their MS or PhD thesis. However, students will need to continue attending the seminar in their dissertation semester until the MS or PhD thesis defense is scheduled. Students are allowed to miss 2 presentations each semester and still receive a passing grade. Students who miss seminar due to attending a scientific conference will be excused.

Students who miss more than 2 seminars without prior approval will need to write a 2-3 page summary describing the work of each speaker whose seminar was missed. These summaries must be sent to the Program Director and Graduate Coordinator within one week of the missed class.

Advanced BME (8 credits)

Students are required to take at least 8 credits of Advanced BME courses from the list below. Note that some courses are not offered every year. All courses are 4 credits unless noted. Students may petition the Graduate Committee for approval of courses containing sufficient advanced BME content that are not on this list.

- ✚BCS 521 Auditory Perceptions (Spring)
- ✚BME 404 Computational Methods Applied to Biological Systems
- ✚BME 410 Introduction to Augmented and Virtual Reality (Fall)
- ✚BME 412 Viscoelasticity in Biological Tissues (Spring)
- ✚BME 414 Biomed Printed Circ Bd Design & Prototyping (Fall)
- ✚BME 418 Introduction to Neuroengineering (Fall)
- ✚BME 425 Human Neurophysiological Measurement (Spring)
- ✚BME 428 Physiological Control Systems (Fall)
- ✚BME 429 Nanotechnology and Nano-Engineering (Fall)
- ✚BME 431 FDA and Intellectual Property (Fall)
- ✚BME 432 FDA and Commercialization (Spring)
- ✚BME 438 Introduction to Quality Engineering (Spring, 2 cr)
- ✚BME 442 Microfluidics for Biomedical Applications (Spring)
- ✚BME 445 Biomaterials Science & Engineering
- ✚BME 451 Biomedical Ultrasound (Spring)
- ✚BME 452 Medical Imaging – Theory & Implementation (Fall)
- ✚BME 453 Ultrasound Imaging (Fall)
- ✚BME 455 Translational Biomedical Optics (Fall)
- ✚BME 460 Quantitative Physiology (Fall)
- ✚BME 462 Cell and Tissue Engineering (Spring)
- ✚BME 465 Cell Mechanics and Mechanobiology (Fall)
- ✚BME 466 Bioprocess Engineering (Fall)
- ✚BME 468 Intro to Structure & Analysis of Biomolecules (Spring)
- ✚BME 472 Advanced Biomedical Microscopy (Spring)
- ✚BME 474 Biomedical Sensors, Circuits & Instrumentation (Spring)
- ✚BME 483 Biosolid Mechanics (Fall)
- ✚BME 486 Finite Elements (Fall)
- ✚BME 492 Neuroenhancement & Rehabilitation Engineering (Fall)
- ✚BST 550 Topics in Data Analysis (Fall)
- ✚OPT 448 Vision and the Eye (Spring)

Additional Requirements (35 Credits)

IND 501 Ethics & Professional Integrity in Research (1 credit)

The ethical practice of research is a serious, multi-faceted topic important to all scientists. It is of particular importance in the biomedical sciences where human and animal subjects are part of the research landscape. Thus, as a key part of the BME core, all students will take *IND 501: Ethics and Professional Integrity* during their first semester.

Approved Statistics (3 credits)

Students are required to take at least 3 credits of statistics courses from the following approved list. Note that some courses are not offered every year. All courses are 4 credits unless noted.

- ✚BST 467 Applied Statistics in the Biomedical Sciences (Spring, 3 cr)
- ✚BST 494 Biostatistical Methods I (Fall)
- ✚CSC 462 Computational Introduction to Statistics (Fall or Summer)
- ✚ME 424 Robust Design/Quality (Spring)

Approved Biology (11 credits)

Students are required to take at least 11 credits of biology courses from the following approved list. Note that some courses are not offered every year. All courses are 4 credits unless noted. Students may petition the Graduate Committee for approval of courses containing sufficient biology content that are not on this list.

- ✚ ANA 411 Cellular & Molecular Bio Found (Fall)
- ✚ ANA 513 Neuroinflammation (Spring)
- ✚ BCS 521 Auditory Perception (Spring, 3 cr)
- ✚ BCS 541 Neurons, Circuits, and Systems (Fall)
- ✚ BCS 546 Biology of Mental Illness (Spring)
- ✚ BIO 419 Nuc Structure and Function (Fall)
- ✚ BIO 422 Biology of Aging (Fall)
- ✚ BIO 426 Developmental Biology (Fall)
- ✚ BIO 428 Lab in Cell and Dev Biology (Spring)
- ✚ BIO 453 Computational Biology (Spring)
- ✚ BME 411 Cell & Molec Bio Foundations (Fall)
- ✚ BME 415 Neuroprosthetics (Spring)
- ✚ BME 416 Speech on the Brain (Spring)
- ✚ BME 459 Applied Human Anatomy (Spring)
- ✚ BME 465 Cell Mechanics and Mechanobiology (Fall)
- ✚ BPH 411 Methods in Structural Biology (Spring, 2 cr)
- ✚ CVS 401 Cardiovascular Bio and Disease (Fall, 3 cr)
- ✚ CVS 402 Seminar in Cardiovascular Science (Fall, 1 cr)
- ✚ GEN 506 Principles in Stem Cell Biology (Spring)
- ✚ GEN 507 Advanced Genetics (Spring)
- ✚ GEN 508 Genes, Devel and Disease (Fall)
- ✚ IND 419, Introduction to Quantitative Biology (Spring)
- ✚ IND 431 Foundations of Modern Biology I (Fall, 5 cr)
- ✚ IND 432 Foundations of Modern Biology II (Spring)
- ✚ IND 443 Eukaryotic Genome I (Spring, 5 cr)
- ✚ IND 447 Signal Transduction (Spring)
- ✚ IND 464 Musculoskeletal Basic Science (Fall, 1 cr)
- ✚ IND 525 Cell and Membrane Biophysics
- ✚ MBI 514 Mech of Microbial Pathogenesis (Fall, 3 cr)
- ✚ MBI 473 Immunology (Fall, 3cr)
- ✚ NSC 511 Human Brain Anatomy (1 cr)
- ✚ NSC 512 Cellular Neuroscience (Fall, 5 cr)
- ✚ NSC 525 Biology of Neurological Diseases (Spring, 3 cr)
- ✚ NSC 531 Integrative Neuroscience (Spring)
- ✚ NSC 541 Neurons, Circuits, and Systems (Fall)
- ✚ OPT 448 Vision and the Eye (Spring)
- ✚ PHP 403 Human Cell Physiology (Fall)
- ✚ PHP 404 Principles of Pharmacology (Spring)
- ✚ PHP 463 Human Anatomy Practicum (Spring, 2 cr)
- ✚ PTH 507 Cancer Biology (Fall, 3 cr)
- ✚ PTH 509 Cell Bio of Human Disease (Fall)
- ✚ PTH 510 Bio of Human Disease (Spring)
- ✚ PTH 571 Mol. Basis of Human Disease (Fall, 3 cr)
- ✚ TOX 503 Skin and the Environment (Fall, 1 cr)
- ✚ TOX 521 Toxicology (Spring)

Approved Engineering (8 credits)

Students are required to take at least 8 credits of engineering courses from the following list. Note that some courses are not offered every year. Courses are 4 credits unless noted. In addition to the courses on this list, Advanced BME courses also count as Approved Engineering if they are cross-listed in both BME

and another engineering department. Students may petition the Graduate Committee for approval of courses containing sufficient engineering content that are not on this list.

