Graduate Handbook
2017-2018
HELLO!

I am writing to you as the Chair of the Department of Biomedical Engineering (BME). Welcome to BME! We are very excited that you chose the University of Wisconsin to pursue your graduate studies, and we look forward to working with you.

In the BME Department, we are improving healthcare by integrating education, discovery, innovation and entrepreneurship. We are committed to providing our students with a dynamic and nurturing environment to learn, discover, innovate and make a difference. Because of our emphasis on improving patient care, the BME Department maintains close collaborative ties with many UW departments in the School of Medicine and Public Health including Surgery, Human Oncology, Medicine, Neurology, Neurological Surgery, Radiology, Orthopedics and Rehabilitation, and Psychiatry. Many faculty members hold joint appointments. These cross-links broaden the scope of the research opportunities open to graduate students, and provide access to additional equipment and areas of research investigation.

If you have a question or concern, please contact me, a faculty member, or staff member. Use this handbook as a guide, and as a primary resource to answer your questions, but always feel free to seek assistance from BME faculty and staff. I would like to encourage you to become an active member in the BME community by getting to know students, faculty and staff both within your academic specialty area, and in other areas of BME.

Sincerely,

Justin Williams, PhD
Professor and Chair
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Arriving on Campus

Upon arrival, students should review campus guidelines and complete the following tasks to make sure that their time on campus starts smoothly.

**Obtain a Wiscard**

The student ID, or Wiscard, is the key to campus life. Students use their Wiscards as a library card, to purchase school supplies and food on campus, as a key card for certain buildings that faculty grant them access to, and more. Having a Wiscard is a prerequisite for many activities on campus, so it is essential that students stop by the Photo ID Office in Union South Room 149 between 8:30 AM and 5 PM Monday-Friday as soon as they arrive in Madison.

**Navigate Campus**

Students can explore the UW campus via map online before setting out on foot, bike, bus, or car. The Associated Students of Madison (ASM) provide students with a free bus pass; Transportation Services can be referenced for bus routes and all other transportation services available.

**Verify Contact Information & Online Logins**

To be sure that they can connect with fellow students and campus offices, students should verify that they can log in to their MyUW account and confirm their mailing address and phone number; campus’ information technology division, known as DoIT, should be contacted through the DoIT Help Desk questions if students encounter any difficulties accessing MyUW.

**Pay Tuition & Fees**

Student account invoices are sent by mail and updated in MyUW each semester. Questions can be directed and payments made to the Bursar’s Office in person on East Campus Mall or online.

**Check in with International Student Services**

International Students who are on a student scholar or visa must check in with International Student Services at the Red Gym immediately upon arrival.
Quick Links: Student Resources

The links below are easy-to-access resources available to students through BME, the College of Engineering, and the university:

**Calendars**

**UW-Madison Academic Calendar**
Start and end dates, holidays, and exam dates for academic terms across campus

**Enrollment Deadlines & Tuition Payment**
Information from the Office of the Registrar regarding when students can adjust their scheduled courses; for tuition due dates and payments, see the Bursar’s Office

**Degree & Dissertator Eligibility Deadlines**
List of dates students requesting final warrants and preparing for graduation should be aware of as they form their academic plans

**Commencement**
The university's official site for all information concerning upcoming graduation ceremonies

**Campus & Academic Life**

**UW-Madison Guide to Campus Life**
The university’s complete compilation of student resources and opportunities; including student organizations, diversity on campus, events, health and wellbeing, and life in Madison

**Graduate Policies & Procedures**
The Graduate School’s expectations for student conduct, academic achievement, and degree-earning efforts

**International Student Services**
A resource for international students searching for programs in the Madison community and assistance related to visas and immigration

**Computers**

**CAE (Computer Aided Engineering)**
The technology resource for computers and software specific to the College of Engineering campus
Quick Links: Student Resources

DoIT (Division of Information Technology)
The university's main provider of technological assistance, products, and education

Department Resources & Office/Lab Space

Working at UW--Resources for faculty and staff (BME)
The department's resource page for employees and graduate students (especially TA/RA/PAs); including links for key/keycard access, travel reimbursements, employee benefits, space availability, and more

Diversity

Office for Equity & Diversity
The university's office for the promotion, integration, and transfer of equity and diversity values to campus

Engineering Diversity Affairs Office
The College of Engineering's local office for the promotion of equity and diversity

Health & Wellness

University Health Services
The university's provider of student physical and mental health services and education

McBurney Disability Resource Center
A resource for students who have a documented disability--or suspect that they may have an undiagnosed disability--to obtain academic accommodations

Learning Resources & Assistance

Engineering Career Services
A college office offering assistance to students searching or preparing for internships, co-ops, and jobs

Engineering Library (Wendt Commons)
The university's main library for engineering and computer science students; home to a collaborative makerspace with prototyping equipment

The Writing Center
Campus-wide organization that provides free of charge, face-to-face and online consultations for students writing papers, reports, resumes, and applications
The Biomedical Engineering Graduate Program

The Biomedical Engineering Program offers graduate sequences leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in biomedical engineering. The program also participates in the University of Wisconsin Medical Scientist Training Program, which leads to a combined MD/Ph.D. degree. The BME graduate program interests students who wish to practice engineering or engage in medical and biological research with an engineering specialization. Graduates are employed in industry, government labs, universities and industrial research establishments.

All policies from the Graduate School's Academic Policies and Procedures document apply to BME graduate students. These policies include protections from harassment, accommodation for disabilities, etc.
Every BME graduate student must have a faculty advisor. A faculty advisor provides the graduate student with academic guidance in their course program and research oversight in their thesis, project, or engineering report. Graduate students should always seek advice from their advisor and other faculty in their interest area prior to enrolling for courses.

When graduate students are admitted to the BME department and provided financial support (RA/PA), the faculty person providing financial support is the student’s advisor. Students who are TAs or do not have financial support should discuss finding an advisor with the Associate Chair of Graduate Advising as soon as possible after arriving in order to find a faculty advisor within their first semester in the program. Changing advisors may be necessary due to changes in a student’s interests or in the funding sources for their support. Students should discuss an advisor change with their current advisor and with the faculty in their new interest area and request the change via email with the BME Graduate Student Coordinator.

Each student's NetID will allow them to log in to a personalized, secure BOX folder at the beginning of their program. This folder will allow students and their advisors to exchange information regarding students' current academic plans: students will maintain digital versions of their degree program planning forms for each semester of their program here (see here for final warrant request via BOX).

For students that are conducting research under a faculty advisor, there are specific expectations for the student-advisor relationship. These advisors are expected to mentor graduate students in a manner that develops a student’s independent research skills and works to help them fulfill their career goals:

- All BME students are expected to develop an individual development plan (IDP). Students are encouraged to discuss their IDP with their advisor.
- Advisors should meet regularly with students.
- The advisor and student should work to develop an independent research direction within the student’s first year of study. This project and the student’s overall academic experience will be discussed during an informal meeting of the student with a member of the Graduate Committee by the end of the student’s 2nd semester.
- Advisors are encouraged to send their students to at least two conferences during their time in graduate school to engage in networking and gain experience in presenting their research. Students are encouraged to apply to the Graduate School for funds.

Changing Degree Levels

Some students who begin working toward a Ph.D., may switch to a M.S. degree. Conversely, some students, who plan to complete only a M.S. degree, may apply to the Ph.D. program to continue their studies. These decisions must be made with the support of their faculty advisor or the Associate Chair of Graduate Advising. If you would like to change your degree please discuss this change with the BME Graduate Student Coordinator. International Students must also inform the International Student Services Office as soon as they decide to change their degree level by completing a Change of Level form.
Class Registration & Credit Load

Course registration is accessed online through the Student Center section of MyUW (a Net ID and password are required for log in). Tutorials on navigating Student Center are available through DoIT.

