MASTER OF BIOENGINEERING (MBE) DEGREE

Program Learning Outcomes for the MBE Degree

Program Learning Outcomes for the Applied Bioengineering Track

Upon completing the MBE degree, students pursuing the Applied Bioengineering track requirements will be able to:

1. Apply and integrate advanced knowledge of Bioengineering topics in at least one of the following areas: Biomaterials and Drug Delivery, Biomedical Imaging and Diagnostics, Computational and Theoretical Bioengineering, Tissue Engineering and Biomechanics, or Systems and Synthetic Biology.
2. Apply knowledge from engineering and other disciplines to identify, formulate, and solve novel and complex problems that require advanced knowledge in bioengineering.
3. Select and apply quantitative analytic techniques to analyze bioengineering data.
4. Gain admission to a graduate or professional program, if students want to pursue further education.

Program Learning Outcomes for the Global Medical Innovation Track

Upon completing the MBE degree, students pursuing the Global Medical Innovation track requirements will be able to:

1. Apply knowledge of Bioengineering topics in at least one of the following areas: Biomaterials and Drug Delivery, Biomedical Imaging and Diagnostics, Computational and Theoretical Bioengineering, Tissue Engineering and Biomechanics, or Systems and Synthetic Biology.
2. Develop effective medical products, from concept to commercialization, within a team environment.
3. Comprehend and navigate the global medical technology industry by leveraging an internship experience.
4. Gain employment or advance professionally in a technical field related to bioengineering.

Requirements for the MBE Degree

The MBE degree is a non-thesis master’s degree. For general university requirements, please see Non-Thesis Master’s Degrees (ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-non-thesis-masters-degrees). For additional requirements, regulations, and procedures for all graduate programs, please see All Graduate Students (ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees). Students pursuing the MBE degree must complete:

- A minimum of 30 credit hours to satisfy degree requirements.
- A minimum of 30 credit hours of graduate-level study (coursework at the 500-level or above).
- A minimum of 24 credit hours must be taken at Rice University.
- A minimum residency enrollment of one fall or spring semester of part-time graduate study at Rice University.

- The requirements for one area of specialization (see below for areas of specialization). The MBE degree program offers two areas of specialization, or tracks:
  - Applied Bioengineering: designed as a flexible degree for students who will pursue careers in research, medicine, or related fields, or
  - Global Medical Innovation: designed specifically for students who will pursue a career in the global medical technology industry. As the medical technology industry becomes increasingly global with an emphasis in cost-effective health care solutions and clinical outcomes, Rice University seeks to prepare engineers for this new and changing environment. This track of the MBE degree is designed to prepare engineers for careers in medical technology through education in innovation, emerging-market design projects and internships. The Rice MBE track in Global Medical Innovation program specifically targets students who have an undergraduate degree in engineering (mechanical, electrical, chemical, or bioengineering/medical) or a related field, and who are interested in pursuing a career in the private, public, or non-profit sectors of medical technology.
  - A minimum overall GPA of 2.67.
  - A minimum GPA of 3.00 in required coursework with a minimum grade of a B- (2.67 grade points) in each course (for the Applied Bioengineering specialization), or a minimum GPA of 3.20 in required coursework with a minimum grade of a B- (2.67 grade points) in each course (for the Global Medical Innovation specialization).

Both tracks have the same prerequisites, though applicants will be evaluated considering the different purposes of each track. More information about each of these tracks can be found below. Curriculum must be approved by the Graduate Academic Affairs Committee and the Bioengineering Department. This is done on a case-by-case basis.

The Master of Bioengineering (MBE) degree is a professional non-thesis master’s degree. Students who have a BS or BA degree in an engineering or science discipline may apply. Depending on their background, some students may need to fulfill prerequisites or take remedial engineering courses to earn the MBE degree. For more information, see the department website.