- ✚CHE 411 Intro to Prob for Chem Engrs
- ✚CHE 413 Engineering of Soft Matter (Spring)
- ✚CHE 421 Thin Film Processing
- ✚CHE 441 Advanced Transport Phenomenon (Fall)
- ✚CHE 443 Fluid Dynamics (Spring)
- ✚CHE 447 Liquid Crystals (Fall)
- ✚CHE 454 Interfacial Engineering
- ✚CHE 460 Biochem & Tech Clinic Diag (Fall)
- ✚CHE 465 Biomass Conversion to Fuels (Spring)
- ✚CHE 468 Fundamentals of Computational Fluid Dynamics (Fall)
- ✚CHE 469 Biotechnology & Bioengineering (Fall)
- ✚CHE 476 Polymer Chemistry (Fall)
- ✚CHE 480 Chemistry of Adv. Materials
- ✚CHE 482 Processing Microelectronic (Fall, 2 cr)
- ✚CHE 486 Polymer Science & Tech
- ✚CHE 492 Biointerfaces
- ✚CSC 442 Intro to Artificial Intelligence (Fall)
- ✚CSC 446 Machine Learning (Spring)
- ✚CSC 449 Machine Vision
- ✚DSCC 465 Introduction to Statistical Machine Learning (Spring)
- ✚ECE 401 Adv Computer Architecture (Fall)
- ✚ECE 404 High Perf Microprocessor (Spring)
- ✚ECE 423 Semiconductors (Fall)
- ✚ECE 432 Acoustic Waves (Spring)
- ✚ECE 440 Intro to Random Processes (Fall)
- ✚ECE 441 Detection & Estimation Theory (Spring)
- ✚ECE 444 Digital Communications
- ✚ECE 445 Wireless Communications
- ✚ECE 446 Digital Signal Processing (Fall)
- ✚ECE 447 Digital Image Process (Spring)
- ✚ECE 450 Information Theory (Fall)
- ✚ECE 452 Med Imaging-Theor & Implemt (Fall)
- ✚ECE 461 Dig Integ Circuit Design (Fall)
- ✚ECE 461 Dig Integ Circuit Design Lab (Fall)
- ✚ECE 466 RF Integrated Circuits (Spring)
- ✚ECE 472 Audio Signal Processing (Spring)
- ✚ECE 477 Computer Audition (Fall)
- ✚ME 400 Applied Boundary Value Problems (Fall)
- ✚ME 401 Methods of Applied Math (Fall)
- ✚ME 402 Partial Differential Eq
- ✚ME 406 Dynamical Systems
- ✚ME 411 Mech Properties of Polymers (Fall)
- ✚ME 424 Robust Design/Quality (Fall)
- ✚ME 437 Incompressible Flow (Fall)
- ✚ME 440 Mechanics of Structures (Spring)
- ✚ME 441 Finite Elements (Fall)
- ✚ME 443 Mechanical Vibrations
- ✚ME 444 Continuum Mechanics (Spring)
- ✚ME 445 Precision Instrument Design (Fall)
- ✚ME 449 Elasticity (Spring)
- ✚ME 458 Nonlinear Finite Elements
- ✚ME 459 Applied Finite Elements (Spring)
- ✚ME 461 Fracture and Adhesion (Spring, 2 cr)
- ✚ME 463 Microstructures
- ✚ME 481 Mechanical Properties (Spring)
- ✚OPT 407 SEM Practicum (Spring)
- ✚OPT 411 Math/Theoretic (Fall)
- ✚OPT 421 Opt Properties of Semi-con (Spring)
- ✚OPT 425 Radiation & Detectors (Fall)
- ✚OPT 428 Opt Commun System (Fall)
- ✚OPT 441 Geometrical Optics (Fall)
- ✚OPT 442 Instrumental Optics (Spring)
- ✚OPT 443 Found of Mod Opt Systems (Fall)
- ✚OPT 444 Lens Design (Spring)
- ✚OPT 446 Optical Coating Tech (Fall)
- ✚OPT 447 Adv Opt Coating Design (Spring)
- ✚OPT 448 Vision and the Eye (Spring)
- ✚OPT 452 Medical Imaging: Th & Prac (Fall)
- ✚OPT 461 Fourier Optics (Fall)
- ✚OPT 462 Physical Optics II (Spring)
- ✚OPT 463 Wave Optics & Imaging (Fall)
- ✚OPT 465 Laser Systems (Spring)
- ✚OPT 467 Non-Linear Optics (Spring)
- ✚OPT 468 Waveguides & Optoelectronic Devices (Fall)
- ✚OPT 476 Biomedical Optics (Spring)

- ✚ OPT 551 Intro to Quantum (Fall)
- ✚ OPT 552 Quant Opt Electromag Field (Spring)
- ✚ OPT 553 Quant Opt Atom-Field

- ✚ OPT 563 Statistical Optics
- ✚ OPT 564 Electr Imaging Sys
- ✚ OPT 592 Nano-Optics

Elective (4 credits)

Elective courses should be relevant to a career in BME. Students unsure of whether a course is appropriate as an elective should consult with the Graduate Director or Graduate Coordinator.

E. Non-curricular Requirements

Teaching Assistantships

Each PhD student is required perform teaching assistantships for at least two semesters. Students are welcome to request specific teaching assignments and efforts are made to accommodate such requests when possible. Assignments will be made by the Graduate Director. If a PhD student performed a teaching assistantship as an MS student in a University of Rochester BME program, the student need only complete one additional TAship to satisfy the requirement for the PhD program.

Public Presentation

The clear communication of a research effort is a vital skill for any scientist. The research effort itself benefits from the preparation, delivery, and discussion associated with a presentation, *especially* if the work is not yet a completed story. For these reasons **the program requires a minimum of four public presentations throughout a student's tenure**. Two of these presentations are satisfied by the qualifying exam presentation and thesis defense presentation. The remaining presentations can be departmental seminars or presentations at national meetings. Only one poster presentation at a national meeting can be applied toward the presentation requirement. Students are strongly encouraged to give presentations during the annual Summer Seminar Series.

F. Advising and Committees

Graduate Committee

The Graduate Committee is responsible for administering the PhD program. This committee sets program requirements and policies and monitors students to determine their status within the program. The Graduate Committee assigns first year exam committees, approves thesis advisory committees (below) and assigns chairs for qualifying exams. The committee also considers petitions for graduate course transfers and exemptions to requirements or policies.

Academic Advisor

First year PhD students will be assigned faculty academic advisors with research interests similar to their own. These advisors are responsible for helping students plan courses during the first two semesters of study.

Thesis Advisor

Any member of the BME Graduate Faculty may serve as a PhD thesis advisor. All faculty with primary appointments in the department are members of the [Graduate Faculty](#). Many, but not all Secondary Faculty are also members of the Graduate Faculty. Graduate Faculty Members are listed on the program web page at hajim.rochester.edu/bme/gradfaculty/index.html. A PhD student may be advised by a member of the faculty outside of the BME Graduate Faculty (including, but not limited to BME Secondary Faculty) only if they are co-advised by a Graduate Faculty member in a project with sufficient BME content. In these situations, the advising structure must be approved by the BME Graduate Committee.

Preliminary (First-Year) Exam Committee

By April 15th of the second term of study, first year students should be nearing completion of their rotations. At this time, students will be asked to select a thesis/research advisor. The choice of the thesis laboratory will be used to design an appropriate preliminary/first-year exam and an exam committee for each student. The preliminary exam committee will include the following:

- The likely mentor (or mentors if the student will be co-advised).
- Two other Primary, Graduate, or Secondary BME faculty.

The exam committee will review the student's curricular strategy as a formal step in the exam process. Details on the preliminary exam procedure are described below. Upon successful completion of the exam, students are expected to immediately begin work in their laboratory of choice. The student's thesis advisor will also become the student's academic advisor for the second year of study and beyond.

PhD Thesis Advisory Committee

After beginning work together, the student and thesis advisor(s) must define the direction of the doctoral research and identify members of the UR faculty that will comprise the thesis advisory committee. The thesis advisory committee performs several functions:

- It provides advisory input during the development of the thesis research project with respect to scientific merit, techniques and methodology, relevant literature, etc.
- It, along with a representative appointed by the BME Graduate Committee, serves as the Qualifying Exam Committee (see below).
- It, along with a representative appointed by the BME Graduate Committee as Chair, is the examining committee for the thesis defense (see below).

The thesis advisory committee must consist of:

- The research advisor and co-advisor (if applicable). Either the advisor or the co-advisor must hold a Primary or Graduate BME faculty appointment. Both advisors must hold full-time tenure-track positions with the rank of Assistant Professor or higher unless written approval is obtained from the Dean of Graduate Studies.

- Two Primary or Graduate BME faculty (referred to as internal committee members). Both internal committee members must hold full-time tenure-track positions with the rank of Assistant Professor or higher.
- At least one faculty member who does not hold a Primary or Graduate BME faculty appointment (but may hold a Secondary BME faculty appointment). This individual is referred to as an external committee member and must hold a full-time position (not required to be tenure-track) with the rank of Assistant Professor or higher.

At least one member of the advisory committee is expected to have trained a graduate student through completion of a doctoral degree. Additional committee members may be included from either within or outside the University if it is considered useful or necessary. The minimum size of the committee will be four members, but five (or more) is allowed. In the case of a co-advised student, a minimum of five members is required. Committees with more than 5 faculty members are allowed but not encouraged and will not be approved by the Graduate Committee without compelling justification provided by the student. According to University policies, the number of external committee members may not exceed the total number of committee members who are internal to the department. This calculation includes the advisor(s), but does not include the proposal or defense examination chair.

In addition to the above requirements, the PhD thesis advisor committee must conform to the guidelines set by the university (see the Regulations and University Policies Concerning Graduate Studies for more information).

Once the advisory committee is formed during the spring of the second year, the student should quickly hold an informal meeting with the committee. The student and the committee should discuss the student's emerging research proposal in the concurrent proposals class, the courses taken by the student in preparation for the research topic, and the appropriateness of the committee members to serve as advisors. It is strongly encouraged that students set a fall date for the qualifying exam at this meeting.

The qualifying exam/proposal defense will be chaired by an additional faculty member (outside of the advisory committee) who must be approved by the Graduate Committee and must hold a Primary, Graduate or Secondary BME faculty appointment. The role of the chair is to run the exam and ensure that it is conducted fairly. This individual can (but does not have to) have expertise related to the student's project.

The thesis defense will be chaired by different faculty member (also outside of the advisory committee) who must be approved by the Graduate Committee and must **not** hold a Primary or Graduate or BME faculty appointment but may hold a Secondary BME faculty appointment. The role of the chair is to run the exam and ensure that it is conducted fairly. This individual can (but does not have to) have expertise related to the student's project.

