

# BIOMEDICAL ENGINEERING, PHD

Biomedical engineering is the application of engineering tools for solving problems in biology and medicine. It is an engineering discipline that is practiced by professionals trained primarily as engineers, who specialize in medical and biological applications. This area of study combines fundamentals of the biomedical sciences with advanced engineering methods of analysis and design, and brings together these two fields in order to contribute to the design of new medical instruments and devices, apply engineering principles for understanding and repairing the human body and other biological systems, and use engineering tools for decision making and cost containment.

The interdisciplinary degree program offers a course of graduate study leading to the master of science or the doctor of philosophy degrees in biomedical engineering. The Department of Biomedical Engineering should be of interest to students who wish to practice engineering or engage in research in an engineering specialization in medicine and biology. An individualized course of study is planned with a faculty advisor. Biomedical engineering faculty and affiliated faculty come from the various colleges and professional schools throughout the university. They specialize in biomedical engineering areas as diverse as biomechanics, bioinstrumentation, biomedical imaging and biophotonics, micro and nanotechnology, systems biology, biomaterials, cellular engineering, tissue engineering, and neuroengineering. A list of biomedical engineering faculty, affiliated faculty, and their respective areas of specialization is available from the department website.

## ADMISSIONS

### ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) of the Graduate School as well as the program(s).** Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 1
Spring Deadline	September 1
Summer Deadline	December 1
GRE (Graduate Record Examinations)	Not required.

English Proficiency Test	Every applicant whose native language is not English, or whose undergraduate instruction was not exclusively in English, must provide an English proficiency test score earned within two years of the anticipated term of enrollment. Refer to the Graduate School: Minimum Requirements for Admission policy: <a href="https://policy.wisc.edu/library/UW-1241">https://policy.wisc.edu/library/UW-1241</a> ( <a href="https://policy.wisc.edu/library/UW-1241/">https://policy.wisc.edu/library/UW-1241/</a> ).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

Applicants should have a bachelor's degree in engineering (biomedical, chemical, electrical, industrial, mechanical, etc.) or science (biology, biochemistry, chemistry, genetics, immunology, physics, etc.). Each application is judged on the basis of:

- Official academic transcripts
- English proficiency test scores (<https://grad.wisc.edu/apply/requirements/#english-proficiency>) (if applicable)
- Three letters of recommendation
- Statement of purpose (<https://grad.wisc.edu/apply/prepare/>)
- Resume

All applicants must satisfy requirements that are set forth by the Graduate School (<https://grad.wisc.edu/>). Admitted applicants to the program may be required to make up deficiency course requirements.

To apply to the Biomedical Engineering program, complete applications (<https://grad.wisc.edu/apply/>), including supportive materials, must be submitted as described below and received by the application deadline.

Summer admissions are generally limited to continuing Biomedical Engineering students at UW-Madison or applicants who have research assistantships already arranged with UW faculty.

### OFFICIAL ACADEMIC TRANSCRIPT

Electronically submit one copy of your transcript of all undergraduate and previous graduate work in your online application to the Graduate School. Unofficial copies of transcripts will be accepted for review. Official copies are required if an applicant is recommended for admission. Do not send transcripts or any other application materials to the Graduate School or the Biomedical Engineering department unless requested. If you have questions, contact [bmegradadmission@enr.wisc.edu](mailto:bmegradadmission@enr.wisc.edu).

### ENGLISH PROFICIENCY TEST SCORES (IF APPLICABLE)

An applicant whose TOEFL (iBT) score is below 92; TOEFL (PBT) score is below 580; or IELTS score is below 7 must take an English assessment test upon arrival. Depending on the result, an applicant may need to register for recommended English as a Second Language (ESL) courses in the first semester of enrollment.

All Biomedical Engineering PhD students will participate in teaching during their graduate degree. International students whose native language is not English must take the SPEAK test (<https://esl.wisc.edu/ita-training/speak/>) during their first semester on campus, unless they have achieved a score 26 or greater on the speaking section of the iBT TOEFL (8.0 for

the IELTS). Any recommended English as a Second Language (ESL) coursework must be completed during the first year.

## THREE LETTERS OF RECOMMENDATION

These letters are required from people who can accurately judge the applicant's academic or research performance. Letters of recommendation are submitted electronically to graduate programs through the online application. Applicants should not send any more than three letters (if more than three are sent, only the first three will be considered). See the Graduate School for FAQs (<https://grad.wisc.edu/apply/>) regarding letters of recommendation.

