

Bioengineering BS BIOE with Engineering Devices Concentration

Overview

The **Bachelor of Science in Bioengineering** is offered by the Department of Bioengineering.

The Bioengineering program integrates engineering science, rigorous mathematical tools and a quantitative approach to the life sciences and applies this spectrum of knowledge in an interdisciplinary fashion to provide solutions to basic and applied biological and medical problems. This goal will be accomplished by offering to the students an integrated set of courses aimed at providing a thorough introduction to the complex and interdisciplinary field of Bioengineering:

- Teach engineering science, analysis, and design in the context of quantitative approaches to solving life science and medicine-related problems.
- Integrate interdisciplinary aspects of biology, physiology, and engineering within courses and design projects.
- Emphasize the interdisciplinary nature of Bioengineering, in terms of problem solving, design, within the framework of interdisciplinary teams focusing on the dialogue between "biology-inspired engineering" and "biology as a specific arm of applied engineering principles."
- Immerse students in key life science and medical principles, while focusing on understanding cell/molecular-level events through quantitative analysis and modeling.
- Provide an exceptional learning environment with significant instruction by Bioengineering faculty and researchers in collaboration with experts from other fields, especially the Health Science Campus.

In this curriculum, incoming students will first and foremost be trained as solid Temple engineers, focusing on applying engineering science, design, and analysis to real life problems specifically in the areas of biology and medicine. Hands-on engineering experience will be gained through intense laboratory coursework and by solving real-life biomedical problems.

Bioengineering study leads to careers in several fields.

Students **must select** from one of three **concentrations** in:

- Cellular Engineering,
- Engineering Devices, or
- Pre-Health.

Engineering Devices Concentration

A **concentration in Engineering Devices** provides students with the skills to apply engineering principles to design and develop instruments, implants and imaging modalities. A range of courses include topics covering biomechanics, bioinstrumentation and bioimaging.

Campus Location: Main

Program Code: EN-BIOE-BSBE

Accreditation

The Bioengineering (BS) program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the General Criteria and Program Criteria for Bioengineering and Biomedical and Similarly Named Engineering Programs. ABET is a non-profit and non-governmental accrediting agency for academic programs in the disciplines of applied science, computing, engineering, and engineering technology recognized by the Council for Higher Education Accreditation (CHEA).

+1 Bachelor to Master's Accelerated Degree Program

High-achieving undergraduates can earn both a bachelor's degree and a master's degree within five years. Students apply for this program in sophomore year, and four graduate-level courses are taken in place of undergraduate requirements during junior and senior years. After the bachelor's degree is earned, one graduate-level course is taken in the summer followed by full-time study in the subsequent Fall and Spring semesters to complete the master's degree study. The following accelerated program is available:

- Bachelor of Science in Bioengineering and Master of Science in Bioengineering

Contact Information

Peter Lelkes, PhD, Chair
Engineering Building, Room 811
215-204-3307

pilelkes@temple.edu

Ruth Ochia, PhD, Undergraduate Coordinator
Engineering Building, Room 813
215-204-3038
ruth.ochia@temple.edu

Learn more about the Bachelor of Science in Bioengineering.

These requirements are for students who matriculated in academic year 2023-2024. Students who matriculated prior to fall 2023 should refer to the Archives to view the requirements for their Bulletin year.

Summary of Requirements

University Requirements

All new students are required to complete the university's General Education (GenEd) Curriculum.

All Temple students must take a minimum of two writing intensive courses for a total of at least six credits. The writing intensive course credits are counted as part of the major; they are not General Education (GenEd) or elective credits. The writing intensive courses must be completed at Temple University and students may not transfer in credits to satisfy this requirement. The specific writing intensive courses required for this major are:

Code	Title	Credit Hours
ENGR 2196 or ENGR 2996	Technical Communication Honors Technical Communication	3
ENGR 4296 or ENGR 4996	Capstone Senior Design Project Honors Capstone Senior Design Project	3

