

BIOMEDICAL ENGINEERING, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Degree Requirements

For the Bachelor of Science degree in Biomedical Engineering, a minimum of 130-131 credits are required:

Requirement	Credits
General Education	45
Requirements for the Major	111-113

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Students in residence at the Commonwealth campuses may satisfy the course requirements for semesters 1-3. They should then transfer to University Park to begin studies in their major beginning with semester 4.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
BME 303	Bio-continuum Mechanics	3
BME 403	Biomedical Instrumentation Laboratory	1
BME 429	Biomedical Mechanics and Techniques Laboratory	2
BME 440	Biomedical Engineering Professional Seminar	1
BME 450W	Biomedical Senior Design	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
EMCH 210	Statics and Strength of Materials	5
MATH 230	Calculus and Vector Analysis	4
<i>Prescribed Courses: Require a grade of C or better</i>		
BME 201	Fundamentals of Cells and Molecules	3
BME 301	Analysis of Physiological Systems	4
BME 313	Thermodynamics for Biomedical Engineering	3
BME 401	Numerical Simulations in Biomedical Engineering	3
BME 402	Biomedical Instrumentation and Measurements	3
CHEM 110	Chemical Principles I	3
CMPSC 200	Programming for Engineers with MATLAB	3
EDSGN 100	Cornerstone Engineering Design	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4

MATH 251	Ordinary and Partial Differential Equations	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses

Select 1 credit of First-Year Seminar		1
ECON 102	Introductory Microeconomic Analysis and Policy	3
or ECON 104	Introductory Macroeconomic Analysis and Policy	

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	

ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	

Select one of the following: 4

BIOL 141 & BIOL 142	Introduction to Human Physiology and Physiology Laboratory	
---------------------	------------------------------------------------------------	--

BIOL 141 & BIOL 162	Introduction to Human Physiology and Human Anatomy and Physiology I - Laboratory	
---------------------	----------------------------------------------------------------------------------	--

BIOL 141 & BIOL 164	Introduction to Human Physiology and Human Anatomy and Physiology II - Laboratory	
---------------------	-----------------------------------------------------------------------------------	--

BIOL 240W	Biology: Function and Development of Organisms	
-----------	------------------------------------------------	--

Supporting Courses and Related Areas

Select 3 credits of Science or Engineering Elective courses from departmental list		3
------------------------------------------------------------------------------------	--	---

Requirements for the Option

Select an option		23-24
------------------	--	-------

Requirements for the Option Biochemical Option (24 credits)

Code	Title	Credits
Prescribed Courses		
BME 409	Biofluid Mechanics	3
BME 413	Mass Transport in Biological Systems	3
BME 423	Reaction Kinetics of Biological Systems	3

Additional Courses

CHEM 202	Fundamentals of Organic Chemistry I	3
or CHEM 210	Organic Chemistry I	

Supporting Courses and Related Areas

Select 9 credits from Biochemical Option department list		9
----------------------------------------------------------	--	---

Select 3 credits from Related Electives department list		3
---------------------------------------------------------	--	---

Medical Imaging and Devices Option (23 credits)

Code	Title	Credits
Prescribed Courses		
BME 406	Medical Imaging	3
EE 210	Circuits and Devices	4

Additional Courses

Select 4 credits from the following: 4

CMPEN 270	Digital Design: Theory and Practice	
CMPEN 271 & CMPEN 275	Introduction to Digital Systems and Digital Design Laboratory	

EE 310	Electronic Circuit Design I	
--------	-----------------------------	--

EE 330	Engineering Electromagnetics	
--------	------------------------------	--

Supporting Courses and Related Areas

Select 6 credits from the Related Electives department list	6
Select 6 credits from Medical Imaging and Device Option department list	6

Biomaterials Option (24 credits)

Code	Title	Credits
Prescribed Courses		
BME 443	Biomedical Materials	3
BME 446	Polymers in Biomedical Engineering	3
MATSE 201	Introduction to Materials Science	3
Additional Courses		
BME 408	Solid Mechanics of Biological Materials	3
or BME 409	Biofluid Mechanics	
or BME 413	Mass Transport in Biological Systems	
CHEM 202	Fundamentals of Organic Chemistry I	3
or CHEM 210	Organic Chemistry I	
Supporting Courses and Related Areas		
Select 3 credits from Related Electives department list		3
Select 6 credits from Biomaterials Option department list		6

Biomechanics Option (24 credits)

Code	Title	Credits
Prescribed Courses		
BME 408	Solid Mechanics of Biological Materials	3
BME 409	Biofluid Mechanics	3
EMCH 212	Dynamics	3
EMCH 315	Mechanical Response of Engineering Materials	2
EMCH 316	Experimental Determination of Mechanical Response of Materials	1
Supporting Courses and Related Areas		
Select 9 credits from Biomechanics Option department list		9
Select 3 credits from Related Electives department list		3

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Knowledge Domains

- **Arts (GA):** 6 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 6 credits

- **Social and Behavioral Sciences (GS):** 6 credits
- **Natural Sciences (GN):** 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)

- **Inter-Domain or Approved Linked Courses:** 6 credits

University Degree Requirements**First Year Engagement**

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- **United States Cultures:** 3 credits
- **International Cultures:** 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.