## STATEMENT OF PURPOSE

In this document, applicants should explain why they want to pursue further education in Biomedical Engineering and discuss which UW faculty members they would be interested in doing research with during their graduate study. See the Graduate School for more advice on how to structure a personal statement (<https://grad.wisc.edu/apply/prepare/>).

## RESUME

Upload your resume in your application.

## APPLICATION FEE

Submission must be accompanied by the one-time application fee. It is non-refundable and can be paid by credit card (Master Card or Visa). [This fee cannot be waived or deferred. Fee grants are available through the Graduate School under certain conditions.](#)

## FUNDING

## FUNDING

### GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (<https://grad.wisc.edu/funding/>) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

### PROGRAM RESOURCES

Students admitted to the Biomedical Engineering PhD program are guaranteed financial support from the department in the form of research assistantships, teaching assistantships and fellowships. Support will continue as long as the student maintains satisfactory progress toward their degree.

## REQUIREMENTS

## MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (<http://guide.wisc.edu/graduate/#policiesandrequirements>), in addition to the program requirements listed below.

## MAJOR REQUIREMENTS

### MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

### Mode of Instruction Definitions

**Accelerated:** Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

**Evening/Weekend:** Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

**Face-to-Face:** Courses typically meet during weekdays on the UW–Madison Campus.

**Hybrid:** These programs combine face-to-face and online learning formats. Contact the program for more specific information.

**Online:** These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

## CURRICULAR REQUIREMENTS

Requirement Detail	
Minimum Credit Requirement	60 credits
Minimum Residence Credit Requirement	32 credits
Minimum Graduate Coursework Requirement	30 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: <a href="https://policy.wisc.edu/library/UW-1244">https://policy.wisc.edu/library/UW-1244</a> ( <a href="https://policy.wisc.edu/library/UW-1244/">https://policy.wisc.edu/library/UW-1244/</a> ).
Overall Graduate GPA Requirement	3.00 GPA required. Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: <a href="https://policy.wisc.edu/library/UW-1203">https://policy.wisc.edu/library/UW-1203</a> ( <a href="https://policy.wisc.edu/library/UW-1203/">https://policy.wisc.edu/library/UW-1203/</a> ).
Other Grade Requirements	n/a
Assessments and Examinations	PhD candidates are required to pass a comprehensive qualifying examination, preliminary examination, and final oral defense. Deposit of the doctoral dissertation to the Graduate School is required.
Language Requirements	No language requirements.

Graduate School Breadth Requirement	Breadth is provided via interdisciplinary training. The central aim of biomedical engineers is to unravel gaps in biological knowledge through the use of engineering principles. Thus, the doctoral program is inherently interdisciplinary. Prior to obtaining a PhD warrant, students will prepare a summary of their effort in interdisciplinary coursework and training. The purpose of the summary will be to document the effort to meet the spirit of the minor requirement. The summary must be approved by the student's thesis committee and filed with the department. Students may elect to pursue a doctoral minor or graduate/professional certificate.
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## REQUIRED COURSES

Code	Title	Credits
<b>General Requirements</b>		
<i>Research Credits (B M E 790, 890, 990)</i>		<i>at least 35</i>
<i>Coursework, including:</i>		<i>at least 25</i>
2 semesters of B M E 701		
B M E 703	Responsible Conduct of Research for Biomedical Engineers	2
One set of PhD pathway requirements (credits vary; see below).		21
<b>Total Credits</b>		<b>60</b>

Students who follow the PhD coursework guidelines should fulfill the Biomedical Engineering: Research, MS (<https://guide.wisc.edu/graduate/biomedical-engineering/biomedical-engineering-ms/biomedical-engineering-research-ms/>) requirements. They may file for that degree prior to their preliminary examination.

### Biomaterials & Tissue Engineering Pathway <sup>1</sup>

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.

