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

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/).

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 1</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>September 1</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>December 1</td>
</tr>
<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>Not required.</td>
</tr>
</tbody>
</table>

English Proficiency Test

Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (https://grad.wisc.edu/apply/requirements/#english-proficiency).

Other Test(s) (e.g., GMAT, MCAT) | n/a
Letters of Recommendation Required | 3

Applications 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/). Students admitted to the program may be required to make up deficiency course requirements.

To apply to the BME program, complete applications (https://grad.wisc.edu/apply/), including supportive materials, must be submitted as described below and received by the following deadline dates:

- Fall Semester—December 1
- Spring Semester—September 1
- Summer Session¹—December 1

¹Please note that summer admissions are generally limited to continuing BME 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 after an applicant is recommended for admission. Please do not send transcripts or any other application materials to the Graduate School or the BME department unless requested. If you have questions, please contact bmegradadmission@engr.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 BME 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 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 BME 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) or debit/ATM. This fee cannot be waived or deferred. Fee grants are available through the Graduate School under certain conditions.

**CURRICULAR REQUIREMENTS**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Credit Requirement</td>
<td>60 credits</td>
</tr>
<tr>
<td>Minimum Residence Credit Requirement</td>
<td>32 credits</td>
</tr>
<tr>
<td>Minimum Graduate Coursework Requirement</td>
<td>30 credits must be graduate-level coursework. Details can be found in the Graduate School’s Minimum Graduate Coursework. Coursework (50%) policy (<a href="https://policy.wisc.edu/library/UW-1244/">https://policy.wisc.edu/library/UW-1244/</a>).</td>
</tr>
<tr>
<td>Overall Graduate GPA Requirement</td>
<td>3.00 GPA required. This program follows the Graduate School’s GPA Requirement policy (<a href="https://policy.wisc.edu/library/UW-1203/">https://policy.wisc.edu/library/UW-1203/</a>).</td>
</tr>
<tr>
<td>Other Grade Requirements</td>
<td>n/a</td>
</tr>
<tr>
<td>Assessments and Examinations Requirement</td>
<td>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.</td>
</tr>
<tr>
<td>Language Requirements</td>
<td>No language requirements.</td>
</tr>
<tr>
<td>Graduate School Breadth Requirement</td>
<td>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 Ph.D. 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.</td>
</tr>
</tbody>
</table>

**FUNDING**

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.

**MAJOR REQUIREMENTS**

**MODE OF INSTRUCTION**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face to Face</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Required Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Credits (B M E 790, 890, 990)</td>
<td>at least 30</td>
<td></td>
</tr>
<tr>
<td>Coursework, including:</td>
<td>at least 25</td>
<td></td>
</tr>
<tr>
<td>2 semesters of B M E 701</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**PROGRAM RESOURCES**

Students admitted to the BME 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/policiesandrequirementstext), in addition to the program requirements listed below.

**REQUIREMENTS**

**FACE TO FACE**

Courses typically meet during weekdays on the UW–Madison campus only.

**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.

**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.
BME 703: Responsible Conduct of Research for Biomedical Engineers 2

One set of Ph.D. pathway requirements (credits vary; see below).

Total Credits: 60

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

Biomaterials & Tissue Engineering Pathway

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRB 640</td>
<td>Fundamentals of Stem Cell and Regenerative Biology</td>
<td>3</td>
</tr>
<tr>
<td>CRB 650</td>
<td>Molecular and Cellular Organogenesis</td>
<td></td>
</tr>
<tr>
<td>M M &amp; I/PATH-BIO 528</td>
<td>Immunology</td>
<td></td>
</tr>
<tr>
<td>ZOOLOGY 570</td>
<td>Cell Biology</td>
<td></td>
</tr>
</tbody>
</table>

Data Analysis Requirement

- B M I/STAT 541: Introduction to Biostatistics 3
- B M I/COMP SCI 776: Advanced Bioinformatics 3
- COMP SCI 765: Data Visualization 3
- STAT/F&W ECOL/HORT 571: Statistical Methods for Bioscience I 3
- STAT/B M I 877: Statistical Methods for Molecular Biology 3

Engineering Requirement

- B M E/PHM SCI 430: Biological Interactions with Materials 9
- B M E 510: Introduction to Tissue Engineering 9
- B M E 511: Tissue Engineering Laboratory 9
- B M E 520: Stem Cell Bioengineering 9
- B M E 545: Engineering Extracellular Matrices 9
- B M E 550: Introduction to Biological and Medical Microsystems 9
- B M E 602: Special Topics in Biomedical Engineering (CRISPR Genome Editing and Engineering Laboratory) 9
- CBE 540: Polymer Science and Technology 9
- CBE 562: Special Topics in Chemical Engineering (Cellular Biomanufacturing) 9
- CBE 648: Synthetic Organic Materials in Biology and Medicine 9

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBE 78I</td>
<td>Biological Engineering: Molecules, Cells &amp; Systems</td>
<td></td>
</tr>
<tr>
<td>M S &amp; E 521</td>
<td>Advanced Polymeric Materials</td>
<td></td>
</tr>
</tbody>
</table>

