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

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

### Term 1 0 - 15 Credit Hours

<table>
<thead>
<tr>
<th>Critical course signified by</th>
<th>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>• ASU 101 or college-specific equivalent First-Year Seminar required of all students.</td>
</tr>
<tr>
<td>CHM 114: General Chemistry for Engineers (SQ)</td>
<td>4</td>
<td>C</td>
<td>• If ENG 105 is taken, a three credit hour applicable elective must also be taken prior to graduation. See advisor.</td>
</tr>
<tr>
<td>MAT 265: Calculus for Engineers I (MA)</td>
<td>3</td>
<td>C</td>
<td>• Prep for success using the First-Year Student Guide.</td>
</tr>
<tr>
<td>BME 100: Introduction to Biomedical Engineering</td>
<td>3</td>
<td>C</td>
<td>• Join a Fulton community.</td>
</tr>
<tr>
<td>BME 182: Biomedical Engineering Product Design and Development I</td>
<td>1</td>
<td>C</td>
<td>• Explore engineering and technical professions.</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>Minimum 2.00 GPA ASU Cumulative.</td>
</tr>
</tbody>
</table>

Term hours subtotal: 15

### Term 2 15 - 31 Credit Hours

<table>
<thead>
<tr>
<th>Critical course signified by</th>
<th>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>• Create a Handshake profile.</td>
</tr>
<tr>
<td>MAT 266: Calculus for Engineers II (MA)</td>
<td>3</td>
<td>C</td>
<td>• Get involved with EPICS, the Generator Labs, and the Fulton Start-Up Center.</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>Complete BME 100 course(s).</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>Complete ENG 101 OR ENG 105 OR ENG 107 course(s).</td>
</tr>
<tr>
<td>Minimum 2.00 GPA ASU Cumulative.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 16

### Term 3 31 - 46 Credit Hours

<table>
<thead>
<tr>
<th>Critical course signified by</th>
<th>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>• Prep for success using the Sophomore Guide.</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 210: 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: Biomedical and Bioengineering Ethics</td>
<td>1</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

Minimum 2.00 GPA ASU Cumulative.
BME 214: FDA Regulatory Processes and Technical Communications  1  C

ECN 211: Macroeconomic Principles (SB) OR ECN 212: Microeconomic Principles (SB)  3  C

Minimum 2.00 GPA ASU Cumulative.

Complete Mathematics (MA) requirement.

Term hours subtotal: 15

<table>
<thead>
<tr>
<th>Term 46 - 61 Credit Hours</th>
<th>Critical course signified by ⚫</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>
</tbody>
</table>

Term hours subtotal: 15

<table>
<thead>
<tr>
<th>Term 561 - 77 Credit Hours</th>
<th>Necessary course signified by 🌟</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 350: Signals and Systems for Bioengineers</td>
<td>3</td>
<td>C</td>
<td>• Plan for success using the Junior Guide.</td>
<td></td>
</tr>
<tr>
<td>BME 316: Biomechanics for Biomedical Engineers</td>
<td>3</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>BME 382: Biomedical Engineering Product Design and Development III</td>
<td>1</td>
<td>C</td>
<td></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>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 16

<table>
<thead>
<tr>
<th>Term 677 - 93 Credit Hours</th>
<th>Necessary course signified by 🌟</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 370: Microcomputer Applications in Biomedical Engineering</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>
<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 318: Biomaterials</td>
<td>4</td>
<td>C</td>
<td>• Apply for an engineering 4+1 program.</td>
<td></td>
</tr>
<tr>
<td>BME 340: Thermodynamics for Biomedical Engineers</td>
<td>3</td>
<td>C</td>
<td>• Develop a professional profile online.</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>
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</tr>
</tbody>
</table>

Term hours subtotal: 16

<table>
<thead>
<tr>
<th>Term 793 -107 Credit Hours</th>
<th>Necessary course signified by 🌟</th>
<th>Hours</th>
<th>Minimum 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>
<td></td>
</tr>
<tr>
<td>BME 413: Biomedical Instrumentation (L)</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>
<td></td>
</tr>
<tr>
<td>BME 423: Biomedical Instrumentation Laboratory (L)</td>
<td>1</td>
<td>C</td>
<td>• Plan for success using the Senior Guide.</td>
<td></td>
</tr>
<tr>
<td>Upper Division Related Elective</td>
<td>3</td>
<td>C</td>
<td>• Use Handshake to apply for full-time positions.</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>Complete Cultural Diversity in the U.S. (C) AND Global Awareness (G) AND Historical Awareness (H) course(s).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Upper Division Related Electives

- ACC 382: Accounting and Financial Analysis
- BCH 361: Advanced Principles of Biochemistry
- BCH 367: Elementary Biochemistry Laboratory
- BCH 461: General Biochemistry
- BCH 462: General Biochemistry
- BCH 467: Analytical Biochemistry Laboratory (L)
- BIO 302: Cancer--Mother of All Diseases (L)
- BIO 312: Bioethics (HU) or PHI 320: Bioethics (HU)
- BIO 331: Animal Behavior
- BIO 340: General Genetics or MBB 347: Molecular Genetics: From Genes to Proteins
- BIO 345: Evolution
- BIO 355: Introduction to Computational Molecular Biology (CS) or MAT 355: Introduction to Computational Molecular Biology (CS) or MBB 355: Introduction to Computational Molecular Biology (CS)
- BIO 360: Animal Physiology
- BIO 440: Functional Genomics or MBB 440: Functional Genomics
- BIO 451: Cell Biotechnology: Cell Culture, Immunocytochemistry and Bioimaging
- BIO 467: Neurobiology
- BME 394: Honors Research

