BIOMEDICAL ENGINEERING, BACHELOR OF ARTS

This program is designed for students who want more flexibility and diversity in their education than the B.S. program in Biomedical Engineering. The number of required engineering courses are less than the B.S. program leaving more options for electives. This program is suitable for a student who wants a general background in engineering but plans to continue his or her education at the graduate level in some field outside of engineering.

The information below describes the academic requirements for students entering JHU as degree-seeking students in Fall 2024. Students who entered JHU as degree-seeking students prior to Fall 2024 should view the appropriate archived catalogue ***(***https://e-catalogue.jhu.edu/archive/***).***

Students must meet the University requirements and the Whiting School of Engineering requirements (see Requirements for a Bachelor's Degree (https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/)in this catalogue), as well as the departmental major requirements, to complete a bachelor's degree.

The Bachelor of Arts degree in Biomedical Engineering requires 120 credits.

The BME department recognizes students with exemplary academic records by awarding Departmental Honors to students with a cumulative Grade Point Average of 3.50 or higher.

UNIVERSITY AND WSE SCHOOL REQUIREMENTS

These requirements are described in this section of the catalogue **(**https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/**).**

First-Year Seminar (FYS)

All students entering Hopkins from high school are required to complete a First-Year Seminar with a Satisfactory (S) grade in their first year of study. First-Year Seminars are offered only with the Satisfactory/Unsatisfactory grading system; they are not offered for letter grades.

Code	Title	Credits
EN.501.124	FYS: Design Cornerstone	2
Total Credits		*2*

Writing Intensive for BA in Biomedical Engineering

A grade of C- or higher is required. No Satisfactory/Unsatisfactory grades will be accepted. Courses must be at least 3 credits each and courses applied here may also be used towards satisfying the Distribution requirement.

Code	Title	Credits
Four Writing Intensive (W) courses		12
Total Credits		*12*

Distribution for BA in Biomedical Engineering

A grade of D or higher is required for a class to apply to the distribution requirement. Please note that any D grade credits used here will also count towards the maximum of 18 credits of D or D+ grades that may be applied towards overall bachelor's degree requirements. No Satisfactory/Unsatisfactory grade will be accepted. Courses must be at least 3 credits each and may overlap with the Writing Intensive requirement. Elementary language courses, which do not carry an area designator, can be used to satisfy the Distribution requirement for engineering students.

Code	Title	Credits
Eight Humanities (H) or Social Science (S) courses that are comprised of the following:		24
	Three courses from one department	
	Three courses at any level	
	One course at 300-level or higher	
Total Credits		*24*

MAJOR REQUIREMENTS

FOREIGN LANGUAGE

A grade of D or higher is required. A maximum of 18 credits of D or D+ grades may be applied toward the total degree credit requirement for graduation. No Satisfactory/Unsatisfactory grade will be accepted.

Code	Title	Credits
Two foreign language courses [1]		6
Total Credits		*6*

[1] Language courses can overlap with the Distribution Requirement and satisfy two Humanities courses.

MATHEMATICS

A grade of D or higher is required. A maximum of 18 credits of D or D + grades may be applied toward the total degree credit requirement for graduation. No Satisfactory/Unsatisfactory (S/U) grade will be accepted. Students who take an approved math course and receive 3 credits are still required to complete at least 120 total credits for the degree.

Code	Title	Credits
AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.110.109	Calculus II (For Physical Sciences and Engineering)	4
AS.110.202	Calculus III	4
or AS.110.211	Honors Multivariable Calculus	
EN.553.291	Linear Algebra and Differential Equations [1]	4
Total Credits [2]		*16*

[1] Students who receive a 0-credit calculus waiver(s) for AS.110.108 Calculus I (Physical Sciences & Engineering) and/or AS.110.109 Calculus II (For Physical Sciences and Engineering) are required to take an additional course(s) from the Department of Mathematics (AS.110) or the Department of Applied Math and Statistics (EN.553) to reach the 16-credit requirement.

- Instead of taking EN.553.291 Linear Algebra and Differential Equations, students can take two separate courses, AS.110.201 Linear Algebra AND AS.110.302 Differential Equations and Applications to make up the credits.
- Students may also consider taking the following courses: AS.110.311 Methods of Complex Analysis, AS.110.421 Dynamical Systems, AS.110.405 Real Analysis I, EN.553.171

Discrete Mathematics, EN.553.361 Introduction to Optimization I, and EN.553.420 Probability.

[2] Students who take an approved math course and receive 3 credits do not need to make up the credit difference; however, they are required to complete at least 120 total credits for the degree.

BASIC SCIENCES

A grade of D or higher is required. A maximum of 18 credits of D or D+ grades may be applied toward the total degree credit requirement for graduation. No Satisfactory/Unsatisfactory (S/U) grade will be accepted. Students receiving chemistry credits via AP, IB, or GCE exams should consult their academic advisor to discuss which chemistry course(s) may be appropriate for them.

