# 2018 - 2019 Major Map
## Biomedical Engineering, BSE

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

### Term 1 0 - 15 Credit Hours

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASU 101-BME: The ASU Experience</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>CHM 114: General Chemistry for Engineers (SQ) OR CHM 116: General Chemistry II (SQ)</td>
<td>4</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>MAT 265: Calculus for Engineers I (MA)</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 100: Introduction to Biomedical Engineering</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 182: Biomedical Engineering Product Design and Development I</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: 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</th>
<th>Credit Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 181: General Biology I (SQ)</td>
<td>4</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>MAT 266: Calculus for Engineers II (MA)</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>PHY 121: University Physics I: Mechanics (SQ)</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>PHY 122: University Physics Laboratory I (SQ)</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 122: Statistics for Biomedical Engineers</td>
<td>2</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

Complete BME 100  
Complete ENG 101 OR ENG 105 OR ENG 107 course(s).

Minimum 2.00 GPA ASU Cumulative.

**Term hours subtotal:** 16

### Term 3 31 - 47 Credit Hours

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 267: Calculus for Engineers III (MA)</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>PHY 131: University Physics II: Electricity and Magnetism (SQ)</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>PHY 132: University Physics Laboratory II (SQ)</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 213: Biomedical and Bioengineering Ethics</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>BME 214: FDA Regulatory Processes and Technical Communications</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>CSE 110: Principles of Programming (CS)</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

**Term hours subtotal:** 16

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* An SAT, ACT, Accuplacer, IELTS, or TOEFL score determines placement into first-year composition courses.  
* Mathematics Placement Assessment score determines placement in mathematics course.  
* ASU 101 or College specific equivalent First Year Seminar required of all students.  
* If ENG 105 is taken, a 3 hour applicable elective must also be taken prior to graduation. See Advisor.  
* Prep for success using the Freshman Guide.  
* Join a Fulton community.  
* Explore engineering and technical professions.

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* Create a Handshake profile.  
* Get involved with EPICS, the Generator Labs, and the Fulton Start-Up Center.
<table>
<thead>
<tr>
<th>Term 4</th>
<th>47 - 62 Credit Hours Critical course signified by 1</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 200: Conservation Principles in Biomedical Engineering</td>
<td>3</td>
<td>C</td>
<td>• Pursue an undergraduate research experience.</td>
<td></td>
</tr>
<tr>
<td>MAT 275: Modern Differential Equations (MA)</td>
<td>3</td>
<td>C</td>
<td>• Apply for internships.</td>
<td></td>
</tr>
<tr>
<td>BME 235: Physiology for Engineers</td>
<td>4</td>
<td>C</td>
<td>• Attend career fairs and events.</td>
<td></td>
</tr>
<tr>
<td>BME 282: Biomedical Engineering Product Design and Development II</td>
<td>1</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEE 202: Circuits I</td>
<td>4</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Term hours subtotal:</td>
<td></td>
<td></td>
<td>16</td>
<td></td>
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<table>
<thead>
<tr>
<th>Term 5</th>
<th>62 - 78 Credit Hours Necessary course signified by ⭐</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Division Biomedical Devices Track OR Upper Division Biological Devices Track</td>
<td>3-4</td>
<td>C</td>
<td>• Plan for success using the Junior Guide.</td>
<td></td>
</tr>
<tr>
<td>BME 318: Biomaterials</td>
<td>4</td>
<td>C</td>
<td>• Network at student organization competitions or professional societies.</td>
<td></td>
</tr>
<tr>
<td>BME 331: Transport Phenomena for Biomedical Engineering</td>
<td>3</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Division Related Elective OR Upper Division Biological Devices Track</td>
<td>6-4</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Term hours subtotal:</td>
<td></td>
<td></td>
<td>15</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Term 6</th>
<th>78 - 93 Credit Hours Necessary course signified by ⭐</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Division Biomedical Devices Track OR Upper Division Biological Devices Track</td>
<td>3</td>
<td>C</td>
<td>• The general studies requirements for HU or SB and the awareness areas do not have to be taken in exact combinations (as outlined on the major map). By the end of term 8, all need to be completed, however the combinations may vary.</td>
<td></td>
</tr>
<tr>
<td>BME 300: Bioengineering Product Design</td>
<td>3</td>
<td>C</td>
<td>• Research and prepare for graduate school.</td>
<td></td>
</tr>
<tr>
<td>BME 301: Numerical Methods in Biomedical Engineering</td>
<td>2</td>
<td>C</td>
<td>• Apply for an engineering 4+1 program.</td>
<td></td>
</tr>
<tr>
<td>BME 316: Biomechanics for Biomedical Engineers</td>
<td>3</td>
<td>C</td>
<td>• Develop a professional profile online.</td>
<td></td>
</tr>
<tr>
<td>BME 340: Thermodynamics for Biomedical Engineers</td>
<td>3</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME 382: Biomedical Engineering Product Design and Development III</td>
<td>1</td>
<td>C</td>
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<td></td>
</tr>
<tr>
<td>Term hours subtotal:</td>
<td></td>
<td></td>
<td>15</td>
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<thead>
<tr>
<th>Term 7</th>
<th>93 - 107 Credit Hours Necessary course signified by ⭐</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>BME 417: Biomedical Engineering Capstone Design I (L)</td>
<td>4</td>
<td>C</td>
<td>• The general studies requirements for HU or SB and the awareness areas do not have to be taken in exact combinations (as outlined on the major map). By the end of term 8, all need to be completed, however the combinations may vary.</td>
<td></td>
</tr>
<tr>
<td>Upper Division Biomedical Devices Track OR Upper Division Biological Devices Track</td>
<td>4-3</td>
<td>C</td>
<td>• Additional information regarding approved related electives can be found online here.</td>
<td></td>
</tr>
<tr>
<td>Humanities, Arts and Design (HU) AND Cultural Diversity in the U.S. (C)</td>
<td>3</td>
<td></td>
<td>• Plan for success using the Senior Guide.</td>
<td></td>
</tr>
<tr>
<td>Humanities, Arts and Design (HU) AND Historical Awareness (H)</td>
<td>3</td>
<td></td>
<td>• Use Handshake to apply for full-time positions.</td>
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</tr>
<tr>
<td>Term hours subtotal:</td>
<td></td>
<td></td>
<td>14-13</td>
<td></td>
</tr>
<tr>
<td>Course</td>
<td>Hours</td>
<td>Minimum Grade</td>
<td>Notes</td>
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</tr>
<tr>
<td>BME 490: Biomedical Engineering Capstone Design II (L)</td>
<td>4</td>
<td>C</td>
<td>• Complete an in-person or virtual practice interview.</td>
<td></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></td>
<td></td>
</tr>
<tr>
<td>Upper Division Related Elective AND Literacy and Critical Inquiry (L)</td>
<td>3-5</td>
<td>C</td>
<td>• The general studies requirements for HU or SB and the awareness areas do not have to be taken in exact combinations (as outlined on the major map). By the end of term 8, all need to be completed, however the combinations may vary.</td>
<td></td>
</tr>
<tr>
<td>Social-Behavioral Sciences (SB) AND Global Awareness (G)</td>
<td>3</td>
<td></td>
<td>• Additional information regarding approved related electives can be found online here.</td>
<td></td>
</tr>
<tr>
<td>Complete Cultural Diversity in the U.S. (C) AND Global Awareness (G) AND Historical Awareness (H) course(s).</td>
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</tr>
</tbody>
</table>