The minimum credit load to be considered a graduate student is two graduate-level credits (300 or above). A student taking 2-6 credits during the Fall or Spring semester is considered a part-time graduate student. The below credit load requirements apply to full-time graduate students.

When enrolling, students should remember both the credit load requirements for their status as a graduate student (and, if applicable, their position as a TA/RA/PA) as well as the types and levels of courses needed to complete their personal degree program. See the sections on the M.S., Ph.D., and MD/Ph.D. programs for more information regarding the types of courses required.

Credit Load Requirements for Full-Time Students

<table>
<thead>
<tr>
<th></th>
<th>Fall &amp; Spring Semester</th>
<th>Summer Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Rule</td>
<td>8-15 Credits</td>
<td>4-8 Credits</td>
</tr>
<tr>
<td>Dissertators</td>
<td>3 Credits</td>
<td>3 Credits</td>
</tr>
<tr>
<td>Non-dissertation TAs &amp; RAs with 33%&lt;</td>
<td>8 Credits</td>
<td>2 Credits</td>
</tr>
<tr>
<td>International Students</td>
<td>8-15 Credits</td>
<td>Not required (unless being paid)</td>
</tr>
</tbody>
</table>

Fall & Spring
A student taking 8-15 credits during the Fall or Spring semester is considered a full-time graduate student. The maximum credit load for fall and spring semester is 15 graduate-level credits. (Note: more than 12 credits per semester is not recommended.) Students who are being paid as an RA, TA or PA must be enrolled as a full-time student.

Summer
Enrollment for summer is not required for Graduate Students. However, it is required for any student who is being paid as an RA. During the summer, students who are required to enroll must take at least 2 credits.

Dissertators
Dissertation status, which is granted once a student has passed their Preliminary Exam, allows a student to enroll for only 3 credits to be considered a full-time student. To maintain dissertation status, students must enroll for no more and no less than 3 credits each semester. For more information on dissertation status, please see the Graduate School’s Academic Policies.

**PLEASE NOTE:**
Courses taken pass/fail, for audit, or below 300 do not count towards these minimums or maximums. They are in essence counted as zero credits.
Unique Registration Situations

Each student’s program plan is unique and may require additional steps for registration or coursework documentation; the following are the most common scenarios that students encounter during registration and the processes to follow regarding proper registration in the case of each:

Carrying a Credit Overload
In order to enroll in more than the maximum credit load, students must submit a Credit Overload Request form, have it signed by their faculty advisor, and return it to the Graduate School at 217 Bascom Hall. The request must be approved by the Add Deadline in order for a student to take more than the max credit load; the student is responsible to add the overload course.

Transferring Graduate Credits from Other Institutions
The Graduate School’s minimum credit requirement for graduation can ONLY be satisfied with graduate-level courses taken as a graduate student at UW-Madison. The minimum credit requirement is 16 credits for master’s degree students and 32 credits for Ph.D. students. Master’s degree students who have been absent for five or more years lose all degree credits earned before their absence. The BME Department will allow the student to use up to 6 credits of graduate course work from another institution toward his/her degree requirements. See the Graduate Student Coordinator for more information.

Registering for a Closed BME Class
To register for a waitlisted BME course, students should use the wait list system. To register for a closed BME course, students should contact the instructor of the course with their campus ID, course number, and number of the lab/discussion section (if needed). An online instruction demo on how to use the waitlist can be found here.

Registering for Graduate Level Independent Study, Research or Thesis Credits
BME students interested in BME Independent Study or Research/Thesis credits should place themselves on the waitlist for the appropriate course (from the following list) and faculty member during general enrollment periods. Non-BME graduate students wishing to enroll should confirm approval for enrollment with a BME faculty member and then place themselves on the waitlist for the BME course and section they wish to enroll in during the general enrollment periods:

- BME 699 - Masters level independent study (graded); PhD pre-dissertation (890 alternative, see advisor)
- BME 790 - Masters level thesis (not graded)
- BME 890 - PhD level research - pre-dissertation, before prelim (not graded); (699 alternative, see advisor)
- BME 990 - PhD level research - dissertator, after prelim (not graded)
- BME 999 - PhD level research - dissertator, after prelim (graded)

Requesting Transcripts
Students can order "unofficial" transcripts at any time by following the instructions listed here by the Registrar; official transcript orders can be placed here.
Master’s Program

The M.S. graduate program offers a 30-credit option. Students who have graduated with their BS from UW-Madison’s Biomedical Engineering Department can complete their MS with 24 credits by using 6 of their UW-Madison undergraduate credits towards their 30 credit total. More information on the degree is available on the BME website and the university’s The Guide.

Coursework Requirements

Specific course selection is very flexible and draws upon a variety of courses. The required coursework is designed to complement each student’s interests and background in biomedical engineering and meet the spirit of a BME degree; deviations from the requirements should be discussed with the Associate Chair of Graduate Advising and will be decided on a case-by-case basis.

MS program requirements
- Two semesters of Seminar in Biomedical Engineering (BME 701)
- At least one course in bioscience (if not from a bioscience or BME background)
- At least 12 credits of engineering courses, 400-level or above
- At least 15 credits in one area of specialization, 400-level or above (any program)
- At least 15 credits that are graduate level (700 or above or from approved list on the following page)
- Optional but recommended: 3-6 credits of independent study project experience or master’s thesis research in the student’s area of specialization (a maximum of 6 credits can be applied to the MS although students may take more). These credits may count towards your area of specialization.

Degree Program Plan

During their first semester of coursework, students must complete and have their advisor approve a Degree Program Plan, which will be stored in their secure BOX folder. This form will be useful for students to reflect upon at the end of their program when they complete their Final Warrant Request Form.
Graduate Level Coursework

The following is a list of courses within the Department of Biomedical Engineering that are 1) under 700 and 2) considered graduate level work. Some courses open to undergraduates may have separate expectations for graduate students. If you have any questions re a specific course, please contact the course's respective instructor or the Graduate Coordinator.

Mixed Undergraduate-Graduate Courses

**B M E 462**
Medical Instrumentation
In addition to common requirements between undergraduates and graduate students, graduate students will be required to write a technical paper that is a review of the research literature on an approved topic.

**B M E / E C E 463**
Computers in Medicine
In addition to common requirements between undergraduates and graduate students, graduate students will be required to write a technical paper that is a review of the research literature on an approved topic.

**B M E 505**
Biofluidics
The end of semester project will be different for undergraduate and graduate students. Graduate students will be required to create their own geometry and mesh in which physiological flows are simulated and they will either be asked to simulate transient, unsteady flows or flows of a non-Newtonian fluid in that geometry. Lastly, whereas undergraduates may work in teams, graduate students will submit individual project reports.

**B M E / CBE 510**
Introduction to Tissue Engineering
Grad-specific grading is done using a different rubric with more advanced expectations. There is also an R21 grant + presentation for grad-only groups.

**B M E / CBE 520**
Stem Cell Bioengineering
In addition to common requirements between undergraduates and graduate students, graduate students will be required to write a R21-styled research proposal. In this proposal, they will have to apply their newly found knowledge to recognize a limitation in a stem cell biology or regenerative medicine related field, and develop a stem cell bioengineering approach to address this limitation or increase the current level of scientific understanding.

**B M E / MED PHYS 530**
Medical Imaging Systems
Exam problems have multiple parts of increasing difficulty. Graduate students are expected to be able to work deeper into problems and couple concepts to a greater degree than undergraduates.
Graduate Level Coursework

B M E / MED PHYS 535
Introduction to Energy-Tissue Interactions
Graduate students are required to complete a more detailed final report, and graduate students receive a few extra exam questions during the semester (e.g. undergrads might be required to complete 4 of 5 parts on a test, while graduate students have to do 5 of 5).

