This is a course-based named option within the Biomedical Engineering M.S. (http://guide.wisc.edu/graduate/biomedical-engineering/biomedical-engineering-ms)

The Biomedical Innovation, Design, and Entrepreneurship named option in the Biomedical Engineering M.S. program is 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, student will be prepared for careers at the interface of engineering and business.

A Admissions

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

<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>October 1</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>December 1</td>
</tr>
<tr>
<td>GRE (Graduate Record Exams)</td>
<td>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)

The MCAT may be accepted as an alternate to the GRE.

Letters of Recommendation

Required

* Not required for continuing UW-Madison BME BS students.

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 2019 Semester—December 1 (Ph.D.), January 1 (MS)
- Starting Fall 2020 Semester—December 1 (MS and Ph.D.)
- Spring Semester—October 1 (MS and Ph.D.)

OFFICIAL ACADEMIC TRANSCRIPT

Electronic submit one copy of your official transcript of all undergraduate and previous graduate work along with your online application to the Graduate School. Unofficial copies of transcripts will be accepted for review, but official copies are required for admitted students. Please do not send transcripts or any other application materials to the Graduate School or the BME department. If you have questions, please contact bmegradadmission@engr.wisc.edu.

GRADUATE RECORD EXAMINATION (GRE)

Applicants should request ETS to send their official GRE scores by using institution code 1846 and department code 1603.

MCAT scores may be substituted for GRE. Domestic applicants who choose to substitute MCAT scores for the GRE should send their MCAT score report to bmegradadmission@engr.wisc.edu.

TEST OF ENGLISH AS A FOREIGN LANGUAGE (TOEFL)

The TOEFL is required for international students unless a degree from a U.S. educational institution is held. Scores should be forwarded using institution code 1846 and department code 69.

An applicant whose TOEFL (paper-based) test score is below 580; TOEFL computer-based test (CBT) score below 237; (TOEFL internet-based iBT) test score below 92; IELTS score below 7; or MELAB below 82 must take an English assessment test upon arrival. Depending on your score, you may need to register for any recommended English as a Second Language (ESL) courses in the first semester you are enrolled.

Any international applicant who will hold a teaching assistantship (TA), and whose native language is not English must take the SPEAK test (https://esl.wisc.edu/ita-training/speak) when arriving on campus.

THREE LETTERS OF RECOMMENDATIONS

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 (FOR PH.D. APPLICATIONS ONLY)**
Include your resume ONLY if applying for the Ph.D. program.

**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. By state law, this fee can only be waived or deferred through the conditions outlined here by the Graduate School (https://grad.wisc.edu/apply/fee-grant).

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

**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 processes related to funding.

**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.

**NAMED OPTION REQUIREMENTS**

**MODE OF INSTRUCTION**

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

**Mode of Instruction Definitions**

**Evening/Weekend:** These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

**CURRICULAR REQUIREMENTS**

**Requirements Detail**

<table>
<thead>
<tr>
<th>Minimum Credit Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 credits</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum Residence Credit Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 credits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum Graduate Coursework Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half of degree coursework (15 credits out of 30 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (<a href="https://registrar.wisc.edu/course-guide/">https://registrar.wisc.edu/course-guide/</a>).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Graduate GPA Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00 GPA required.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Grade Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessments and Examinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are no degree-specific assessments and examinations outside of those given in individual courses. If an M.S. student should decide to extend their studies and pursue a Ph.D. in BME, they will need to take Qualifying and Preliminary Examinations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
</tr>
</tbody>
</table>

**REQUIRED COURSES**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>B M E 515</td>
<td>Therapeutic Medical Devices</td>
<td>1</td>
</tr>
<tr>
<td>B M E 601</td>
<td>Special Topics in Biomedical Engineering</td>
<td>1.5</td>
</tr>
<tr>
<td>B M E/M E 603</td>
<td>Topics in Bio-Medical Engineering</td>
<td>1.5</td>
</tr>
<tr>
<td>M E 449</td>
<td>Redesign and Prototype Fabrication</td>
<td>3</td>
</tr>
<tr>
<td>M E 514</td>
<td>Additive Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>M E 549</td>
<td>Product Design</td>
<td>3</td>
</tr>
</tbody>
</table>
Biomedical Engineering: Biomedical Innovation, Design, and Entrepreneurship, M.S.

M E 601  Special Topics in Mechanical Engineering  1-3
M E/I SY E 641  Design and Analysis of Manufacturing Systems  3
M E 748  Optimum Design of Mechanical Elements and Systems  3
I SY E 415  Introduction to Manufacturing Systems, Design and Analysis  3
I SY E 515  Engineering Management of Continuous Process Improvement  3
I SY E 552  Human Factors Engineering Design and Evaluation  3
INTEREGR 601  Topics in Interdisciplinary Engineering  1-3

9 credits of general business, entrepreneurship and strategic innovation courses:
GEN BUS 310  Fundamentals of Accounting and Finance for Non-Business Majors  3
GEN BUS 311  Fundamentals of Management and Marketing for Non-Business Majors  3
M H R/A A E 540  Intellectual Property Rights, Innovation and Technology  3
M H R 715  Strategic Management of Innovation  3
M H R 722  Entrepreneurial Management  3
M H R 734  Venture Creation  3
M H R 738  Weinert Applied Ventures in Entrepreneurship (WAVE)  3
R M I 650  Sustainability, Environmental and Social Risk Management  3