Code	Title	Credits
AS.030.101	Introductory Chemistry I	3
AS.030.102	Introductory Chemistry II [1]	3
AS.030.105	Introductory Chemistry Laboratory I	1
AS.030.106	Introductory Chemistry Laboratory II [1]	1
AS.171.101	General Physics: Physical Science Major I	4
or AS.171.107	General Physics for Physical Sciences Majors (AL)	
AS.171.102	General Physics: Physical Science Major II	4
or AS.171.108	General Physics for Physical Science Majors (AL)	
AS.173.111	General Physics Laboratory I [2]	1
AS.173.112	General Physics Laboratory II [2]	1
Total Credits		*18*

[1] Students who have exam credits for Chemistry I and the lab must take AS.030.103 rather than AS.030.102 and AS.030.106 .

[2] Students who receive credit for Physics I and/or Physics II via exam will receive a waiver for the laboratory course. This will reduce the required number of credits for Basic Sciences by 1 or 2 credits. Students do not need to take additional courses to meet the 18 Science Credit requirement. Students, however, must complete at least 120 total credits for the degree.

The BME-specific requirements are comprised of Computer Programming, Core Courses, and Core Electives.

COMPUTER PROGRAMMING

A grade of D or higher is required. A maximum of 18 credits of D or D+ grades may be applied toward the total degree credit requirement for graduation. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

Code	Title	Credits
EN.500.113	Gateway Computing: Python	3
or EN.500.112	Gateway Computing: JAVA	
Total Credits		*3*

BME CORE COURSES

A grade of D or higher is required. A maximum of 18 credits of D or D+ grades may be applied toward the total degree credit requirement for graduation. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

Code	Title	Credits
EN.501.124	FYS: Design Cornerstone	2
EN.580.111	Biomedical Engineering: Health and Human Physiology	2
EN.580.151	Cellular and Molecular Foundations	2
EN.580.221	Biochemistry and Molecular Engineering	4
EN.580.241	Statistical Physics	2
EN.580.242	Biological Models and Simulations	2
EN.580.243	Linear Signals and Systems	2
EN.580.244	Nonlinear Dynamics of Biological Systems	2
EN.580.246	Systems and Controls	2
EN.580.248	Systems Biology of the Cell	2
EN.580.475	Biomedical Data Science [1]	2
EN.580.477	Biomedical Data Science Laboratory [1]	1
EN.580.485	Computational Medicine: Cardiology	2
EN.580.487	Computational Medicine: Cardiology Laboratory	1
Total Credits		**28**

[1] While not required, a course in Probability and Statistics, EN.553.211 or EN.553.311, is highly recommended prior to enrolling in EN.580.475 and EN.580.477.

BME CORE ELECTIVES

A grade of D or higher is required. A maximum of 18 credits of D or D+ grades may be applied toward the total degree credit requirement for graduation. No Satisfactory/Unsatisfactory (S/U) grade will be accepted.

Code	Title	Credits
Complete two courses from the following:		
EN.580.424	Neuroengineering and Lab	
EN.580.427	Microphysiological Systems and Laboratory	
EN.580.452	Cell and Tissue Engineering Lab	
EN.580.453	Immunoengineering Principles and Applications	
EN.580.454	Methods in Nucleic Acid Sequencing Lab	
EN.580.494	Build an Imager	
Total Credits		*6*

FREE ELECTIVES

A grade of D or higher is required. Satisfactory (S) grade will be accepted.

Code	Title	Credits
Elective courses to reach 120 credits		

Sample Program

First Year

First Semester	Credits	Second Semester	Credits
AS.030.101	3	AS.030.102	3
AS.030.105	1	AS.030.106	1
AS.110.108	4	AS.110.109	4
EN.580.111	2	EN.501.124	2
Writing Intensive (also count as Humanities/Social Sciences)	3	EN.580.151	2

Elective	2	Writing Intensive (also count as Humanities/Social Sciences)	3
	15		**15**

Second Year

First Semester	Credits	Second Semester	Credits
AS.171.101	4	AS.110.202	4
AS.173.111	1	AS.171.101	4
EN.553.291	4	AS.173.112	1
Writing Intensive (also count as Humanities/Social Sciences)	3	EN.500.112 or 113	3
Elective	3	Writing Intensive (also count as Humanities/Social Sciences)	3
	15		**15**

Third Year

First Semester	Credits	Second Semester	Credits
EN.580.221	4	EN.580.242	2
EN.580.241	2	EN.580.244	2
EN.580.243	2	EN.580.246	2
Foreign Language (also count as Humanities/Social Sciences)	4	EN.580.248	2
Elective	3	Foreign Language (also count as Humanities/Social Sciences)	4
		Elective	3
	15		**15**

Fourth Year

First Semester	Credits	Second Semester	Credits
EN.580.475	2	Core Elective 1	3
EN.580.477	1	Core Elective 2	3
EN.580.485	2	Humanities/Social Sciences	3
EN.580.487	1	Elective	3
Humanities/Social Sciences	4	Elective	3
Elective	2		
Elective	3		
	15		**15**

Total Credits 120