Elective credits chosen in consultation with your advisor 6

Total Credits: 21-22

Biomedical Imaging & Optics Pathway

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 443</td>
<td>Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>ANAT&amp;PHY 335</td>
<td>Physiology</td>
<td>3-5</td>
</tr>
<tr>
<td>BIOCHEM 501</td>
<td>Introduction to Biochemistry</td>
<td></td>
</tr>
<tr>
<td>ZOOLOGY 570</td>
<td>Cell Biology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP SCI/E C E/ M E 532</td>
<td>Matrix Methods in Machine Learning</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 766</td>
<td>Computer Vision</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/ B M I 767</td>
<td>Computational Methods for Medical Image Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Engineering Requirement

- B M E/MED PHYS 530: Medical Imaging Systems 9
- B M E/MED PHYS 573: Mathematical Methods in Medical Physics 9
- B M E/MED PHYS 574: Data Science in Medical Physics 9
- B M E/MED PHYS 578: Non-Ionizing Diagnostic Imaging 9
- B M E 651: Biophotonics Laboratory 9
- B M E/MED PHYS/PHMCOL-M/PHYSICS/RADIOL 619: Microscopy of Life 9
- B M E/MED PHYS 710: Advances in Medical Magnetic Resonance 9
- B M E/CHEM/MED PHYS 750: Biological Optical Microscopy 9
- B M E 751: Biomedical Optics and Biophotonics 9
- B M E 780: Methods in Quantitative Biology 9
- MED PHYS/B M E/H ONCOL/PHYSICS 501: Radiation Physics and Dosimetry 9
- MED PHYS/B M E 580: The Physics of Medical Imaging with Ionizing Radiation 9
Biomedical Engineering, Ph.D.

**MED PHYS 777**  
Principles of X-ray Computed Tomography

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

**Total Credits**  
21-23

### Biomechanics Pathway

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>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.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B M E/M E 414</td>
<td>Orthopaedic Biomechanics - Design of Orthopaedic Implants</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 415</td>
<td>Biomechanics of Human Movement</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 505</td>
<td>Biofluidics</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 516</td>
<td>Finite Elements for Biological and Other Soft Materials</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 603</td>
<td>Topics in Bio-Medical Engineering (Image-Based Biomechanics)</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 615</td>
<td>Tissue Mechanics</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 715</td>
<td>Advanced Tissue Mechanics</td>
<td></td>
</tr>
<tr>
<td><strong>Advanced Mechanics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M E 440</td>
<td>Intermediate Vibrations</td>
<td></td>
</tr>
<tr>
<td>M/E/CIV ENGR/ E M A 508</td>
<td>Composite Materials</td>
<td></td>
</tr>
<tr>
<td>M/E M A 540</td>
<td>Experimental Vibration and Dynamic System Analysis</td>
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</tr>
<tr>
<td>M E 563</td>
<td>Intermediate Fluid Dynamics</td>
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</tr>
<tr>
<td>M/E M A 570</td>
<td>Experimental Mechanics</td>
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</tr>
<tr>
<td>M E 573</td>
<td>Computational Fluid Dynamics</td>
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</tr>
<tr>
<td>E M A 506</td>
<td>Advanced Mechanics of Materials I</td>
<td></td>
</tr>
<tr>
<td>E M A 519</td>
<td>Fracture Mechanics</td>
<td></td>
</tr>
<tr>
<td>E M A/ M S &amp; E 541</td>
<td>Heterogeneous and Multiphase Materials</td>
<td></td>
</tr>
<tr>
<td>E M A 545</td>
<td>Mechanical Vibrations</td>
<td></td>
</tr>
<tr>
<td>E M A 605</td>
<td>Introduction to Finite Elements</td>
<td></td>
</tr>
<tr>
<td>E M A/E P 615</td>
<td>Micro- and Nanoscale Mechanics</td>
<td></td>
</tr>
<tr>
<td>E M A 622</td>
<td>Mechanics of Continua</td>
<td></td>
</tr>
<tr>
<td>E M A 630</td>
<td>Viscoelastic Solids</td>
<td></td>
</tr>
<tr>
<td>E M A 700</td>
<td>Theory of Elasticity</td>
<td></td>
</tr>
<tr>
<td><strong>Biosciences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANAT&amp;PHY 335</td>
<td>Physiology</td>
<td>3-5</td>
</tr>
<tr>
<td>ANAT&amp;PHY 435</td>
<td>Fundamentals of Human Physiology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ GENETICS/ MD GENET 620</td>
<td>Eukaryotic Molecular Biology</td>
<td></td>
</tr>
</tbody>
</table>

### Medical & Microdevices Pathway

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
</table>
|            | **Mathematics Requirement**  
2|                                          | 3       |
| MATH 443   | Applied Linear Algebra                     |         |
| MATH 519   | Ordinary Differential Equations            |         |
| MATH 619   | Analysis of Partial Differential Equations  |         |
|            | **Biology Requirement**                    | 3-5     |
| 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   |         |
| ZOOLOGY/ PSYCH 523 | Neurobiology                             |         |
| ZOOLOGY 570 | Cell Biology                               |         |
|            | **Data Analysis Requirement**              | 3-4     |
| 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                   |         |
|            | **Engineering Requirement**                | 9       |
| B M E/C E 462 | Medical Instrumentation                   |         |
| B M E 515   | Therapeutic Medical Devices                |         |
| 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              |         |
Elective credits chosen in consultation with your advisor 3

