# Table of Contents

The Biomedical Engineering Graduate Program ................................................................................................. 4

**Arriving on Campus** ........................................................................................................................................ 5
  Obtain a Wiscard
  Navigate Campus
  Verify Contact Information and Online Logins
  Pay Tuition and Fees
  Check In with International Student Services

**Class Registration and Credit Load** ............................................................................................................. 6-7
  Credit Load Requirements for Full-Time Students
  Transferring Graduate Credits
  Requesting Transcripts
  Unique Registration Situations

**Accelerated Master’s in Biomedical Engineering** ............................................................................................ 8
  Overview
  Requirements
  Course Selection
  Degree Program Plan

**Courses in Biomaterials and Tissue Engineering** .......................................................................................... 9

**Courses in Biomechanics** ............................................................................................................................. 10

**Courses in Biomedical Imaging and Optics** ................................................................................................... 11

**Courses in Medical and Microdevices** ........................................................................................................ 12

**Courses in Neuroengineering** ..................................................................................................................... 13

**Courses in Systems and Synthetic Biology** ................................................................................................. 14

**Biomedical Innovation, Design, and Entrepreneurship (BIDE)** ................................................................. 15
  Overview
  Requirements
  Course Selection
  Degree Program Plan

**BIDE: Engineering Courses in Design, Prototyping, and Manufacturing** .................................................... 16
Table of Contents

BIDE: Courses in General Business, Entrepreneurship, and Strategic Innovation ........................................ 17
BIDE: Technical Engineering Electives Courses .......................................................................................... 18
Financial Support ..................................................................................................................................... 19
Completing a Graduate Degree ............................................................................................................ 20–21
   Requirements for Graduation
   Things to Remember When Finishing a Degree
   Commencement

Academic Standards .............................................................................................................................. 22
   Satisfactory Progress
   Probation

Grievance Procedures .......................................................................................................................... 23
   Procedures for the Proper Accounting of Student Grievances

Hostile and Intimidating Behavior ....................................................................................................... 24–25
   What is Hostile and Intimidating Behavior?
   What to Do if You Feel You’ve Been the Target of Hostile and Intimidating Behavior

Quick Links: Student Resources .......................................................................................................... 26–27
   Calendars
   Campus and Academic Life
   Computers
   Department Resources and Office/Lab Space
   Diversity
   Health and Wellness
   Learning Resources and Assistance
The biomedical engineering graduate program is of interest to 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 non-profit organizations.

The department offers two options for accelerated graduate programs leading to a Master of Science (MS) degree in Biomedical Engineering. The Biomedical Engineering Accelerated Program, and the Biomedical Innovation, Design, and Entrepreneurship Program, are intended to be completed in 12 months. The master’s programs emphasize the enhancement of professional knowledge and skills, do not require a thesis and can be tailored to a curriculum that suits individual and professional interests.

**The Biomedical Engineering Accelerated Program** is designed to better prepare students for further education in medical school, PhD programs, or to directly enter the biomedical industry. Our courses help you combine the fundamentals of the biomedical sciences with advanced engineering methods of analysis and design to contribute to designing new medical instruments and devices, understanding and repairing the human body, and making technologies cost-effective for both companies and patients.

**The Biomedical Innovation, Design, and Entrepreneurship Program** gives you the interdisciplinary training needed to break into a career at the interface of engineering and business. You will learn in project-based classes and gain advanced knowledge in design, prototyping, and manufacturing, as well as general business fundamentals, entrepreneurship, and project management. Offered through the College of Engineering, and in cooperation with the School of Business, you will learn from acclaimed experts in both fields and graduate prepared to succeed as an engineer in the business world.

All policies from the Graduate School’s Academic Policies and Procedures document apply to BME graduate students; including protections from harassment, accommodation for disabilities, etc. Student questions and concerns regarding the program can be directed to the Associate Chair of the Master’s Degree Programs.
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 Wiscard Office in Union South Room 149 between 8:30 a.m. and 5 p.m. Monday–Friday as soon as possible after arriving in Madison. In order to receive a Wiscard you must present some form of personal photo identification such as a valid passport or U.S. driver’s license.

**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 and 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. The campus information technology division, known as DoIT, should be contacted through the DoIT Help Desk if students encounter any difficulties accessing MyUW.

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 the student to exchange information with their advisor(s) regarding their academic plan. Students will maintain digital versions of their degree program planning forms for each semester of their program here.

**Pay Tuition and 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.
Course registration is accessed online through MyUW in Course Search & Enroll. A Net ID and password are required for log in. Tutorials on navigating Student Center are available through the Enrollment Help Desk.