**Term hours subtotal: 13-15**
STP 420: Introductory Applied Statistics (CS)
STP 421: Probability
STP 429: Experimental Statistics (CS)

KIN 340: Physiology of Exercise
KIN 348: Psychological Skills for Optimal Performance (SB)
KIN 352: Psychosocial Aspects of Physical Activity (SB & C)
KIN 412: Biomechanics of the Skeletal System
KIN 413: Qualitative Analysis in Sport Biomechanics
KIN 414: Electromyographic Kinesiology (L)
KIN 440: Exercise Biochemistry
MAE 318: System Dynamics and Control I
MAE 341: Mechanism Analysis and Design
FSE 301: Entrepreneurship and Value Creation
MEE 322: Structural Mechanics

Upper Division Related Elective
(Pre-Medical)

BCH 361: Advanced Principles of Biochemistry
BCH 461: General Biochemistry
BIO 302: Cancer--Mother of All Diseases (L)
BIO 312: Bioethics (HU) or PHI 320: Bioethics (HU)
BIO 340: General Genetics
BIO 355: Introduction to Computational Molecular Biology (CS)
BIO 360: Animal Physiology
BIO 440: Functional Genomics
BIO 467: Neurobiology
BMI 465: Introduction to Comparative Genomics
CHE 475: Biochemical Engineering
CHM 341: Elementary Physical Chemistry
HCD 320: Applied Medical/Health Care Ethics (HU)
HCR 350: Introduction to Clinical Research
KIN 334: Functional Anatomy and Kinesiology
KIN 335: Biomechanics

Upper Division Related Elective (Business, Entrepreneurship, Management)

ACC 382: Accounting and Financial Analysis
AGB 302: International Management and Agribusiness (G)
BIO 312: Bioethics (HU) or PHI 320: Bioethics (HU)
BUA 380: Small Business Leadership
BUA 381: Small Business Accounting and Finance
BUA 383: Small Business Working Relationships
BUS 384: Business Operations and Planning
CHE 494: Six Sigma Methodology/Engineering Experimentation
CIS 300: Web Design and Development
COM 312: Communication, Conflict, and Negotiation
ECN 306: Survey of International Economics (SB & G)
ENT 360: Entrepreneurship and Value Creation
FIN 300: Fundamentals of Finance
FIN 380: Personal Financial Management
FSE 301: Entrepreneurship and Value Creation