Department and Major Requirements

Code	Title	Credit Hours
MATH 1041 or MATH 1941	Calculus I Honors Calculus I	4
MATH 1042 or MATH 1942	Calculus II Honors Calculus II	4
MATH 2043 or MATH 2943	Calculus III Honors Calculus III	4
Select one of the following:		3
MATH 2041 or MATH 2941	Differential Equations I Honors Differential Equations I	
MATH 3041 or MATH 3941	Differential Equations I Honors Differential Equations I	
BIOL 1012	General Biology II	4
CHEM 1031 or CHEM 1951	General Chemistry I Honors General Chemical Science I	3
CHEM 1033 or CHEM 1953	General Chemistry Laboratory I Honors Chemical Science Laboratory I	1
Select one of the following:		4
PHYS 1061 or PHYS 1961	Elementary Classical Physics I Honors Elementary Classical Physics I	
PHYS 2021 or PHYS 2921	General Physics I Honors General Physics I	
Select one of the following:		4
PHYS 1062 or PHYS 1962	Elementary Classical Physics II Honors Elementary Classical Physics II	
PHYS 2022 or PHYS 2922	General Physics II Honors General Physics II	

Required General Education Courses

Select from one of the following:		4
ENG 0802	Analytical Reading and Writing	
ENG 0812	Analytical Reading and Writing: ESL	
ENG 0902	Honors Writing About Literature	
IH 0851	Intellectual Heritage I: The Good Life	3
or IH 0951	Honors Intellectual Heritage I: The Good Life	
IH 0852	Intellectual Heritage II: The Common Good	3
or IH 0952	Honors Intellectual Heritage II: The Common Good	
GenEd 08xx or 09xx (Human Behavior)		3
GenEd 08xx or 09xx (Race and Diversity)		3
GenEd 08xx or 09xx (Global/World Society)		3
GenEd 08xx or 09xx (U.S. Society)		3
GenEd 08xx or 09xx (Arts)		3

Required Bioengineering & Engineering Courses (Common for all Pathways)

BIOE 2001	Frontiers in Bioengineering	2
BIOE 2101	Engineering Principles of Physiological Systems	3
BIOE 3001	Research Design and Methods in Bioengineering	2
BIOE 3101	Bioelectrical Engineering Lab	3
BIOE 3102	Biomaterials Lab	3
BIOE 3201	Biomedical Instrumentation	2
BIOE 4101	Biomechanics Lab	3
BIOE 4311	The Entrepreneurial Bioengineer	3
ENGR 1101	Introduction to Engineering & Engineering Technology	3
or ENGR 1901	Honors Introduction to Engineering	
ENGR 1102	Introduction to Engineering Problem Solving	3
ENGR 2196	Technical Communication	3
or ENGR 2996	Honors Technical Communication	
ENGR 3571	Classical and Statistical Thermodynamics	3
Bioengineering Design Course - select one of the following:		3
BIOE 3402	Design Elective: Biodesign	
BIOE 3512		
BIOE 4279		
ENGR 4296	Capstone Senior Design Project	3
or ENGR 4996	Honors Capstone Senior Design Project	

Required Bioengineering Electives

BIOE 2312	Mechanics for Bioengineering I	4
BIOE 3312	Mechanics for Bioengineering II	4
BIOE 3301	Biomedical Signals and Systems	3

Required Technical Electives (minimum 15 credits)

BIOE 2201	Modeling Fundamentals in Bioengineering	1.5
BIOE 2202	Programming Fundamentals in Bioengineering	1.5
BIOE 3303	Biotransport Phenomena	3
CHEM 1032	General Chemistry II	3
or CHEM 1952	Honors General Chemical Science II	
CHEM 1034	General Chemistry Laboratory II	1
or CHEM 1954	Honors Chemical Science Laboratory II	
MATH 2101	Linear Algebra	3
or ENGR 2011	Engineering Analysis & Applications	

Select from the following list: 3

BIOE 2401	Biodesign - Needs and Ideation	
BIOE 3401	Biodesign - Testing and Validation	

BIOE 3511	Interactions of Biomaterials with Living Tissues	
BIOE 3725	Cell Biology for Engineers	
BIOE 4278	Cardiac Devices	
ENGR 3553	Mechanics of Fluids	
ENGR 3117	Computer-Aided Design (CAD)	
ECE 2332	Principles of Electric Circuits	
ECE 2333	Principles of Electric Circuits Lab	
Bioengineering Capstone Course		
Select one of the following:		3
BIOE 4333	Capstone Elective: Applied Biospectroscopy	
BIOE 4431	Capstone Elective: Neuroengineering	
BIOE 4441	Capstone Elective: Biomechanics	
Free Electives		
Free Elective		3
Total Credit Hours		128

Suggested Academic Plan

Please note that this is a **suggested** academic plan. Depending on your situation, your academic plan may look different.

