Students accepted to the Master of Science in Bioengineering program have four concentrations from which to choose:

- Concentration 1: Bioimaging and Signal Processing
- Concentration 2: Cell and Tissue Engineering
- Concentration 3: Biomechanics
- Concentration 4: Biomedical Devices

**Concentrations**

A concentration is required. Each concentration has two required courses and a list of technical electives from which the student should select three to five courses, depending on whether he or she selects the thesis option, project option, or course-only option.

**CONCENTRATION IN BIOIMAGING AND SIGNAL PROCESSING**

This concentration is appropriate for students interested in biomedical imaging and processing of a wide array of signals from biological systems and biomedical instruments. Two courses (Linear Systems Analysis (EECE 7200) and Applied Probability and Stochastic Processes (EECE 7204) are required of all students choosing this option. Extensive additional options are available as approved technical electives.

**CONCENTRATION IN CELL AND TISSUE ENGINEERING**

The cell and tissue engineering concentration is appropriate for students interested in molecular, cell, and tissue engineering. Two courses (Molecular Bioengineering (BIOE 5410) and Cellular Engineering (BIOE 5420) are required of all cell and tissue engineering students. There is an extensive list of approved technical electives to choose from to complete the degree.

**CONCENTRATION IN BIOMECHANICS**

Students who join the biomechanics concentration will cover multiscale mechanics, including whole-body movement, mechanical properties of biomaterials, and fluid mechanics of physiological fluids. The two courses required of all biomechanics concentration students are Multiscale Biomechanics (BIOE 5650) and Musculoskeletal Biomechanics (ME 5665).

**CONCENTRATION IN BIOMEDICAL DEVICES**

The biomedical devices concentration is appropriate for students interested in the design and implementation of biological devices and implants. Two core courses, Design of Biomedical Instrumentation (BIOE 5810) and Design, Manufacture, and Evaluation of Medical Devices (BIOE 5250), are required for all students in this concentration.

**Graduate Certificate Options**

Students enrolled in a master’s degree have the opportunity to also pursue one of the many engineering graduate certificate options in addition to or in combination with the MS degree. Students should consult their faculty advisor regarding these options (http://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs).

**GORDON INSTITUTE OF ENGINEERING LEADERSHIP**

Master’s Degree in Bioengineering with Graduate Certificate in Engineering Leadership

Students may complete a Master of Science in Bioengineering in addition to earning a Graduate Certificate in Engineering Leadership. Students must apply and be admitted to the Gordon Engineering Leadership Program in order to pursue this option. The program requires fulfillment of the 16-semester-hour-curriculum required to earn the Graduate Certificate in Engineering Leadership, which includes an industry-based challenge project with multiple mentors. The integrated 33-semester-hour degree and certificate will require 17 hours of advisor-approved bioengineering technical courses.

Engineering Leadership (http://catalog.northeastern.edu/graduate/engineering/leadership/engineering-leadership-graduate-certificate/#text)

**Program Requirements**

Complete all courses and requirements listed below unless otherwise indicated. Note: This major requires a concentration: biomechanics, biomedical devices, bioimaging and signal processing, or cell and tissue engineering. Consult your college administrator.

**Core Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 7390</td>
<td>Seminar</td>
<td>0</td>
</tr>
</tbody>
</table>

**Required Core**

A grade of C or higher is required in each course:

- BIOE 5100 Medical Physiology 4
- BIOE 6000 Principles of Bioengineering 1

**Concentrations**

Complete one of the following four concentrations:

- Bioimaging and Signal Processing (p. 1)
- Cell and Tissue Engineering (p. 2)
- Biomechanics (p. 2)
- Biomedical Devices (p. 2)

**BIOIMAGING AND SIGNAL PROCESSING**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECE 7200</td>
<td>Linear Systems Analysis</td>
<td>4</td>
</tr>
<tr>
<td>EECE 7204</td>
<td>Applied Probability and Stochastic Processes</td>
<td>4</td>
</tr>
</tbody>
</table>