Code	Title	Credits
<b>Biology Requirement</b>		
		<b>3</b>
CRB 640	Fundamentals of Stem Cell and Regenerative Biology	
CRB 650	Molecular and Cellular Organogenesis	
M M & I/PATH-BIO 528	Immunology	
ZOOLOGY 570	Cell Biology	
<b>Data Analysis Requirement</b>		<b>3-4</b>
B M I/STAT 541	Introduction to Biostatistics	
B M I/COMP SCI 776	Advanced Bioinformatics	
COMP SCI 765	Data Visualization	
STAT/F&W ECOL 571	Statistical Methods for Bioscience I	
STAT/B M I 877	Statistical Methods for Molecular Biology	

<b>Engineering Requirement</b>		<b>9</b>
B M E/PHM SCI 430	Biological Interactions with Materials	
B M E 510	Introduction to Tissue Engineering	
B M E 511	Tissue Engineering Laboratory	
B M E 520	Stem Cell Bioengineering	
B M E 545	Engineering Extracellular Matrices	
B M E 550	Introduction to Biological and Medical Microsystems	
B M E 602	Special Topics in Biomedical Engineering (CRISPR Genome Editing and Engineering Laboratory)	
CBE 540	Polymer Science and Technology	
CBE 562	Special Topics in Chemical Engineering (Cellular Biomanufacturing)	
CBE 648	Synthetic Organic Materials in Biology and Medicine	
CBE 781	Biological Engineering: Molecules, Cells & Systems	
M S & E 521	Advanced Polymeric Materials	
<b>Elective credits chosen in consultation with your advisor</b>		<b>6</b>
<b>Total Credits</b>		<b>21-22</b>

### Biomedical Imaging & Optics Pathway <sup>1</sup>

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 pathway are expected to gain a detailed understanding of mathematics, biology and engineering both optical and/or physical methods relevant to their research focus.

Code	Title	Credits
<b>Mathematics Requirement <sup>2</sup></b>		
		<b>3</b>
MATH 443	Applied Linear Algebra	
<b>Biology Requirement</b>		
		<b>3-5</b>
ANAT&PHY 335	Physiology	
BIOCHEM 501	Introduction to Biochemistry	
ZOOLOGY 570	Cell Biology	
<b>Data Analysis Requirement</b>		
		<b>3</b>
B M E/MED PHYS 574	Data Science in Medical Physics	
COMP SCI 319	Data Science Programming I for Research	
COMP SCI/E C E/M E 532	Matrix Methods in Machine Learning	
COMP SCI/E C E 766	Computer Vision	
COMP SCI/B M I 767	Computational Methods for Medical Image Analysis	
<b>Engineering Requirement</b>		
		<b>9</b>
B M E/MED PHYS 573	Mathematical Methods in Medical Physics	

B M E/ MED PHYS 578	Non-Ionizing Diagnostic Imaging
B M E 651	Biophotonics Laboratory
B M E/ MED PHYS/ PHMCO L- M/PHYSICS/ RADIOL 619	Microscopy of Life
B M E/ MED PHYS 710	Advances in Medical Magnetic Resonance
B M E/CHEM/ MED PHYS 750	Biological Optical Microscopy
B M E 751	Biomedical Optics and Biophotonics
B M E 780	Methods in Quantitative Biology
MED PHYS/ B M E/H ONCOL/ PHYSICS 501	Radiation Physics and Dosimetry
MED PHYS/ B M E 580	The Physics of Medical Imaging with Ionizing Radiation
MED PHYS 777	Principles of X-ray Computed Tomography

**Elective credits chosen in consultation with your advisor** **3**

**Total Credits** **21-23**

### Biomechanics Pathway<sup>1</sup>

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 relevant to their research focus.

Code	Title	Credits
<b>Mechanics</b>		<b>12</b>
To provide depth, 6 credits of Biomechanics courses are required. The remaining 6 credits may be selected from either the Advanced Mechanics or Biomechanics lists.		
<i>Biomechanics</i>		
B M E/M E 414	Orthopaedic Biomechanics - Design of Orthopaedic Implants	
B M E/M E 415	Biomechanics of Human Movement	
B M E/M E 505	Biofluidics	
B M E/M E 516	Finite Elements for Biological and Other Soft Materials	
B M E 603	Special Topics in Bioinstrumentation and Medical Devices (Image-Based Biomechanics)	
B M E/M E 615	Tissue Mechanics	
B M E/M E 715	Advanced Tissue Mechanics	
<i>Advanced Mechanics</i>		
M E 440	Intermediate Vibrations	
M E/CIV ENGR/ E M A 508	Composite Materials	
M E/E M A 540	Experimental Vibration and Dynamic System Analysis	
M E 563	Intermediate Fluid Dynamics	

M E/E M A 570	Experimental Mechanics
M E 573	Computational Fluid Dynamics
E M A 506	Advanced Mechanics of Materials I
E M A 519	Fracture Mechanics
E M A/ M S & E 541	Heterogeneous and Multiphase Materials
E M A 545	Mechanical Vibrations
E M A 605	Introduction to Finite Elements
E M A/E P 615	Micro- and Nanoscale Mechanics
E M A 630	Viscoelastic Solids
E M A 700	Theory of Elasticity
E M A 710	Mechanics of Continua

**Biosciences** **3-5**

ANAT&PHY 335	Physiology
ANAT&PHY 435	Fundamentals of Human Physiology
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology
CRB/B M E 670	Biology of Heart Disease and Regeneration
KINES 773	Cardiorespiratory Adaptions to Environment and Exercise
ZOOLOGY 570	Cell Biology

**Elective credits chosen in consultation with your advisor** **6**

**Total Credits** **21-23**

### Medical & Microdevices Pathway<sup>1</sup>

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.