Bachelor of Science in Bioengineering with Concentration in Engineering Devices

Suggested Plan for New Students Starting in the 2023-2024 Academic Year

Year 1		
Fall		Credit Hours
MATH 1041 or MATH 1941	Calculus I or Honors Calculus I	4
CHEM 1031 or CHEM 1951	General Chemistry I or Honors General Chemical Science I	3
CHEM 1033 or CHEM 1953	General Chemistry Laboratory I or Honors Chemical Science Laboratory I	1
ENGR 1101 or ENGR 1901	Introduction to Engineering & Engineering Technology or Honors Introduction to Engineering	3
ENG 0802 or ENG 0812 or ENG 0902	Analytical Reading and Writing or Analytical Reading and Writing: ESL or Honors Writing About Literature	4
Credit Hours		15
Spring		
MATH 1042 or MATH 1942	Calculus II or Honors Calculus II	4
Select one of the following:		4
PHYS 1061 or PHYS 1961	Elementary Classical Physics I or Honors Elementary Classical Physics I	
PHYS 2021 or PHYS 2921	General Physics I or Honors General Physics I	
BIOE 2001	Frontiers in Bioengineering	2
CHEM 1032 or CHEM 1952	General Chemistry II or Honors General Chemical Science II	3
CHEM 1034 or CHEM 1954	General Chemistry Laboratory II or Honors Chemical Science Laboratory II	1
BIOL 1012	General Biology II	4
Credit Hours		18
Year 2		
Fall		
MATH 2043 or MATH 2943	Calculus III or Honors Calculus III	4

Select one of the following: 4

PHYS 1062 or PHYS 1962	Elementary Classical Physics II or Honors Elementary Classical Physics II	
PHYS 2022 or PHYS 2922	General Physics II or Honors General Physics II	
IH 0851 or IH 0951	Intellectual Heritage I: The Good Life or Honors Intellectual Heritage I: The Good Life	3
BIOE 3001	Research Design and Methods in Bioengineering	2
ENGR 1102	Introduction to Engineering Problem Solving	3
BIOE 2202	Programming Fundamentals in Bioengineering	1.5

Credit Hours 17.5

Spring

BIOE 3201	Biomedical Instrumentation	2
BIOE 2101	Engineering Principles of Physiological Systems	3
BIOE 3102	Biomaterials Lab	3
BIOE 2312	Mechanics for Bioengineering I	4
ENGR 3571	Classical and Statistical Thermodynamics	3
BIOE 2201	Modeling Fundamentals in Bioengineering	1.5

Credit Hours 16.5

Year 3

Fall

BIOE 3101	Bioelectrical Engineering Lab	3
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Select one of the following: 3

ENGR 2011	Engineering Analysis & Applications	
MATH 2101	Linear Algebra	
BIOE 3312	Mechanics for Bioengineering II	4
BIOE 3303	Biotransport Phenomena	3

Select one of the following: 3

MATH 2041 or MATH 2941	Differential Equations I or Honors Differential Equations I	
MATH 3041 or MATH 3941	Differential Equations I or Honors Differential Equations I	

Credit Hours 16

Spring

BIOE 3301	Biomedical Signals and Systems	3
BIOE 4101	Biomechanics Lab	3
Technical Elective Course		3
ENGR 2196 or ENGR 2996	Technical Communication or Honors Technical Communication	3
IH 0852 or IH 0952	Intellectual Heritage II: The Common Good or Honors Intellectual Heritage II: The Common Good	3

Credit Hours 15

Year 4

Fall

Bioengineering Capstone - select one of the following: 3

BIOE 4333	Capstone Elective: Applied Biospectroscopy	
BIOE 4441	Capstone Elective: Biomechanics	
BIOE 4431	Capstone Elective: Neuroengineering	
BIOE 4311	The Entrepreneurial Bioengineer	3

Bioengineering Design Course - select one of the following: 3

BIOE 3402	Design Elective: Biodesign	
BIOE 3512		
BIOE 4279		

GenEd Breadth Course		3
GenEd Breadth Course		3
Credit Hours		15
Spring		
ENGR 4296 or ENGR 4996	Capstone Senior Design Project or Honors Capstone Senior Design Project	3
GenEd Breadth Course		3
GenEd Breadth Course		3
GenEd Breadth Course		3
Free Elective		3
Credit Hours		15
Total Credit Hours		128