Upper Division Related Elective (Neural)

BIO 312: Bioethics (HU) or PHI 320: Bioethics (HU)
BIO 360: Animal Physiology
BIO 467: Neurobiology
CSE 310: Data Structures and Algorithms
CSE 340: Principles of Programming Languages
CSE 412: Database Management
EDP 310: Emotional Intelligence (SB)
EDP 310: Gender Development (SB)
EDP 310: Learning and Memory (SB)
EDP 310: Motivation (SB)
EDP 310: Understanding the Brain (SB)
EEE 350: Random Signal Analysis
EEE 480: Feedback Systems
EEE 481: Computer-Controlled Systems
FSE 301: Entrepreneurship and Value Creation
IND 464: Collaborative Design Development I (L)
IND 465: Collaborative Design Development II (L)
MAE 318: System Dynamics and Control I
KIN 412: Biomechanics of the Skeletal System
LES 305: Business Law and Ethics for Managers
MIC 360: Bacterial Physiology
MIC 420: Immunology: Molecular and Cellular Foundations
NTR 457: Sports Nutrition
PAF 410: Building Leadership Skills (SB)

HON 394: Deductive Logic, Leadership/Management Techniques
HON 494: Genetics and the Law or HON 494: Information Measurement Theory I
IEE 300: Economic Analysis for Engineers
IEE 320: Extreme Excel
IEE 369: Work Analysis and Design (L)
IEE 431: Engineering Administration (L)
IND 464: Collaborative Design Development I (L)
IND 465: Collaborative Design Development II (L)
LES 305: Business Law and Ethics for Managers
LES 380: Consumer Perspective of Business Law
MGT 300: Organization and Management Leadership
MGT 302: Principles of International Business (G)
MGT 380: Management and Strategy for Nonmajors
MKT 300: Marketing and Business Performance
MKT 370: Professional Sales and Relationship Management
MKT 390: Essentials of Marketing
MKT 391: Essentials of Selling
PAF 410: Building Leadership Skills (SB)
PHI 306: Applied Ethics (HU)
SCM 300: Global Supply Operations
SOC 334: Technology and Society (L or SB)
STS 304: Science, Technology, and Society (SB)
STS 332: Global Issues in Science and Technology (SB)
TWC 451: Copyright and Intellectual Property in the Electronic Age

Upper Division Related Elective (Molecular, Cellular, Materials)
BCH 361: Advanced Principles of Biochemistry

MAE 417: System Dynamics and Control II
PSY 325: Physiological Psychology
PSY 470: Psychopharmacology
General Studies Awareness Requirements:

- Cultural Diversity in the U.S. (C)

General University Requirements Legend

General Studies Core Requirements:

- Literacy and Critical Inquiry (L)
- Mathematical Studies (MA)
- Computer/Statistics/Quantitative Applications (CS)
- Humanities, Arts and Design (HU)
- Social-Behavioral Sciences (SB)
- Natural Science - Quantitative (SQ)
- Natural Science - General (SG)

Total Hours: 120
Upper Division Hours: 45 minimum
Major GPA: 2.00 minimum
Cumulative GPA: 2.00 minimum
Total hrs at ASU: 30 minimum
Hrs Resident Credit for Academic Recognition: 56 minimum
Total Community College Hrs: 64 maximum

MIC 360: Bacterial Physiology
MIC 420: Immunology: Molecular and Cellular Foundations
MSE 301: Materials and Civilization
MSE 330: Thermodynamics of Materials
MSE 335: Materials Kinetics and Processing
MSE 355: Structure and Defects
MSE 356: Structures, Properties, and Defects Lab
MSE 415: Mathematical and Computer Methods in Materials (CS)
MSE 420: Physical Metallurgy
MSE 421: Physical Metallurgy Laboratory
MSE 440: Mechanical Behavior of Materials
MSE 442: Fatigue, Fracture, and Creep of Materials
MSE 450: Introduction to Materials Characterization
MSE 451: Introduction to Materials Characterization Lab
MSE 458: Introduction to Electronic, Magnetic, and Optical Properties
MSE 460: Nanomaterials in Energy Production and Storage
MSE 470: Polymers and Composites
MSE 471: Introduction to Ceramics
MSE 482: Materials Engineering Design (L)
MSE 494: Bioinspired Materials and Biomaterials
General Studies designations listed on the major map are current for the 2018 - 2019 academic year.

- Global Awareness (G)
- Historical Awareness (H)

First-Year Composition

General Studies designations listed on the major map are current for the 2018 - 2019 academic year.