# 2022 - 2023 Major Map
## Biomedical Engineering (Biological Devices), BSE

**School/College:** Ira A. Fulton Schools of Engineering  
**Location:** Tempe  
ESBMEDBSE

### Term 1 0 - 15 Credit Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASU 101-BME</td>
<td>The ASU Experience</td>
<td>1</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>CHM 114</td>
<td>General Chemistry for Engineers (SQ)</td>
<td>4</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>MAT 265</td>
<td>Calculus for Engineers I (MA)</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>BME 100</td>
<td>Introduction to Biomedical Engineering</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>BME 182</td>
<td>Biomedical Engineering Product Design and Development I</td>
<td>1</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>ENG 101 or ENG 102</td>
<td>First-Year Composition OR ENG 105</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>ENG 107 or ENG 108</td>
<td>First-Year Composition</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
</tbody>
</table>

- Minimum 2.00 GPA ASU Cumulative.

**Term hours subtotal:** 15

### Term 2 15 - 31 Credit Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 181</td>
<td>General Biology I (SQ)</td>
<td>4</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>MAT 266</td>
<td>Calculus for Engineers II (MA)</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>PHY 121</td>
<td>University Physics I: Mechanics (SQ)</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>PHY 122</td>
<td>University Physics Laboratory I (SQ)</td>
<td>1</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>BME 122</td>
<td>Statistics for Biomedical Engineers</td>
<td>2</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>ENG 101 or ENG 102</td>
<td>First-Year Composition OR ENG 105</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>ENG 107 or ENG 108</td>
<td>First-Year Composition</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
</tbody>
</table>

- Complete BME 100 course(s).
- Complete ENG 101 OR ENG 105 OR ENG 107 course(s).
- Minimum 2.00 GPA ASU Cumulative.

**Term hours subtotal:** 16

### Term 3 31 - 46 Credit Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 267</td>
<td>Calculus for Engineers III (MA)</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>PHY 131</td>
<td>University Physics II: Electricity and Magnetism (SQ)</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>PHY 132</td>
<td>University Physics Laboratory II (SQ)</td>
<td>1</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>BME 210</td>
<td>Programming for Biomedical Engineers: Introduction to Computers, Programming and Data (CS)</td>
<td>3</td>
<td>C</td>
<td>-</td>
</tr>
<tr>
<td>BME 213</td>
<td>Biomedical and Bioengineering Ethics</td>
<td>1</td>
<td>C</td>
<td>-</td>
</tr>
</tbody>
</table>

- Prep for success using the Sophomore Guide.
<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 214: FDA Regulatory Processes and Technical Communications</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>ECN 211: Macroeconomic Principles (SB) OR ECN 212: Microeconomic Principles (SB)</td>
<td>3</td>
<td>C</td>
<td>Minimum 2.00 GPA ASU Cumulative. Complete Mathematics (MA) requirement.</td>
</tr>
</tbody>
</table>

Term hours subtotal: 15

### Term 4 - 61 Credit Hours Critical course signified by 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 275: Modern Differential Equations (MA)</td>
<td>3</td>
<td>C</td>
<td>• Pursue an undergraduate research experience.</td>
</tr>
<tr>
<td>BME 200: Conservation Principles in Biomedical Engineering</td>
<td>3</td>
<td>C</td>
<td>• Apply for internships.</td>
</tr>
<tr>
<td>BME 235: Physiology for Engineers</td>
<td>4</td>
<td>C</td>
<td>• Attend career fairs and events.</td>
</tr>
<tr>
<td>BME 282: Biomedical Engineering Product Design and Development II</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>EEE 202: Circuits I</td>
<td>4</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 15

### Term 5 - 61 - 76 Credit Hours Necessary course signified by 🌟

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 353: Cell Biology</td>
<td>3</td>
<td>C</td>
<td>• Plan for success using the Junior Guide.</td>
</tr>
<tr>
<td>BME 362: Methods in Molecular and Cellular Biology</td>
<td>1</td>
<td>C</td>
<td>• Network at student organization competitions or professional societies.</td>
</tr>
<tr>
<td>BME 318: Biomaterials</td>
<td>4</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>CHM 231: Elementary Organic Chemistry (SQ) AND CHM 235: Elementary Organic Chemistry Laboratory (SQ)</td>
<td>4</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 15