[G. Grading & Performance Evaluation](#)

Grading

Graduate students in Arts, Sciences & Engineering are graded in two standard ways: either with a standard letter grade (A, A-, B+, B, B-, C, E) or on the basis of Satisfactory/Unsatisfactory (S, E). In either case, the course must be graded consistently for all students. Courses that are graded with standard

letter grades may not receive a grade of S or vice versa. Dissertation courses (897, 997, 899, 999) can be graded only on the basis of Satisfactory/Unsatisfactory (S, E). For more information about the graduate grading scheme, visit the registrar's webpage.

While some courses will be graded via a standard letter grade, GPAs are not calculated for graduate programs due to the number of courses graded on the basis of Satisfactory/Unsatisfactory. If necessary, students can estimate a GPA using the [GPA calculator](#) found on the registrar's website. If necessary, the AS&E Graduate Education and Postdoctoral Affairs (GEPA) office can provide verification that a GPA is not issued.

The minimum passing grades for courses or research work carrying graduate credit are C or S. However, **only one grade of C or lower is allowed in a student's graduate program of study**. A student who receives a grade of C or lower in two or more courses (or a grade of C or lower in a single course totaling 8 or more credits) will be subject to dismissal from the program unless an exception is granted by the AS&E Dean of Graduate Studies.

A student who receives a grade of C or E will be considered to have an unsatisfactory record and will be automatically placed on academic probation. A student on academic probation cannot be awarded a graduate degree. Students in extenuating circumstances may appeal to the AS&E Dean of Graduate Education and Postdoctoral Affairs (GEPA). Students who receive their first and only C in their final semester are not subject to academic probation.

When a student is placed on probation by the AS&E GEPA office, the student will be notified in writing and will be given one semester to resume satisfactory academic standing. See the AS&E Graduate Handbook for a more detailed description of academic probation.

Course Registration Deadlines

Students are required to be registered each semester until the degree has been awarded. A student who has not registered by the drop/add deadline will be withdrawn. Registration deadlines can be found on the AS&E GEPA calendar.

Policy for Transferring in Credits Toward PhD

AS&E allows up to 30 credit hours of acceptable graduate work taken at this or another university to be transferred toward the 90-credit requirement for the PhD degree. All transfer credits must not have been used as part of an undergraduate degree program and require the approval of the BME Graduate Committee and the AS&E Dean of Graduate Education and Postdoctoral Affairs in order to be applied to a PhD program of study. The BME Graduate Committee is responsible for determining the specific requirement fulfilled by the transferred credits (e.g., Advanced BME, Approved Biology, etc.). Students seeking to transfer credits must first fill out and submit the BME Transfer Request form to the Program Coordinator. This form is available from the Program Coordinator by request.

Annual Evaluations

An annual evaluation is required for all PhD students. For 1st year PhD students, the Preliminary/First-Year Exam serves as an annual evaluation. For 2nd year PhD students, the PhD Research Planning Form serves as an annual evaluation for any students who have not held advisory committee meetings. 3rd year

PhD students and above will hold a committee meeting on at least an annual basis. After each committee meeting, the student and committee must complete the Advisory Committee Meeting Report form and submit it to the Graduate Program Coordinator. The report will serve as an annual evaluation required by GEPA.

Scheduling advisory committee meetings is the responsibility of the student. If a progress report is not on file each academic year (by August 1), stipend funding may be suspended.

Research Internship Policy

Research Internship requests are managed by the Office of Graduate Education and Postdoctoral Affairs (GEPA). GEPA requires time to approve an internship and create a unique course registration number (CRN) for an internship. **All completed paperwork is required in GEPA at least two weeks prior to the start of the term in which the internship will be held.**

A graduate practical research internship is designed to allow a student to obtain practical experience in their graduate research field by working on an internship outside the University for a short period of time during their graduate education.

An internship requires a faculty member to agree to serve as the advisor. The student must obtain the signature of the faculty member (on the Internship Approval Form) in order to register for an internship. Students are required to submit a short write-up of their internship experience to their internship faculty advisor. The faculty member will provide a grade for the one-credit internship based on this write-up.

The student must register for one credit under

- Full-time internship: 594 (PhD)
- Part-time internship (less than 20 hours/week, in the Rochester area) 594P (PhD)

If a full-time internship is taken over the semester rather than over the summer, the student must also register for continuing enrollment, 999A (PhD). Each one-credit internship, up to a maximum of two, counts toward the total required credits for the degree (30 or 32 for Master's; 90 for PhD) and must be included in the student's program of study. In order to count additional credits of internship beyond two toward the degree requirements, approval from the AS&E Dean of Graduate Education and Postdoctoral Affairs must be obtained.

While performing an internship, students must maintain health insurance coverage. Students currently enrolled in the University of Rochester Student Health Insurance plan may remain on this plan during the internship period as long as they make the appropriate arrangements with University Health Service.

Exclusion (Dismissal)

A student who fails to resume satisfactory academic standing during the probationary period after being notified of placement on probation will be excluded (dismissed). The exclusion decision is final when a student does not meet the criteria for satisfactory academic progress and has failed to remediate within the AS&E GEPA office's probationary period. In such cases, there is no process for appeal, and the exclusion will take effect immediately.

In the BME Department, a student may be asked to leave a degree program before graduation if:

- 1) the student does not pass preliminary, qualifying or final (exit) exams
- 2) the student earns a grade of C in two or more classes (or in a single class totaling eight or more credits)
- 3) the student's advisory committee (or academic advisor for Plan B MS students) indicate that the student is failing to make satisfactory progress toward a degree over a period of at least one year
- 4) the Graduate Committee determines that the student has accumulated a significant record of poor performance in any number of evaluated areas including: class work, research, exams, rotations, and teaching assistantships
- 5) the student's behavior is detrimental to the welfare of individuals, the program, or the department. Final decisions on termination are made by the Graduate Committee after a careful review of the student's record. An exception is the case of poor academic standing (case 2) which, according to University policy, is reviewed by the Associate Dean for GEPA.

Funding will cease on the effective date of the exclusion unless other arrangements are made. When a student is excluded (dismissed) by the program, the student has an opportunity to appeal the exclusion decision to the AS&E GEPA office. When a student appeals the program's exclusion decision, the exclusion becomes effective after the appeal process has concluded if the appeal is denied. More information on appeal process and academic grievance policy is available in the GEPA AS&E Handbook.

H. Preliminary (First Year) Exam

Objectives

The objectives of the preliminary (first year) exam are to

- A. Clearly identify students who are not likely to make successful biomedical engineering graduate students; and
- B. Ensure that students are executing a curricular plan that will provide engineering and biological depth and the biological and engineering breadth appropriate to their chosen field of research.

Subject

The subject of the preliminary exam is a recent article from the literature. In April of each year, the Graduate Committee will organize exam committees for each student. Each committee will assemble a collection of papers that align with the background and interests of the student.

Exam Guidance

The first year exam will be broadly discussed at graduate student orientation in August and in more detail in BME 402. In addition, first year graduate students will meet with the Graduate Program Director shortly after finals week in May. At this meeting, the Director will review the instructions for completing the exam and explain the expectations for passing the exam.

Exam Committee

All three committee members must hold positions with the rank of Assistant Professor or higher and must be members of the Primary, Graduate, or Secondary BME faculty. Under exceptional circumstances, the Graduate Committee may approve a committee member outside of the BME faculty. When possible, committee members will be selected who have expertise related to the student's likely field of research.

The student's selected advisor must serve on the committee. In the rare case that the student has not yet selected an advisor, at least one committee member should have supervised one of the student's research rotations.

One of the committee members will serve as the exam chair. Typically, the committee member most experienced in serving on BME 1st year exams will be asked to take on this role. However, the student's advisor may not serve as chair.

Procedure

At the start of the exam, each student will be presented with a collection of papers (chosen by the committee) and will be given at least 2 days to select from this collection the paper that will be the subject of the exam. During this time, the student should also begin to schedule the oral exam (in consultation with the exam committee and Graduate Coordinator) on a date roughly 3 weeks from the day the paper is selected. While the student is responsible for scheduling the exam, the Graduate Coordinator will assist with booking a room for the oral examination. The oral exam should take place in person when possible, but may be held via Zoom if necessary.

After selecting a paper, each student will be given 14 days to prepare a formal report. Reports are to be no more than 20 double spaced pages in 12 pt font (or an alternative legible format of equivalent length). Figures and legends should be embedded within the text and count towards the page limit, but references and appendices can be inserted after the text. The report should begin with an executive summary and must include a critical evaluation of the paper and an example of the student's ability to apply quantitative engineering approaches to medicine/biology. The report must also include appendices with a copy of the critiqued paper, relevant (raw) data and software codes used in the student's engineering analysis, the student's CV, and the student's completed Program of Study Form (obtained from the Graduate Coordinator). The report must be submitted as a single PDF file and should be sent to the student's committee, the Graduate Director, and the Graduate Coordinator.

The critical analysis should address:

- 1) the significance of the study in the context of human health;
- 2) the findings of previous studies that address similar questions; and
- 3) the quality of the work, data, and/or model(s), and 4) the strength of the conclusions.