Credit Load Requirements for Full-Time Students

<table>
<thead>
<tr>
<th></th>
<th>Fall and 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>
</tbody>
</table>

**Fall and 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: taking more than 12 credits per semester is not recommended.)

**Summer**

Enrollment for summer is not required but the accelerated master’s programs are spread into three semesters (Fall, Spring and Summer). Students who do not enroll in summer may need to complete degree requirements in the following fall semester.

**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. Graduate level courses are either greater than 700 level or have a designation as having a “50% graduate coursework requirement” in the course guide. Questions about a specific course should be directed to the Graduate Student Services Coordinator.

Each student’s program plan is unique and may require additional steps for registration or coursework documentation. Enrollment in courses outside the prescribed curriculum requires approval from the Associate Chair of the Master’s Degree Programs.

**Transferring Graduate Credits from Other Institutions**

The BME department does not allow students in the accelerated master’s programs to transfer graduate course work from another institution. Students who have earned a BS in BME at UW-Madison can transfer two advanced BME courses from their bachelor's degree toward their degree requirements. The Graduate School's minimum credit requirement for graduation can ONLY be satisfied with 300 level or above courses taken as a graduate student at UW–Madison. The minimum credit requirement is 15 credits for the accelerated master's programs. Master's degree students who have been absent for five or more years lose all degree credits earned before their absence. Please discuss this with the BME Associate Chair of the Master's Degree Programs.

**Requesting Transcripts**

Students can order "unofficial" transcripts at any time by following the instructions listed here. Official transcript orders can be placed here.
Class Registration and Credit Load

Unique Registration Situations

**Registering for a Closed BME Class**
To register for a waitlisted BME course (▲), students should use the waitlist 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, or Research Credits**
BME students interested in conducting research should enroll in the appropriate course (BME 799), faculty member section, and number of credits during the general enrollment periods. It is the student’s responsibility to enroll with the correct course and faculty member section. Incorrect enrollment may result in an incomplete or unsatisfactory grade. Contact the Graduate Student Coordinator for support with enrollment in these.

- BME 799: Master’s level independent study

**Registering for Co-op Credits**
Co-op internships are permitted in both accelerated programs, even during the first semester, and the experience will count as a graduate level, project experience. To initiate the enrollment process in BME 702, students must contact Julie Rae in Engineering Career Services (julie.rae@wisc.edu). Student will need approval from the Associate Chair of the Master’s Degree Programs.

- BME 702: Co-op internship (2 credits)

For additional information of Co-op and internship opportunities check [Engineering Career Services](#).

**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.
Accelerated Master’s Program Overview

The Accelerated Program in Biomedical Engineering is a non-thesis, 30-credit program with coursework focused on engineering and science to afford further preparation and training for students interested in careers in industry or pursuing advanced academic degrees. Completion of this program to be done within 12 months with a maximum timeline of 16 months, which may include courses during the summer session. Students in this program will be advised by the Associate Chair of the Master’s Degree Programs to design their degree plan and course selection. Complete MS degree requirements can be found in The Guide.

Requirements

Area of Specialization
All graduate students in the Accelerated Master’s Program must choose an area of specialization at the beginning of the first semester. Options include: Biomaterials and Tissue Engineering, Biomechanics, Biomedical Imaging and Optics, Medical and Microdevices, Neuroengineering, and Systems and Synthetic Biology.

Graduate Level Courses
Half of the degree coursework (15 credits out of 30 total credits) must be designed for graduate work. Classes that satisfy that requirement include courses numbered 700 or higher, courses listed in Course Search and Enroll with “Course Options: 50% Graduate Requirement”, graduate research credits, independent study credits, Co-op/internship credits.

Engineering Courses
Students must enroll in at least 12 credits of engineering courses at 400 level or above.

Biological Science Credits
Students must enroll in 3-5 credits of biological science courses. Students that earned a BS in BME at UW-Madison can waive that requirement but must substitute those credits for additional elective courses.

Biomedical Engineering Seminar
Students must enroll in two semesters of BME 701.

Area of specialization/Track credits
Half of the degree coursework (15 credits out of 30 total credits) must fall into the area of specialization. The following pages will provide options of courses that could be considered for each track. If you find a course that is not listed, please discuss with the Associate Chair of the Master’s Degree Programs to evaluate if the course could count towards the specialization.

Course Selection
Specific course selection is flexible and draws upon a variety of courses. The required coursework is designed to complement each student’s interest and background in biomedical engineering and meet the spirit of a BME degree. The next 6 pages list courses that meet the requirements for each area of specialization in the program. Enrollment in courses outside the prescribed curriculum may be possible but requires approval from the Associate Chair of the Master’s Degree Programs.