B M E 545
Engineering Extracellular Matrices
For the group project (literature learning), the graduate students are in separate groups from the undergraduates, and are graded using a different rubric, with more advanced expectations.

B M E 550
Introduction to Biological and Medical Microsystems (BioMEMS)
Students who are enrolled in this course for graduate credit will be required to perform additional work and will be graded separately based on those graduate level assignments. Additional work includes advanced homework problems, a more in depth final report and an end of the semester presentation. The exams will also be graded separately, with graduate students expected to provide more in depth answers to achieve the equivalent credit for selected problems.

B M E 556
Systems Biology: Mammalian Signaling Networks
Final grades are compiled separately for the undergraduates and graduates at the end of the semester. Based on the compiled averages, final grades are distributed to each group so that students are compared to their peer group.

B M E / MED PHYS 568
Magnetic Resonance Imaging
Graduate students will be required to serve as group leaders (the course is in a problem-based learning format so 90% of the course is group activities). They will receive training in effective group leadership, and part of their grade will reflect their efficacy as group leaders. In contrast, undergraduates will not be expected to serve as group leaders. In addition, graduate student performance on exams will be assessed on a different curve than undergraduates because of the advanced course work they have already taken.

B M E 615
Tissue Mechanics
Grad-specific grading is done using a different rubric with more advanced expectations.

B M E / MED PHYS / PHMCOL-M / PHYSICS / RADIOL 619
Microscopy of Life
The grading on the final project (a mock review article) is more rigorous for graduate students.
Graduate Level Coursework

BME 699
Advanced Independent Study
Graduate (Masters) Students are graded differently than any advanced undergraduate students.

Special Topics Courses (Designed Specifically for Graduates)

BME 601
Special Topics in Biomedical Engineering: Optical Microscopy

BME 601
Special Topics in Biomedical Engineering: Nanomaterials for Biomedical Applications

Cross-Listed Courses with a Primary Home in a Graduate-Only Program

BME / HONCOL / MED PHYS / PHYSICS 501
Radiological Physics and Dosimetry

BME / MED PHYS 566
Physics of Radiotherapy

BME / MED PHYS 567
The Physics of Diagnostic Radiology

BME / MED PHYS 573
Medical Image Science: Mathematical and Conceptual Foundations

BME / MED PHYS 574
Imagine in Medicine: Applications

BME / MED PHYS 575
Diagnostic Ultrasound Physics

BME / MED PHYS 578
Non-Ionizing Diagnostic Imaging
The Doctor of Philosophy (Ph.D.) degree is the highest degree conferred by the university. It is a research degree and is never conferred solely as a result of any prescribed period of study. The degree is only granted on evidence of general proficiency, distinctive attainment in a special field, and the ability for independent investigation as demonstrated in a thesis presenting original research or creative scholarship with a high degree of literary skill.

The BME Ph.D. program provides excellent opportunities for interdisciplinary research. To receive a Ph.D., a student must complete 30 credits beyond that of the M.S. degree requirements (these are typically research credits).

Students transferring with a M.S. from another program or university should discuss their individual situation with the Associate Chair of Graduate Advising to determine if any additional courses are required.

Courses should be selected with the faculty advisor to prepare the student for the Ph.D. qualifying examination, add depth of knowledge in the student’s chosen area of specialization, and provide research experience. Because of the diverse technical requirements for various specialties, the PhD is administered on a degree-by-committee basis.

**Basic Ph.D. Requirements**

Basic requirements for a Ph.D. degree with a major in Biomedical Engineering include:

- **Coursework and Research**
- **PhD Minor** (or interdisciplinary training)
- **Qualifying Examination**
- **Forming the PhD Committee**
- **Preliminary Examination**
- **Dissertator Status/Thesis Research**
- **Final Defense**

**MD/Ph.D. (MSTP) Requirements**

The MD/PhD (MSTP) program requires 28 credits beyond the BME M.S degree; these credits are flexible and may be entirely research credits or may include some coursework.

Additional requirements are similar to the BME PhD program (qualifying exams, preliminary exams, thesis defense). The bioscience course requirement from the MS will be waived using some of your MD coursework in your first or second year, please discuss with the Associate Chair of Graduate Advising as you plan your coursework.
Coursework Tracks

30 credits of a Ph.D. student's coursework must include one of six focused tracks; these tracks can be found on pages 16-21 of this handbook and include the following:

- Biomedical Imaging & Optics
- Biomechanics
- Medical & Microdevices
- Neuroengineering
- Systems & Synthetic Biology
- Tissue Engineering/Biomaterials

In addition to their track coursework, students are encouraged to take at least one elective that incorporates professional development (e.g., writing, project management, ethics, Delta courses). Example courses include:

- OBS&GYN 955 - Responsible Conduct of Research for Biomedical Students
- ONCOLOGY675 - Advanced or Special Topics in Cancer Research: Appropriate Conduct of Science
- MED HIST 545 - Ethical and Regulatory Issues in Clinical Investigation
- B M E 601 - Special Topics in Biomedical Engineering: Foundations of Innovations in Stem Cell Industry
- B M E 601 - Special Topics in Biomedical Engineering: Technical Communication for BME Students
- BIOLOGY 660 - Research Mentor Training Practicum
Biomaterials and tissue engineering employ a diverse range of approaches to develop methods to diagnose and treat diseases, create living tissue environments that may be used to restore the function of a damaged organ, and uncover biological mechanisms related to tissue development and disease. Graduate students trained in biomaterials and tissue engineering are expected to gain a detailed understanding of cellular and molecular biology, materials science, and engineering methods relevant to their research focus.

**Track Components:**

(3 Credits)
- CRB 650 – Molecular and Cellular Organogenesis
- ONCOLOGY 401 – Intro to Experimental Oncology
- ZOOLOGY 570 - Cell Biology
- ZOOLOGY 630 – Cellular Signal Transduction Mechanisms

**Data Analysis (1-3 Credits)**
- BME 601 – Matlab skills
- BMI 541 – Introduction to Biostatistics
- CS 765 – Data Visualization

**Systems and Synthetic Biology (6 Credits)**
- BME 430 – Biomaterials
- BME 510 – Introduction to Tissue Engineering
- BME 511 – Tissue Engineering Laboratory
- BME 520 – Stem Cell Bioengineering
- BME 545 – Engineering Extracellular Matrices
- BME 550 – Introduction to Biological and Medical Microsystems
- BME 545 – Modeling Biological Systems (spring – even years)
- BME 601 – Nanomaterials for Biomedical Applications
- CBE 540 – Polymer Science and Technology
- MSE 521 – Advanced Polymeric Materials

**Electives (6 Credits)**
To provide breadth, 6 credits of electives must be from courses that are not listed above.
Biomechanics utilizes experimental and computational tools to analyze and develop novel biomechanical systems. Graduate students trained in biomechanics are expected to gain a detailed understanding of mathematics, biology and engineering methods relevant to their research focus.