Code	Title	Credits
<b>Mathematics Requirement<sup>2</sup></b>		<b>3</b>
MATH 443	Applied Linear Algebra	
MATH 519	Ordinary Differential Equations	
MATH 619	Analysis of Partial Differential Equations	
<b>Biology Requirement</b>		<b>3-5</b>
ANAT&PHY 335	Physiology	
BIOCHEM 501	Introduction to Biochemistry	
BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology	
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	
PATH 750	Cellular and Molecular Biology/ Pathology	
PATH 752	Cellular and Molecular Biology/ Pathology Seminar	
ZOOLOGY/ PSYCH 523	Neurobiology	
ZOOLOGY 570	Cell Biology	
<b>Data Analysis Requirement</b>		<b>3-4</b>
B M I/STAT 541	Introduction to Biostatistics	

B M I/STAT 542	Introduction to Clinical Trials I	
B M I/ COMP SCI 576	Introduction to Bioinformatics	
B M I/ COMP SCI 776	Advanced Bioinformatics	
<b>Engineering Requirement</b>		<b>9</b>
B M E/E C E 462	Medical Instrumentation	
B M E/ MED PHYS 535	Introduction to Energy-Tissue Interactions	
B M E 550	Introduction to Biological and Medical Microsystems	
B M E 602	Special Topics in Biomedical Engineering (Introduction to Neuroengineering)	
B M E 640	Medical Devices Ecosystem: The Path to Product	
B M E 651	Biophotonics Laboratory	
B M E/CHEM/ MED PHYS 750	Biological Optical Microscopy	
<b>Elective credits chosen in consultation with your advisor</b>		<b>3</b>
<b>Total Credits</b>		<b>21-24</b>

### Neuroengineering Pathway<sup>1</sup>

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 pathway 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.

Code	Title	Credits
<b>Data Analysis Requirement</b>		<b>3</b>
COMP SCI 319	Data Science Programming I for Research	
COMP SCI/E C E/ M E 532	Matrix Methods in Machine Learning	
COMP SCI/ E C E 533	Image Processing	
COMP SCI/ B M I 567	Medical Image Analysis	
<b>Engineering Requirement</b>		<b>9</b>
B M E 520	Stem Cell Bioengineering	
B M E 550	Introduction to Biological and Medical Microsystems	
B M E 602	Special Topics in Biomedical Engineering (Introduction to Neuroengineering)	
B M E 640	Medical Devices Ecosystem: The Path to Product	
E C E/B M E 462	Medical Instrumentation	
E C E/B M E 463	Computers in Medicine	
<b>Biology Requirement</b>		<b>3</b>
KINES 721	Neural Basis for Movement	

KINES 861	Principles of Motor Control and Learning	
NTP/ NEURODPT 610	Cellular and Molecular Neuroscience	
NTP/NEURODPT/ PSYCH 611	Systems Neuroscience	
NTP 735		
PSYCH 610	Design and Analysis of Psychological Experiments I	
PSYCH 733	Perceptual and Cognitive Sciences	
ZOOLOGY 625	Development of the Nervous System	
<b>Elective credits chosen in consultation with your advisor</b>		<b>6</b>
<b>Total Credits</b>		<b>21</b>

### Systems & Synthetic Biology Pathway<sup>1</sup>

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

**Students interested in earning a doctoral minor in Quantitative Biology (<http://guide.wisc.edu/graduate/biomedical-engineering/quantitative-biology-doctoral-minor/>):** enrollment in B M E 780 Methods in Quantitative Biology is a requirement. Additionally, students 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 pathway).