The engineering analysis can be used to evaluate the paper, to provide a clearer explanation of complex mathematical ideas within the paper, and/or to illustrate an extension of the paper for future research. The engineering analysis must be quantitative.

Examples of how engineering analysis might be used for the exam include:

- a) A student develops a simplified version of a simulation included in the paper and uses it to demonstrate how different (but reasonable) parameter choices lead to conclusions very different than the authors'.
- b) By consulting supporting literature a student, is able to clearly derive a complex set of expressions used (but not derived) in the paper. The student concludes that the analysis is fundamentally correct. The student now better understands the assumptions inherent in the work and can explain why the assumptions are reasonable given the experimental conditions used.
- c) A student develops an idea for extending the work in the paper using a different device than a device used by the authors. The student presents a computational analysis of the device that clearly identifies design parameters for the new device and how they might be adjusted to answer the biological question.
- d) A student uses Monte-Carlo simulations to fabricate a data set resembling data presented in the paper. The student then analyzes the data in a manner distinct from the paper and compares the acquired results with analyses presented in the paper.

Students are cautioned that their prepared materials must obviously include both an engineering analysis and a critique. A student failing to meet this requirement will automatically fail the exam. Students are prohibited to have already reviewed the paper in a completed rotation or class. The paper and engineering analysis should be original to the 1st year exam. Papers authored by any member of the exam committee are not allowed, and papers authored by University of Rochester researchers are highly discouraged.

Within a week following submission of the document, students will have an oral exam before their committee. Prior to the oral exam, each student is to prepare an oral presentation on the paper and engineering analysis. The maximum length of the presentation (not including questions from the committee) is 20 minutes. The presentation may include extensions or corrections to the written analysis. Students are required to add to the end of the presentation a single slide listing their course choices and the rationale behind these choices. This slide and any discussions that follow will not be included in the 20 minute time limit for the presentation. Students are advised to review all graduate and undergraduate materials that might be reasonably connected to the paper through questioning. The paper is used as a starting point for questioning, but the student's understanding of fundamental engineering principles and biology will be tested during the oral portion of the exam.

Basis for Evaluation

The examining committee will question the student for a minimum of 1 hour after the student's presentation. The committee will evaluate the student based on four equally weighted criteria:

- A) Is the student an independent (*i.e. critical*) thinker?
- B) Is the student capable of communicating in a professional, clear, and scholarly manner?
- C) Is the student clearly able to apply principles of engineering/physics to biology/medicine?
- D) Is the student able to apply knowledge of biology/physiology to solve a problem in biomedical engineering?

At the close of questioning, the committee will meet without the student to determine a final result. The student cannot pass the exam if the committee concludes that the student did not include an engineering analysis and/or critique in the prepared document and/or presentation. The examination panel will also

determine if the student is executing a curricular plan that will provide engineering and biological depth and breadth appropriate to their chosen field of research.

Following the panel's discussion, the student will be informed of the committee's recommended exam result (pass, contingent pass, or fail) and will be provided with feedback from the committee if applicable. However, the student cannot officially pass or fail the exam until the faculty discusses the student's exam and complete academic record at the next faculty meeting. After a failure of the exam, in some cases, the exam can be re-taken at the recommendation of the faculty.

I. Qualifying Examination (Proposal Defense)

Objective and Basis for Evaluation

The goal of the PhD qualifying exam (proposal defense) is to determine whether the PhD student is prepared to conduct a high-quality inquiry in an important area of medical or biological science. The basis of the PhD qualifying exam in BME is a research proposal that is both *written and defended by the student*. Through written and oral presentations, and through oral discussion, the student must convince the exam committee that:

- 1) The proposed research addresses an unsolved, scientifically important problem.
- 2) The proposal contains an approach that is well-reasoned, well-controlled, innovative, and optimized. In other words, the plan is likely to be met with some success.
- 3) The student has the ability to successfully complete the work using the resources available to them.

Format

Students are instructed to use a standard NIH-style format for their proposal. Details of the format are provided below. Include a cover page, table of contents, references, and appendices as needed. These pages do not count against a *13 page limit* for the body of the proposal.

Font

- Use an *Arial, Helvetica, Palatino Linotype or Georgia* typeface, a black font color, and a font size of *11 points or larger*. A symbol font may be used to insert Greek letters or special characters. However, the font size requirement still applies.
- Type density, including characters and spaces, must be no more than 15 characters per inch.
- Type may be no more than six lines per inch.
- Print must be clear and legible.

Page Margins

- Use *standard size (8 1/2" x 11")* sheets of paper. Use at least 1/2 inch margins (top, bottom, left, and right) for all pages, including continuation pages.

Page Numbering

- The proposal should be single-sided and single-spaced with consecutively numbered pages throughout.

Figures, Figure Legends, and Footnotes

- A smaller type size may be used in figures, tables and footnotes, but it must be in black ink, readily legible, and follow the font typeface requirement. Embed key figures in the main document. Supplemental figures can be added to an appendix.

Proposal Sections (13 page limit not including References and Appendix)

- Specific Aims (1 page limit):* State concisely and realistically what the research described in the proposal is intended to accomplish and/or what hypothesis is to be tested.
- Significance:* Briefly sketch the background to the proposal and critically evaluate the existing knowledge. State concisely the importance of the research described in the proposal by explaining how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Innovation:* Explain how the application challenges and seeks to shift current research or clinical practice paradigms. Describe any novel theoretical concepts, approaches or methodologies, instrumentation or intervention(s) to be developed or used, and any advantage over existing methodologies, instrumentation or intervention(s). Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation or interventions.
- Approach:* Discuss in detail the experimental design and the procedures to be used to accomplish the specific aims of the work described in the proposal. Describe the protocols to be used and a tentative timetable for the investigation. Include the means by which the data will be analyzed and interpreted. Attempt to convince the reader, with preliminary data where possible, that you have a reasonable chance of achieving the aims in the proposed time. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the aims.
- References:* Use a standard journal format that includes names of authors and full title.
- Appendix:* Additional graphs, diagrams, tables, and charts supporting the proposal should be included in this section. One or two key publications may also be included.

Exam Committee

The exam committee will consist of the members of the student's thesis advisory committee and an exam chair. The exam chair must be approved by the Graduate Committee. Only members of the BME graduate and secondary faculty are allowed to chair PhD proposal defenses. In the BME qualifying examination, the thesis advisor does not vote on the final exam outcome.

Timing

PhD Proposal defense should be taken before the end of the first semester of the third year. Waiting longer only increases the expectations of the advisory committee on exam day. Students must have

completed a minimum of 24 hours of course work credit, as outlined above, at the time of the exam. The completed Ph.D. thesis research proposal must be submitted to each member of the thesis advisory committee and to the Program Office at least two weeks before the day of the examination. Students should inform the Graduate Program Coordinator at least two months in advance of the exam, as the Graduate Committee must approve the exam chair and the exam must be formally approved by AS&E Dean of Graduate Education and Postdoctoral Affairs at least 2 weeks prior to the exam date. Students who successfully pass the PhD proposal defense are eligible for one-time \$500 travel award from the BME department.

Timeline

At least 8 weeks (2 months) prior to exam date:

Student submits a completed **Request for Chair of PhD Proposal form** to the Coordinator. The form must be formally approved by the Graduate Committee before the AS&E Dean of GEPA approves it. Please note that Graduate Committee meets monthly, every 4th Monday. The Graduate Coordinator verifies with the selected Chairperson that they are able to fulfill the role and informs the student.

At least 4 weeks (20 business days) prior to exam date:

Student submits to the Graduate Coordinator:

- The date and time agreed upon by the advisory committee for the public seminar and closed exam
- The title and abstract of the written proposal

The Graduate Coordinator will schedule rooms for the public seminar and closed exam (if applicable) and prepare the Examination Appointment form and seminar announcement. Virtual qualifying exams are allowed if necessary or if preferred by the student and committee.

At least 2 weeks (10 business days) prior to the exam date:

The Coordinator submits the Examination Appointment form to the AS&E Dean of Graduate Education and Postdoctoral Affairs (GEPA) to formally schedule the exam. At this time, the student submits the written thesis proposal to the advisory committee (including the chair).

Procedure

Students must hold a public oral presentation prior to the exam. While the presentation does not need to coincide with a departmental seminar series, it must be advertised to the department as an open session. The seminar should not exceed 50 minutes in duration. Following the presentation, the student and committee will meet for a closed examination. A typical examination will take between two and three hours (including the open session). At the close of the exam, the committee will meet with the student to explain their findings.

