

Bachelor of Science in Bioengineering - Cellular Engineering Concentration

Learn more about the Bachelor of Science in Bioengineering.

Goals, Objectives & Integration

A concentration in Cellular Engineering within the Bioengineering program provides students with the skills to apply quantitative approaches to problem solving in cellular and molecular engineering, particularly as they relate to human health. A range of courses include design, development, and uses of biomaterials; building functional tissues using cells and scaffolds and repairing diseased tissues and organs at the cellular and molecular level. It also explores the host-biomaterial interface and interactions.

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	Senior Design Project II Honors Senior Design Project II	3

Department and Major Requirements

Code	Title	Credit Hours
Required Math & Basic Science Courses		
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	
Select one of the following:		4
BIOL 2112 or BIOL 2912	Introduction to Cellular and Molecular Biology Honors Introduction to Cellular and Molecular Biology	
BIOL 1112	Introduction to Biomolecules, Cells and Genomes	
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 one of the following:		4
ENG 0802	Analytical Reading and Writing	
ENG 0812	Analytical Reading and Writing: ESL	
ENG 0902	Honors Literature/Reading/Writing	
IH 0851 or IH 0951	Intellectual Heritage I: The Good Life Honors Intellectual Heritage I: The Good Life	3
IH 0852 or IH 0952	Intellectual Heritage II: The Common Good Honors Intellectual Heritage II: The Common Good	3
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 or ENGR 1901	Introduction to Engineering & Engineering Technology Honors Introduction to Engineering	3
ENGR 1102	Introduction to Engineering Problem Solving	3
ENGR 2196 or ENGR 2996	Technical Communication (WI) Honors Technical Communication	3
ENGR 3571	Classical and Statistical Thermodynamics	3
ENGR 4169	Engineering Seminar	1
ENGR 4174	Senior Design Project I for Bioengineering	2
ENGR 4296 or ENGR 4996	Senior Design Project II (WI) Honors Senior Design Project II	3
Required Bioengineering Electives (minimum of 9 credits)		
BIOE 2201	Modeling Fundamentals in Bioengineering	1.5
BIOE 2202	Programming Fundamentals in Bioengineering	1.5
BIOE 3303	Biotransport Phenomena	3
Select from the following list:		3
BIOE 2312	Mechanics for Bioengineering I	
BIOE 2401	Biodesign - Needs and Ideation	
BIOE 3302	Drug Delivery	
BIOE 3331	Principles of Macromolecular Science	
BIOE 3401	Biodesign - Testing and Validation	
BIOE 3511	Interactions of Biomaterials with Living Tissues	
BIOE 3725	Cell Biology for Engineers	

BIOE 4278	Cardiac Devices	
BIOE 3301	Biomedical Signals and Systems ((with additional pre-reqs))	
Required Technical Electives		
CHEM 1032 or CHEM 1952	General Chemistry II Honors General Chemical Science II	3
CHEM 1034 or CHEM 1954	General Chemistry Laboratory II Honors Chemical Science Laboratory II	1
CHEM 2201 or CHEM 2921	Organic Chemistry I Organic Chemistry for Honors I	3
CHEM 2203 or CHEM 2923	Organic Chemistry Laboratory I Organic Honors Laboratory I	1
CHEM 2202 or CHEM 2922	Organic Chemistry II Organic Chemistry for Honors II	3
CHEM 2204 or CHEM 2924	Organic Chemistry Laboratory II Organic Honors Laboratory II	1
CHEM 3401	Applications of Biochemistry	3
Bioengineering Capstone Course		
Select one of the following:		3
BIOE 4333	Capstone Elective: Applied Biospectroscopy	
BIOE 4411	Capstone Elective: Biomaterials	
BIOE 4431	Capstone Elective: Neuroengineering	
BIOE 4461	Capstone Elective: Principles of Tissue Engineering	
BIOE 4501	Capstone Elective: Regenerative Engineering	
BIOE 4555	Capstone Elective - Biophotonics: Seeing is Believing	
Free Electives		
Free Elective #1		3
Free Elective #2		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: Cellular Engineering Concentration Requirements for New Students starting in the 2022-2023 Academic Year