**Track Components**

**Mathematics (3 Credits)**
- MATH 443 – Applied Linear Algebra
- MATH 519 – Ordinary Differential Equations
- MATH 619 – Analysis of PDE (spring)

**Biomechanics of Solids & Fluids (9 Credits)**
- BME / ME 415 – Biomechanics of Human Movement
- BME / ME 505 – Biofluidics
- BME / ME 603 – Finite Elements for Biomechanics (approx. every 3 semesters)
- BME 615 – Tissue Mechanics
- ME 601 – Orthopedic Biomechanics: Design of Implants

**Biosciences (3 Credits)**
- ANATOMY 622 – Human Anatomy-Physical Therapy, Occupational Therapy
- KINES 350 – Introduction to exercise physiology
- KINES 531 – Neural control of movement
- KINES / PHYSIOL 773 – Respiratory Adaptation to Exercise and Altitude
- PHYSIOL 335 – Human Physiology
- PHYSIOL 435 – Fundamentals of Human Physiology
- ZOOLOGY 570 – Cell Biology

**Electives (6 Credits)**
To provide breadth, electives must be from courses that are not listed above. Some recommendations are below.

**Data Analysis**
- BMI/STAT 541 – Introduction to Biostatistics
- COMP SCI 368 – Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)

**Computational Methods:**
- EMA 405 – Practicum in Finite Elements
- EMA 605 – Introduction to Finite Elements
- ME 460 – Applied Thermal/Structural Finite Element Analysis

**Solid and Fluid Mechanics**
- EMA 622 – Continuum Mechanics
- EMA 630 – Viscoelasticity
- EMA 700 – Theory of Elasticity
- ME 563 – Intermediate Fluid Mechanics
- ME / EMA 570 – Experimental Mechanics
- ME 573 – Computational fluid dynamics

**Other**
- BME / ECE 462 – Medical Instrumentation
- BME / MED PHYS 530 – Medical Imaging Systems
- BME / MED PHYS / PHMCOL-M / PHYSICS / RADIOL 619 – Microscopy of Life
- ME / STAT 424 – Statistical Experimental Design
Biomedical imaging and optics research develops and utilizes new experimental and computational tools to characterize tissue structure across multiple size scales. A particular focus is on human health, especially with respect to achieving superior diagnostic/prognostic tools for a spectrum of diseased states. Graduate students trained in this track are expected to gain a detailed understanding of mathematics, biology and engineering both optical and/or physical methods relevant to their research focus.

**Track Components**

**Mathematics**
- MATH 443 – Applied Linear Algebra (fall) or previous undergrad course B- or better

**Biology (3 Credits)**
- PHYSIOL 335
- ZOOLOGY 570 – Cell Biology (fall)

**Data Analysis (>3 Credits)**
- BME 601 – Matlab image analysis (Rogers)
- COMP SCI 368 – Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)
- CS 767 – Computational Methods for Medical Image Analysis
- CS 766 – Computer Vision
- ECE Signal Processing Course OR BME / MED PHYS 573 – Image Science

**Imaging (9 Credits)**
- BME / MED PHYS 530 – Medical Imaging Systems
- BME / MED PHYS 573 – Image Science
- BME / MED PHYS 574 – Image Science II
- BME / MED PHYS 578 – Non-ionizing radiation
- BME / CHEM / MED PHYS 650 – Optical Microscopy
- BME 601 - Biophotonics
- BME / MED PHYS 710 - Advanced MRI

**Electives (6-11 Credits)**
*To provide breadth, up to 6 credits of electives must be from courses that are not listed above.*
Ph.D. Track: Medical and Microdevices

Medical and microdevices involve the use of electronic and computational tools to develop devices used in diagnosis and treatment of disease ranging from the systemic to the cellular and molecular levels.

Track Components

Mathematics requirements (3 Credits)
- MATH 443 – Applied Linear Algebra (or previous undergrad course)
- MATH 519 – Ordinary Differential Equations
- MATH 619 – Analysis of Partial Differential Equations

Biology (3 Credits)
- BME 601 - Physiology for BME students (if taught)
- ZOOLOGY 570 – Cell Biology (fall)

Data Analysis (3 Credits)
- COMP SCI 300 - Programming II
- COMP SCI 368 – Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)
- Biostatistics & Medical Informatics (B M I) Course
- Signal Processing Course (Sochastic Methods)

Medical and Micro Devices (6 Credits)
- BME 515 - Therapeutic Medical Devices
- BME / MED PHYS 535 - Intro to Energy-Tissue Interactions
- BME 550 - Introduction to BioMEMs
- BME / ECE 762 - Biomedical Instrumentation
- BME / ECE 763 - Projects in Computers in Medicine

Electives (6 Credits)
To provide breadth, 6 credits of electives must be from courses that are not listed above. Examples of possible classes include:
- BME / MED PHYS 574 - Image Science I
- ECE 630 - All of Signal Processing
Ph.D. Track:
Neuroengineering

Neuroengineering is the convergence of neuroscience, computation, device development, and mathematics to improve human health. Neuroengineering brings together state-of-the-art technologies for the development of devices and algorithms to assist those with neural disorders. It is also used to reverse engineer living neural systems via new algorithms, technologies and robotics. Students pursuing this track are involved in all of these endeavors so as the next generation of engineers, they will transcend the traditional boundaries of neuroscience, technology, engineering and mathematics.

Track Components

Mathematics (3 Credits)
- MATH 443 – Applied Linear Algebra (or previous undergrad course)

Ethics (1 Credit)
- MED HIST 545 - Ethical and Regulatory Issues in Clinical Investigation
- MED PHYS 701 - Ethics and the Responsible Conduct of Research

Data Analysis (3 Credits)
- COMP SCI 368 – Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)
- COMP SCI 567 - Medical Image Analysis
- COMP SCI 766 - Computer Vision
- COMP SCI 767 - Computational Methods for Medical Image Analysis

Engineering (12 Credits)
- BME 515 - Therapeutic Medical Devices
- BME 601 – BioMEMS
- BME 601 – Neuroinstrumentation
- BME / ECE 763 - Projects in Computers in Medicine
- ECE / BME 462 - Medical Instrumentation
- ECE / BME 463 - Computers in Medicine
- ECE 524 - Introduction to Optimization
- ECE 533 - Image Processing
- ECE / COMP SCI M 539 - Introduction to Artificial Neural Network and Fuzzy Systems
- MED PHYS / NTP - Methods for Neuroimaging Research

Neurobiology (6 Credits)
- BME / CBE - Stem Cell Bioengineering
- KINES 721 - Neural Basis for Movement
- KINES 861 - Principles of Motor Control and Learning
- NTP / PHMCOL-M / PHYSIOL 610 - Cellular and Molecular Neuroscience
- NTP / ANATOMY / PHMCOL-M / PHYSIOL / PSYCH 611 - Systems Neuroscience
- NTP / NEURODPT 630 - Neuronal Mechanisms for Sensation and Memory in Cerebral Cortex
- NTP / NEUROL 735 - Neuronobiology of Disease
- PHMCOL-M 711 – Neurotransmitter Receptors/Ion Channels
- PSYCH 610 - Statistical Analysis of Psychological Experiments
- PSYCH 733 - Perceptual and Cognitive Sciences
- ZOOLOGY 625 - Development of the Nervous System

Biology (3 Credits)

Electives (6 Credits)
Ph.D. Track: Systems and Synthetic Biology

Systems and synthetic biology utilizes experimental and computational tools in an iterative fashion to analyze and regulate biological systems.