Degree Program Plan
During their first semester of coursework, students must complete and have their advisor (the Associate Chair of Master’s Degree Programs) 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.
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.

**Engineering Courses at 400 level or above (12 credits)**

- BME 430: Biological Interactions with Materials
- 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 601: Nanomaterials for Biomedical Applications
- CBE 540: Polymer Science and Technology
- CBE 562: Cellular Biomanufacturing
- CBE 648: Synthetic Organic Materials in Biology and Medicine
- CBE 781: Biological Engineering: Molecules, Cells and System
- MSE 521: Advanced Polymeric Materials

**Biological Science Courses (3-5 credits)**

- ANAT & PHYS 335: Physiology
- BIOCHEM 501: Introduction to Biochemistry
- CRB 640: Fundamentals of Stem Cell and Regenerative Biology
- CRB 650: Molecular and Cellular Organogenesis
- ZOOLOGY 570: Cell Biology
- ZOOLOGY 630: Cellular Signal Transduction Mechanisms

**Elective Courses (6-12 credits)**

- BMI 541: Introduction to Biostatistics
- BMI 776: Advanced Bioinformatics
- COMP SCI 765: Data Visualization
- STAT 571: Statistical Methods for Bioscience I
- STAT 877: Statistical Methods for Molecular Biology
- BME 556: Systems Biology: Mammalian Signaling Networks
- BME/CBE 560: Biochemical Engineering
- BME/MED PHYS 619: Introduction to Multiscale Imaging
- BME/CHEM/MED PHYS 750: Biological Optical Microscopy
- BME/CBE 783: Design of Biological Molecules
- CHEM 654: Materials Chemistry of Polymers
- MED PHYS 705: Women Leadership: Science, Health, and Engineering

*Courses not listed here may be considered for the track but must be approved by the Associate Chair of the Master’s Degree Programs. Engineering or biological science courses could count as electives once the minimum credit requirement is met.*
Biomechanics

Biomechanists use experiments and computational tools to investigate the mechanical aspects of biological systems, at levels ranging from whole organisms to organs, tissues, and cells. Graduate students trained in biomechanics are expected to gain a detailed understanding of mechanics, mathematics, biology, and engineering.

**Engineering Courses at 400 level or above (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME/ME 414</td>
<td>Orthopaedic Biomechanics–Design of Implants</td>
</tr>
<tr>
<td>BME/ME 415</td>
<td>Biomechanics of Human Movement</td>
</tr>
<tr>
<td>BME 505</td>
<td>Biofluidics</td>
</tr>
<tr>
<td>BME/ME 603</td>
<td>Finite Elements for Biomechanics</td>
</tr>
<tr>
<td>BME/ME 603</td>
<td>Imaging Biomechanics</td>
</tr>
<tr>
<td>BME/ME 603</td>
<td>Cell Mechanics</td>
</tr>
<tr>
<td>BME/ME 603</td>
<td>Advanced Cardiovascular Biomechanics</td>
</tr>
<tr>
<td>BME 615</td>
<td>Tissue Mechanics</td>
</tr>
<tr>
<td>ME 540</td>
<td>Experimental Vibration and Dynamic System Analysis</td>
</tr>
<tr>
<td>ME/EMA 508</td>
<td>Composite Materials</td>
</tr>
<tr>
<td>ME 563</td>
<td>Intermediate Fluid Mechanics</td>
</tr>
<tr>
<td>ME/EMA 570</td>
<td>Experimental Mechanics</td>
</tr>
<tr>
<td>ME 573</td>
<td>Computational Fluid Dynamics</td>
</tr>
<tr>
<td>EMA 506</td>
<td>Advanced Mechanics of Materials I</td>
</tr>
<tr>
<td>EMA 519</td>
<td>Fracture mechanics</td>
</tr>
<tr>
<td>EMA 541</td>
<td>Heterogeneous and Multiphase Materials</td>
</tr>
<tr>
<td>EMA 545</td>
<td>Mechanical Vibrations</td>
</tr>
<tr>
<td>EMA 605</td>
<td>Introduction to Finite Elements</td>
</tr>
<tr>
<td>EMA 615</td>
<td>Micro- and Nanoscale Mechanics</td>
</tr>
<tr>
<td>EMA 622</td>
<td>Mechanics of Continua</td>
</tr>
<tr>
<td>EMA 630</td>
<td>Viscoelastic Solids</td>
</tr>
</tbody>
</table>