Year 1		Credit Hours
Fall		
MATH 1041 or 1941	Calculus I	4
CHEM 1031 or 1951	General Chemistry I	3
CHEM 1033 or 1953	General Chemistry Laboratory I	1
ENGR 1101 or 1901	Introduction to Engineering & Engineering Technology	3
ENG 0802, 0812, or 0902	Analytical Reading and Writing [GW]	4
Term Credit Hours		15
Spring		
MATH 1042 or 1942	Calculus II	4
Select one of the following:		4
PHYS 1061 or 1961	Elementary Classical Physics I	
PHYS 2021 or 2921	General Physics I	
BIOE 2001	Frontiers in Bioengineering	2
ENGR 1102	Introduction to Engineering Problem Solving	3
CHEM 1032 or 1952	General Chemistry II	3
CHEM 1034 or 1954	General Chemistry Laboratory II	1
Term Credit Hours		17

Year 2**Fall**

MATH 2043 or 2943	Calculus III	4
Select one of the following:		4
PHYS 1062 or 1962	Elementary Classical Physics II	
PHYS 2022 or 2922	General Physics II	
CHEM 2201 or 2921	Organic Chemistry I	3
CHEM 2203 or 2923	Organic Chemistry Laboratory I	1
BIOE 3001	Research Design and Methods in Bioengineering	2
Select one of the following:		4
BIOL 2112 or 2912	Introduction to Cellular and Molecular Biology	
BIOL 1112	Introduction to Biomolecules, Cells and Genomes	

Term Credit Hours**18****Spring**

BIOE 3201	Biomedical Instrumentation	2
BIOE 2101	Engineering Principles of Physiological Systems	3
BIOE 3102	Biomaterials Lab	3
CHEM 2202 or 2922	Organic Chemistry II	3
CHEM 2204 or 2924	Organic Chemistry Laboratory II	1
ENGR 3571	Classical and Statistical Thermodynamics	3
BIOE 2201	Modeling Fundamentals in Bioengineering (Proposed New Course: Modeling in BioE)	1.5
BIOE 2202	Programming Fundamentals in Bioengineering (Proposed New Course: Programming in BioE)	1.5

Term Credit Hours**18****Year 3****Fall**

BIOE 3101	Bioelectrical Engineering Lab	3
BIOE 3303	Biotransport Phenomena	3
IH 0851 or 0951	Intellectual Heritage I: The Good Life [GY]	3
ENGR 2196 or 2996	Technical Communication [WI]	3
Select one of the following:		3
MATH 2041 or 2941	Differential Equations I	
MATH 3041 or 3941	Differential Equations I	

Term Credit Hours**15****Spring**

CHEM 3401	Applications of Biochemistry	3
ENGR 4169	Engineering Seminar	1
BIOE 4101	Biomechanics Lab	3
GenEd Breadth Course		3
IH 0852 or 0952	Intellectual Heritage II: The Common Good [GZ]	3
Free Elective #1		3

Term Credit Hours**16****Year 4****Fall**

ENGR 4174	Senior Design Project I for Bioengineering	2
GenEd Breadth Course		3
Bioengineering Capstone - select one of the following:		3
BIOE 4333	Capstone Elective: Applied Biospectroscopy	
BIOE 4411	Capstone Elective: Biomaterials	
BIOE 4431	Capstone Elective: Neuroengineering	
BIOE 4461	Capstone Elective: Principles of Tissue Engineering	
BIOE 4501	Capstone Elective: Regenerative Engineering	
BIOE 4555	Capstone Elective - Biophotonics: Seeing is Believing	

BIOE Elective	3
GenEd Breadth Course	3

Term Credit Hours	14
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Spring

ENGR 4296 or 4996	Senior Design Project II [WI]	3
Free Elective #2		3
GenEd Breadth Course		3
GenEd Breadth Course		3
BIOE 4311	The Entrepreneurial Bioengineer	3

Term Credit Hours	15
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Total Credit Hours:	128
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Code	Title	Credit Hours
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Other Approved Technical Electives (check for prerequisites)

BIOL 3096	Cell Structure and Function	4
BIOL 3352	Systems Neuroscience	3
CIS 1057	Computer Programming in C	4
ECE 2332 & ECE 2333	Principles of Electric Circuits and Principles of Electric Circuits Lab	5
ECE 3412 & ECE 3413	Classical Control Systems and Classical Control Laboratory	4
ECE 3512 or ECE 3912	Signals: Continuous and Discrete Honors Signals: Continuous and Discrete	4
ENGR 2011 or MATH 2101 or MEE 2011	Engineering Analysis & Applications Linear Algebra Linear Systems	3
ENGR 3117	Computer-Aided Design (CAD)	3
ENGR 3201	Material Science for Engineers	3
ENGR 3553 or ENGR 3953	Mechanics of Fluids Honors Mechanics of Fluids	3