**Track Components:**

**Mathematics (3 Credits)**
- CBE 660 – Intermediate problems in chemical engineering
- MATH 443 – Applied Linear Algebra
- MATH 519 – Ordinary Differential Equations
- MATH 619 – Analysis of Partial Differential Equations

**Biology (3 Credits)**
- BIOCHEM 501 – Introduction to Biochemistry
- ZOOLOGY 570 – Cell Biology
- ZOOLOGY 630 – Cellular Signal Transduction Mechanisms

**Data Analysis (1-3 Credits)**
- BME 601 – Matlab skills (1 credit)
- BME / STAT 541 – Introduction to Biostatistics
- COMP SCI 368 – Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)

**Systems and Synthetic Biology (6 Credits)**
- BME 556 – Systems Biology: Mammalian Signaling Networks
- CBE / BME 560 – Biochemical Engineering
- CBE 781 – Biological Engineering: Molecules, Cells, & Systems
- CBE / BME 782 – Modeling Biological Systems

**Electives (6 Credits)**
To meet the requirement of 12 credits of engineering courses, 3-6 credits of electives must be engineering coursework. To provide breadth, 6 credits of electives must be from courses that are not listed above. Suggested courses include:
- BME / CBE 510 – Introduction to Tissue Engineering
- BME / CBE 520 – Stem Cell Engineering
- BME 545 – Engineering Extracellular Matrices
- BME 550 – Introduction to Biological and Medical Microsystems
- BME / MED PHYS / PHMCOL-M / PHYSICS / RADIOL 619 – Microscopy of Life

***Students that are interested in earning a doctoral minor in Quantitative Biology are required to enroll in BME 601 – Methods in Quantitative Biology (fall, 1 credit). Additionally, they will need to take one additional 3-credit course in quantitative science, biology, or integrated biology/quantitative science from the approved list of courses in the doctoral minor (this course counts toward the elective credits for this track).
Exemption from Minor Requirements for BME Ph.D. Students:

The purpose of a doctoral minor is to provide breadth to students' work. Since the central aim of biomedical engineers is to unravel gaps in biological knowledge through the use of engineering principles, the doctoral program in Biomedical Engineering is inherently interdisciplinary.

We understand and appreciate the aim of the Graduate School to guarantee that interdisciplinary education is being provided if the Minor Requirement is removed. We have worked with the Graduate School and, effective January 2013, allow BME students to be exempted from the Minor requirement based on the following principles of the BME Ph.D. program:

Interdisciplinary training for graduate students on NIH T-32 Programs
Our students who are supported by T-32 programs such as the Biotechnology Training Program (BTP), Clinical Neuroengineering (CNTP), Computational Informatics in Biology and Medicine (CIBM) would meet the level of our current Minor requirement. These programs develop interdisciplinary educational programs, in which our faculty assist in teaching, to partially meet the training goals of the program.

Bioscience Requirement
All students are required to take a bioscience course outside of BME and outside of courses offered by the College of Engineering.

Area of Specialization
All BME students are required to show how 15 hours of their coursework combines to fill an area of specialization. The areas of specialization are documented in a half page description provided by the student, approved by their adviser, and approved by the BME Graduate Committee. This requires an additional 1-2 course(s) outside of Biomedical Engineering.

Interdisciplinary Training
BME students traditionally go further than required to meet university requirements to have representation in their thesis committee outside the student’s department. For example:
- A student working in a tissue engineering laboratory that develops cartilage will work with specialists in biomechanics and biomedical imaging to validate the advances of their work in tissue engineering.
- A student developing non-invasive diagnostic imaging methods to quantify blood flow will work side by side with scientists/engineers who specialize in fluid dynamics and physicians requesting the blood flow characterization of specific regions of the body.
- Journal papers authored by BME graduate students often are co-authored with individuals from this team.
Documenting the Education and Training to Replace the Minor Requirement

Prior to obtaining a PhD warrant, students will prepare a summary of their interdisciplinary coursework and training to document an effort to meet the spirit of the Minor Requirement. The summary requires approval from the student’s thesis committee and be maintained for possible audits by the Graduate School.

Obtaining a Minor in BME

BME and Non-BME students are eligible to earn a minor in the BME program. To earn a minor, students must complete a cohesive body of work outside of their major in order to add breadth to their Ph.D. work. There are two ways to meet the requirements for a minor: Option A and Option B. Option A requires students to complete at least ten (10) credits in a single department. This option is available to both BME and non-BME majors. Option B requires students to complete at least twelve (12) credits in two or more departments (this may include BME courses that are not part of the student’s major area). Both options require students to maintain a GPA of 3.00 across the minimum number of minor credits.

Students must consult with their advisor before declaring a minor and complete the Minor Approval Form located on the BME website. Questions regarding the minor can be directed to the BME Associate Chair of Graduate Advising and the Graduate Student Coordinator.

Quantitative Biology Doctoral Minor

Technological innovations have revolutionized the scale and detail with which biological systems can be explored. With that revolution has come a demand for scientists who can develop and analyze quantitative and predictive models of biological systems. The QBio doctoral minor is designed to complement the depth of training in biological or quantitative sciences that a student achieves through UW-Madison’s graduate programs with the breadth that is needed to conduct research under this paradigm. In addition to coursework in biological, quantitative, and integrated courses, students in the program will take an interdisciplinary research seminar to prepare them for research that crosses these boundaries. This training will prepare students for careers in academic and industrial settings, where the ability to cross disciplinary lines and work in teams with diverse expertise is critical.

Students who are candidates for the Ph.D. degree in any department or program may obtain an interdisciplinary minor in Quantitative Biology by earning a minimum of 10 credits from the courses listed on here. Requirements include one course from a quantitative science, one course from a biological science, one integrated course, and a one-credit research seminar. Courses may be taken in any sequence, although it is strongly advised that the research seminar is taken during the first year of graduate school.

Questions can be directed to the minor’s faculty director, Dr. Pam Kreeger, at kreeger@wisc.edu.
Ph.D. Program:
Quantitative Biology Minor

Quantitative Biology Coursework

Quantitative Courses (Choose One):
- CBE 660 - Intermediate Problems in Chemical Engineering
- COMP SCI 760 - Machine Learning
- MATH 443 - Applied Linear Algebra
- MATH / COMP SCI 513 - Numerical Linear Algebra
- MATH / COMP SCI 514 - Numerical Analysis
- MATH 519 - Ordinary Differential Equations
- MATH 531 - Probability Theory
- MATH 605 - Stochastic Methods for Biology
- MATH 608 - Mathematical Methods for Continuum Modeling in Biology
- MATH 619 - Analysis of Partial Differential Equations
- MATH / COMP SCI 714 - Methods of Computational Mathematics I
- STAT / MATH 431 - Introduction to the Theory of Probability
- STAT / B M I 541 - Introduction to Biostatistics
- STAT / F&W ECOL / HORT 571 - Statistical Methods for Bioscience I
- STAT / F&W ECOL / HORT 572 - Statistical Methods for Bioscience II
- STAT 609 - Mathematical Statistics 1
- STAT 610 - Introduction to Statistical Inference
- STAT / I SY E / MATH / OTM 632 - Introduction to Stochastic Processes
- STAT / MATH 709 - Mathematical Statistics
- STAT / MATH 710 - Mathematical Statistics

Biological Courses (Choose One):
- BIOCHEM 501 - Introduction to Biochemistry
- BIOCHEM 601 - Protein and Enzyme Structure and Function
- BIOCHEM / GENETICS /
- MICROBIO 612 - Prokaryotic Molecular Biology
- BIOCHEM / GENETICS /
- MD GENET 620 - Eukaryotic Molecular Biology
- BIOCHEM / BOTANY 621 - Plant Biochemistry
- BIOCHEM 625 - Coenzymes and Cofactors in Enzymology
- BIOCHEM / PHMCOL-M /
- ZOOLOGY 630 - Cellular Signal Transduction
- BIOCHEM 660 - Methods in Biochemistry
- BIOCHEM / CHEM 704 - Chemical Biology
- BIOCHEM / MICROBIO 726 - Regulation of Gene Expression in Prokaryotes
- GENETICS 466 - Principles of Genetics
- GENETICS / MICROBIO 607 - Advanced Microbial Genetics
- GENETICS / BOTANY / M M & I / MICROBIO /
- PL PATH 655 - Biology and Genetics of Fungi
- GENETICS 701 - Advanced Genetics
- MICROBIO 625 - Advanced Microbial Physiology
- MICROBIO / BMOLCHEM 668 - Microbiology at Atomic Resolution
- ZOOLOGY 570 - Cell Biology