**Biological Science Courses (3-5 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAT &amp; PHYS 335</td>
<td>Physiology</td>
</tr>
<tr>
<td>ANAT &amp; PHYS 435</td>
<td>Fundamentals of Human Physiology</td>
</tr>
<tr>
<td>CRB 670</td>
<td>Biology of Heart Disease and Regeneration</td>
</tr>
<tr>
<td>KINES/PHYSIOL 773</td>
<td>Cardiorespiratory Adaptations to Environment and Exercise</td>
</tr>
<tr>
<td>ZOOLOGY 570</td>
<td>Cell Biology</td>
</tr>
</tbody>
</table>

**Elective Courses (6-12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 443</td>
<td>Applied Linear Algebra</td>
</tr>
<tr>
<td>MATH 519</td>
<td>Ordinary Differential Equations</td>
</tr>
<tr>
<td>MATH 619</td>
<td>Analysis of Partial Differential Equations</td>
</tr>
<tr>
<td>ME/STAT 424</td>
<td>Statistical Experimental Design</td>
</tr>
<tr>
<td>ME/CS/ECE 532</td>
<td>Matrix Methods in Machine Learning</td>
</tr>
<tr>
<td>BMI/STAT 541</td>
<td>Introduction to Biostatistics</td>
</tr>
<tr>
<td>COMP SCI 368</td>
<td>Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)</td>
</tr>
<tr>
<td>BME/MED PHYS 619</td>
<td>Introduction to Multiscale Imaging</td>
</tr>
<tr>
<td>ME 439</td>
<td>Introduction to Robotics</td>
</tr>
<tr>
<td>MED PHYS 705</td>
<td>Women Leadership: Science, Health, and Engineering</td>
</tr>
</tbody>
</table>

*Courses not listed here may be considered for the track but must be approved by the Associate Chair of the Master’s Degree Programs. Engineering or biological science courses could count as electives once the minimum credit requirement is met.*
Biomedical Imaging and Optics

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 as well as optical and/or physical methods.

**Engineering Courses at 400 level or above (12 credits)**

- BME/MED PHYS 530: Medical Imaging System
- BME/MED PHYS 573: Medical Image Science: Mathematical and Conceptual Foundations
- BME/MED PHYS 574: Imaging in Medicine: Applications
- BME/MED PHYS 575: Diagnostic Ultrasound Imaging
- BME/MED PHYS 578: Non-Ionizing Diagnostic Imaging
- BME/MED PHYS 619: Introduction to Multiscale Imaging
- BME/MED PHYS 710: Advanced Medical Magnetic Resonance
- BME/CHEM/MED PHYS 750: Biological Optical Microscopy
- BME 751: Biomedical Optics and Biophotonics
- ECE 630: All of Signal Processing

**Biological Science Courses (3-5 credits)**

- ANAT & PHYS 335: Physiology
- BIOCHEM 501: Introduction to Biochemistry
- ZOOLOGY 570: Cell Biology

**Elective Courses (6-12 credits)**

- MATH 443: Applied Linear Algebra
- COMP SCI 368: Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)
- COMP SCI 532: Matrix Methods in Machine Learning
- COMP SCI 766: Computer Vision
- COMP SCI 767: Computational Methods for Medical Image Analysis
- MED PHYS 777: Principles of X-Ray Computed Tomography
- MED PHYS 705: Women Leadership: Science, Health, and Engineering

*Courses not listed here may be considered for the track but must be approved by the Associate Chair of the Master’s Degree Programs. Engineering or biological science courses could count as electives once the minimum credit requirement is met.*
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.

**Engineering Courses at 400 level or above (12 credits)**

- BME 462: Medical Instrumentation
- BME 515: Therapeutic Medical Devices
- BME/MED PHYS 535: Intro to Energy-Tissue Interactions
- BME 550: Introduction to Biological and Medical Microsystems
- BME 601: Medical Design and Manufacturing
- BME 601: Introduction to Neuroengineering
- BME 463: Computers in Medicine
- BME/MED PHYS 574: Imaging in Medicine: Applications

**Biological Science Courses (3-5 credits)**

- ANAT & PHYS 335: Physiology
- BIOCHEM 501: Introduction to Biochemistry
- BIOCHEM/GENETICS/MICROBIO 612: Prokaryotic Molecular Biology
- BIOCHEM/GENETICS/MD GENETICS 620: Eukaryotic Molecular Biology
- PATH 750: Cellular and Molecular Biology/Pathology
- ZOOLOGY 523: Neurobiology
- ZOOLOGY 570: Cell Biology
- ZOOLOGY 630: Cellular Signal Transduction Mechanisms

**Elective Courses (6-12 credits)**

- MATH 443: Applied Linear Algebra
- MATH 519: Ordinary Differential Equations
- MATH 619: Analysis of Partial Differential Equations
- COMP SCI 300: Programming II
- COMP SCI 320: Data Programming II
- COMP SCI 368: Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)
- ECE 630: All of Signal Processing
- MED PHYS 705: Women Leadership: Science, Health, and Engineering

*Courses not listed here may be considered for the track but must be approved by the Associate Chair of the Master’s Degree Programs. Engineering or biological science courses could count as electives once the minimum credit requirement is met.*
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 that as the next generation of engineers, they will transcend the traditional boundaries of neuroscience, technology, engineering and mathematics.

