

2023 - 2024 Major Map

Biomedical Engineering (Biological Devices), BSE

School/College: [Ira A. Fulton Schools of Engineering](#)
ESBMEBDBSE

Term 1 0 - 16 Credit Hours Critical course signified by 	Hours	Minimum Grade	Notes
 ASU 101-BME: The ASU Experience	1	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.
 CHM 114: General Chemistry for Engineers (SQ)	4	C	
 MAT 265: Calculus for Engineers I (MA)	3	C	
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	
FSE 100: Introduction to Engineering	2	C	
STP 226: Elements of Statistics (CS) OR STP 231: Statistics for Life Science (CS)	3	C	
 Minimum 2.00 GPA ASU Cumulative.			
Term hours subtotal:	16		
Term 2 16 - 30 Credit Hours Critical course signified by 	Hours	Minimum Grade	Notes
 BIO 181: General Biology I (SQ)	4	C	- Create a Handshake profile. - Get involved with EPICS, the Generator Labs, and the Fulton Start-Up Center.
 MAT 266: Calculus for Engineers II (MA)	3	C	
 PHY 121: University Physics I: Mechanics (SQ)	3	C	
 PHY 122: University Physics Laboratory I (SQ)	1	C	
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	
 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:	14		
Term 3 30 - 46 Credit Hours Critical course signified by 	Hours	Minimum Grade	Notes
 MAT 242: Elementary Linear Algebra	2	C	Select your Bioscience Elective course(s) from the approved list found at the bottom of the major map.
 MAT 267: Calculus for Engineers III (MA)	3	C	

	PHY 131: University Physics II: Electricity and Magnetism (SQ)	3	C
	PHY 132: University Physics Laboratory II (SQ)	1	C
	BME 210: Programming for Biomedical Engineers: Introduction to Computers, Programming and Data (CS)	3	C
	Bioscience Elective	4	C
	Minimum 2.00 GPA ASU Cumulative.		
	Complete Mathematics (MA) requirement.		
Term hours subtotal:		16	

Term 4 46 - 60 Credit Hours **Critical course signified by**

Term 4 46 - 60 Credit Hours Critical course signified by ⚠️		Hours	Minimum Grade
⚠️	BME 200: Conservation Principles in Biomedical Engineering	3	C
⚠️	MAT 275: Modern Differential Equations (MA)	3	C
	BME 235: Physiology for Engineers	4	C
	EEE 202: Circuits I	4	C
Term hours subtotal:		14	

- Prep for success using the [Sophomore Guide](#).

- Pursue an [undergraduate research experience](#).
- Apply for [internships](#).
- Attend [career fairs and events](#).

Term 5 60 - 77 Credit Hours **Necessary course signified by**

Term 5 60 - 77 Credit Hours Necessary course signified by		Hours	Minimum Grade
★			
★	BIO 353: Cell Biology	3	C
★	BME 362: Methods in Molecular and Cellular Biology	1	C
	BME 318: Biomaterials	4	C
	BME 331: Transport Phenomena for Biomedical Engineering	3	C
	Upper Division Engineering Elective	3	C
	Humanities, Arts and Design (HU) AND Cultural Diversity in the U.S. (C)	3	
Term hours subtotal:		17	

- Select your Upper Division Engineering 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.
- Plan for success using the [Junior Guide](#).
- Network at [student organization](#) competitions or professional societies.

Term 6 77 - 92 Credit Hours **Necessary course signified by**

Term 6 77 - 92 Credit Hours Necessary course signified by 		Hours	Minimum Grade
	BME 360: Control in Biological Systems	3	C
	BME 213: Biomedical and Bioengineering Ethics	1	C
	BME 300: Bioengineering Product Design	3	C
	BME 301: Numerical Methods in Biomedical Engineering	2	C
	BME 316: Biomechanics for Biomedical Engineers	3	C

- Select your Upper Division Engineering Elective courses from the approved list found at the bottom of the major map.
- Research and prepare for [graduate school](#).
- Apply for an [engineering 4+1 program](#).
- Develop a [professional profile online](#).