Integrated Courses (Choose One):
- B M E 556 - Systems Biology: Mammalian Signaling Networks
- B M E / CBE 782 - Modeling Biological Systems
- B M E / CBE 783 - Design of Biological Molecules
- B M I / COMP SCI 576 - Introduction to Bioinformatics
- B M I / BIOCHEM / BMOLCHEM / MATH 606 - Mathematical Methods for Structural Biology
- B M I / BIOCHEM / BMOLCHEM / MATH 609 - Math Methods for Systems Biology
- B M I / COMP SCI 776 - Advanced Bioinformatics
- B M I / STAT 877 - Statistical Methods for Molecular Biology
- GENETICS 885 - Advanced Genomic and Proteomic Analysis

Research Seminar (Required):
- B M E 780 - Methods in Quantitative Biology
Ph.D. Program: Qualifying Examinations

The Ph.D. Qualifying Examination is a general examination that places emphasis on a student’s ability to reason, formulate and solve problems, and apply basic engineering and analytical skills. Special emphasis is placed on problem solving relative to the student’s Fundamental Track. The BME qualifying exam is offered twice a year, in November and April. The qualifying exam is usually taken during (and must be successfully completed by) the second year of the Ph.D. program, though case by case exceptions may be considered by the program: for example, very well-qualified students can consider taking it during their first year and students who do not pass their qualifying exams may be given a second chance, based on the discretion of the program. Students in the MS program are not eligible to take the qualifying exam, even if they have applied for admission to the PhD program. The student must consult with their advisor and the Graduate Student Coordinator for the schedule and specific current procedures.

Examination Structure:

The BME Ph.D. Qualifying Examination consists of five oral examinations, each of which is approximately 30 minutes in duration, with five BME faculty. An online signature form, verifying that a student is ready to take the qualifying exam, must be approved by the student’s advisor.

All students are evaluated in one of these five examinations in their choice of Physiology OR Cellular Biology to assess their familiarity with basic bio-sciences at either a system or cellular level.

The remaining four oral examinations are made up of two types of examinations: Advanced Exams and Breadth Exams. Criteria for both examination types is as follow; students should note that for both types of examinations, topics should be chosen according to the Fundamental Tracks listed on the next page. Students will receive an official letter from the chair notifying them if they passed the qualifying exam.

Advanced Exams
Two of the remaining four examinations are termed Advanced Exams. Advanced exams will test depth of knowledge in a particular area that the student should describe in one or two sentences in the qualifying exam application materials.

Any two of the sub-specialties listed under the Fundamental Tracks can be chosen for the Advanced Exams (in one track or in two different tracks).

Breadth Exams
The remaining two exams are known as Breadth Exams. Any two main Fundamental Track titles may be chosen for these exams outside of the area(s) selected for the Advanced Exams. Breadth Exams are meant to cover the learning outcomes for fundamental BME tracks in a broad sense, and are limited to coursework that has been taken.
Ph.D. Program: Qualifying Examinations

**Fundamental Tracks**

- **Bioinstrumentation**
  - Clinical Bioinstrumentation
  - Biosignal Processing**
  - BioMEMS and Microfluidics

- **Biomaterials**
  - Natural Materials
  - Synthetic Materials
  - Nano-materials

- **Biomedical Imaging**
  - Biomedical Optics
  - Multi-dimensional Bio-signal Processing**
  - Clinical Imaging Modalities

- **Cellular & Molecular Engineering**
  - Stem Cell Bioengineering
  - Systems & Synthetic Biology

- **Tissue Engineering**
  - Tissue Engineering
  - Extracellular Matrix Engineering

- **Biomechanics**
  - Musculoskeletal/Orthopedic Biomechanics
  - Biofluids
  - Ergonomics

***Both signal processing exams cannot be selected together for the advanced exams***
Ph.D. Program: Graduate Committee

Attainment of a Ph.D. degree requires the preparation of a thesis on a research topic selected by the student and their advisor. Once a research project is selected, the student must choose his or her thesis committee. This committee will advise and evaluate satisfactory progress, administer preliminary and final oral examinations, evaluate a thesis or dissertation, and/or sign a degree warrant (see the Graduate School’s Academic Policies and Procedures for more information on committees).

Ph.D. students should develop their thesis committee within two semesters of passing qualifying exams. Following the preliminary exam, the student must meet annually with their committee to provide an update and seek input. Members of the thesis committee are listed on a student’s Preliminary Examination Warrant Request and Final Defense Committee Approval forms. These forms must also be signed by the department/program chairperson to represent the approval of the program/department executive committee (or its equivalent), before the warrant request forms are submitted to the Graduate Student Services Office for final approval to obtain the preliminary and final warrants.

Graduate Committee Requirements

As of September 1, 2017, the Graduate School has updated its requirements for graduate committees; students should reference the updated list of requirements found in the Graduate School’s Academic Policies and Procedures when forming their committees.

BME Departmental Committee Requirements

In addition to the committee requirements put forth by the Graduate School, BME has department-specific criteria that students must meet when forming their committees:

- Committees should consist of 5 members (one more than the Graduate School’s requirement of four)
- The chair should be a faculty member in BME (primary or affiliate).
- At least one member must be from outside of the primary BME faculty.
- At least one member must be a primary BME faculty.
- The Ph.D. committee chair should approve the other members of the committee.
- Students must have a yearly committee meeting after passing the preliminary exam.
The **Preliminary Examination** is an oral examination based upon a student’s written proposal and a detailed plan to carry out the Ph.D. thesis. Students must consult with their advisor for specific details regarding the requirements for the preliminary examination. Upon completion of 32 credits of graduate level coursework taken as a graduate student at UW-Madison, completion of the (optional) minor requirement, and passing the preliminary examination, a student is eligible to become a dissertator.

Students **must** take their preliminary exam at least 18 months before their final defense and are recommended to take it within one year after passing the Qualifying Examination. It must be taken as soon as a student’s Ph.D. research activities and goals are sufficiently defined for compilation of a formal proposal. It is unacceptable to take the preliminary exam after the research is effectively complete.

### Preparing for the Preliminary Examination

#### Requesting a Warrant
The preliminary exam warrant request must be completed at least three weeks before the proposed exam date; to request a warrant, students must complete a BME Ph.D. Program Plan of Study form and the Ph.D. Track Plan that pertains to their chosen BME Ph.D. Track (e.g., Neuroengineering). Both documents must be approved and signed by their faculty advisor, and uploaded to their student folder on BOX. Once the documents are uploaded to BOX, please inform the Graduate Coordinator via email and the warrant will be requested for you. Warrant requests are found in a student’s secure BOX file. Completed forms should be uploaded to BOX and an email sent to the **Graduate Student Coordinator** confirming the completion.

#### Writing a Thesis Proposal
Students must prepare a written thesis proposal and seek approval of this proposal from all members of the Ph.D. Thesis Committee. Since this requires all of the Ph.D. Thesis Committee members to read the proposal, it is strongly recommended that it be concise and required that it be given to the committee at least 1 week before the prelim exam. A suggested model is similar to either an NSF or NIH grant proposal format (no more than 15 pages, including figures and equations, but not references or title page). The Thesis Proposal must be presented orally before all Thesis Committee members to judge whether the proposed research is satisfactory. The scope of the proposed work will be evaluated during the preliminary exam. The scope should require a period of 18 months to complete, at a minimum, prior to a final defense. Formal approval will require the signature of every member of the Thesis Committee on the Preliminary Warrant. Once the signed form is uploaded to a student’s BOX file, the **Graduate Student Coordinator**

### Dissertator Status
Dissertator is a unique reduced tuition fee status for students who have passed their preliminary exam and completed all requirements for a Ph.D. degree except for the dissertation. As a dissertator, students enroll in only research credits and work towards completing their thesis project. See the **Graduate School’s Academic Policy and Procedures** for information on dissertator eligibility.
The Ph.D. Final Defense committee consists of five faculty members. Usually, this committee is the same committee as for the preliminary exam. This examination requires a demonstration of the unique contributions of the research and a defense of the methods used and conclusions drawn.