**Course Work Option**

Complete 20 semester hours from the course list. 20

**Project Option**

- BIOE 7890 Master’s Project 4

**Electives**

Complete 16 semester hours from the course list. 16

**Thesis Option**

Complete the following (repeatable) course twice: 8

- BIOE 7990 Thesis

**Electives**

Complete 12 semester hours from the course list. 12

**Course List**

- BIOE 5320 Advanced Biomedical Measurements and Instrumentation
- BIOE 5235 Biomedical Imaging
### Bioengineering, MSBioE

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 7100</td>
<td>Special Topics in Biomedical Imaging and Signal Processing</td>
<td></td>
</tr>
<tr>
<td>BIOL 5581</td>
<td>Biological Imaging</td>
<td></td>
</tr>
<tr>
<td>EECE 5639</td>
<td>Computer Vision</td>
<td></td>
</tr>
<tr>
<td>EECE 5648</td>
<td>Biomedical Optics</td>
<td></td>
</tr>
<tr>
<td>EECE 7203</td>
<td>Complex Variable Theory and Differential Equations</td>
<td></td>
</tr>
<tr>
<td>EECE 7204</td>
<td>Applied Probability and Stochastic Processes</td>
<td></td>
</tr>
<tr>
<td>PHSC 6226</td>
<td>Imaging in Medicine and Drug Discovery</td>
<td></td>
</tr>
</tbody>
</table>

### CELL AND TISSUE ENGINEERING

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Course Work</td>
<td>A grade of C or higher is required.</td>
<td></td>
</tr>
<tr>
<td>BIOE 5410</td>
<td>Molecular Bioengineering</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 5420</td>
<td>Cellular Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

| Course Work Option | Complete 20 semester hours from the course list.          | 20    |

| Project Option    | BIOE 7890 | Master's Project | 4     |

| Electives | Complete 16 semester hours from the course list. | 16    |

| Thesis Option   | Complete the following (repeatable) course twice:      | 8     |
|                 | BIOE 7990   | Thesis          |       |

| Electives | Complete 12 semester hours from the course list.       | 12    |

| Course List    | BIOE 5250 | Design, Manufacture, and Evaluation of Medical Devices |       |
|                | BIOE 5430 | Principles and Applications of Tissue Engineering     |       |
|                | BIOE 5820 | Biomaterials                                           |       |
|                | BIOL 5543 | Stem Cells and Regeneration                            |       |
|                | BIOL 6301 | Molecular Cell Biology                                 |       |
|                | ME 5667   | Solid Mechanics of Cells and Tissues                   |       |
|                | NNMD 5370 | Nanomedicine Research Techniques                       |       |
|                | NNMD 5470 | Nano/Biomedical Commercialization: Concept to Market   |       |

### BIOMEDICAL DEVICES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 5810</td>
<td>Design of Biomedical Instrumentation</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 5250</td>
<td>Design, Manufacture, and Evaluation of Medical Devices</td>
<td>4</td>
</tr>
</tbody>
</table>

| Course Work Option | Complete 20 semester hours from the course list.          | 20    |

| Project Option    | BIOE 7890 | Master's Project | 4     |

| Electives | Complete 16 semester hours from the course list.       | 16    |

| Thesis Option   | Complete the following (repeatable) course twice:      | 8     |
|                 | BIOE 7990   | Thesis          |       |

| Electives | Complete 12 semester hours from the course list.       | 12    |

| Course List    | BIOL 5587  | Comparative Neurobiology                                |       |
|                | BIOL 5850  | Design of Implants                                      |       |
|                | BIOE 7400  | Special Topics in Biomedical Devices                    |       |
|                | CHEM 7247  | Advances in Nanomaterials                               |       |
|                | EECE 5606  | Micro- and Nanofabrication                              |       |
|                | ME 5659    | Control Systems Engineering                             |       |
|                | ME 5665    | Musculoskeletal Biomechanics                            |       |
|                | ME 5667    | Solid Mechanics of Cells and Tissues                    |       |
|                | NNMD 5470  | Nano/Biomedical Commercialization: Concept to Market    |       |
|                | NNMD 5370  | Nanomedicine Research Techniques                        |       |
|                | PHSC 6226  | Imaging in Medicine and Drug Discovery                  |       |
Program Credit/GPA Requirements
32 total semester hours required
Minimum 3.000 GPA required