[J. PhD Thesis and PhD Defense](#)

Requirements

The qualifying examination must have been passed no sooner than six months prior to the thesis defense. In addition, the thesis defense must take place within specific time limits (7 years for most graduate students and 6 years for students who continue after receiving an MS degree from the University of Rochester, unless an extension is granted by the AS&E Dean of GEPA). The following are also required in advance of the thesis defense:

- Satisfactory completion of the appropriate number of credit hours for the program (90 credit hours with no grades outstanding excluding the current term).
- The student's *Program of Study* must be on file with all requirements met. Note that the *Program of Study* should be filed before student completes the qualifying exam and will be used as a guideline for completion of degree work. The *Program of Study* reflects the minimum courses/credits needed to complete the degree.
- The student must have maintained continuous enrollment since admittance into the Graduate Degree Program.
- The PhD thesis committee must conform to the guidelines described above in addition to guidelines set by the university. University regulations are available at <https://www.rochester.edu/GradBulletin/PDFbulletin/Regulations.pdf>

Written Thesis

A manual entitled, "[Formatting the Thesis and Preparing for Final Defense](#)" is available from the Program Coordinator or online at <http://www.rochester.edu/Theses/>. Previous theses are also available in the BME Suite in front of Room 207. It is the responsibility of the student to see that style, format, margins, paper, binding, etc. are in accordance with University regulations. If you have questions or concerns regarding thesis preparation, please contact the Office of the University Dean for Graduate Studies, x54279. T

Dissertation Registration

In order to register your dissertation, student or the Program Coordinator creates a record on the [Graduate Studies PhD Completion website](https://phdprocess.ur.rochester.edu) at <https://phdprocess.ur.rochester.edu>

This record will include:

- Degree information
- Past degree information
- Contact information
- The defense version of your dissertation as a PDF
- Other relevant documents

The version of your dissertation attached to your online record is considered **the registration copy**.

When your PhD completion record is finalized, committee members will receive emails with links to access your record and approve your dissertation to progress to defense.

You will need to provide copies of the dissertation identical to the registration copy to all members, including the chair, at least five weeks before the record is finalized. Everyone but the chair is required to comment or sign off on the dissertation before it is submitted. They have ten business days to review and approve your thesis.

After all committee members have provided their approval, your thesis will be reviewed by your department chair, the AS&E Dean of Graduate Education and Postdoctoral Affairs (GEPA), and the office of the University Dean of Graduate Studies. When all of these officials have approved your committee and dissertation for defense, your dissertation is considered registered. You will be able to track these approvals in your online record and will receive a confirmation email when approvals are complete.

The GEPA Office, AS&E Dean of GEPA, as well as the University Dean of Graduate Studies, may make corrections to the PDF of your dissertation. This annotated copy of your dissertation, along with the original version, will be stored in the PhD completion website. You are not allowed to distribute updated versions of your dissertation prior to the defense, but be sure to incorporate any corrections before uploading your final dissertation to ProQuest®.

After the defense, if the committee has required major revisions to be approved by one or more of its members, it is your responsibility to provide them with the corrected final version for their approval. They will be asked to submit written confirmation of that approval to the University Graduate Studies Office. Failure to do so could delay conferral of your degree.

After the defense, you will receive additional instructions by e-mail for completion of all PhD degree requirements.

Timeline

At least 12 months prior to scheduling a defense:

Student meets with the advisory committee to ensure that all members of the committee agree that the work is ready to progress towards thesis writing and defense.

At least 4 months prior to scheduling a defense:

Student submits a Request for Approval of PhD Chair form to the Graduate Coordinator. The chair of the PhD defense may not hold a Primary or Graduate BME faculty appointment. The chair should have previously either (1) graduated a PhD student or (2) chaired a PhD defense. This individual should (but does not have to) have expertise related to the student's project. The Graduate Committee will review and approve the request. Please note that Graduate Committee meets monthly, every 4th Monday.

At least 3 months prior to scheduling a defense:

Student begins scheduling the defense date to ensure that the advisor, committee members, and chair are able to be present and that rooms are available on the date and time selected. The [PhD date calculator](http://www.rochester.edu/college/gradstudies/phd-defense/datecalculator/index.html) is available at <http://www.rochester.edu/college/gradstudies/phd-defense/datecalculator/index.html> to determine the deadline dates.

At least 6 weeks prior to the date of defense:

Student or the Graduate Coordinator creates a record on the [Graduate Studies PhD Completion website](#). Student provides the title and abstract of their dissertation to the Graduate Coordinator. The coordinator uploads forms for thesis registration (UR advising record and approved *Program of Study*).

The system allows the student's personal information, necessary forms, and required approvals to be collected electronically prior to the defense.

At least 5 weeks/25 business days prior to defense:

Student uploads PhD thesis in a PDF format to the PhD Candidate Processing System. Student needs to ask advisory committee whether they prefer paper or/and electronic versions of the thesis. Student provides copies of the dissertation identical to the registration copy to all members of the advisory committee, including the chair. The committee members have 2 weeks to review the PhD dissertation. Everyone but the chair is required to sign off on the dissertation before it is submitted for further approvals. Please note that URM Copy Center requires 4 business days to print and bind your thesis.

At least 3 weeks/15 full business days prior to the date of defense:

Coordinator approves student's record in the PhD Defense Processing System, triggering e-mails to committee members asking for their approval. After the advisory committee's approval, the BME Chair approves the record. Next the AS&E Dean of GEPA and the University Dean of Graduate Studies review and approve the thesis online in the PhD Defense Processing System.

The student will receive a notification from the University Dean's Office confirming scheduling of the defense and the appointment of the Chair. The Chair of the defense and the committee will receive exam information from the University Dean via e-mail.

Final PhD Examination/Thesis Defense

The exam may be held either in-person or virtually. The first hour of the thesis defense is an open seminar to the public. The student's presentation should last 45 minutes and 10 minutes should be allowed at the conclusion for questions from the audience. The student and the examining committee will then adjourn to a private session where the second part of the exam will be conducted. Using oral interrogation, the committee will scrutinize the student's comprehension, execution, description and interpretation of the research described in the thesis.

After the Defense

The student must submit the final corrected copy of the dissertation as soon as any remaining comments that were brought up during the defense or noted in the registration copy of the dissertation are addressed. The student can maintain full-time status for up to a semester following the defense in order

to address comments from the committee. The degree conferral date depends on when the final corrected copy of the dissertation is submitted.

Correcting and Finalizing the Dissertation

The day after the defense, the student will receive an email from the University dean of graduate studies that provides instructions on how to:

- Submit the final corrected dissertation through ProQuest
- Provide authorization for the release of the dissertation through [UR Research](#)
- Complete a mandatory online exit survey
- Verify to the University Dean of GEPA that the dissertation has been submitted

Publishing the Final Dissertation

The University of Rochester requires all doctoral candidates to deposit their dissertations for publication with ProQuest Dissertation Publishing and with the University libraries. Hard copies are not required. The library receives an electronic copy of the dissertation from ProQuest, but students must give the University permission to obtain it. For questions regarding publishing through ProQuest, contact Author Relations at disspub@proquest.com or (800) 521-0600 ext. 77020.

Students should check with the Graduate Coordinator to see if the department wants a bound copy of the dissertation, and, if so, how the cost of binding will be covered.

K. Summary of PhD Student Responsibilities

First Year

- Choose PhD research advisor (before April 15)
- Complete rotations
- Complete preliminary examination (June)
- Begin PhD thesis research (June)

Second Year

- Form thesis advisory committee (before January)
- Complete coursework
- Complete TA requirements
- Meet with PhD research advisory committee (before August)

Third Year

- Complete qualifying examination (before January)

Each Year Thereafter

- Meet with PhD advisory committee at least annually.

Note: The expectation of the program is that students should not take more than six years to successfully complete the PhD. University Regulation require that students exceeding a 7 year stay receive approval for an extension both from the department (Graduate Committee) and the AS&E Dean of GEPA.

L. General Graduate Program Policy in BME

This handbook summarizes the major features and policies of the graduate program in Biomedical Engineering. The broader policies that govern BME and all graduate programs are summarized in the Graduate Bulletin (<http://www.rochester.edu/GradBulletin/>) updated every two years. Both students and advisors will need to consult both sources, though it is our intent to provide the salient features here. Policy, of course, continues to evolve in response to the changing needs of the graduate program and the students in it. Thus, it is wise to verify any crucial decisions with the Biomedical Engineering Graduate Committee.

Stipends, Health Fees, Taxes, and Tuition

All matriculated BME PhD students in good standing receive a stipend to cover living expenses that is paid semi-monthly (on the 15th and last day of each month). Stipends are not guaranteed following the 6th year in the program. Paper checks are sent to the BME Coordinator and must be picked up in person.

Direct deposit may be set up online via the University of Rochester HRMS Employee Self Service or may submit a hard copy direct deposit request to the Payroll Office. When submitting hard copy, a voided check or deposit statement must be supplied in order for the Payroll Office to process the request. If you have questions about the status of your paycheck, contact your graduate coordinator.

PhD students' positions are categorized by whether or not the position is academically required for a specific program of study. The category students are appointed to may have tax implications that students should be aware of.

Academically required codes:

- Grad Fellowship/Stipend: **6000**
- Grad Assistantship: **6002**

Academically required job categories are considered taxable income but are not considered "earned income" and thus do not count toward an earned income tax credit. A W-2 will not be issued for this type of payment; however, you will receive a letter in January that states your yearly payments for tax purposes. It should be noted that these job categories are not taxed at the time of payment and require the student to make estimated quarterly tax payments. For information on how to estimate your quarterly tax payments see the provost's guide. Other tax implications may result from this type of appointment, so please make sure to consult a tax professional. International students may contact the International Services Office (ISO) for tax guidance that is provided as part of the international student fee.