**Final Defense Warrant Request**

The Ph.D. Final Defense Warrant Request must be filled out and sent to the Graduate School at least three weeks in advance of the defense. This form is available in students’ secure BOX files. It should be signed by the advisor/major professor and BME Associate Chair of Graduate Advising and be returned to the Graduate Student Coordinator 3 weeks before the final defense exam via the MyUW BOX System. Please then notify the Graduate Student Coordinator that your completed form is in your online BOX student folder and that you would like to request your final BME PhD final warrant. (If any changes are made in the membership of the committee, dissertation title, or defense date, please let the Student Coordinator know via email.).

Students will be notified via email when the approval and your final warrant has been processed by the Graduate School. Students should refer to the Graduate School’s "Guide to Preparing Your Doctoral Dissertation" for additional information.

**Final Defense & Dissertation Submission**

The thesis is submitted to the Ph.D. committee for review 1-2 weeks before the scheduled defense. The Ph.D. defense is open to the public. Following the defense, revisions are made to the thesis as required by the committee.

After the final defense, the student must follow all of Graduate School procedures and contact the Graduate School by phone at 608-262-2433 to arrange an appointment for the final review. The student is responsible for submitting the dissertation to the Graduate School and reviewing the information in this handbook regarding the completion of their degree so that they can prepare for situations such as the end of TA/RA/PA positions and the presentation of diplomas to international students.
Academic Standards

Students should note the below university, college, and departmental policies regarding graduate students' academic performance:

**Satisfactory Progress**

Continuation in the Graduate School is at the discretion of a student's program, the Graduate School, and a student's faculty advisor.

The Graduate School sets minimum standards that all graduate students in the university must meet; students should consult the Graduate Student Coordinator and/or the Associate Chair for Graduate Advising with questions regarding possible departmental requirements.

The Graduate School requires that students maintain a minimum graduate GPA of 3.00 in all graduate-level work (300 or above, excluding research, audit, credit/no credit, and pass/fail courses) taken as a graduate student unless probationary admission conditions require higher grades. The Graduate School also considers Incomplete (I) grades to be unsatisfactory if they are not removed during the next fall or spring semester in which a student is enrolled; however, the instructor may impose an earlier deadline. A student may be placed on probation or suspended from the Graduate School for low grades or for failing to resolve incompletes in a timely fashion. In special cases, the Graduate School permits students who do not meet these minimum standards to continue on probation upon recommendation and support of their advisor. Most programs require satisfactory progress to continue funding support.

**Probation**

If a student was admitted on probation and s/he satisfies the conditions outlined at the time of admission, probationary status will be removed automatically. Once their studies have begun, students are expected to make satisfactory progress toward their degree. Students must be in good academic standing with the Graduate School, their program, and their advisor.

The Graduate School regularly reviews the record of any student who received grades of BC, C, D, F, or I in graduate-level courses (300 or above), or grades of U in research and thesis. This review could result in academic probation with a hold on future enrollment, and the student may be suspended from graduate studies. The Graduate School may also put students on probation for incompletes not cleared within one term. Dissertators will not be placed on probation for incomplete grades in research courses. All incomplete grades must be resolved before a degree is granted.

Please note that any student who is on probation will not be able to enroll for the following semester until their final grades are submitted and the Graduate School has verified they are making satisfactory progress. For any questions relating to probation, please contact Michelle Holland, Director of Academic Services at michelle.holland@wisc.edu.
If a student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve the grievance. Students’ concerns about unfair treatment are best handled directly with the person responsible for the objectionable action. Options for grievance reporting beyond the research advisor include seeking out the graduate program coordinator, BME grievance committee (details below), CoE Assistant Dean for Graduate Affairs, and UW-Madison Ombuds. These are presented at increasing level of administration; the department encourages students to report at the lowest level they feel comfortable with and seek out higher levels if needed. For more information, students should consult the College of Engineering.

**Procedures for Proper Accounting of Student Grievances**

**Step 1**
The student is encouraged to speak first with the person toward whom the grievance is directed to see if a situation can be resolved at this level.

**Step 2**
Should a satisfactory resolution not be achieved, the student should contact the program’s Grievance Advisor, Professor Beth Meyerand, to discuss the grievance. The Grievance Advisor will facilitate problem resolution through informal channels and facilitate any complaints or issues of students.
Grievance Procedures

Step 2 (continued)
The first attempt is to help students informally address the grievance prior to any formal complaint. Students are also encouraged to talk with their faculty advisors regarding concerns or difficulties if necessary. University resources for sexual harassment, discrimination, disability accommodations, and other related concerns can be found on the UW Office of Equity and Diversity website:

Step 3
Other campus resources include:
- The Assistant Dean for Graduate Affairs in the College of Engineering, Laura Albert
- The Graduate School
- McBurney Disability Resource Center
- Employee Assistance Office
- Ombuds Office
- University Health Services

Step 4
If the issue is not resolved to the student’s satisfaction, the student can submit the grievance to the Grievance Advisor in writing, within 60 calendar days of the alleged unfair treatment.

Step 5
On receipt of a written complaint, a faculty committee will be convened by the Grievance Advisor to manage the grievance. The program faculty committee will obtain a written response from the person toward whom the complaint is directed. This response will be shared with the person filing the grievance.

Step 6
The faculty committee will determine a decision regarding the grievance. The Grievance Advisor will report on the action taken by the committee in writing to both the student and the party toward whom the complaint was directed within 15 working days from the date the complaint was received.

Step 7
At this point, if either party (the student or the person toward whom the grievance is directed) is unsatisfied with the decision of the faculty committee, the party may file a written appeal. Either party has 10 working days to file a written appeal to the School/College.

Step 8
Documentation of the grievance will be stored for at least 7 years. Significant grievances that set a precedent will be stored indefinitely. The Graduate School has procedures for students wishing to appeal a grievance decision made at the school/college level.

These policies are described in the Graduate School’s Academic Policies and Procedures.
Assistantship Opportunities

The Biomedical Engineering Department offers several different types of financial support for graduate students. Three common types of financial support are Teaching Assistantships, Research Assistantships, and Project Assistantships (TA/RA/PA respectively). Teaching Assistants, Research Assistants, and Project Assistants with at least a 33.33% appointment are eligible to receive tuition remission. Please note, students who receive tuition remission, are still required to pay segregated fees by the tuition due date. The amount charged for segregated fees is based upon the number of credits the student has enrolled in. Tuition and Segregated fees can be viewed and paid through the student center section of a student’s MyUW account.

Applying for Teaching Assistantships (TAs)

Any graduate student in the College of Engineering enrolled as a full-time student (8-15 credit load) may apply for a TA position in BME. First consideration will be given to BME Graduate Students. In selecting among applicants, the Department will consider applicants’ preparation and achievement in relevant subjects and their potential as effective teachers for UW undergraduates. Professors in the courses seeking TAs will review applications and select TAs for their courses. Application materials can be found on the BME departmental website under Forms. There are two classifications of Teaching Assistants based on experience training and education: Senior TA and Standard TA.