The courses listed below satisfy the requirements for this degree program. In certain instances, courses not on this official list may be substituted upon approval of the program’s academic advisor, or where applicable, the department or program’s Director of Graduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the department or program’s Official Certifier (https://registrar.rice.edu/facstaff/degreeworks/officialcertifier).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Credit Hours Required for the Master of Bioengineering (MBE) Degree</td>
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</table>
# Master of Bioengineering (MBE) Degree

## Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td><strong>Area of Specialization</strong></td>
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<tr>
<td></td>
<td>Select 1 of the following Areas of Specialization (see below for</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Areas of Specialization):</td>
<td></td>
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<tr>
<td></td>
<td>Applied Bioengineering</td>
<td></td>
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<td></td>
<td>Global Medical Innovation</td>
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<td></td>
<td><strong>Total Credit Hours</strong></td>
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</table>

### Areas of Specialization

#### Area of Specialization: Applied Bioengineering

Students pursuing the Applied Bioengineering area of specialization must complete:

- A minimum of 2 courses (3 credit hours) from the core requirements.
- A minimum of 9 courses (27 credit hours) taken at the 500-level or above from selected course offerings.
  - A minimum of 6 courses (18 credit hours) from approved departmental (BIOE) course offerings.
  - A minimum of 1 course (3 credit hours) as a professional development elective course.
  - A minimum of 1 course (3 credit hours) as a quantitative elective course.
  - A minimum of 1 course (3 credit hours) from approved departmental (BIOE) course offerings or another department.
- A minimum GPA of 3.00 in required coursework.

#### Core Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 627</td>
<td>MEDICAL TECHNOLOGY DESIGN SEMINAR</td>
<td>1.5</td>
</tr>
<tr>
<td>Select 1 from the following:</td>
<td></td>
<td></td>
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<tr>
<td>BIOE 628</td>
<td>MEDICAL TECHNOLOGY DESIGN SEMINAR</td>
<td>1.5</td>
</tr>
<tr>
<td>BIOE 633 / MGMT 633</td>
<td>ROLES OF PHYSICIANS, SCIENTISTS, ENGINEERS AND MBA’S IN HIGH-TECH STARTUPS</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Elective Requirements

- Select 6 courses from approved departmental (BIOE) course offerings at the 500-level or above
- Select a minimum of 3 credit hours from the following:
  - ENGI 510 | TECHNICAL AND MANAGERIAL COMMUNICATIONS                        | 3            |
  - ENGI 515 | LEADING TEAMS AND INNOVATION                                     |              |
  - ENGI 529 / CEVE 529 | ETHICS AND ENGINEERING LEADERSHIP                              |              |
  - ENGI 542 | COMMUNICATION FOR ENGINEERS: BUILDING A PRACTICAL TOOLBOX       |              |
  - ENGI 545 / LEAD 545 | STRATEGIC THINKING FOR COMPLEX PROBLEM SOLVING                 |              |
  - ENGI 610 | MANAGEMENT FOR SCIENCE AND ENGINEERING                          |              |
- Select 1 additional course from approved departmental (BIOE) course offerings or another department.
- A minimum GPA of 3.20 in required coursework.

### Area of Specialization: Global Medical Innovation

Students pursuing the Global Medical Innovation area of specialization must complete:

- A minimum of 4 courses (9 credit hours) from the core requirements.
- An internship or independent study (6 credit hours).
- A minimum of 5 courses (15 credit hours) taken at the 500-level or above from selected course offerings.
  - A minimum of 2 courses (6 credit hours) from approved departmental (BIOE) course offerings.
  - A minimum of 1 course (3 credit hours) as a professional development elective course.
  - A minimum of 1 course (3 credit hours) as a quantitative elective course.
  - A minimum of 1 course (3 credit hours) from approved departmental (BIOE) course offerings or another department.
- A minimum GPA of 3.20 in required coursework.