Non-academically required codes:

- Grad Assistant-Add On: **6004**
- Grad Teaching Assistant Add On: **6006**

Non-academically required appointments are considered taxable income, have tax withheld at the time of payment, and are considered earned income. A W-2 will be issued for these payments. Please note that you must have an I-9 on file with the University for these types of appointments.

Individual health fee coverage is the basic coverage through the University Health Service. Additional coverage for family members or a spouse is available, but is not provided by the program. Full tuition costs are covered for 32 credit hours per academic year up to 90 credit hours.

Grants and Fellowships

Students are encouraged to submit applications for grants and fellowships to support their research. You can register in the GENIUS/SMARTS/SPIN databases at <http://www.rochester.edu/ORPA/funding/index.html> and receive funding opportunities on a daily basis. If you are interested in learning more about grants and fellowships, you may call the Office of Research and Project Administration (ORPA) for an appointment, x54031 (Hylan Building, Rm. 515 on River Campus) or you can visit them on-line at: <http://www.rochester.edu/ORPA/>.

Additional Employment

PhD students are not to simultaneously be employed full time while maintaining full-time student status, unless it is an internship related to the student's academic program and supported by the student's advisor, the Graduate Program Director, and the AS&E Dean of Graduate Education and Postdoctoral Affairs. Part-time employment for full-time students is limited by individual programs—any part-time employment must be approved by the student's advisor and the program director of graduate studies. International students must discuss with the International Services Office (ISO) any special rules and regulations for internships and part-time employment, such as the number of allowable work hours.

Vacation

Graduate students are entitled to two weeks of vacation each year in addition to official University Holidays. University holidays include Christmas Day, New Year's Day, Martin Luther King Day, Memorial Day, the 4th of July, Labor Day, and 2 days at Thanksgiving. While the scheduling of vacations is left to the discretion of the student, prior approval from the advisor must be obtained so as not to conflict with coursework, laboratory experiments and other duties.

Before scheduling an extended absence from the University (i.e., more than 10 business days), students must obtain permission from their thesis advisor and the BME Program Director.

*It is extremely important that ALL international students inform the BME Coordinator of their **international travel** (including Canada) at least 10 days in advance, as there are specific documents from the University that are needed in order to ensure successful re-entry into the United States. Travel within the U.S. does not require documentation (but see below).

Travel within Rochester, and beyond: The International Services Office (ISO) recommends that international students always carry a university ID, current I-20 or DS-2019, and passport when traveling in the U.S., even within the Rochester area. These documents, including the I-94 card stapled to your passport when you enter the country, document your valid F-1 or J-1 student status. Since Rochester is so close to the U.S. border with Canada, a team of Border Patrol agents routinely check the immigration

status of individuals in the community, especially near the airport, train and bus stations. If you are stopped and questioned about your status, the ISO may be contacted to help. When you arrive, you will receive a card with ISO Contact Information to carry with you. For more information, go to <http://www.iso.rochester.edu/>.

International students should refer to the University's *Travel Information and Documentation website* (<http://www.iso.rochester.edu/travel/index.html>) before traveling within the U.S. or abroad.

II. MS PROGRAMS

A. MS Program Objectives

Three MS options are offered in BME: The Plan A or 'thesis' MS, the Plan B or 'coursework' MS, and the MS in CMTI.

Plan A MS

The primary goal of the Plan A masters is for the student to successfully execute and communicate an in-depth research project. In Plan A, courses are taken both in support of the research project and to broaden the student's educational experience.

Plan B MS

The primary goal of the Plan B masters is for a student to develop and demonstrate advanced understanding of biomedical engineering principles. Courses are selected to provide depth in areas of the student's interest and to allow the student to develop an understanding of the breadth of applications in biomedical engineering.

MS in CMTI

The third MS degree in Biomedical Engineering is offered by the Department of Biomedical Engineering through the Center for Medical Technology and Innovation (CMTI). The CMTI is a joint collaboration between the [Hajim School of Engineering & Applied Sciences](#) and the [School of Medicine & Dentistry](#).

The CMTI MS degree program in Biomedical Engineering is designed to be completed within one year. Students have the option of extending the program to three semesters in order to accommodate a corporate internship during the second summer.

The CMTI MS degree in Biomedical Engineering follows the Plan B coursework-only path within the Department of Biomedical Engineering. Students who choose this program must complete a total of 30 credits to graduate. The primary difference of the CMTI MS Program is that students take designated courses focused on medical device design that serve to prepare them for a career in the medical device industry. This option features an **eight-week summer program that includes workshops and clinical observations within the operating rooms of Strong Memorial Hospital**. During the clinical rotations, students observe surgical procedures within the clinical setting and are trained in identifying unmet clinical needs that serve as the foundation for new medical products. The CMTI program is team-oriented, **and allows students to develop technical expertise, creativity, and**

communication, while also gaining knowledge related to the process of medical device design and regulation. For more information please visit the Center for Medical Technology and Innovation website at <http://cmti.rochester.edu/>.

B. Curricular Requirements

All three MS degrees require 30 credits. According to NYSED, at least 21 of these credits must come from engineering-prefixed coursework. The content of all courses has to be “advanced in content, rigor, and requirements.” A faculty member must review the program of study for any student seeking to take a course below 400-level and provide approval for including this course. Specific credit requirements for each degree are summarized in the following table.

<i>Plan A</i>	<i>Plan B</i>
Advanced BME (4 credits minimum)	Advanced BME (4 credits minimum)
Approved Statistics (3 credits minimum)	Approved Statistics (3 credits minimum)
Approved Engineering (4 credits minimum)	Approved Engineering (4 credits minimum)
Approved Biology (4 credits minimum)	Approved Biology (4 credits)
<i>BME 496: Current Research Seminars (0 credit)</i> <i>IND 501: Ethics in Research (1 credit)</i>	<i>BME 496: Current Research Seminars (0 credits)</i>
Additional coursework (incl. 6-11 research credits)	Additional coursework (incl. 6 research credits max.)
30 credits total (not to exceed 34 credits) > 21 credits from eng.-prefixed coursework	30 credits total (not to exceed 34 credits) > 21 credits from eng.-prefixed coursework

Courses satisfying the *Advanced BME*, *Approved Statistics*, *Approved Engineering* and *Approved Biology* requirements are specified in the detailed description of the PhD curricular requirements. All full-time MS students are required to complete one TAsip.

C. Grading

Graduate students in Arts, Sciences & Engineering are graded in two standard ways: either with a standard letter grade (A, A-, B+, B, B-, C, E) or on the basis of Satisfactory/Unsatisfactory (S, E). In either case, the course must be graded consistently for all students. Courses that are graded with standard letter grades may not receive a grade of S or vice versa. For more information about the graduate grading scheme, visit the registrar’s webpage.

While some courses will be graded via a standard letter grade, GPAs are not calculated for graduate programs due to the number of courses graded on the basis of Satisfactory/Unsatisfactory. If necessary, students can estimate a GPA using the [GPA calculator](#) found on the registrar’s website. If necessary, the AS&E Graduate Education and Postdoctoral Affairs (GEPA) office can provide verification that a GPA is not issued.

The minimum passing grades for courses or research work carrying graduate credit are C or S. However, **only one grade of C or lower is allowed in a student’s graduate program of study**. A student who receives a grade of C or lower in two or more courses (or a grade of C or lower in a single course totaling 8 or more credits) will be subject to dismissal from the program unless an exception is granted by the AS&E Dean of Graduate Studies.

A student who receives a grade of C or E will be considered to have an unsatisfactory record and will be automatically placed on academic probation. A student on academic probation cannot be awarded a graduate degree. Students in extenuating circumstances may appeal to the AS&E Dean of Graduate Education and Postdoctoral Affairs (GEPA). Students who receive their first and only C in their final semester are not subject to academic probation.

When a student is placed on probation by the AS&E GEPA office, the student will be notified in writing and will be given one semester to resume satisfactory academic standing. See the AS&E Graduate Handbook for a more detailed description of academic probation.

D. Course Transfer

AS&E allows up to 10 credit hours of acceptable graduate work taken at this or another university to be transferred towards the MS degree. All transfer credits must not have been used as part of an undergraduate degree program and require the approval of the BME Graduate Committee and the AS&E Dean of GEPA in order to be applied. The BME Graduate Committee is responsible for determining the specific requirement fulfilled by the transferred credits (e.g., Advanced BME, Approved Biology, etc.). Students seeking to transfer credits must first fill out and submit the BME Transfer Request form to the Program Coordinator. This form is available from the Program Coordinator by request.

E. Financial Support

Competitive tuition scholarships are available for both Plan A and Plan B students. Students receiving a tuition scholarship may be asked to serve as teaching assistants for 1 semester. Part-time students are not eligible for the tuition scholarship.

The department does not guarantee stipend support for any MS student, although some Plan A (and even some Plan B) students may be paid for their work in research laboratories. Federal loans are available to assist with cost-of-living expenses. Information on graduate loans is available at the University's financial aid website.

F. Teaching Assistantship

All MS students, except part-time students, must serve as a teaching assistant for at least one semester. Students are welcome to request specific teaching assignments and efforts are made to accommodate such requests when possible. Assignments will be made by the Graduate Director.