Total Credits 21-24

Neuroengineering Pathway

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP SCI 319</td>
<td>Data Science Programming I for Research</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/ECE/ME 532</td>
<td>Matrix Methods in Machine Learning</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/ECE 533</td>
<td>Image Processing</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/BME 567</td>
<td>Medical Image Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Engineering Requirement 9

BME 515  Therapeutic Medical Devices
BME 520  Stem Cell Bioengineering
BME 550  Introduction to Biological and Medical Microsystems
BME 602  Special Topics in Biomedical Engineering (Introduction to Neuroengineering)
BME 640  Medical Devices Ecosystem: The Path to Product
ECE/BME 462  Medical Instrumentation
ECE/BME 463  Computers in Medicine

Biology Requirement 3

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/NEUROL 735  Neurobiology of Disease
PSYCH 610  Design and Analysis of Psychological Experiments I
PSYCH 733  Perceptual and Cognitive Sciences
ZOOLOGY 625  Development of the Nervous System

Elective credits chosen in consultation with your advisor 6

Total Credits 21

Systems & Synthetic Biology Pathway

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 BME 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).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 443</td>
<td>Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 519</td>
<td>Ordinary Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 619</td>
<td>Analysis of Partial Differential Equations</td>
<td></td>
</tr>
</tbody>
</table>

Biology Requirement 3

BIOCHEM 501  Introduction to Biochemistry
BIOCHEM/GENETICS/MICROBIO 612  Prokaryotic Molecular Biology
BIOCHEM/GENETICS/MD GENET 620  Eukaryotic Molecular Biology
M & I/PATH-BIO 528  Immunology
ZOOLOGY 570  Cell Biology

Data Analysis Requirement 3

BME 550  Introduction to Biological and Medical Microsystems
BME 556  Systems Biology: Mammalian Signaling Networks
BME 602  Special Topics in Biomedical Engineering (CRISPR Genome Editing and Engineering Laboratory)
BME 780  Methods in Quantitative Biology
CBE/BME 560  Biochemical Engineering
CBE 660  Intermediate Problems in Chemical Engineering
CBE 781  Biological Engineering: Molecules, Cells & Systems
CBE/BME 782  Modeling Biological Systems

Elective credits chosen in consultation with your advisor 3

Total Credits 21
**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**

1. 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.

2. The math requirement can be waived by a B- or better in the equivalent course in undergraduate. To request this waiver, 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 Work from 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 Graduate Residence Credit at UW-Madison (32 credits). Coursework earned five years or more prior to admission to the PhD program is not allowed to satisfy requirements. Reach out to the BME 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 BME the program may transfer up to 18 credits of PhD pathway coursework requirements. Students must fulfill the remaining pathway requirements and then meet the 32 credit minimum at UW-Madison in order to advance to dissertation status (research credits count towards this minimum).
2. Those with a master’s in other fields can earn a Master of Science in BME at UW-Madison; only 7 credits of coursework will be transferred 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 five 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.

**UW-Madison Undergraduate**

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. Coursework earned five or more years prior to admission to a Ph.D. degree is not allowed to satisfy requirements. These courses may not be used toward the Graduate School’s Minimum Graduate Residence Credit.

**UW-Madison University Special**

This program follows the Graduate School’s policy for Transfer from UW-Madison University Special Student Career at UW–Madison. (https://policy.wisc.edu/library/UW-1216/)

**PROBATION**

This program follows the Graduate School’s Probation policy. (https://policy.wisc.edu/library/UW-1217/)

**ADVISOR / COMMITTEE**

Adviser: Every BME 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 BME faculty or a BME affiliate; if the advisor is a BME affiliate, the student must identify a primary BME 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, BME has department-specific criteria that Ph.D. 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 BME faculty must be on the committee
- The Ph.D. committee chair must be a primary BME 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 BME faculty
- The Ph.D. 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/)
- Dean of Students Office (https://doso.students.wisc.edu/) (for all students to seek grievance assistance and support)
- 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://employeedisabilities.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 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

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

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

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

FACULTY

Paul Campagnola (Chair)
Randolph Ashton
David Beebe
Walter Block
Christopher Brace
Kevin Eliceiri
Shaoqin ‘Sarah’ Gong
Aviad Hai
Melissa Kinney
Pamela Kreeger
Wan-ju Li
Kip Ludwig
Kristyn Masters
Megan McClean
Beth Meyerand
William Murphy
Krishanu Saha
Melissa Skala
Darryl Thelen
Justin Williams
Colleen Witzenburg
Filiz Yesilkoy

INSTRUCTIONAL STAFF AND TEACHING FACULTY

Amit Nimunkar
John Puccinelli
Tracy Jane Puccinelli
Darilis Suarez-Gonzalez
Aaron Suminski

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