**Engineering Courses at 400 level or above (12 credits)**
- BME 515: Therapeutic Medical Devices
- BME 520: Stem Cell Bioengineering
- BME 550: Introduction to Biological and Medical Microsystems
- BME 601: Introduction to Neuroengineering
- BME 601: Medical Device Design and Manufacturing
- ECE/BME 462: Medical Instrumentation
- ECE/BME 463: Computers in Medicine
- ECE 630: All of Signal Processing
- ECE 524: Introduction to Optimization
- ECE 533: Image Processing
- ECE/COMP SCI/ME 539: Introduction to Artificial Neural Network and Fuzzy Systems
- MED PHYS /NPT 651: Methods for Neuroimaging Research

**Biological Science Courses (3-5 credits)**
- ANAT & PHYS 335: Physiology
- BIOCHEM 501: Introduction to Biochemistry
- 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: Neurobiology of Disease
- PSYCH 610: Statistical Analysis of Psychological Experiments
- PSYCH 733: Perceptual and Cognitive Sciences
- ZOOLOGY 625: Development of the Nervous System
- ZOOLOGY 570: Cell Biology

**Elective Courses (6-12 credits)**
- MATH 443: Applied Linear Algebra
- COMP SCI 320: Data Programming II
- COMP SCI 368: Learning a Programming Language (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
- MED PHYS 705: Women Leadership: Science, Health, and Engineering

*Courses not listed here may be considered for the track but must be approved by the Associate Chair of the Master’s Degree Programs. Engineering or biological science courses could count as electives once the minimum degree requirement is met.*
Systems and Synthetic Biology

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

**Engineering Courses at 400 level or above (12 credits)**

- BME 550: Introduction to Biological and Medical Microsystems
- BME 556: Systems Biology: Mammalian Signaling Networks
- BME 780: Methods in Quantitative Biology
- CBE/BME 560: Biochemical Engineering
- CBE 781: Biological Engineering: Molecules, Cells and Systems
- CBE/BME 782: Modeling Biological Systems
- CBE 660: Intermediate Problems in Chemical Engineering

**Biological Science Courses (3-5 credits)**

- BIOCHEM 570: Computational Modeling of Biological Systems
- BIOCHEM 919: Synthetic Biology
- BIOCHEM 501: Introduction to Biochemistry
- BIOCHEM/GENETICS/MICROBIO 612: Prokaryotic Molecular Biology
- BIOCHEM/GENETICS/MD GENETICS 620: Eukaryotic Molecular Biology

**Elective Courses (6-12 credits)**

- MATH 443: Applied Linear Algebra
- MATH 519: Ordinary Differential Equations
- MATH 619: Analysis of Partial Differential Equations
- BMI/STAT 541: Introduction to Biostatistics
- BMI/COMP SCI 576: Introduction to Bioinformatics
- BMI 826: Special Topics in Computational Network Biology
- BMI 776: Advanced Bioinformatics
- COMP SCI 368: Learning a Programming Language (note that there are multiple 1 credit options, including R, C++, and Matlab)
- MED PHYS 705: Women Leadership: Science, Health, and Engineering

*Courses not listed here may be considered for the track but must be approved by the Associate Chair of the Master’s Program. Engineering or biological science courses could count as electives once the minimum credit requirement is met.*
The Biomedical Innovation, Design, and Entrepreneurship program is a non-thesis, 30-credit program, designed to provide additional graduate-level, project-based experiences in design, prototyping, and manufacturing, as well as an understanding of business fundamentals, entrepreneurship, and project management. Upon completion, students will be prepared for careers at the interface of engineering and business. The program is designed to be completed within 12 months with a maximum timeline of 16 months, which may include courses during the summer session.

Complete MS degree requirements can be found in The Guide.

**Requirements**

**Graduate Level Courses**
Half of the degree coursework (15 credits out of 30 total credits) must be designed for graduate work. Classes that satisfy that requirement include courses numbered 700 or higher, courses listed in Course Search and Enroll with “Course Options: 50% Graduate Requirement”, graduate research credits, independent study credits, Co-op/internship credits.

