SBME Pre-Approved Electives

In general, electives need to be at a 3000-level or above. The sections below serve as a source of pre-approved course options; however, approval from an SBME faculty advisor is recommended when selecting 'Math, Science, & Engineering' electives. Other courses not on this list may be approved with permission by the SBME faculty via the Undergraduate Studies Committee.

Not all classes are offered frequently. **Students are responsible for ensuring that courses will be offered in the semester they intend to take it, and that all prerequisites or other permissions are acquired before enrolling in electives.** Courses less than 3 credit hours will have to be supplemented with another course to account for the credit hour discrepancy.

Student should refer to their degree plans to determine the number of credit hours required for BME electives. For student on the 2019-degree plan or earlier, a total of at least 6 credit hours are required for BME electives. For students on the 2020-degree plan or later, a total of at least 12 credit hours are required for BME electives. For all students, a total of at least 6 credit hours are required for 'Science, Math, & Engineering' electives. BME elective course credits in excess of the required number of credit hours can be counted toward 'Science, Math, & Engineering' elective credit hours.

<u>Courses not approved as electives:</u>

- Anything below 3000 level
- Courses cannot be double counted for the 'Upper-Level Biology Elective' and a 'Science, Math, & Engineering' Elective
- Courses cannot be double counted for 'Science, Math, & Engineering' and 'BME" electives
- Any other courses already fulfilling another graduation requirement (e.g., ENGR 3511 Transfer Engineering Experience)

List of Approved Courses for 'BME' Electives

Course Code	Course Title	Typically Offered		Undergrad Credit only	Undergrad / Grad Credit	Grad Credit only	NOTES
BME 3113	Bioimaging	Spring	Annual	✓			
BME 3133	Bioelectricity	Fall	Annual	✓			
BME 3153	Molecular, Cellular, and Tissue Engineering	Fall	Annual	✓			
BME 3163	Biomedical Micro- and Nanotechnology	Spring	Annual	✓			
BME 3243	Biomechanics of Human Movement	Spring	Annual	✓			
BME 3440 / 3980	Mentored Research	All	Annual	✓			See Research for Credit Policy
BME 4050	Design Projects in BME	All	Annual	✓			See Research for Credit Policy
BME 4281	Engineering Co-Op Program	All	Annual	✓			See Internships & Co-Ops Policy
BME 4533 / 5533	Neural Engineering	Fall	Bi-Annual		✓		*
BME 4873 / 5873	Network Modeling & Analysis of Complex Systems	Spring	Bi-Annual		✓		*
BME 4970 / 5970	Special Topics in Biomedical Engineering	Fall / Spring	Irregular		✓		*
BME 5023	Conduct & Communication in Biomedical Research	Fall	Bi-Annual		✓		
BME 5123	Biophotonics Imaging & Microscopy	Fall	Bi-Annual		✓		
BME 5133	Therapeutic Biophotonics	Spring	Bi-Annual		✓		
BME 5143	Biosensors: Fundamentals & Application	Spring	Bi-Annual		✓		
BME 5283	Immunoengineering	Fall	Bi-Annual		✓		
BME 5413	Nanomedicine	Fall	Bi-Annual		✓		
BME 5443	Neural System & Rehabilitation Engineering	Spring	Irregular		✓		
BME 5543	Neural Imaging & Data Sciences	Fall	Bi-Annual		✓		
AME / BME 4013 / 5013	Introduction to Medical Device Design	Spring	Bi-Annual		✓		*
AME / BME 4093 / 5093	Ear Mechanics	Fall	Bi-Annual		✓		*
AME / BME 4213 / 5213	Biomechanics I	Spring	Bi-Annual		✓		*
CH E / BME 4243 / 5243	Biochemical Engineering	Spring	Bi-Annual		✓		*
CH E / BME 4373 / 5373	Tissue Engineering	Fall	Irregular		✓		*
CH E / BME 4423 / 5423	Genetic Eng & Biotechnology	Fall	Bi-Annual		✓		*
CH E / BME 5293	Transport in Biological Systems	Fall	Irregular		✓		
CH E 4583 / 5583	Advanced Techniques in Biomanufacturing	Fall/ Spring	Annual		✓		*
CH E 5453	Polymer Science & Engineering	Spring	Annual		✓		
CS 4273 / 5273	Neural Data Science	Fall	Annual		✓		*