G. Continuity of Registration

All MS students, including part-time students, must register each term to continue progress toward the MS degree. If a student fails to enroll for any term, the College may terminate a student's status with the university. To maintain continuity, full-time Plan A students who have completed coursework should register for 0 credits of *BME 899: Master's Dissertation* until the thesis is complete. When registering for MS dissertation research for the first time, students should register for *BME 897*. Part-time Plan B students who do not wish to take a course in a particular term should register for *BME 895: Continuation of Master's Enrollment* or *BME 985: Leave of Absence* if they anticipate more than one term away from the university.

H. Duration

A full-time student should not take more than 1 year to complete the Plan B Master's requirements. A full-time student will typically take more than one year to complete the Plan A thesis. In the first year of study, a student in Plan A should satisfy all credit requirements, become fully trained in the laboratory, and make substantial progress on the thesis project. The teaching assistantship should also be completed in this year. Typically, all efforts beyond the 1st year are devoted to the completion of the research thesis. The University has a five-year limit on the time taken to complete any Master's degree (Plan A, Plan B, CMTI, full-time or part-time).

I. Advising

MS students will be assigned faculty academic advisors to provide guidance with class selection and help the student construct a program of study. These advisors are responsible for helping students plan courses during the first two semesters of study.

Each Plan A student should identify a thesis advisor within the first year of study. All members of the BME Graduate Faculty, including Secondary Faculty, may serve as an MS thesis advisor. Graduate and Secondary Faculty are listed on the program web pages at www.urmc.rochester.edu/bme/people/faculty/.

Plan A students are also required to form a thesis advisory committee. This committee must consist of 1) the thesis advisor, 2) one faculty member who is part of the BME Graduate or Secondary Faculty, and 3) one faculty member from outside the department (*i.e.* not part of the BME Graduate or Secondary Faculty). The student is required to meet with the advisory committee at least once before taking the exit exam and this meeting should take place at least four months before the exam.

J. MS Thesis Preparation and Exit Exam

MS - Plan A

Plan A students are required to prepare a written thesis following the format specified for the PhD thesis. The thesis manual is available at <https://www.rochester.edu/Theses/ThesesManual.pdf>. The thesis document must be registered with the AS&E Graduate Education and Postdoctoral Affairs (GEPA) office at least 5 days prior to the defense. Thesis copies must be delivered to the members of the examining committee at least two weeks prior to the oral exam. The BME Graduate Coordinator will assist the student in registering the thesis with the GEPA office. The thesis work must be presented in a public seminar and followed by a closed session oral examination.

Examination Criteria

The written document, the prepared presentation, and the oral exam will be used in evaluating the following criteria:

- A) Is the student clearly capable of executing an original study over a prolonged period?
- B) Is the student capable of presenting the rationale and results of new study in a clear manner?
- C) Did the student become thoroughly acquainted with the literature in a limited field?

MS Thesis Advisory Committee

The MS thesis advisory committee must satisfy the following requirements:

- All committee members must be faculty of the University of Rochester
- The student's advisor and (if applicable) co-advisor must serve on the committee. Either the advisor or co-advisor must have an appointment as a Primary, Graduate or Secondary BME faculty member.
- In addition to the MS advisor and co-advisor, one Primary or Graduate BME faculty (referred to as an internal committee member) must serve on the committee.
- The committee must have at least one external member who does not hold a Primary, Graduate or Secondary BME faculty appointment. This individual is referred to as an external committee member.
- Additional committee members may be added to the committee. Committees with more than 4 faculty members are allowed but not encouraged and will not be approved by the Graduate Committee without compelling justification provided by the student.

Timeline

At least 8 weeks (2 months) prior to exam date:

Student submits a *Request for Approval of MS Advisory Committee* form to the Coordinator. The form must be formally approved by the Graduate Committee. Please note that the Graduate Committee meets monthly, every 4th Monday.

At least 4 weeks (20 business days) prior to the exam date:

Student submits to the Graduate Coordinator:

- The date and time agreed upon by Advisory Committee for the public presentation and closed exam
- The title and abstract of the written proposal

The Graduate Coordinator will schedule rooms for the seminar and exam (if applicable), prepare necessary paperwork (Examination Appointment Form), and send the seminar announcement.

At least 2 weeks (10 business days) prior to the exam date student submits the written thesis proposal to the Advisory Committee including the chair.

At least 5 days prior to the exam date the Graduate Coordinator submits Examination Appointment form to AS&E Graduate Education and Postdoctoral Affairs (GEPA) office along with a registration copy of the thesis.

Defenses can be held on any day the University's Graduate Studies Office is open (not weekends, evenings, holidays, or the days between Christmas and New Year's). The student is advised to check the [academic calendar](#) for important dates and deadlines. The exam may be held either in-person or virtually.

After the Defense

The student must submit two final corrected copies of the thesis as soon as all comments brought up during the defense or noted in the registration copy of the thesis are addressed. Two corrected, unbound copies of the final thesis are required by the AS&E GEPA office to provide to the [University Libraries](#).

Thesis copies can be dropped off in GEPA's office located in Lattimore 206. The student should check with your Graduate Coordinator to determine if there is additional paperwork that you need to complete before your student status is terminated.

MS - Plan B

A student in Plan B must pass a comprehensive oral examination. Two formats are offered for the exam: 1) a course-based exam, or 2) a literature-based exam. The advantage of the course-based exam is that a student can schedule the exam at any time. A student wishing to participate in May commencement can schedule the exam in the final weeks of the spring term (the student will receive a firm deadline by e-mail for May commencement). The literature-based exam follows the PhD preliminary examination schedule and thus will always take place in June. A student must inform the program office of the desired exam format by March 1st (Oct 15th if a course-based exit exam is to be taken at the end of the fall term).

Course-based exam

In advance of this exam, the student will ask two or more members of the BME faculty to serve on the exam committee. The student should have taken at least one course from each of these instructors. In rare cases, an examiner outside of the BME faculty may be approved with appropriate justification. The names of the proposed exam committee members and the proposed date of the exam should be registered with the BME office one month prior to the exam to give the Graduate Committee time to approve or revise the student's suggested examiners and exam schedule. During the exam, the exam committee members will each question the student on topics covered in their courses. Typically, each examiner will begin by asking the student to answer questions similar in scope to questions that appeared in either exams or problem sets during the original course. The student will solve these problems on the board, providing a detailed rationale for each step. If appropriate, the examiner may ask follow-up questions to more deeply test the student's knowledge of the course material and its broader applications. The entire exam should last 60 to 90 minutes, where each examiner is allotted 30-45 minutes for his/her portion on the exam. Once the exam is finished, the student is excused and the examiners deliberate on the performance and outcome. The student passes by demonstrating 1) the ability to solve problems relevant to the course with few deficiencies; and 2) the ability to effectively communicate understanding of BME concepts and BME-related course material. It is the responsibility of the examiners to provide a written report of the exam proceedings and the student's performance to justify the outcome. This justification should be communicated orally in person to the student at the conclusion of the exam.

Literature-Based Exam

This exam follows the PhD preliminary exam format except that the basis for evaluation is different. Like 1st year PhD students, MS students taking this exam will be assigned an examination committee by the graduate director (see above). The committee will assemble a collection of articles that will be sent to the

student, and the student will be given at least two days to select the article that will be the basis of the exam. The student will then have two weeks to prepare a report on the paper. The MS report should begin with an executive summary and be no more than 20 double-spaced pages, 12 pt font (or an alternative legible format of equivalent length). Figures and legends should be embedded within the text and count towards the page limit, but references and appendices can be inserted after the text. The report should begin with an executive summary and must also include appendices with a copy of the critiqued paper and the student's CV. The report must be submitted as a single PDF file and should be sent to the student's committee, the Graduate Director, and the Graduate Coordinator.

The report should demonstrate a clear understanding of the article and include all the key engineering and biology background. After turning in the report, students will have one week before oral exams begin. During this time, students are to prepare a ~20 minute oral presentation on the paper and their report. Students are advised to review all graduate and undergraduate materials that might be reasonably connected to the paper through questioning. The examination committee will evaluate the student's written report and presentation. As criteria for passing, the committee must decide:

- A) Is the student capable of understanding a recent journal article from a field of interest, and of clearly explaining the article in oral and written presentations?
- B) In an oral examination, is the student able to draw on graduate coursework to explain concepts contained within or peripherally related to the article?

Students who fail to satisfactorily meet either of these criteria will fail the exam.

Re-Examination

Any student failing either format of the exit exam may be allowed to re-take an exam of the same format. The exam committee will recommend whether or not a student should be permitted to retake the exam, but the Graduate Committee will make the final decision. According to university regulations, the re-examination can happen as soon as the following semester, but not more than one year after the first exam. No student is permitted to take the exit exam a third time.

III. MD/PhD PROGRAM

Students earning a PhD in Biomedical Engineering through the MD/PhD program will begin PhD training in the third year of graduate school after two years of medical school training. Unless explicitly stated below all requirements and definitions for the PhD in Biomedical Engineering apply to students in the MD/PhD program.

