BIOMEDICAL ENGINEERING: BIOMEDICAL INNOVATION, DESIGN, AND ENTREPRENEURSHIP, M.S.

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.

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 15</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>October 1</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>GRE (Graduate Record</td>
<td>Not required.</td>
</tr>
<tr>
<td>Examinations)</td>
<td></td>
</tr>
<tr>
<td>English Proficiency</td>
<td>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 (<a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a>).</td>
</tr>
<tr>
<td>Test(s) (e.g., GMAT,</td>
<td>n/a</td>
</tr>
<tr>
<td>MCAT)</td>
<td></td>
</tr>
<tr>
<td>Letters of Recommendation Required</td>
<td>3*</td>
</tr>
<tr>
<td>* Not required for applicants with a UW–Madison Biomedical Engineering bachelor’s degree.</td>
<td></td>
</tr>
</tbody>
</table>

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 deadline.

OFFICIAL ACADEMIC TRANSCRIPT

Electronically submit one copy of your 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 unless requested. If you have questions, please contact 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 sent using institution code 1846.

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 (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. 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 restrictions 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>Mode of Instruction Definitions</th>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students are able to complete a program with minimal disruptions to careers and other commitments.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>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.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>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.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

CURRICULAR REQUIREMENTS
Requirements Detail

| Minimum Residence Credit Requirement | 16 credits |
| Minimum Graduate Coursework Requirement | 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 (https://registrar.wisc.edu/course-guide/). |
| Overall Graduate GPA Requirement | 3.00 GPA required. |
| Other Grade Requirements | 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. |
| Assessments and Examinations | There are no degree-specific assessments and examinations outside of those given in individual courses. |
| Language Requirements | n/a |

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>9</td>
</tr>
<tr>
<td>B M E 601</td>
<td>Special Topics in Biomedical Engineering</td>
<td></td>
</tr>
<tr>
<td>B M E 602</td>
<td>Special Topics in Biomedical Engineering</td>
<td></td>
</tr>
<tr>
<td>B M E/M E 603</td>
<td>Topics in Bio-Medical Engineering</td>
<td></td>
</tr>
<tr>
<td>B M E/I SY E 662</td>
<td>Design and Human Disability and Aging</td>
<td></td>
</tr>
<tr>
<td>M E 449</td>
<td>Redesign and Prototype Fabrication</td>
<td></td>
</tr>
<tr>
<td>M E 514</td>
<td>Additive Manufacturing</td>
<td></td>
</tr>
<tr>
<td>M E 549</td>
<td>Product Design</td>
<td></td>
</tr>
<tr>
<td>M E 601</td>
<td>Special Topics in Mechanical Engineering</td>
<td></td>
</tr>
<tr>
<td>M E/I SY E 641</td>
<td>Design and Analysis of Manufacturing Systems</td>
<td></td>
</tr>
<tr>
<td>M E 748</td>
<td>Optimum Design of Mechanical Elements and Systems</td>
<td></td>
</tr>
<tr>
<td>I SY E 415</td>
<td>Introduction to Manufacturing Systems, Design and Analysis</td>
<td></td>
</tr>
<tr>
<td>I SY E 515</td>
<td>Engineering Management of Continuous Process Improvement</td>
<td></td>
</tr>
<tr>
<td>I SY E 517</td>
<td>Decision Making in Health Care</td>
<td></td>
</tr>
<tr>
<td>I SY E 552</td>
<td>Human Factors Engineering Design and Evaluation</td>
<td></td>
</tr>
<tr>
<td>I SY E 557</td>
<td>Human Factors Engineering for Healthcare Systems</td>
<td></td>
</tr>
<tr>
<td>I SY E 601</td>
<td>Special Topics in Industrial Engineering</td>
<td></td>
</tr>
</tbody>
</table>
Biomedical Engineering: Biomedical Innovation, Design, and Entrepreneurship, M.S.

I SY E 602 Special Topics in Human Factors
I SY E 603 Special Topics in Engineering Analytics and Operations Research
I SY E 604 Special Topics in Manufacturing and Supply Chain Management
I SY E 606 Special Topics in Healthcare Systems Engineering
INTEREGR 477 Tools for Prototyping and Manufacturing
INTEREGR 601 Topics in Interdisciplinary Engineering

9 credits of general business, entrepreneurship and strategic innovation courses:

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

At most, 6 credits of other technical elective engineering courses:

B M E/MED PHYS/MEDICAL PHYSICS/RADIOL 619 Biomechanics of Human Movement
B M E/PHM SCI 430 Biological Interactions with Materials
B M E/E C E 462 Medical Instrumentation
B M E/E C E 463 Computers in Medicine
B M E/M E 505 Biofluidics
B M E/CBE 510 Introduction to Tissue Engineering
B M E 511 Tissue Engineering Laboratory
B M E/CBE 520 Stem Cell Bioengineering
B M E/MED PHYS 530 Medical Imaging Systems
B M E/MED PHYS 535 Introduction to Energy-Tissue Interactions
B M E 545 Engineering Extracellular Matrixes
B M E 550 Introduction to Biological and Medical Microsystems
B M E 556 Systems Biology: Mammalian Signaling Networks
B M E/CBE 560 Biochemical Engineering
B M E/MED PHYS 573 Medical Image Science: Mathematical and Conceptual Foundations
B M E/MED PHYS 574 Imaging in Medicine: Applications
B M E/MED PHYS 578 Non-Ionizing Diagnostic Imaging
B M E/M E 615 Tissue Mechanics

At most, 3 credits of advanced design or research project:

B M E 799 Advanced Independent Study

Additional credits taken in consultation with advisor

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.

NAMED OPTION-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. Coursework earned five years or more prior to admission to the master’s program is not allowed to satisfy requirements. Reach out to the BME Graduate Coordinator for more information.

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 level or above. Coursework earned five or more years prior to admission to a M.S. 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
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
The MS BIDES is typically completed in less than 18 months.

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.

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
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 (DDEA)
- 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**

Due to the accelerated, course-based nature of the Biomedical Innovation, Design, and Entrepreneurship program, **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 BME Biomedical Innovation, Design, and Entrepreneurship student 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 program, Darilis Suarez-Gonzalez and provide details on the funded position. Dr. Suarez-Gonzalez 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.

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**

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
Jeremy Rogers
Krishanu Saha
Melissa Skala
Darryl Thelen
Justin Williams
Colleen Witzenburg
Filiz Yesilkoy

**INSTRUCTIONAL STAFF AND FACULTY ASSOCIATES**

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

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