### Term 6 - 76 - 91 Credit Hours Necessary course signified by 🌟

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 360: Control in Biological Systems</td>
<td>3</td>
<td>C</td>
<td>• Research and prepare for graduate school.</td>
</tr>
<tr>
<td>BME 300: Bioengineering Product Design</td>
<td>3</td>
<td>C</td>
<td>• Apply for an engineering 4+1 program.</td>
</tr>
<tr>
<td>BME 301: Numerical Methods in Biomedical Engineering</td>
<td>2</td>
<td>C</td>
<td>• Develop a professional profile online.</td>
</tr>
<tr>
<td>BME 316: Biomechanics for Biomedical Engineers</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 340: Thermodynamics for Biomedical Engineers</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 382: Biomedical Engineering Product Design and Development III</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 15

### Term 7 - 91 - 107 Credit Hours Necessary course signified by 🌟

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 417: Biomedical Engineering Capstone Design I (L)</td>
<td>4</td>
<td>C</td>
<td>• Select your Upper Division Related Elective courses from the approved list found at the bottom of the major map.</td>
</tr>
<tr>
<td>BME 467: Tissue Engineering and Regenerative Medicine</td>
<td>3</td>
<td>C</td>
<td>• The general studies requirements for HU, SB, and the awareness areas (C, G, H) do not have to be taken in exact combinations as outlined on the major map. By the end of term 8, all must be completed; however, the combinations may vary.</td>
</tr>
<tr>
<td>Upper Division Related Elective</td>
<td>3</td>
<td>C</td>
<td>• Plan for success using the Senior Guide.</td>
</tr>
<tr>
<td>Upper Division Humanities, Arts and Design (HU) OR Upper Division Social-Behavioral Sciences (SB)</td>
<td>3</td>
<td></td>
<td>• Use Handshake to apply for full-time positions.</td>
</tr>
<tr>
<td>Humanities, Arts and Design (HU) AND Cultural Diversity in the U.S. (C)</td>
<td>3</td>
<td></td>
<td>• Complete an in person or virtual practice interview.</td>
</tr>
</tbody>
</table>

Complete Cultural Diversity in the U.S. (C) AND Historical Awareness (H) AND Historical Awareness (H) course(s).

Term hours subtotal: 16
### Upper Division Related Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 382:</td>
<td>Accounting and Financial Analysis</td>
</tr>
<tr>
<td>BCH 361:</td>
<td>Advanced Principles of Biochemistry</td>
</tr>
<tr>
<td>BCH 367:</td>
<td>Elementary Biochemistry Laboratory</td>
</tr>
<tr>
<td>BCH 461:</td>
<td>General Biochemistry</td>
</tr>
<tr>
<td>BCH 462:</td>
<td>General Biochemistry</td>
</tr>
<tr>
<td>BCH 467:</td>
<td>Analytical Biochemistry Laboratory (L)</td>
</tr>
<tr>
<td>BIO 302:</td>
<td>Cancer—Mother of All Diseases (L)</td>
</tr>
<tr>
<td>BIO 312:</td>
<td>Bioethics (HU) or PHI 320: Bioethics (HU)</td>
</tr>
<tr>
<td>BIO 331:</td>
<td>Animal Behavior</td>
</tr>
<tr>
<td>BIO 340:</td>
<td>General Genetics or MBB 347: Molecular Genetics: From Genes to Proteins</td>
</tr>
<tr>
<td>BIO 345:</td>
<td>Evolution</td>
</tr>
<tr>
<td>BIO 355:</td>
<td>Introduction to Computational Molecular Biology (CS) or MAT 355: Introduction to Computational Molecular Biology (CS) or MBB 355: Introduction to Computational Molecular Biology (CS)</td>
</tr>
<tr>
<td>BIO 360:</td>
<td>Animal Physiology</td>
</tr>
<tr>
<td>BIO 440:</td>
<td>Functional Genomics or MBB 440: Functional Genomics</td>
</tr>
<tr>
<td>BIO 451:</td>
<td>Cell Biotechnology; Cell Culture, Immunocytochemistry and Bioimaging</td>
</tr>
<tr>
<td>BIO 467:</td>
<td>Neurobiology</td>
</tr>
<tr>
<td>BME 394:</td>
<td>Honors Research</td>
</tr>
<tr>
<td>BME 394:</td>
<td>SBHSE Research Projects</td>
</tr>
<tr>
<td>BME 492:</td>
<td>Honors Directed Study</td>
</tr>
</tbody>
</table>