A. Curricular Requirements

Because the medical school training emphasizes biology and physiology, the BME PhD requirement for 11 credits of Approved Biology is waived. Additionally, only 4 credits of Advanced BME courses are required, and both BME 402 and the preliminary exam are waived. A teaching assistantship is encouraged but not required. The BME faculty believe that experience and training in teaching is a valuable part of doctoral education for biomedical engineers, however the program does not require TA service in order to be consistent with MD/PhD requirements in other departments. BME 402 is not required for MD/PhD students, although they are welcome to take the course if they are interested. At least two rotations are

required by the MD/PhD program and these are typically completed before beginning the PhD training. The following summarizes the full non-research requirements for BME PhDs in the MD/PhD program:

- 12 credits of Approved Engineering
- 3 credits of Approved Statistics
- 4 credits of Advanced BME
- *BME 589: Writing Proposals in BME* (2 credits)
- *IND 501: Ethics & Professional Integrity in Research* (1 credit)
- *BME 496: Current Research Seminars* (0 credit)
- Three formal presentations in a public forum

A student should complete the curricular requirements in one academic year, and it is expected that 2-3 additional years will be required to complete the PhD thesis. Students must select a research advisor by the beginning of the spring term, and research should be underway by the spring term so that the proposal writing class is most effective. The qualifying exam should be taken in the fall of the second year of PhD study.

[B. Clerkships](#)

During the years of doctoral training, students will continue with clerkship activities for one afternoon each week to remain active in medical training. The clerkship time accumulates as medical school credit, and enables the student to have a free block in the last year of medical training to pursue either additional elective or further research activities.

IV. CAMPUS RESOURCES

[BME Graduate Student Council \(BME GSC\)](#)

The BME GSC fosters a threefold mission to promote scholastic excellence, community engagement, and mentorship extending across the biomedical engineering department and into the greater Rochester area.

[Graduate Student Association \(GSA\)](#)

The GSA exists to act as an advocate and liaison for, and to promote interaction among, the graduate students in departments of Arts, Sciences & Engineering at the University of Rochester. Visit the GSA website and Facebook page to find out more.

[Graduate Students of Color \(GSOC\)](#)

GSOC offers professional and social events to discuss topics addressing the racial and ethnic diversity of the University of Rochester graduate student population. Previous workshops have included **i)** Negotiating Race and Gender on the Job Market, **ii)** Identifying and Applying for Fellowships, **iii)** Finding 'the right fit' in Your Job Search, and **iv)** Next Steps After Completing a Master's Degree. GSOC also facilitates connecting graduate students to undergraduates who might one day follow in their footsteps up the academic ladder, thus helping to replenish the pipeline. A key objective is to expand the intellectual community of underrepresented minority students.

[Alliance for Diversity in Science and Engineering \(ADSE\)](#)

ADSE is a national organization whose primary mission is to increase the participation of underrepresented groups in academia, industry, and government through graduate student-led chapters – including the Rochester chapter – that reach out to students and scientists of all ages and backgrounds. For more information, see <https://www.urmc.rochester.edu/education/graduate/current-students/graduate-student-society/alliance-for-diversity-in-science-and-engineering.aspx>.

[Graduate Women in Science \(GWIS\)](#)

GWIS mentors women throughout their graduate and postdoctoral careers through a monthly meeting and one-on-one interactions, with the goal of improving the representation of women in science, especially at higher levels. Invited speakers have included successful individuals (who are usually women) from big pharma, start-up companies, publishing, funding agencies, small colleges, public policy institutes, science writing venues, and biomedical licensing.

[Graduate Housing](#)

The University of Rochester has several graduate housing options available for students and their family members. Visit the Graduate Housing website for more information.

[Department of Transportation and Parking Management](#)

Get connected in, around, and between campuses when you ride on the University's shuttle fleet or register your vehicle and purchase a permit to park on campus. Visit the [Department of Transportation and Parking Management](#) website for details on shuttle services and parking permits.

[Customer Service Center/ID Office](#)

Visit the Customer Service Center for ID cards, dining plan enrollment or modification, UROs account deposits, OneCard inquiries, and laundry and vending transfers. The office is located on the first floor of Susan B. Anthony Hall. Please note that you should report a lost or stolen ID card to the ID Office as soon as you become aware that it is missing.

[Athletics and Recreation](#)

Full-time graduate students enjoy free access to the campus fitness and aquatic centers. Part-time students can join the membership program, R Club, to use campus athletic facilities. Both full-time graduate students and R Club members can participate in club and intramural sports. For a full list of offerings, visit the [Athletics & Recreation](#) website.

[Interfaith Chapel](#)

The Interfaith Chapel provides students of many faith traditions a place to meet, meditate, and mingle, contributing to the rich diversity that is the University of Rochester experience.

[Center for Excellence in Teaching and Learning \(CETL\)](#)

CETL provides graduate students with resources to support their work as classroom TAs, laboratory TAs, and instructors. CETL also offers academic honesty support, including educational outreach programming and confidential counseling for students.

[URBEST](#)

URBEST is one of seventeen programs funded by the NIH to experiment with methods to enhance training opportunities for early career scientists and prepare them for a variety of career options in the dynamic biomedical workforce landscape. BEST's mission is to **Broaden Experiences in Scientific Training** for today's PhD graduate students and postdoctoral scientists. We believe that all biomedical research and science careers are equally valued as successful careers. The URBEST Program aims to increase the confidence and motivation of trainees to identify and pursue their career goals, and to reduce training time by enabling trainees to more efficiently direct their efforts.

[Libraries](#)

With combined holdings of more than 3.5 million volumes and extensive collections of online databases, electronic journals, rare books, and musical scores, Rochester's libraries rank among the top academic research libraries in the United States and Canada.

[Writing, Speaking, and Argument Program \(WSAP\)](#)

In concert with faculty across the College, WSAP builds a strong community of undergraduate and graduate writers, speakers, and researchers. WSAP offers a range of services designed for graduate student writers, including writing groups, tutoring, writing boot camps, and workshops.

[The Gwen M. Greene Center for Career Education and Connections](#)

Career advisors at the Greene Career Center assist students in achieving their individual career goals while providing them with the resources and tools they need to develop connections among their aspirations, academic pursuits, and co-curricular experiences.

[University Health Service \(UHS\)](#)

UHS provides confidential, high-quality health care services for students, employees, and other members of the University community. Services include treatment for illnesses and injuries, management of ongoing medical problems, and care and advice for health care concerns.

[University Counseling Center \(UCC\)](#)

UCC provides a comprehensive initial assessment and an individualized treatment plan to fulltime members of the University community who pay the mandatory health fee. The center offers individual, couples, and group therapy; outreach and consultation services; and referral services to help coordinate care.

[Health Promotion Office](#)

The Health Promotion Office offers resources to help students develop healthy skills and attitudes related to their personal health decisions. The office offers programs and services to address many student health needs, and there is a health educator available to answer questions and provide health related guidance.

[CARE Network](#)

The CARE Network allows University faculty, staff, students, and parents to report when a student is in or headed toward distress. The CARE team responds to referrals by connecting with the student and referring them to appropriate support resources on campus.

[International Services Office \(ISO\)](#)

The ISO provides immigration and related support services for the University's international population and the divisions and departments that sponsor them. The office staff offers support through immigration advising, cross-cultural counseling, advocacy, and programming.

[Office of Disability Resources](#)

The Office of Disability Resources offers a variety of services for undergraduate students, graduate students, and faculty. These services aim to provide an inclusive experience and equal access to academic content and program requirements.

[The David T. Kearns Center for Leadership and Diversity](#)

The Kearns Center strives to expand the educational pipeline through the doctoral degree for low-income, first-generation college, and underrepresented minority students. The center also helps develop and guide the University's diversity and inclusion efforts.

[Sexual Misconduct and Title IX Coordinator](#)

The Sexual Misconduct and Title IX coordinator and deputy coordinators assist with the prevention of and response to incidents of gender discrimination, including sexual harassment and assault. Students, faculty, and staff can connect with the Title IX coordinator for information on options for reporting if they or someone they know has been subject to harassment or discrimination. Visit the Sexual Misconduct and Title IX website for a full list of resources or to report an incident.

[Ombudsperson for the Natural Sciences and Engineering](#)

The Ombudsperson provides a resource for and information about institutional policies and acts as a facilitator to help students resolve their problems, connecting students with those who can help, accompanying the student in discussions of problems or issues with faculty or administrators, and acting as an informal mediator between the student and faculty or administrators. Ombudsperson can also help to effect positive change by providing feedback on patterns of problems and complaints to appropriate administrators. Students can contact either Ombudsperson for general questions. For questions related to a particular field of study, students are encouraged to contact the appropriate Ombudsperson for that

discipline. Discussions with the Ombudsperson can be through email, phone or in-person. Information about the current Ombudsperson for the Natural Sciences and Engineering can be found at <https://www.rochester.edu/college/gradstudies/current/ombuds.html>.

University Intercessor

The University Intercessor promotes a respectful, inclusive University for all members of the community by resolving disputes, challenging perceptions, and advocating for fairness at the University. Any member of the University community may request their assistance.

Department of Public Safety

The Department of Public Safety oversees matters related to life safety, crime prevention, and law enforcement. The department offers crime prevention training and awareness, victim and witness support, personal safety escorts, lost and found, and property storage. Public Safety can always be reached at (585) 275-3333.