Code	Title	Credits
<b>Mathematics Requirement<sup>2</sup></b>		<b>3</b>
MATH 443	Applied Linear Algebra	
MATH 519	Ordinary Differential Equations	
MATH 619	Analysis of Partial Differential Equations	
<b>Biology Requirement</b>		<b>3</b>
BIOCHEM 501	Introduction to Biochemistry	
BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology	
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	
M M & I/PATH- BIO 528	Immunology	
ZOOLOGY 570	Cell Biology	
<b>Data Analysis Requirement</b>		<b>3</b>
B M I/STAT 541	Introduction to Biostatistics	
B M I/ COMP SCI 576	Introduction to Bioinformatics	
COMP SCI 319	Data Science Programming I for Research	
COMP SCI/E C E/ M E 532	Matrix Methods in Machine Learning	
<b>Engineering Requirement</b>		<b>9</b>
B M E 550	Introduction to Biological and Medical Microsystems	



B M E 556	Systems Biology: Mammalian Signaling Networks	
B M E 602	Special Topics in Biomedical Engineering (CRISPR Genome Editing and Engineering Laboratory)	
B M E 780	Methods in Quantitative Biology	
CBE/B M E 560	Biochemical Engineering	
CBE 660	Intermediate Problems in Chemical Engineering	
CBE 781	Biological Engineering: Molecules, Cells & Systems	
CBE/B M E 782	Modeling Biological Systems	
<b>Elective credits chosen in consultation with your advisor</b>		<b>3</b>
<b>Total Credits</b>		<b>21</b>

### Guidelines for students who earned a master's degree in another field at UW-Madison

1. Students who have earned a master's degree in another field at UW-Madison should contact the Associate Chair of the PhD Degree to understand remaining course requirements. A maximum of 7 credits can be counted from a separate MS degree, in compliance with the Graduate School's Double Degrees policy (<https://grad.wisc.edu/documents/double-degrees/>).
2. Master's degree students who have been absent for five or more years lose all degree credits earned before their absence.
3. All students with a prior master's degree will need to complete the Qualifying Exams and Preliminary Exam requirements even if coursework requirements have been met. Please discuss your specific plan with the Associate Chair of the PhD Degree.

### Footnotes

- <sup>1</sup> These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.
- <sup>2</sup> The math requirement can be satisfied with a B- or better in the equivalent course in undergraduate. For approval, please e-mail the Associate Chair of the PhD Degree a copy of your unofficial transcript and indicate the course you are proposing to use. The credits do not transfer; you will instead be able to take an additional 3 credits of electives.

## POLICIES

### GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

## MAJOR-SPECIFIC POLICIES

### PRIOR COURSEWORK

#### Graduate Credits Earned at Other Institutions

A student may transfer graduate coursework from other institutions with program approval. These courses may not be used toward the Graduate School's minimum residence credit requirement (32 credits). Coursework earned ten years or more prior to admission to the PhD program is not allowed to satisfy requirements. Reach out to the Biomedical Engineering Graduate Coordinator for more information.

If a student earned a master's degree at another institution, the following guidelines apply:

1. If the previous degree was a master's in biomedical engineering, the program may transfer up to 18 credits of PhD pathway coursework requirements. Students must fulfill the remaining pathway requirements and then meet the minimum credit requirement to advance to dissertator status (research credits satisfy this minimum).
2. Those with a master's in other fields can earn a Master of Science in Biomedical Engineering at UW-Madison. Only 7 credits of coursework will transfer in this case.
3. All students with a prior master's will still need to complete the Qualifying Exams and Preliminary Exam but may be able to do so at an accelerated pace.
4. Master's degree credits earned ten or more years prior to the initiation of the PhD program cannot be transferred.
5. Students should develop a list of course equivalents between their chosen pathway and courses taken at their prior institution. This list, the syllabi for all courses from the prior institution, and a copy of the unofficial transcript should be provided to the Associate Chair of the PhD Degree for determination of equivalency.

#### Undergraduate Credits Earned at Other Institutions or UW-Madison

A student who has completed their bachelor's degree at UW-Madison may transfer 6 credits of coursework with program approval. These courses must be coursework numbered 400 or above. Credits earned at other institutions are not allowed to transfer. Coursework earned ten or more years prior to admission to a PhD degree is not allowed to satisfy requirements. These courses may not be used toward the Graduate School's minimum residence credit requirement.

#### Credits Earned as a Professional Student at UW-Madison (Law, Medicine, Pharmacy, and Veterinary careers)

Refer to the Graduate School: Transfer Credits for Prior Coursework (<https://policy.wisc.edu/library/UW-1216/>) policy.

#### Credits Earned as a University Special Student at UW-Madison

Refer to the Graduate School: Transfer Credits for Prior Coursework (<https://policy.wisc.edu/library/UW-1216/>) policy.

