2023 - 2024 Major Map
Biomedical Engineering, BSE

School/College: Ira A. Fulton Schools of Engineering
ESBMEBSE

Term 1 - A 0 - 6 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
MAT 265: Calculus for Engineers I (MA)	3	C	• ASU 101 or college-specific equivalent First-Year Seminar required of all first-year students. • If ENG 105 is taken, a three credit hour applicable elective must also be taken prior to graduation. See advisor. • Prep for success using the First-Year Student Guide. • Join a Fulton community. • Explore engineering and technical professions.
ASU 101-BME: The ASU Experience	1	C	
FSE 100: Introduction to Engineering	2	C	
Term hours subtotal:	6		

Term 1 - B 6 - 12 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
MAT 266: Calculus for Engineers II (MA)	3	C	• View ASU Online first-year student registration information here.
ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition	3	C	
Minimum 2.00 GPA ASU Cumulative.			
Term hours subtotal:	6		

Term 2 - A 12 - 19 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
CHM 114: General Chemistry for Engineers (SQ)	4	C	• Create a Handshake profile. • Get involved with EPICS, the Generator Labs, and the Fulton Start-Up Center.
ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition	3	C	
Term hours subtotal:	7		

Term 2 - B 19 - 26 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
MAT 267: Calculus for Engineers III (MA)	3	C	
PHY 121: University Physics I: Mechanics (SQ)	3	C	
PHY 122: University Physics Laboratory I (SQ)	1	C	
Complete ENG 101 OR ENG 105 OR ENG 107 course(s).			
Complete FSE 100 course(s).			

Minimum 2.00 GPA ASU Cumulative.			
	Term hours subtotal:	7	

Term 3 - A 26 - 32 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
BIO 181: General Biology I (SQ)	4	C	• Prep for success using the Sophomore Guide.
MAT 242: Elementary Linear Algebra	2	C	
	Term hours subtotal:	6	

Term 3 - B 32 - 39 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
PHY 131: University Physics II: Electricity and Magnetism (SQ)	3	C	
PHY 132: University Physics Laboratory II (SQ)	1	C	
STP 226: Elements of Statistics (CS) OR STP 231: Statistics for Life Science (CS)	3	C	
Minimum 2.00 GPA ASU Cumulative.			
Complete Mathematics (MA) requirement.			
	Term hours subtotal:	7	

Term 4 - A 39 - 46 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
MAT 275: Modern Differential Equations (MA)	3	C	• Pursue an undergraduate research experience. • Apply for internships. • Attend career fairs and events.
BME 210: Programming for Biomedical Engineers: Introduction to Computers, Programming and Data (CS)	3	C	
BME 213: Biomedical and Bioengineering Ethics	1	C	
	Term hours subtotal:	7	

Term 4 - B 46 - 53 Credit Hours Critical course signified by	Hours	Minimum Grade	Notes
BME 200: Conservation Principles in Biomedical Engineering	3	C	
EEE 202: Circuits I	4	C	
	Term hours subtotal:	7	

Term 5 - A 53 - 60 Credit Hours Necessary course signified by	Hours	Minimum Grade	Notes

★	BME 350: Signals and Systems for Bioengineers OR BIO 353: Cell Biology	3	C	• Plan for success using the Junior Guide. • Network at student organization competitions or professional societies.
	BME 235: Physiology for Engineers	4	C	
	Term hours subtotal:	7		

Term 5 - B 60 - 67 Credit Hours	Hours	Minimum Grade	Notes
BME 318: Biomaterials	4	C	
BME 331: Transport Phenomena for Biomedical Engineering	3	C	
Term hours subtotal:	7		

Term 6 - A 67 - 75 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes
★ BME 370: Microcomputer Applications in Biomedical Engineering OR BME 360: Control in Biological Systems AND BME 362: Methods in Molecular and Cellular Biology	3-4	C	• Research and prepare for graduate school. • Apply for an engineering 4+1 program. • Develop a professional profile online.
BME 301: Numerical Methods in Biomedical Engineering	2	C	
BME 316: Biomechanics for Biomedical Engineers	3	C	
Term hours subtotal:	8-9		

Term 6 - B 75 - 82 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes
BME 300: Bioengineering Product Design	3	C	• Select your Bioscience Elective course(s) 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 the degree, all must be completed; however, the combinations may vary.
Bioscience Elective	4	C	
★ Complete Cultural Diversity in the U.S. (C) AND Global Awareness (G) AND Historical Awareness (H) course(s).			
Term hours subtotal:	7		

Term 7 - A 82 - 89 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes
★ BME 417: Biomedical Engineering Capstone Design I (L)	4	C	• Plan for success using the Senior Guide. • Use Handshake to apply for full-time positions. • Complete an in person or virtual practice interview. • 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 the
Social-Behavioral Sciences (SB) AND Global Awareness (G)	3		
Term hours subtotal:	7		

degree, all must be completed; however, the combinations may vary.