### Upper Division Related Electives continued

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDP 310:</td>
<td>Developing as a Leader (SB)</td>
</tr>
<tr>
<td>EDP 310:</td>
<td>Emotional Intelligence (SB)</td>
</tr>
<tr>
<td>EDP 310:</td>
<td>Gender Development (SB)</td>
</tr>
<tr>
<td>EDP 310:</td>
<td>Learning and Memory (SB)</td>
</tr>
<tr>
<td>EDP 310:</td>
<td>Motivation (SB)</td>
</tr>
<tr>
<td>EDP 310:</td>
<td>Understanding the Brain (SB)</td>
</tr>
<tr>
<td>EEE 307:</td>
<td>Signal Processing for Digital Culture</td>
</tr>
<tr>
<td>EEE 334:</td>
<td>Circuits II</td>
</tr>
<tr>
<td>EEE 350:</td>
<td>Random Signal Analysis</td>
</tr>
<tr>
<td>EEE 352:</td>
<td>Properties of Electronic Materials</td>
</tr>
<tr>
<td>EEE 407:</td>
<td>Digital Signal Processing</td>
</tr>
<tr>
<td>EEE 480:</td>
<td>Feedback Systems</td>
</tr>
<tr>
<td>EEE 481:</td>
<td>Computer-Controlled Systems</td>
</tr>
<tr>
<td>ENT 305:</td>
<td>Principles of Entrepreneurship</td>
</tr>
<tr>
<td>FIN 300:</td>
<td>Fundamentals of Finance</td>
</tr>
<tr>
<td>FIN 380:</td>
<td>Personal Financial Management</td>
</tr>
<tr>
<td>FSE 301:</td>
<td>Entrepreneurship and Value Creation or ENT 360: Entrepreneurship and Value Creation</td>
</tr>
<tr>
<td>HCR 350:</td>
<td>Introduction to Clinical Research</td>
</tr>
<tr>
<td>IEE 300:</td>
<td>Economic Analysis for Engineers</td>
</tr>
<tr>
<td>IEE 320:</td>
<td>Extreme Excel</td>
</tr>
<tr>
<td>IEE 369:</td>
<td>Work Analysis and Design (L)</td>
</tr>
<tr>
<td>IEE 381:</td>
<td>Lean Six Sigma Methodology</td>
</tr>
<tr>
<td>IEE 431:</td>
<td>Engineering Administration (L)</td>
</tr>
<tr>
<td>IND 464:</td>
<td>Collaborative Design Development I (L)</td>
</tr>
</tbody>
</table>

### Term 8 107 - 120 Credit Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 490:</td>
<td>Biomedical Engineering Capstone Design II (L)</td>
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</table>

<table>
<thead>
<tr>
<th>Hours</th>
<th>Minimum Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>C</td>
</tr>
</tbody>
</table>

- Select your Upper Division Related Elective courses from the approved list found at the bottom of the major map.
- The general studies requirements for HU, SB, and the awareness areas (C, G, H) do not have to be taken in exact combinations as outlined on the major map. By the end of term 8, all must be completed; however, the combinations may vary.

### Notes
- **HU**
- **SB**
- **G**
- **C**
- **G**
- **H**

### Term hours subtotal: 13
**Notes:**

- First-Year Composition: All students are placed in ENG 101 unless submission of SAT, ACT, Accuplacer, IELTS, or TOEFL score, or college-level transfer credit or test credit equivalent to ASU's first-year composition course(s), determine otherwise. Students on Polytechnic, Downtown
Phoenix and West Campuses are encouraged to complete the Directed Self-Placement survey to choose the first-year composition option they believe best suits their needs. Visit: https://cisa.asu.edu/DSP

- Mathematics Placement Assessment score determines placement in first mathematics course.

<table>
<thead>
<tr>
<th>General University Requirements Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Studies Core Requirements:</td>
</tr>
<tr>
<td>• Literacy and Critical Inquiry (L)</td>
</tr>
<tr>
<td>• Mathematical Studies (MA)</td>
</tr>
<tr>
<td>• Computer/Statistics/Quantitative Applications (CS)</td>
</tr>
<tr>
<td>• Humanities, Arts and Design (HU)</td>
</tr>
<tr>
<td>• Social-Behavioral Sciences (SB)</td>
</tr>
<tr>
<td>• Natural Science - Quantitative (SQ)</td>
</tr>
<tr>
<td>• Natural Science - General (SG)</td>
</tr>
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<table>
<thead>
<tr>
<th>Total Hours: 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Division Hours: 45 minimum</td>
</tr>
<tr>
<td>Major GPA: 2.00 minimum</td>
</tr>
<tr>
<td>Cumulative GPA: 2.00 minimum</td>
</tr>
<tr>
<td>Total hrs at ASU: 30 minimum</td>
</tr>
<tr>
<td>Hrs Resident Credit for Academic Recognition: 56 minimum</td>
</tr>
<tr>
<td>Total Community College Hrs: 64 maximum</td>
</tr>
</tbody>
</table>

General Studies Awareness Requirements:

- Cultural Diversity in the U.S. (C)
- Global Awareness (G)
- Historical Awareness (H)

First-Year Composition

General Studies designations listed on the major map are current for the 2022 - 2023 academic year.