

2020 - 2021 Major Map

Biomedical Engineering, BSE

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

Term 1 0 - 15 Credit Hours Critical course signified by 	Hours	Minimum Grade	Notes
 ASU 101-BME: The ASU Experience	1	C	- 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 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	
BME 100: Introduction to Biomedical Engineering	3	C	
BME 182: Biomedical Engineering Product Design and Development I	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	
 Minimum 2.00 GPA ASU Cumulative.			
Term hours subtotal:	15		
Term 2 15 - 31 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	
BME 122: Statistics for Biomedical Engineers	2	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 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 Critical course signified by 	Hours	Minimum Grade	Notes
 MAT 267: Calculus for Engineers III (MA)	3	C	Prep for success using the Sophomore Guide.

	PHY 131: University Physics II: Electricity and Magnetism (SQ)	3	C
	PHY 132: University Physics Laboratory II (SQ)	1	C
	BME 213: Biomedical and Bioengineering Ethics	1	C
	BME 214: FDA Regulatory Processes and Technical Communications	1	C
	CSE 110: Principles of Programming (CS)	3	C
	ECN 211: Macroeconomic Principles (SB) OR ECN 212: Microeconomic Principles (SB)	3	C
	MAE 215: Introduction to Programming in MATLAB	1	C
	Minimum 2.00 GPA ASU Cumulative.		
	Complete Mathematics (MA) requirement.		
Term hours subtotal:		16	

Term 4 47 - 62 Credit Hours 	Hours	Minimum Grade	Notes
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	BME 200: Conservation Principles in Biomedical Engineering	3	C
	MAT 275: Modern Differential Equations (MA)	3	C
	BME 235: Physiology for Engineers	4	C
	BME 282: Biomedical Engineering Product Design and Development II	1	C
	EEE 202: Circuits I	4	C
Term hours subtotal:		15	

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

Term 5 62 - 76 Credit Hours   Necessary course signified by	Hours	Minimum Grade	Notes
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	Upper Division Biomedical Devices Track OR Upper Division Biological Devices Track	3-4	C
	BME 318: Biomaterials	4	C
	BME 331: Transport Phenomena for Biomedical Engineering	3	C
	CHM 231: Elementary Organic Chemistry (SQ) AND CHM 235: Elementary Organic Chemistry Laboratory (SQ)	4	C
Term hours subtotal:		14-15	

- Select courses from the Biomedical Devices Track OR the Biological Devices Track (required courses listed in track groups below; must complete all courses within one track).
- Complete the appropriate number of Upper Division Related Elective credits based on your selected track. Course options can be found [here](#).
- Plan for success using the [Junior Guide](#).
- Network at [student organization](#) competitions or professional societies.

Term 6 76 - 91 Credit Hours   Necessary course signified by	Hours	Minimum Grade	Notes
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★	Upper Division Biomedical Devices Track OR Upper Division Biological Devices Track	3	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
	BME 340: Thermodynamics for Biomedical Engineers	3	C
	BME 382: Biomedical Engineering Product Design and Development III	1	C
★	Complete Cultural Diversity in the U.S. (C) AND Global Awareness (G) AND Historical Awareness (H) course(s).		
Term hours subtotal:		15	

- Select course from the Biomedical Devices Track OR the Biological Devices Track (required courses listed in track groups below; must complete all courses within one track).
- Research and prepare for [graduate school](#).
- Apply for an [engineering 4+1 program](#).
- Develop a [professional profile online](#).

★ Term 7 91 - 105 Credit Hours Necessary course signified by	Hours	Minimum Grade	Notes
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★	BME 417: Biomedical Engineering Capstone Design I (L)	4	C
★	Upper Division Biomedical Devices Track OR Upper Division Biological Devices Track	4-3	C
	Humanities, Arts and Design (HU) AND Cultural Diversity in the U.S. (C)	3	
	Humanities, Arts and Design (HU) AND Historical Awareness (H)	3	
Term hours subtotal:		14-13	

- 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.
- Complete the appropriate number of Upper Division Related Elective credits based on your selected track. Course options can be found [here](#).
- Plan for success using the [Senior Guide](#).
- Use [Handshake](#) to apply for full-time positions.
- Complete an in person or virtual [practice interview](#).