### PROBATION

Refer to the Graduate School: Probation (<https://policy.wisc.edu/library/UW-1217/>) policy.

### ADVISOR / COMMITTEE

Advisor: Every Biomedical Engineering graduate student must have a faculty advisor. A faculty advisor provides the student with academic

guidance in their course program and research oversight in their thesis. The advisor must be a primary Biomedical Engineering faculty or a Biomedical Engineering affiliate; if the advisor is a Biomedical Engineering affiliate, the student must identify a primary Biomedical Engineering faculty to serve as co-advisor within their first semester. Graduate students should always seek advice from their advisor and/or co-advisor prior to enrolling for courses.

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

- Committees consist of at least 5 members (one more than the Graduate School's requirement of four)
- The student's advisor(s) must be on the committee
- A minimum of two primary Biomedical Engineering faculty must be on the committee
- The PhD committee chair must be a primary Biomedical Engineering faculty – either the student's advisor or their co-advisor (if the advisor is an affiliate)
- At least one member must be from outside of the primary Biomedical Engineering faculty.
- The PhD committee chair must approve the other members of the committee and any committee changes.
- Students must have a yearly committee meeting after passing the preliminary exam.

## CREDITS PER TERM ALLOWED

15 credits

## TIME LIMITS

Students typically complete their degree within six years of entering the program.

Within two years of entering their program, students are required to pass a comprehensive qualifying examination.

Within three years of entering their program, students are required to prepare for a preliminary examination.

## GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
  - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employee disabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)

- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office Student Assistance and Support (OSAS) (<https://osas.wisc.edu/>) (for all students to seek grievance assistance and support)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

## BME 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.

### 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.

### OTHER

n/a

## PROFESSIONAL DEVELOPMENT

### PROFESSIONAL DEVELOPMENT GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (<https://grad.wisc.edu/pd/>) to build skills, thrive academically, and launch your career.

### PROGRAM RESOURCES

#### The Individual Development Plan (IDP)

An Individual Development Plan (IDP) (<https://grad.wisc.edu/pd/idp/>) helps graduate students and postdoctoral researchers:

- assess current skills, interests, and strengths;
- make a plan for developing skills to meet academic and professional goals; and
- communicate with supervisors, advisors, and mentors about evolving goals and related skills.

The IDP is a document to be revisited again and again, to update and refine as goals change and/or come into focus, and to record progress and accomplishments.

The university **recommends** IDPs for all postdoctoral researchers and graduate students, and **requires** IDPs for all postdoctoral researchers and graduate students supported by National Institutes of Health (NIH) funding. See the Graduate School for more information and IDP resources (<https://grad.wisc.edu/pd/idp/>).

#### Engineering Career Services

The Engineering Career Services (<https://ecs.wisc.edu/>) staff offers assistance to students searching or preparing for internships, co-ops, and jobs with well-recognized organizations.

#### The Writing Center

The Writing Center (<https://writing.wisc.edu/>) is a campus-wide organization that provides free of charge, face-to-face and online consultations for students writing papers, reports, resumes, and applications.

## LEARNING OUTCOMES

### LEARNING OUTCOMES

1. Demonstrate an ability to synthesize knowledge from a subset of the biological and physical sciences.
2. Conduct original research.

3. Demonstrate an ability to create new knowledge and communicate it to their peers.
4. Foster ethical and professional conduct.

## PEOPLE

### PEOPLE FACULTY

Paul Campagnola (Chair)  
 Randolph Ashton  
 Randy Bartels  
 David Beebe  
 Walter Block  
 Christopher Brace  
 Joshua Brockman  
 Kevin Eliceiri  
 Shaoqin 'Sarah' Gong  
 Aviad Hai  
 Pamela Kreeger  
 Wan-ju Li  
 Kip Ludwig  
 Megan McClean  
 Beth Meyerand  
 William Murphy  
 Krishanu Saha  
 Melissa Skala  
 Darryl Thelen  
 Pallavi Tiwari  
 Justin Williams  
 Colleen Witzenburg  
 Filiz Yesilkoy

### INSTRUCTIONAL STAFF AND TEACHING FACULTY

Amit Nimunkar  
 John Puccinelli  
 Tracy Jane Puccinelli  
 Darilis Suarez-Gonzalez  
 Christa Wille

See also Biomedical Engineering Faculty Directory (<http://directory.engr.wisc.edu/bme/>).