#### Core Requirements

- Medical Technology Design
  - BIOE 527 | MEDICAL TECHNOLOGY DESIGN I                                      | 3            |
  - BIOE 529 | MEDICAL TECHNOLOGY DESIGN 2                                      | 3            |
- Industry Seminar Series
  - BIOE 627 | MEDICAL TECHNOLOGY DESIGN SEMINAR                                 | 1.5          |
  - Select 1 from the following:                              |              |
  - BIOE 628 | MEDICAL TECHNOLOGY DESIGN SEMINAR                                 | 1.5          |
  - BIOE 633 / MGMT 633 | ROLES OF PHYSICIANS, SCIENTISTS, ENGINEERS AND MBA’S IN HIGH-TECH STARTUPS | 2            |

#### Internship or Independent Study

- BIOE 506 | GRADUATE INDEPENDENT STUDY (2 semesters required, 1st semester)  | 6            |
- BIOE 506 | GRADUATE INDEPENDENT STUDY (2 semesters required, 2nd semester) |              |

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1. Additional course offerings may be completed as a Professional Development Elective with advisor approval.
2. BIOE 539 or an alternative quantitative-based BIOE course, taken at the 400-level or above.
3. Students may complete a course offered by another department, but it must be relevant to the MBE degree.
Elective Requirements

Elective Category: BIOE Departmental Electives
Select 2 courses from approved departmental (BIOE) course offerings at the 500-level or above 6

Elective Category: Professional Development
Select a minimum of 3 credit hours from the following: 3

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<td>TECHNICAL AND MANAGERIAL COMMUNICATIONS</td>
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<td>STRATEGIC THINKING FOR COMPLEX PROBLEM SOLVING</td>
</tr>
<tr>
<td>ENGI 610 / NSCI 610</td>
<td>MANAGEMENT FOR SCIENCE AND ENGINEERING</td>
</tr>
<tr>
<td>ENGI 615</td>
<td>LEADERSHIP COACHING FOR ENGINEERS</td>
</tr>
</tbody>
</table>

Elective Category: Quantitative Requirement

BIOE 539 | APPLIED STATISTICS FOR BIOENGINEERING AND BIOTECHNOLOGY ²

Elective Category: BIOE General Elective
Select 1 additional course from approved departmental (BIOE) course offerings (or another department) at the 500-level or above ³

Total Credit Hours 30

Footnotes and Additional Information
1 This will be considered on a case-by-case basis, and the student is responsible for obtaining and selecting an internship that best aligns with their career goals.
2 BIOE 539 or an alternative quantitative-based BIOE course, taken at the 400-level or above, with the advisor's approval.
3 Students may complete a course offered by another department, but it must be relevant to the MBE degree.

Policies for the MBE Degree

Department of Bioengineering Graduate Program Handbook
The General Announcements (GA) is the official Rice curriculum. As an additional resource for students, the department of Bioengineering publishes a graduate program handbook, which can be found here: http://gradhandbooks.rice.edu/2018_19/Bioengineering_Graduate_Handbook.pdf

Enrollment Status Requirements
Students may enroll for the Applied Bioengineering track on a full-time or part-time basis. Students may only enroll on a full-time basis for the Global Medical Innovation track. University graduation requirements (including the minimum residency requirement for students in graduate degree programs) still apply.

Transfer Credit
For Rice University's policy regarding transfer credit, see Transfer Credit (ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer). Some departments and programs have additional restrictions on transfer credit. Students are encouraged to meet with their academic program's advisor when considering transfer credit possibilities.

Additional Information
For additional information, please see the Bioengineering website: https://bioengineering.rice.edu/

Opportunities for the MBE Degree
Fifth-Year Master's Degree Option for Rice Undergraduate Students
Rice students have an option to pursue the Master of Bioengineering (MBE) degree by adding an additional fifth year to their four undergraduate years of science and engineering studies.

Advanced Rice undergraduate students in good academic standing may apply to the MBE degree program during their junior or senior year. Upon acceptance, depending on course load, financial aid status, and other variables, they may then start taking some required courses of the master's degree program. A plan of study will need to be approved by the student's undergraduate advisor and the MBE program director.

As part of this option and opportunity, Rice undergraduate students:
• must complete the requirements for a bachelor's degree and the master's degree independently of each other (i.e. no course may be counted toward the fulfillment of both degrees).
• should be aware there could be financial aid implications if the conversion of undergraduate coursework to that of graduate level reduces their earned undergraduate credit for any semester below that of full-time status (12 credit hours).
• more information on this Undergraduate - Graduate Concurrent Enrollment opportunity, including specific information on the registration process can be found here (ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment).

Additional Information
For additional information, please see the Bioengineering website: https://bioengineering.rice.edu/