At most, 6 credits of other technical elective engineering courses:
B M E/M E 415  Biomechanics of Human Movement  3
B M E/PHM SCI 430  Biological Interactions with Materials  3
B M E/E C E 462  Medical Instrumentation  3
B M E/E C E 463  Computers in Medicine  3
B M E/E M 505  Biofluidics  3
B M E/CBE 510  Introduction to Tissue Engineering  3
B M E 511  Tissue Engineering Laboratory  1
B M E/CBE 520  Stem Cell Bioengineering  3
B M E/ MED PHYS 530  Medical Imaging Systems  3
B M E/ MED PHYS 535  Introduction to Energy-Tissue Interactions  3
B M E 545  Engineering Extracellular Matrices  3
B M E 550  Introduction to Biological and Medical Microsystems  3
B M E 556  Systems Biology: Mammalian Signaling Networks  3
B M E/ MED PHYS 573  Medical Image Science: Mathematical and Conceptual Foundations  3
B M E/ MED PHYS 574  Imaging in Medicine: Applications  3
B M E/ MED PHYS 578  Non-Ionizing Diagnostic Imaging  3
B M E/M E 615  Tissue Mechanics  3
B M E/ANATOMY/MED PHYS/PHMCOL-M/PHYSICS/RADIOL 619  Microscopy of Life  3
B M E/CHEM/MED PHYS 650  Biological Optical Microscopy  3
B M E/CBE 560  Biochemical Engineering  3
CBE 540  Polymer Science and Technology  3
E C E/COMP SCI/I SY E 524  Introduction to Optimization  3
E C E/COMP SCI 533  Image Processing  3
E C E/COMP SCI/M E 539  Introduction to Artificial Neural Network and Fuzzy Systems  3
M E 563  Intermediate Fluid Dynamics  3
M E/M A 570  Experimental Mechanics  3
M E 573  Computational Fluid Dynamics  3
M S & E 521  Advanced Polymeric Materials  3
At most, 3 credits of advanced design or research project:
B M E 799  Advanced Independent Study  1-5

Additional 3-12 credits taken in consultation with advisor

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.

NAMED OPTION-SPECIFIC POLICIES

GRADUATE PROGRAM HANDBOOK

The Graduate Program Handbook (https://www.engr.wisc.edu/app/uploads/2016/01/bme_grad_handbook_2017-2.pdf) is the repository for all of the program’s policies and requirements.

PRIOR COURSEWORK

Graduate Work from Other Institutions

With program approval, students are allowed to count graduate coursework from other institutions toward the minimum graduate degree credit requirement and the minimum graduate coursework (50%) requirement. No credits from other institutions can be counted toward the minimum graduate residence credit requirement. Course work earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

UW–Madison Undergraduate

With program approval, students are allowed to count up to 7 credits numbered 300 or above graduate coursework...
from UW-Madison taken in excess of undergraduate degree requirements toward the minimum graduate degree credit requirement; if that coursework is numbered 700 or above it may be used to satisfy the minimum graduate coursework (50%) requirement. No credits can be counted toward the minimum graduate residence credit requirements. Course work earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

UW–Madison University Special
With program approval and payment of the difference in tuition (between Special and graduate tuition), students are allowed to count up to 15 credits of coursework numbered 300 or above taken as a UW–Madison Special student toward the minimum graduate residence credit requirement and the minimum graduate degree credit requirement; if that coursework is numbered 700 or above it may be used to satisfy the minimum graduate coursework (50%) requirement.

PROBATION
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE
Every BME graduate student must have a faculty advisor. A faculty advisor provides the graduate student with academic guidance in their course program and research oversight in their thesis, project, or engineering report. Graduate students should always seek advice from their advisor and other faculty in their interest area prior to enrolling for courses.

CREDITS PER TERM ALLOWED
15 credits maximum

TIME CONSTRAINTS
Master’s degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

OTHER
Students enrolled in this program are not permitted to accept teaching assistantships, project assistantships, research assistantships or other appointments that would result in a tuition waiver without department approval. Students in this program may not take courses outside the prescribed curriculum without faculty advisor approval. Students in this program cannot enroll concurrently in other undergraduate, graduate or certificate programs.

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.

PEOPLE

FACULTY
See also BME Faculty Directory (https://directory.engr.wisc.edu/bme/faculty)

PROFESSORS
- Justin Williams (Chair)
- David Beebe
- Walter Block
- Paul Campagnola
- Naomi Chesler
- Shaoqin (Sarah) Gong
- Kristyn Masters
- Beth Meyerand
• William Murphy
• Darryl Thelen

ASSISTANT PROFESSORS
• Randolph Ashton
• Aviad Hai
• Melissa Kinney
• Megan McClean
• Jeremy Rogers
• Krishanu Saha
• Colleen Witzenburg

ASSOCIATE PROFESSORS
• Christopher Brace
• Pamela Kreeger
• Wan-ju Li
• Kip Ludwig
• Melissa Skala

FACULTY ASSOCIATES
• Amit Nimunkar
• John Puccinelli
• Tracy Jane Puccinelli
• Darilis Suarez-Gonzalez
• Aaron Suminski
• Mitchell Tyler

EMERITUS
• Ed Bersu
• Willis Tompkins
• John Webster