ECE 4823	Engineering Principles of the Human Body	Spring	Bi-Annual		✓		
BME / ECE 5843	Medical Imaging Systems	Fall	Annual		✓		
BME / ECE 5853	Biomedical Signals & Systems	Spring	Irregular		✓		
BME 5990	Independent Study	All	Annual			✓	**&**
CS 5970	Bioinformatics	Fall	Bi-Annual			✓	
ECE 6813	Advanced Topics in Biomedical Engineering	Spring	Bi-Annual			✓	
ECE 5973	Special Topics in Electrical & Computer Engineering	Fall/ Spring	Annual			✓	**&**
BME / ECE 6213	Optical Information Processing	Spring	Irregular			✓	**&**

***** Undergrad Credit = 4000 level | Grad credit = 5000 level

& Can be approved for undergrad credit in special cases with petition

List of Approved Courses for 'Upper Division Biology' Electives

- BIOL 3113 - Cell Biology
  - Prerequisite: 1114, or 1124, or Biology 1134, or Botany 1114, and Chemistry 3053.
- BIOL 3333 - Genetics
  - Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; Biology 1134 recommended
- BIOL 3833 - Introduction to Neurobiology
  - Prerequisite: BIOL 1124
- BIOL 4843 - Intro to Molecular Biology
  - Prerequisite: 1114 or 1124, or Botany/PBIO 1114, or Microbiology 3813 and 3812, and one course in organic chemistry
- CHEM 3053 - Organic Chemistry I: Biological Emphasis
  - ****Only applies to students on the 2021-degree plan or later**
  - Prerequisite: CHEM 1415 or CHEM 1425 or CHEM 1435.
- CHEM 3653 - Introduction to Biochemistry
  - Prerequisite: CHEM 3013, CHEM 3053, or CHEM 3064.
- MBIO 3813: Fundamentals of Microbiology
  - Prerequisite: BIOL 1005 or BIOL 1114 or BIOL 1124 or BIOL 1134 or PBIO 1114; and CHEM 1315 and CHEM 1415, or CHEM 1335 and CHEM 1435
- BIOL G4533 – Basic Immunology
  - Prerequisite: one semester of organic chemistry, and an introductory biology course, plus one of the following: BIOL 3813 and 3812, Zoology 2124, 3113, 3204, 3333.

List of Approved Courses for 'Science, Math, and Engineering' Electives

Anthropology
$ANTH 5273 Bioethics, Biotechnology, Biomedicine
ANTH 4823 Medical Anthropology

Biology
BIOL 3103 Principles of Physiology
*BIOL 3113 Cell Biology
BIOL 3201 Animal Development Lab
BIOL 3203 Animal Development
*BIOL 3333 Genetics
*BIOL 3833 Intro to Neurobiology
BIOL 4233 Neurobiology of Disease
BIOL 4244 Animal Histology
*BIO G4533 Basic Immunology
*BIOL 4843 Intro to Molecular Biology
BIOL 4853 Neurobiology of Memory
BIOL 4893 Behavioral Neurobiology
BIOL 4913 Quantitative Biology
BIOL 5153 Endocrine Physiology
BIOL 5293 Cytology Ultrastructure
BIOL 5343 Developmental Genetics
BIOL 5364 Transmission Electron Microscopy
BIOL 5374 Scanning Electron Microscopy
BIOL 5843 Molecular Biology
$BIOL 5923 Programming in R for Biology
MBIO 3673 Practical Bioinformatics
MBIO 3812 Fund. Microbiology Lab
*MBIO 3813 Fundamentals of Microbiology

Chemical, Biological, & Materials Engineering
CHE 3313 Structure & Properties of Materials
CHE 5463 Polymer Processing