**Engineering Courses in Design, Prototyping, and Manufacturing**
Students must enroll in at least 9 credits.

**Advanced Design/Research Project**
Students must enroll in 1-3 credits of BME 799: Advanced Independent Study.

**General Business, Entrepreneurship, and Strategic Innovations**
Students must enroll in at least 9 credits.

**Technical Engineering Electives**
Students must enroll in up to 6 credits.

**Additional Credits taken in consultation with advisor**

**Course Selection**
Specific course selection is 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. The next 3 pages list courses that meet the requirements for the program. Enrollment in courses outside the prescribed curriculum may be possible but requires approval from the Associate Chair of the Master’s Degree Programs.

**Degree Program Plan**
During their first semester of coursework, students must complete and have their advisor (Associate Chair of Master’s Degree Programs) 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.
BIDE: Engineering Courses in Design, Prototyping, and Manufacturing

9 credits

BME 799: Advanced Independent Study
BME 515: Therapeutic Medical Devices
BME 601: Special Topics in Biomedical Engineering
BME/ME 602: Topics in Biomedical Engineering
BME 662: Design and Human Disability and Aging
ME 449: Redesign and Prototype Fabrication
ME 514: Additive Manufacturing
ME 549: Product Design
ME 601: Special Topics in Mechanical Engineering
ME/ISYE 641: Design and Analysis of Manufacturing Systems
ME 748: Optimum Design of Mechanical Elements & Systems
ISYE 415: Introduction to Manufacturing Systems, Design, and Analysis
ISYE 515: Engineering Management of Continuous Process Improvement
ISYE 517: Decision Making in Healthcare
ISYE 552: Human Factors Engineering Design and Evaluation
ISYE 557: Human Factors Engineering for Healthcare Systems
ISYE 601: Special Topics in Industrial Engineering
ISYE 602: Special Topics in Human Factors
ISYE 603: Special Topics in Engineering Analytics and Operations Research
ISYE 604: Special Topics in Manufacturing and Supply Chain Management
ISYE 606: Special Topics in Healthcare Systems Engineering

Courses not listed here may be considered for the engineering requirement but must be approved by the Associate Chair of the Master’s Degree Programs. Courses in this list may also be considered as electives.
BIDE: Courses in General Business, Entrepreneurship, and Strategic Innovations

9 credits

GEN BUS 310: Fundamentals of Accounting and Finance for Non-Business Majors
GEN BUS 311: Fundamentals of Management and Marketing for Non-Business Majors
MHR/AAE 540: Intellectual Property Rights, Innovation and Technology
MHR 715: Strategic Management of Innovation
MHR 722: Entrepreneurial Management
MHR 734: Venture Creation
MHR 738: Weinert Applied Ventures in Entrepreneurship (WAVE)
RMI 650: Sustainability, Environmental and Social Risk Manage

Courses not listed here may be considered for the requirement in general business, entrepreneurship, and strategic innovations but must be approved by the Associate Chair of the Master’s Degree Programs. Courses in this list may also be considered as electives.
BIDE: Technical Engineering Electives

0-6 credits

BME/ME 415: Biomechanics of Human Movement

BME/PHM SCI 430: Biological Interactions with Materials

BME/ECE 462: Medical Instrumentation

BME/ECE 463: Computers in Medicine

BME/ME 505: Biofluidics

BME/CBE 510: Introduction to Tissue Engineering

BME 511: Tissue Engineering Laboratory

BME/CBE 520: Stem Cell Bioengineering

BME/MED PHYS 530: Medical Imaging Systems

BME/MED PHYS 535: Introduction to Energy-Tissue Interactions

BME 545: Engineering Extracellular Matrices

BME 550: Introduction to Biological and Medical Microsystems

BME 556: Systems Biology: Mammalian Signaling Networks

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

BME/MED PHYS 574: Imaging in Medicine: Applications

BME/MED PHYS 578: Non-Ionizing Diagnostic Imaging

BME/ME 615: Tissue Mechanics

BME/MED PHYS/PHMCOL-M/PHYSICS/RADIOL 619: Microscopy of Life

BME/CHEM/MED PHYS 750: Biological Optical Microscopy

BME/CBE 560: Biochemical Engineering

CBE 540: Polymer Science and Technology

ECE/COMP SCI/ISYE 524: Introduction to Optimization

ECE/COMP SCI 533: Image Processing

ECE/COMP SCI/ME 539: Introduction to Artificial Neural Networks

ME 563: Intermediate Fluid Dynamics

ME/EMA 570: Experimental Mechanics

ME 573: Computational Fluid Dynamics

MS&E 521: Advanced Polymeric Materials

MED PHYS 705: Women Leadership: Science, Health, and Engineering

BME/ECE/MED PHYS 778: Machine Learning in Ultrasound Imaging

Courses not listed here may be considered for the engineering requirement but must be approved by the Associate Chair of the Master's Degree Programs. Courses in this list may also be considered as electives.
Financial Support

