Chemical Engineering and Bioengineering, BSChE

The Bachelor of Science in Chemical Engineering and Bioengineering provides students with a broad education built on fundamentals in science, mathematics, and engineering, with the breadth of knowledge and problem solving established in chemical engineering applied through a bioengineering focus. Chemical engineering and bioengineering have long been closely related, working to understand human diseases, developing new therapies and drug delivery systems, and producing new medicines through cell culture techniques. This specific combined major allows for chemical engineering expertise in advanced materials and chemical processes, with the additional specialized bioengineering mastery of the biological constraints intrinsic to supporting and designing systems to aid and repair living systems.

Program Requirements
Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

Universitywide Requirements
All undergraduate students are required to complete the Universitywide Requirements (http://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/).

NUpath Requirements
All undergraduate students are required to complete the NUpath Requirements (http://catalog.northeastern.edu/undergraduate/university-academics/nupath/).

NUpath requirements Interpreting Culture (IC), Societies and Institutions (SI), and Differences and Diversity (DD) are not satisfied by required engineering courses. Students are responsible for satisfying these requirements with general electives.

Chemical Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHME 2308</td>
<td>Conservation Principles in Chemical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CHME 2310</td>
<td>Transport Processes 1</td>
<td>4</td>
</tr>
<tr>
<td>CHME 2320</td>
<td>Chemical Engineering Thermodynamics 1</td>
<td>4</td>
</tr>
<tr>
<td>CHME 3312</td>
<td>Transport Processes 2</td>
<td>4</td>
</tr>
<tr>
<td>CHME 3315</td>
<td>Chemical Engineering Experimental Design 1</td>
<td>4</td>
</tr>
<tr>
<td>and CHME 3316</td>
<td>and Recitation for CHME 3315</td>
<td></td>
</tr>
<tr>
<td>CHME 3322</td>
<td>Chemical Engineering Thermodynamics 2</td>
<td>4</td>
</tr>
<tr>
<td>CHME 4315</td>
<td>Chemical Engineering Experimental Design 2</td>
<td>4</td>
</tr>
<tr>
<td>and CHME 4316</td>
<td>and Recitation for CHME 4315</td>
<td></td>
</tr>
<tr>
<td>CHME 4510</td>
<td>Chemical Engineering Kinetics</td>
<td>4</td>
</tr>
<tr>
<td>CHME 4512</td>
<td>Chemical Engineering Process Control</td>
<td>4</td>
</tr>
</tbody>
</table>

Supplemental Credit
2 semester hours from the following course count toward the engineering requirement:
GE 1501 Cornerstone of Engineering 1

3 semester hours from the following course count toward the engineering requirement:
GE 1502 Cornerstone of Engineering 2

Students can substitute GE 1110 and GE 1111 for GE 1501 and 1502 in approved situations.

Bioengineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 2355</td>
<td>Quantitative Physiology for Bioengineers</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 3210</td>
<td>Bioelectricity</td>
<td>4</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>
<tr>
<td>BIOE 5430</td>
<td>Principles and Applications of Tissue Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

Bioengineering Capstone
Supporting Courses: Mathematics/Science
Complete all mathematics/science courses with a minimum of 30 semester hours.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Mathematics/Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 1111</td>
<td>General Biology 1</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1151</td>
<td>General Chemistry for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>and CHEM 1153</td>
<td>and Recitation for CHEM 1151</td>
<td></td>
</tr>
<tr>
<td>CHEM 2311</td>
<td>Organic Chemistry 1</td>
<td>5</td>
</tr>
<tr>
<td>and CHEM 2312</td>
<td>and Lab for CHEM 2311</td>
<td></td>
</tr>
<tr>
<td>CHEM 2313</td>
<td>Organic Chemistry 2</td>
<td>5</td>
</tr>
<tr>
<td>and CHEM 2314</td>
<td>and Lab for CHEM 2313</td>
<td></td>
</tr>
<tr>
<td>MATH 1341</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1342</td>
<td>Calculus 2 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2321</td>
<td>Calculus 3 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2341</td>
<td>Differential Equations and Linear Algebra for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1151</td>
<td>Physics for Engineering 1</td>
<td>5</td>
</tr>
<tr>
<td>and PHYS 1152</td>
<td>and Lab for PHYS 1151</td>
<td></td>
</tr>
<tr>
<td>and PHYS 1153</td>
<td>and Interactive Learning Seminar for PHYS 1151</td>
<td></td>
</tr>
<tr>
<td>PHYS 1155</td>
<td>Physics for Engineering 2</td>
<td>5</td>
</tr>
<tr>
<td>and PHYS 1156</td>
<td>and Lab for PHYS 1155</td>
<td></td>
</tr>
<tr>
<td>and PHYS 1157</td>
<td>and Interactive Learning Seminar for PHYS 1155</td>
<td></td>
</tr>
<tr>
<td>Supplemental Credit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 semester hour from the following course counts toward the mathematics/science requirement:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GE 1501 Cornerstone of Engineering 1 ¹</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Students can substitute GE 1110 and GE 1111 for GE 1501 and 1502 in approved situations.