Upper Division Engineering Elective	3	C	
★ Complete Cultural Diversity in the U.S. (C) AND Global Awareness (G) AND Historical Awareness (H) course(s).			
Term hours subtotal:		15	
Term 7 92 - 105 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes
★ BME 417: Biomedical Engineering Capstone Design I (L)	4	C	- 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. - Plan for success using the Senior Guide. - Use Handshake to apply for full-time positions. - Complete an in person or virtual practice interview.
BME 467: Tissue Engineering and Regenerative Medicine	3	C	
Upper Division Related Elective	3	C	
Social-Behavioral Sciences (SB) AND Global Awareness (G)	3		
Term hours subtotal:		13	
Term 8 105 - 120 Credit Hours Necessary course signified by ★	Hours	Minimum Grade	Notes

★ BME 490: Biomedical Engineering Capstone Design II (L)	4	C	- 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.
Upper Division Related Elective	2	C	
Upper Division Humanities, Arts and Design (HU) OR Upper Division Social-Behavioral Sciences (SB)	3		
Humanities, Arts and Design (HU) AND Historical Awareness (H)	3		
Social-Behavioral Sciences (SB)	3		
Term hours subtotal:		15	

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

Bioscience Electives	Upper Division Engineering Electives	Upper Division Related Electives
BIO 182: General Biology II (SG)	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)	ACC 382: Accounting and Financial Analysis
BIO 201: Human Anatomy and Physiology I (SG)	BME 340: Thermodynamics for Biomedical Engineers or CHE 342: Introduction to Applied Chemical Thermodynamics	BCH 361: Advanced Principles of Biochemistry
CHM 231: Elementary Organic Chemistry (SQ) AND CHM 235: Elementary Organic Chemistry Laboratory (SQ)		BCH 367: Elementary Biochemistry Laboratory
CHM 233: General Organic Chemistry I AND CHM 237: General Organic		BCH 461: General Biochemistry
		BCH 462: General Biochemistry

Chemistry Laboratory I	BME 465: Magnetic Resonance Imaging	BCH 467: Analytical Biochemistry Laboratory (L)
MIC 205: Microbiology (SG) AND MIC 206: Microbiology Laboratory (SG)	BME 494: Bioenergy and Microbial Biotechnology	BIO 302: Cancer--Mother of All Diseases (L)
	BME 494: Finite Element Modeling for Biomedical Application	BIO 312: Bioethics (HU) or PHI 320: Bioethics (HU)
	BME 494: Medical Imaging Instrumentation	BIO 331: Animal Behavior
	BME 494: Polymeric Drug Delivery	BIO 340: General Genetics or MBB 347: Molecular Genetics: From Genes to Proteins
	BME 494: Systems Biology of Disease	BIO 345: Evolution
	BME 494: Technology for Global Health	BIO 360: Animal Physiology
	BMI 311: Modeling Biomedical Knowledge	BIO 440: Functional Genomics or MBB 440: Functional Genomics
	CEE 384: Numerical Methods for Engineers (CS)	BIO 451: Cell Biotechnology: Cell Culture, Immunocytochemistry and Bioimaging
	CHE 468: Polymer Principles and Processing	BIO 467: Neurobiology
	CHE 473: Fuel Cells and Biofuel Cells	BME 394: Honors Research
	CHE 478: Biomass Energy Conversion Technology	BME 394: SBHSE Research Projects
	CHE 479: Microbial Bioprocess Engineering	BME 492: Honors Directed Study
	CHE 494: Fundamentals of Scaleup	BME 493: Honors Thesis (L)
	CHE 494: Nanobiotechnology	BMI 465: Introduction to Comparative Genomics
	CHE 494: Soft Matter Morphology	BUA 380: Small Business Leadership
	CHE 494: Sustainable Macromolecular Synthesis	BUA 381: Small Business Accounting and Finance
	CHM 325: Analytical Chemistry	BUA 383: Small Business Working Relationships
	CHM 341: Elementary Physical Chemistry or BCH 341: Physical Chemistry with a Biological Focus	BUS 384: Business Operations and Planning
	CSE 340: Principles of Programming Languages	CHE 475: Biochemical Engineering
	DAT 301: Exploring Data in R and Python	CHM 302: Environmental Chemistry
	EEE 334: Circuits II	CHM 326: Advanced Analytical Chemistry Laboratory
	EEE 350: Random Signal Analysis	CIS 300: Web Design and Development
	EEE 352: Properties of Electronic Materials	COM 312: Communication, Conflict, and Negotiation
	EEE 407: Digital Signal Processing	CSE 310: Data Structures and Algorithms
	EEE 481: Computer-Controlled Systems	CSE 412: Database Management
	HCD 403: Process Engineering	ECN 306: Survey of International Economics (SB & G)
	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)	
	MAT 451: Mathematical Modeling (CS)	
	MEE 322: Structural Mechanics	