Due to the accelerated, course-based nature of the Accelerated Master’s in Biomedical Engineering and the Biomedical Innovation, Design, and Entrepreneurship programs, 

**students cannot hold funded appointments such as research assistantships, teaching assistantships, or project assistantships, either inside the BME department or elsewhere on campus.** These appointments may impact the student’s progress and are inconsistent with the nature of an accelerated program. Compliance with this policy will be confirmed by regular audits of appointments. Students can be placed in probation for failure to adhere to these policies.

In the uncommon instance that a student in either program has an offer for a funded appointment (research assistantship, teaching assistantship, or project assistantship) they may appeal this policy. In order to initiate the process, the student should contact the Associate Chair of the Master’s Degree Programs, and provide details on the funded position. The Associate Chair of the Master’s Degree Program will bring the student’s request to the other members of the appeals committee and the committee will determine if the student can accept the funded appointment. The student may not accept the position without approval from the appeals committee.

**Resources**

Resources to help you afford graduate study might include the following:

- [External Fellowships](#)
- [Financial Aid](#)
- [Student Jobs](#)

Further funding information is available from the Graduate School.
Completing a Graduate Degree

The Graduate Student Services Office (3180 Mechanical Engineering) will send out an email at the beginning of each semester requesting the names of students who plan to graduate. This email will contain instructions and deadlines for submitting final degree warrant information for graduation. Students must also indicate plans for graduation in their MyUW Student Center at the beginning of their final semester.

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

Requirements for Graduation

MS Requirements
To be eligible for graduation, a student must:

- Complete a MS Warrant Request form (found in student's BOX file) approved by the Associate Chair of the Master's Degree Programs and the Associate Chair of Graduate Advising. Contact the Graduate Student Services Coordinator so a final warrant can be requested by the deadline.
- Be enrolled in at least 2 credits the semester preceding graduation (students should note that once a student submits their MS degree warrant, they will no longer be able to enroll in courses).
- Have a GPA of 3.0 or higher.
- Meet all MS 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 MS 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.
- Complete the online exit survey.
Completing a Graduate Degree

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 and Benefits Specialist to determine the end date of the appointment and its ramifications.

Diplomas
Diplomas will be mailed 12-14 weeks after the degree deadline to the mailing address listed in the Student Center. 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 emailed 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. In-person interviews are also possible for MS degrees.

Email and Continued Department Communications
Student email can be accessed after graduation. Consult the university’s KnowledgeBase (KB) 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.

College of Engineering Graduate Recognition Event
The College of Engineering holds a Graduate Recognition event every spring semester after the Saturday commencement ceremony. Students who are graduating with a BS, MS or PhD engineering degrees are welcome to take part in the College of Engineering event. Learn more on the College of Engineering graduation webpage.
Academic Standards

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

Satisfactory Progress

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.

Probation

If a student was admitted on probation and they satisfy 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.
Grievance Procedures

If a student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve the grievance.

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. Students are also encouraged to talk with their faculty advisors regarding concerns or difficulties, or reach out to the Graduate Student Services Coordinator or Associate Chair of BME Graduate Advising for additional assistance. These activities do not rise to the level of a formal grievance; however, the student is encouraged to keep documentation of these interactions as they may be useful if a formal grievance is pursued.

Step 2
Should a satisfactory resolution not be achieved, a formal grievance can be filed with the BME Grievance Committee. To do so, the student contacts the Department Administrator, who will provide the student with the name of the current chair of the Grievance Committee. The student will then contact the Chair of the Grievance Committee, who will reply within seven calendar days. If the grievance is with the current Chair of the Grievance Committee, please let the Department Administrator know and they will identify an alternate committee member to contact. It is advised that grievances are filed within 60 calendar days of the alleged unfair treatment to enable a thorough investigation.

Step 3
If the student does not feel comfortable working through the departmental process, they are encouraged to seek out other campus resources including:

- The Assistant Dean for Graduate Affairs in the College of Engineering
- The Graduate School
- UW Division of Diversity, Equity & Educational Achievement (DDEEA)
- McBurney Disability Resource Center
- Employee Assistance Office
- Ombuds Office
- University Health Services

Step 4
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 ten working days to file a written appeal to the School/College. For more information, students should consult the College of Engineering Academic Advising Policies and Procedures.