Upper Division Related Electives continued

- EDP 310: Developing as a Leader (SB)
- 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 307: Signal Processing for Digital Culture
- EEE 334: Circuits II
- EEE 350: Random Signal Analysis
- EEE 352: Properties of Electronic Materials
- EEE 407: Digital Signal Processing
- EEE 480: Feedback Systems
- EEE 481: Computer-Controlled Systems
- ENT 305: Principles of Entrepreneurship
- FIN 300: Fundamentals of Finance
- FIN 380: Personal Financial Management
- FSE 301: Entrepreneurship and Value Creation or ENT 360: Entrepreneurship and Value Creation
- HCR 350: Introduction to Clinical Research
- IEE 300: Economic Analysis for Engineers
- IEE 320: Extreme Excel
- IEE 369: Work Analysis and Design (L)
- IEE 381: Lean Six Sigma Methodology
- IEE 431: Engineering Administration (L)

Upper Division Related Electives, continued

- MEE 322: Structural Mechanics
- MEE 340: Heat Transfer
- MGT 300: Organization and Management Leadership
- MGT 302: Principles of International Business (G)
- MGT 380: Management and Strategy for Nonmajors
- MIC 360: Bacterial Physiology
- MIC 420: Immunology: Molecular and Cellular Foundations or BIO 420: Immunology: Molecular and Cellular Foundations
- MKT 300: Marketing and Business Performance
- MKT 370: Professional Sales and Relationship Management
- MKT 390: Essentials of Marketing
- MKT 391: Essentials of Selling
- MSE 301: Materials and Civilization
- MSE 330: Thermodynamics of Materials
- MSE 335: Materials Kinetics
- MSE 355: Structure and Defects
- MSE 356: Thin Film and Microelectronic Devices Lab
- MSE 415: Mathematical and Computer Methods in Materials (CS)
BME 394: SBHSE Research Projects
BME 492: Honors Directed Study
BME 493: Honors Thesis (L)
BMI 311: Modeling Biomedical Knowledge
BMI 465: Introduction to Comparative Genomics
BUA 380: Small Business Leadership
BUA 381: Small Business Accounting and Finance
BUA 383: Small Business Working Relationships
BUS 384: Business Operations and Planning
CEE 384: Numerical Methods for Engineers (CS) or MAE 384: Advanced Mathematical Methods for Engineers (CS)
CHE 475: Biochemical Engineering
CHM 302: Environmental Chemistry
CHM 325: Analytical Chemistry
CHM 326: Advanced Analytical Chemistry Laboratory
CHM 341: Elementary Physical Chemistry or BCH 341: Physical Chemistry with a Biological Focus
CIS 300: Web Design and Development
COM 312: Communication, Conflict, and Negotiation
CSE 310: Data Structures and Algorithms
CSE 340: Principles of Programming Languages
CSE 412: Database Management
DAT 301: Exploring Data in R and Python
ECN 306: Survey of International Economics (SB & G)
IND 464: Collaborative Design Development I (L)
IND 465: Collaborative Design Development II (L)
KIN 334: Functional Anatomy and Kinesiology
KIN 340: Physiology of Exercise
KIN 412: Biomechanics of the Skeletal System
KIN 413: Qualitative Analysis in Sport Biomechanics
KIN 414: Electromyographic Kinesiology (L)
KIN 440: Exercise Biochemistry
LES 305: Business Law and Ethics for Managers
LES 380: Consumer Perspective of Business Law
LSC 347: Fundamentals of Genetics
MAE 318: System Dynamics and Control I
MAE 341: Mechanism Analysis and Design
MAE 417: System Dynamics and Control II
MAT 300: Mathematical Structures (L)
MAT 310: Introduction to Geometry
MAT 342: Linear Algebra or MAT 343: Applied Linear Algebra
MAT 451: Mathematical Modeling (CS)
MAT 460: Vector Calculus
MAT 462: Applied Partial Differential Equations
MBB 343: Genetic Engineering and Society (L) or BIO 343: Genetic Engineering and Society (L)
MSE 420: Advanced Metallurgical Alloys and Processes
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: Nanomaterials and Electronics Characterization Lab
MSE 458: 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)
NTR 457: Sports Nutrition
PAF 301: Applied Statistics (CS)
PAF 410: Building Leadership Skills (SB)
PHI 306: Applied Ethics (HU)
PHI 313: Probability, Evidence, and Decision
PHY 361: Introductory Modern Physics
PSY 325: Physiological Psychology
PSY 470: Psychopharmacology
SCM 300: Global Supply Operations
SOC 334: Technology and Society (L or SB)
STP 420: Introductory Applied Statistics (CS)
STP 421: Probability
STP 429: Applied Regression (CS)
STS 304: Science, Technology and Society (SB)
STS 332: Global Issues in Science and Technology (SB)
TEM 330: Systems Innovation
TWC 446: Technical and Scientific Reports (L)
TWC 451: Copyright and Intellectual Property in the Electronic Age

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.

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

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.