MEE 340: Heat Transfer

MSE 415: Mathematical and Computer
Methods in Materials (CS)

MSE 440: Mechanical Behavior of
Materials

MSE 450: Introduction to Materials
Characterization

MSE 451: Nanomaterials and Electronics
Characterization Lab

MSE 470: Polymers and Composites

MSE 471: Introduction to Ceramics

MSE 482: Materials Engineering Design
(L)

TWC 446: Technical and Scientific
Reports (L)

TWC 451: Copyright and Intellectual
Property in the Electronic Age

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 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)

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

Upper Division Related Electives,
continued

MGT 300: Principles of Management and
Leadership

MGT 302: Principles of International
Business (G)

MGT 380: Management and Strategy for
Nonmajors

MIC 314: HIV/AIDS: Science, Behavior,
and Society

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 330: Thermodynamics of Materials

MSE 335: Materials Kinetics

MSE 355: Structure and Defects

MSE 356: Thin Film and Microelectronic
Devices Lab

MSE 420: Advanced Metallurgical Alloys
and Processes

MSE 421: Physical Metallurgy Laboratory

MSE 442: Fatigue, Fracture, and Creep of
Materials

KIN 412: Biomechanics of the Skeletal System	MSE 458: Electronic, Magnetic, and Optical Properties
KIN 413: Qualitative Analysis in Sport Biomechanics	MSE 460: Nanomaterials in Energy Production and Storage
KIN 414: Electromyographic Kinesiology (L)	NTR 457: Sports Nutrition
KIN 440: Exercise Biochemistry	PAF 301: Applied Statistics (CS)
LES 305: Business Law and Ethics for Managers	PAF 410: Building Leadership Skills (SB)
LES 380: Consumer Perspective of Business Law	PHI 306: Applied Ethics (HU)
LSC 347: Fundamentals of Genetics	PHI 313: Probability, Evidence, and Decision
MAE 318: System Dynamics and Control I	PHY 361: Introductory Modern Physics
MAE 341: Mechanism Analysis and Design	PSY 325: Physiological Psychology
MAE 417: System Dynamics and Control II	PSY 470: Psychopharmacology
MAT 300: Mathematical Structures (L)	SCM 300: Global Supply Operations
MAT 310: Introduction to Geometry	SOC 334: Technology and Society (L or SB)
MAT 342: Linear Algebra or MAT 343: Applied Linear Algebra	STP 420: Introductory Applied Statistics (CS)
MAT 460: Vector Calculus	STP 421: Probability
MAT 462: Applied Partial Differential Equations	STP 429: Applied Regression (CS)
MBB 343: Genetic Engineering and Society (L) or BIO 343: Genetic Engineering and Society (L)	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.