Term 7 - B 89 - 95 Credit Hours	Hours	Minimum Grade	Notes
Upper Division Engineering Elective	3	C	• Select your Upper Division Engineering Elective and Upper Division Related Elective courses from the approved lists found at the bottom of the major map.
Upper Division Related Elective	3	C	
Term hours subtotal:	6		

Term 8 - A 95 - 102 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes
★ BME 490: Biomedical Engineering Capstone Design II (L)	4	C	• 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 the degree, all must be completed; however, the combinations may vary.
Humanities, Arts and Design (HU) AND Cultural Diversity in the U.S. (C)	3		
Term hours subtotal:	7		

Term 8 - B 102 - 110 Credit Hours	Hours	Minimum Grade	Notes
Upper Division Engineering Elective	3	C	• Select your Upper Division Engineering Elective and Upper Division Related Elective courses from the approved lists 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 the degree, all must be completed; however, the combinations may vary.
Upper Division Related Elective	2	C	
Upper Division Humanities, Arts and Design (HU) OR Upper Division Social-Behavioral Sciences (SB)	3		
Term hours subtotal:	8		

Term 9 - A 110 - 117 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes
★ BME 413: Biomedical Instrumentation (L) AND BME 423: Biomedical Instrumentation Laboratory (L) OR BME 467: Tissue Engineering and Regenerative Medicine	4-3	C	• 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 the degree, all must be completed; however, the combinations may vary.
Social-Behavioral Sciences (SB)	3		
Term hours subtotal:	7-6		

Term 9 - B 117 - 120 Credit Hours	Hours	Minimum Grade	Notes

Humanities, Arts and Design (HU) AND Historical Awareness (H)	3
Term hours subtotal:	3

- 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 the degree, all must be completed; however, the combinations may vary.

Hide Course List(s)/Track Group(s)

Bioscience Electives
BIO 182: General Biology II (SG)
BIO 201: Human Anatomy and Physiology I (SG)
CHM 231: Elementary Organic Chemistry (SQ) AND CHM 235: Elementary Organic Chemistry Laboratory (SQ)
CHM 233: General Organic Chemistry I AND CHM 237: General Organic Chemistry Laboratory I
MIC 205: Microbiology (SG) AND MIC 206: Microbiology Laboratory (SG)

Upper Division Engineering Electives
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)
BME 465: Magnetic Resonance Imaging
CHM 325: Analytical Chemistry
CHM 341: Elementary Physical Chemistry or BCH 341: Physical Chemistry with a Biological Focus
CSE 340: Principles of Programming Languages
DAT 301: Exploring Data in R and Python
EEE 334: Circuits II
EEE 350: Random Signal Analysis
EEE 352: Properties of Electronic Materials
EEE 407: Digital Signal Processing
EEE 481: Computer-Controlled Systems
HCD 403: Process Engineering
IEE 300: Economic Analysis for Engineers
IEE 380: Probability and Statistics for Engineering Problem Solving (CS)
IEE 381: Lean Six Sigma Methodology
MAE 384: Advanced Mathematical Methods for Engineers (CS)
MEE 322: Structural Mechanics
MEE 340: Heat Transfer
TWC 446: Technical and Scientific Reports (L)
TWC 451: Copyright and Intellectual Property in the Electronic Age

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
BIO 345: Evolution
BIO 360: Animal Physiology
BIO 440: Functional Genomics or MBB 440: Functional Genomics
BIO 467: Neurobiology
BUA 380: Small Business Leadership
BUA 381: Small Business Accounting and Finance
BUA 383: Small Business Working Relationships
BUS 384: Business Operations and Planning
CHM 326: Advanced Analytical Chemistry Laboratory
CIS 300: Web Design and Development
COM 312: Communication, Conflict, and Negotiation
CSE 310: Data Structures and Algorithms
CSE 412: Database Management

ECN 306: Survey of International Economics (SB & G)

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 407: Digital Signal Processing
EEE 480: Feedback 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 320: Extreme Excel
IEE 369: Work Analysis and Design (L)
IEE 431: Engineering Administration (L)
LES 305: Business Law and Ethics for Managers
LSC 347: Fundamentals of Genetics
MAE 318: System Dynamics and Control I
MAE 417: System Dynamics and Control II
MAT 343: Applied Linear Algebra

Upper Division Related Electives, continued
MGT 300: Principles of Management and Leadership
MGT 302: Principles of International Business (G)
MGT 380: Management and Strategy
MIC 314: HIV/AIDS: Science, Behavior, and Society
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
PAF 301: Applied Statistics (CS)
PAF 410: Building Leadership Skills (SB)
PHI 306: Applied Ethics (HU)
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)
STS 304: Science, Technology and Society (SB)
STS 332: Global Issues in Science and Technology (SB)
TEM 330: Systems Innovation

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.

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 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)

General Studies Awareness Requirements:

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

First-Year Composition

General Studies designations listed next to courses on the major map were valid for the 2023 - 2024 academic year. Please refer to the course catalog for current General Studies designations at time of class registration. General Studies credit is applied according to the designation the course carries at the time the class is taken.