Professional Development

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE 1000</td>
<td>First-Year Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ENCP 2000</td>
<td>Introduction to Engineering Co-op Education</td>
<td>1</td>
</tr>
<tr>
<td>ENCP 3000</td>
<td>Professional Issues in Engineering</td>
<td>1</td>
</tr>
</tbody>
</table>

Additional Required Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 semester hour from the following course counts toward the professional development requirement:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GE 1501</td>
<td>Cornerstone of Engineering 1 ¹</td>
<td></td>
</tr>
</tbody>
</table>

1 Students can substitute GE 1110 and GE 1111 for GE 1501 and 1502 in approved situations.

Writing Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A grade of C or higher is required:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGW 1111</td>
<td>First-Year Writing</td>
<td>4</td>
</tr>
<tr>
<td>ENGW 3302</td>
<td>Advanced Writing in the Technical Professions</td>
<td>4</td>
</tr>
<tr>
<td>or ENGW 3307</td>
<td>Advanced Writing in the Sciences</td>
<td></td>
</tr>
<tr>
<td>or ENGW 3315</td>
<td>Interdisciplinary Advanced Writing in the Disciplines</td>
<td></td>
</tr>
</tbody>
</table>

Required General Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete 8 semester hours of academic, nonremedial, nonrepetitive courses.</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>
### Integrative Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHME 4315</td>
<td>Chemical Engineering Experimental Design 2</td>
<td>4</td>
</tr>
<tr>
<td>CHME 4510</td>
<td>Chemical Engineering Kinetics</td>
<td>4</td>
</tr>
</tbody>
</table>

These courses are already required above and also fulfill the integrative requirement.

### Major GPA Requirement

2.000 minimum GPA required in CHME courses

2.000 minimum GPA required in all BIOE courses

### Program Requirement

135 total semester hours required

### Plan of Study

**Four Years, One Co-op in Summer 2/Fall**

#### Year 1

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1151 (ND)</td>
<td>4</td>
<td>BIOL 1111 (ND)</td>
<td>4</td>
<td>MATH 2321 (FQ)</td>
<td>4</td>
<td>Vacation</td>
<td></td>
</tr>
<tr>
<td>CHEM 1153</td>
<td>0</td>
<td>GE 1502 (ER)</td>
<td>4</td>
<td>PHYS 1155 (ND)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGW 1111 (WF)</td>
<td>4</td>
<td>MATH 1342 (FQ)</td>
<td>4</td>
<td>PHYS 1156 (AD)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE 1000</td>
<td>1</td>
<td>PHYS 1151 (ND)</td>
<td>3</td>
<td>PHYS 1157</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE 1501</td>
<td>4</td>
<td>PHYS 1152 (AD)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1341 (FQ)</td>
<td>4</td>
<td>PHYS 1153</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>17</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Co-op</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

#### Year 2

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 2355</td>
<td>4</td>
<td>CHEM 2313</td>
<td>4</td>
<td>Vacation</td>
<td></td>
<td>Vacation</td>
<td></td>
</tr>
<tr>
<td>CHEM 2311 (AD, WI)</td>
<td>4</td>
<td>CHEM 2314</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 2312</td>
<td>1</td>
<td>CHME 2310</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHME 2308</td>
<td>4</td>
<td>CHME 2320</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2341</td>
<td>4</td>
<td>General elective</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>17</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Co-op</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

#### Year 3

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 3210</td>
<td>4</td>
<td>BIOE 5410</td>
<td>4</td>
<td>BIOE 4790 (EL, CE, WI)</td>
<td>4</td>
<td>Co-op</td>
<td></td>
</tr>
<tr>
<td>CHME 3312</td>
<td>4</td>
<td>BIOE 5420</td>
<td>4</td>
<td>General elective</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHME 3322</td>
<td>4</td>
<td>CHME 3315 (AD)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGW 3302, 3307, or 3315 (WD)</td>
<td>4</td>
<td>CHME 3316</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHME 4510</td>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENCP 2000</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>16</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Co-op</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

#### Year 4

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op</td>
<td></td>
<td>BIOE 4792 (EL, CE, WI)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>BIOE 5430</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>CHME 4315 (AD, WI)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>CHME 4316</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>CHME 4512</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>ENCP 3000</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 135
### Five Years, Three Co-ops in Summer 2/Fall

#### Year 1

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1151 (ND)</td>
<td>4</td>
<td>BIOL 1111 (ND)</td>
<td>4</td>
<td>MATH 2321 (FQ)</td>
<td>4</td>
<td>Vacation</td>
<td>0</td>
</tr>
<tr>
<td>CHEM 1153</td>
<td>0</td>
<td>GE 1502 (ER)</td>
<td>4</td>
<td>PHYS 1155 (ND)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGW 1111 (WF)</td>
<td>4</td>
<td>MATH 1342 (FQ)</td>
<td>4</td>
<td>PHYS 1156 (AD)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE 1000</td>
<td>1</td>
<td>PHYS 1151 (ND)</td>
<td>3</td>
<td>PHYS 1157</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE 1501</td>
<td>4</td>
<td>PHYS 1152 (AD)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1341 (FQ)</td>
<td>4</td>
<td>PHYS 1153</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Year 2

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 2355</td>
<td>4</td>
<td>CHEM 2313</td>
<td>4</td>
<td>Vacation</td>
<td>Co-op</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 2311 (AD, WI)</td>
<td>4</td>
<td>CHEM 2314</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 2312</td>
<td>1</td>
<td>CHME 2310</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHME 2308</td>
<td>4</td>
<td>CHME 2320</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2341</td>
<td>4</td>
<td>ENCP 2000</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General elective</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Year 3

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op</td>
<td></td>
<td>BIOE 3210</td>
<td>4</td>
<td>Vacation</td>
<td>Co-op</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHME 3312</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHME 3322</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENGW 3302, 3307, or 3315 (WD)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Year 4

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op</td>
<td></td>
<td>BIOE 5410</td>
<td>4</td>
<td>BIOE 4790 (EL, CE, WI)</td>
<td>4</td>
<td>Co-op</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BIOE 5420</td>
<td>4</td>
<td>General elective</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHME 3315 (AD)</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHME 3316</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHME 4510</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENCP 3000</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>17</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Year 5

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op</td>
<td>BIOE 4792 (EL, CE, WI)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIOE 5430</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHME 4315 (AD, WI)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHME 4316</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHME 4512</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 135