Senior vs. Standard TA

A Senior TA has had one and two-thirds (1 2/3) or more semester-units of experience and has completed all course-work and departmental requirements for candidacy for a Ph.D., or has already been awarded a Ph.D. and has completed one and two thirds (1 2/3) or more semester units of experience prior to employment within their first semester in the program.

A Standard TA is a student who does not meet the qualifications of a Senior TA.

Teaching Assistantship Expectations

First time TAs are required to attend the New Educators Orientation (NEO) or the Teaching Improvement Program (TIP) that occurs at beginning of every semester. In addition, first time non-native, English-speaking TAs are required to take a SPEAK test to prove they possess the required level of oral English proficiency to qualify for a TA appointment. All Teaching Assistants must attend the College of Engineering Teaching Improvement workshops held in August and January. Teaching Assistants will receive student evaluations using the College of Engineering Teaching Evaluation Form. The department recommends supervising faculty evaluate inexperienced (first two semesters) TAs during the fifth or sixth week of their first two semesters. The evaluation will usually involve a planned visit to a classroom/lab section and a subsequent conference with the TA.
Assistantship Opportunities

Applying for Research Assistantships (RAs)

Students should contact professors in their area of interest about open positions. For paid positions, students must be enrolled as full-time students in spring and fall semesters (8-15 credit load) and taking at least 2 graduate-level credits during the summer session. Professors decide whom they will appoint on their research grants. Faculty reviews all graduate applicants when hiring new Research Assistants. All BME students with an RA appointment will be compensated according to BME’s current stipend rates. Contact the Department Administrator for current rates.

Applying for Project Assistantships (PAs)

There are a few project assistant opportunities across campus. Announcements of openings are posted on the UW Job Center.

For Project Assistantships in the Department, please submit a resume to the main office. The process established for selecting TAs is also used for PAs; similarly, PAs carry the same credit requirements as TAs (full-time enrollment of 8-15 credits in fall and spring semesters).
Health Insurance & Leave Benefits for Assistantships

Health Insurance
All UW-Madison students are eligible to receive health care at the University Health Service (UHS) as part of their tuition fees (excluding hospitalization and emergency room services). TAs, RAs, PAs, and fellows holding a minimum 33.33% appointment are eligible for enrollment in group health insurance through the university within the first 30 days of employment. The university will pay for most of the premium. To learn more about benefits and order to activate insurance, students should see the department’s new employee resource page and see the Payroll & Benefits Specialist in 2122 ECB.

Parental Leave
The College of Engineering (CoE) is fully committed to providing a climate of support for women and their partners who choose to have children during their graduate studies. The goal of this CoE parental leave policy is to reduce academic and financial hardships for a) female graduate students during the late stages of their pregnancy, childbirth, and postpartum periods, and b) any graduate student who is a new parent providing care for his/her infant.

All CoE graduate students with current research, teaching, or project assistantships are eligible to request a parental leave under this policy. Upon request, expectant mothers will be provided with 12 weeks of paid accommodation time for childbirth. Other new parents (father, adoptive mother, adoptive father) will, upon request, be provided with 6 weeks of paid accommodation time. There will be no research or teaching expectations of the student during the leave. Students should ideally notify their department (through the Department Administrator or Department Chair) six months prior to the expected birth to request the leave. Students should alert their research advisor or TA coordinator at that time as well to ensure that the ongoing research and teaching environment is safe for the expectant mother. It is recognized that each case will be unique in terms of the timing of the pregnancy or adoption relative to the academic calendar, and that creative and supportive solutions will be required on the part of advisors, chairs, TA coordinators, etc.

The leave will ordinarily begin at the time of birth, but other proposals will be considered. Departments – both advisors and chairs – are expected to provide flexibility in working out the details of the leave and to adjust the timeline of the leave as needed to accommodate any unexpected medical issues that arise during pregnancy (e.g., doctor-ordered bed rest). All academic requirement deadlines (e.g., qualifying exams) will be extended for the student requesting the leave, consistent with department academic timelines.

Additional Leave
RA appointments do not have an associated paid leave requirement for general absences (e.g., sick leave, vacation). However, the following leave policies are expected for BME students.

- University legal holidays are to be kept free of mandatory requirements.
- Consistent with UW policy, student religious observances are to be free of mandatory requirements.
- Advisors are encouraged to develop a policy for additional paid leave for students.
- If necessary, a student may discuss the option for an extended leave of absence with their advisor and the graduate program coordinator.
Completing a Graduate Degree

The Graduate Student Services Office (3182 Mechanical Engineering) will send out an e-mail at the beginning of each semester requesting the names of students who plan to graduate and with instructions and deadlines for submitting final degree warrant information for graduation. Students must also indicate plans for graduation their final semester in their MyUW student center at the beginning of their final semester.

Students should be knowledgeable of campus-wide Graduate School Degree & Dissertation Eligibility Deadlines and ensure that the following, program-specific requirements and paperwork are complete the following paperwork about 2 months before graduation:

Requirements for Graduation

M.S. Requirements: To be eligible for graduation, a student must:
- Complete a MS Warrant Request form (found in student’s BOX file) approved by the student’s faculty advisor and the Associate Chair of Graduate Advising. Contact the Graduate Student Coordinator so a final warrant can be requested by the deadline (please note this form MUST be accompanied by a paragraph)
- Be enrolled in at least 2 credits the semester preceding graduation (students should note that once a student submits their M.S. degree warrant, they will no longer be able to enroll in courses).
- Have a GPA of 3.0 or higher
- Meet all M.S. degree requirements listed in this document
- Have all grades entered (except for the current semester; no Is or NRs can be present on transcript).
- **Double M.S. Degrees**: students receiving a second master’s degree from UW-Madison--and students receiving two master’s degrees during the same semester--must submit official lists of courses used for each degree. Students can overlap up to 25% of credits from the program with the lower degree credit requirement.

Ph.D. Requirements: To be eligible for graduation, a student must:
- Meet all Ph.D. degree requirements listed in this document
- Complete a Final PHD Final Oral Warrant Request form (found in student’s BOX file), upload to BOX, and notify the Graduate Student Coordinator of its completion at least 3 weeks prior to the Final Defense for processing with the Graduate School.

Things to Remember When Finishing a Degree

End of Student Status and Financial Support
All graduate students will retain student status through the end of the semester, until the official date of graduation and at that time are no longer eligible for financial support. If the student holds an assistantship or a fellowship, the student must consult with his or her advisor and the Payroll Soordinator to determine the end date of the appointment and its ramifications.
Completing a Graduate Degree

**Diplomas**
Diplomas will be mailed 12-14 weeks after the degree deadline to the mailing address listed in students’ Student Centers. All international students are required to enter a diploma address into their Student Center to receive a diploma. Consult the Office of the Registrar’s page on diplomas for more information.

**Feedback**
An online survey will be e-mailed to all graduate students completing their degree. This survey is extremely helpful to the department in tracking where students go after graduation. We greatly appreciate cooperation in completing this survey.

**Email & Continued Department Communications**
Student e-mail can be accessed after graduation. Consult the university's KnowledgeBase for more information on alumni access to email services.

Students should remember to keep in touch via Facebook, Twitter, and LinkedIn, and feel free to contact the BME Department or Student Services Office with any questions or concerns after graduation.

**Commencement:**
Once a student has met their degree requirements, they may choose to attend a fall or spring commencement ceremony.

Students should reference the Graduate School’s and the university’s information regarding commencement for more details regarding preparing for the ceremony proper attire, dates and times.

Traditionally, Ph.D. students are escorted by their faculty advisor. Ph.D. students should discuss their commencement plans with their advisor.