★ Term 8 105 - 120 Credit Hours Necessary course signified by	Hours	Minimum Grade	Notes
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★	BME 490: Biomedical Engineering Capstone Design II (L)	4	C
	Upper Division Related Elective	5	C
	Upper Division Humanities, Arts and Design (HU) OR Upper Division Social-Behavioral Sciences (SB)	3	
	Social-Behavioral Sciences (SB) AND Global Awareness (G)	3	
Term hours subtotal:		15	

- 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.
- Complete the appropriate number of Upper Division Related Elective credits based on your selected track. Course options can be found [here](#).

Biomedical Devices Track
BME 350: Signals and Systems for Bioengineers
BME 370: Microcomputer Applications in Biomedical Engineering
BME 413: Biomedical Instrumentation (L) AND BME 423: Biomedical Instrumentation Laboratory (L)

Upper Division Related Elective (Professional)
BME 394: SBHSE Research Projects or BME 394: Honors Research
BME 492: Honors Directed Study
BME 493: Honors Thesis (L)

Upper Division Related Elective (Neural)
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)

Biological Devices Track
BIO 353: Cell Biology AND BME 362: Methods in Molecular and Cellular Biology
BME 360: Control in Biological Systems
BME 467: Tissue Engineering and Regenerative Medicine

Upper Division Related Elective (Math)
MAE 384: Advanced Mathematical Methods for Engineers (CS)
MAT 300: Mathematical Structures (L)
MAT 310: Introduction to Geometry
MAT 342: Linear Algebra or MAT 343: Applied Linear Algebra
MAT 355: Introduction to Computational Molecular Biology (CS)
MAT 451: Mathematical Modeling (CS)
MAT 460: Vector Calculus
MAT 462: Applied Partial Differential Equations
PAF 301: Applied Statistics (CS)
STP 421: Probability
STP 429: Experimental Statistics (CS)

Upper Division Related Elective (Pre-Medical)
BCH 361: Advanced Principles of Biochemistry
BCH 367: Elementary Biochemistry Laboratory
BIO 302: Cancer--Mother of All Diseases (L)
BIO 340: General Genetics
BIO 360: Animal Physiology
BIO 440: Functional Genomics

Upper Division Related Elective (Imaging)
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
PHY 361: Introductory Modern Physics

Upper Division Related Elective (Biomechanics)
KIN 334: Functional Anatomy and Kinesiology
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
MAE 417: System Dynamics and Control II
MEE 322: Structural Mechanics

Upper Division Related Elective (Molecular, Cellular, Materials)
BCH 461: General Biochemistry
BCH 462: General Biochemistry
BCH 467: Analytical Biochemistry Laboratory (L)
BIO 331: Animal Behavior
BIO 345: Organic Evolution
BIO 355: Introduction to Computational Molecular Biology (CS)
BIO 360: Animal Physiology

EDP 310: Understanding the Brain (SB)	BIO 467: Neurobiology	BIO 440: Functional Genomics or MBB 440: Functional Genomics
PSY 325: Physiological Psychology	BMI 465: Introduction to Comparative Genomics	BIO 467: Neurobiology
PSY 470: Psychopharmacology	CHM 341: Elementary Physical Chemistry	BMI 465: Introduction to Comparative Genomics
	HCD 320: Applied Medical/Health Care Ethics (HU)	CHE 475: Biochemical Engineering
	HCR 350: Introduction to Clinical Research	CHM 302: Environmental Chemistry
	MIC 314: HIV/AIDS: Science, Behavior, and Society	CHM 341: Elementary Physical Chemistry
	MIC 360: Bacterial Physiology	LSC 347: Fundamentals of Genetics
	MIC 420: Immunology: Molecular and Cellular Foundations	MBB 343: Genetic Engineering and Society (L)
	NTR 457: Sports Nutrition	MBB 347: Molecular Genetics: From Genes to Proteins
		MEE 340: Heat Transfer
		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

Upper Division Related Elective (Business, Entrepreneurship, Management)

ACC 382: Accounting and Financial Analysis

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)

EDP 310: Developing as a Leader (SB)

FIN 300: Fundamentals of Finance

FIN 380: Personal Financial Management

FSE 301: Entrepreneurship and Value Creation or ENT 360: Entrepreneurship and Value Creation

HON 394: Deductive Logic, Leadership/Management Techniques

HON 494: Genetics and the Law

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 446: Technical and Scientific Reports
(L)

TWC 451: Copyright and Intellectual
Property in the Electronic Age

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 2020 - 2021 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.