Chemistry
*&CHEM 3053 Organic Chemistry I: Biological
CHEM 3153 Organic Chemistry II: Biological
CHEM 3423 Physical Chemistry
CHEM 3523 Physical Chemistry II
*CHEM 3653 Biochemistry
CHEM 3753 Intro to Biochemical Methods
CHEM 4023 Instrumental Methods in Chemical Analysis
CHEM 4333 Advanced Inorganic Chemistry
CHEM 5453 Polymer Science
CHEM 5753 Principles of Biochem I
CHEM 5853 Principles of Biochem II
CHEM 6813 Intro to Biochemical Methods
CHEM 6823 Protein, Nucleic Acids, & Gene Expression
CHEM 6833 Structure & Function of Membranes & Hormones
CHEM 6843 Enzyme Mechanisms & Metabolic Regulation
CHEM 6853 Protein Structure & Function

Computer Science
CS 4013 Artificial Intelligence
CS 4033 Machine Learning
CS 4063 Human Computer Interaction
CS 4433 Computational Methods in Discrete Optimization
CS 5043 Advanced Machine Learning
CS 5073 Artificial Neural Networks Evolution
CS 5593 Data Mining
CS 5703 Machine Learning Practice

Data Science & Analytics
DSA 3013 Machine Learning for Data Science
DSA 3023 Big Data Engineering
^DSA 5013 Fundamentals of Engineering Statistical Analysis
^DSA 5103 Intelligent Data Analytics
DSA 5011 Introduction to R
DSA 5203 Time Series Analysis
^DSA 5503 Healthcare Analytics
DSA 5403 Bayesian Statistic

Engineering
#ENGR 3401 Engineering Economics
#ENGR 3431 Electromechanical Systems
#ENGR 3441 Fluid Mechanics
ENGR 4003 Engineering Practice
ENGR 4013 Leadership & Management for Engineers
ENGR 4023 Disruptive & Innovative Technology Ideation
$ENGR G4510 Global Environmental Health
ENGR 5213 Foundations of Engr Education

Electrical and Computer Engineering
ECE 3323 Intro-Solid State Elec Devices
ECE 3813 Introductory Electronics
ECE 4813 Electronics
ECE 5213 Digital Signal Processing
ECE 5273 Digital Image Processing
ECE 5523 Random Signals
ECE 5363 Optical Engineering

Health & Exercise Science
HES 3513 Health Promotion Planning
HES 3583 Sociocultural Aspects of Health
HES 3843 Biomechanics
HES 4543 Comprehensive Stress Management
HES 4553 Measurement and Evaluation in Health Promotion
HES 4573 Chronic Disease Intervention
^HES 5823 Exercise Physiology

Industrial Systems Engineering
ISE 4223 Fundamentals of Engineering Economics
ISE 4553 Data Driven Decision Making I
ISE 4804 Ergonomics in Systems Design
^ISE 5013 Fundamentals of Engineering Statistical Analysis
ISE 5033 Systems Engineering
^ISE 5103 Intelligent Data Analytics
ISE 4553 Data Driven Decision Making
ISE 5373 Additive Manufacturing
^ISE 5503 Healthcare Analytics
^ISE 5823 Exercise Physiology

Math
MATH 3333 Linear Algebra
MATH 3423 Physical Math II
MATH 4163 Intro Partial Diff. Equations
MATH 4373/5373 Abstract Linear Algebra
MATH 4383/5383 Modern Algebra

Meteorology
METR 4990-024 Foundations of Academic Research Creative Activity

Physics
PHYS 3043 Physical Mechanics
PHYS 3233-001 Modern Physics for Engineers

Psychology
PSY 3203 Cognitive Psychology
PSY 3803 Physiological Psychology

Notes:
* *If not taken as Upper-Level Biology Requirement*

[#] *Needs to be combined with other 1 credit courses to make 3 credits.*

[&] *Only applies to students on the 2021-degree plan or later.*

^ No student may earn credit for both sections of cross-listed courses.

[$] *These courses are offered on an irregular basis.*