Step 5
Documentation of the grievance will be stored for at least seven 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.
Hostile and Intimidating Behavior

Hostile and intimidating behavior, sometimes known by the shorthand term “bullying,” is defined in university policy as “unwelcome behavior pervasive or severe enough that a reasonable person would find it hostile and/or intimidating and that does not further the University’s academic or operational interests.”

Hostile and intimidating behavior (HIB) can occur in the university setting. Even individual instances of such behavior can have a significant effect on the person it’s aimed at, and can take a physical and emotional toll, reducing the effectiveness of a person’s work or learning. It is a significant reason for unhealthy workplace climate and culture and should be addressed immediately. Hostile and intimidating behavior is prohibited by university policy.

What is Hostile and Intimidating Behavior?

Hostile and intimidating behavior is defined as unwelcome behavior pervasive or severe to the extent that it makes the conditions for work inhospitable and impairs another person’s ability to carry out his/her responsibilities to the university, and that does not further the University’s academic or operational interests. A person or a group can perpetrate this behavior. The person need not be more senior than or a supervisor to the target. Unacceptable behavior may include, but is not limited to:

1. Abusive expression (including spoken, written, recorded, visual, digital, or nonverbal, etc.) directed at another person in the workplace, such as derogatory remarks or epithets that are outside the range of commonly accepted expressions of disagreement, disapproval, or critique in an academic culture and professional setting that respects free expression;
2. Unwarranted physical contact or intimidating gestures; Conspicuous exclusion or isolation having the effect of harming another person’s reputation in the workplace and hindering another person’s work;
3. Sabotage of another person’s work or impeding another person’s capacity for academic expression, be it oral, written, or other;
4. Abuse of authority, such as using threats or retaliation in the exercise of authority, supervision, or guidance, or impeding another person from exercising shared governance rights, etc.

Repeated acts or a pattern of hostile and/or intimidating behaviors are of particular concern. A single act typically will not be sufficient to warrant discipline or dismissal, but an especially severe or egregious act may warrant either.
Hostile and Intimidating Behavior

What to Do if You Feel You’ve Been the Target of Hostile and Intimidating

Undesired consequences of hostile and intimidating behavior can be avoided or minimized when the problem is addressed early on, but victims are often hesitant to pursue a formal process before the impact is severe. Educational opportunities and campus resources have been implemented with the intent of aiding all employees and students in defusing situations before they become severe. These resources, including trained personnel who can advise and mediate, comprise the “informal process.” It is possible that situations will continue to arise in which informal interventions are not effective, and the “formal process” has been designed to address those situations.

You are encouraged to seek out advice and consultation after the first instance of hostile and intimidating behavior: consultation is not escalation. Discussing what’s happened in a timely way can often prevent continued bullying. Here are some ways to do this:

1. Seek advice from a trusted colleague;
2. You may choose to seek informal resolution by approaching the individual yourself or with an intermediary;
3. Consult your advisor, human resources representative, department chair, director, dean, or any campus resource to discuss options for resolution;
4. Keep notes of what happened, when, where, and who was present. Retain copies of any correspondence.

Graduate students sometimes experience hostile and intimidating behavior from faculty members. If you are a student who is experiencing such behavior, you are entitled to support as a university employee through the Ombuds office, the Dean of Students office, and the Graduate School. Graduate student workers should also consult with Graduate Coordinators, TAA Stewards, and/or the Graduate School.

BME graduate students with concerns may contact the Associate Chair for Graduate Advising, the BME Grievance Advisor, or the College of Engineering Assistant Dean for Graduate Affairs. Additional campus information on hostile and intimidating behavior is available here.
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 and 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 and 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 and 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 and 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.

**WiscGuardian**
An app that turns your smartphone into a personal safety device (virtual safe walk, day or night).

**Computers**

**CAE (Computer Aided Engineering)**
The technology resource for computers and software specific to the College of Engineering campus.

**DoIT (Division of Information Technology)**
The university's main provider of technological assistance, products, and education.
Quick Links: Student Resources

Department Resources and Office/Lab Space

BME Staff Directory
The staff directory page for the department.

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

Diversity

Office for Equity and 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 and 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.

Food Assistance
The resources and student organizations listed are available at no cost to all students.

Learning Resources and Assistance

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

Steenbock Library
The university's main library for engineering students. The engineering librarian team is located in room 118.

Makerspace
A student-run, rapid prototyping facility with a wide range of rapid prototyping equipment.

Technical Education and Manufacturing (TEAM) Lab
Provides UW engineering faculty, staff, and students with the majority of the tools and equipment found in a modern machine shop as well as a full wood lab, welding lab and sheet metal lab.

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.