Bioengineering and Biochemistry, BSBioE (Boston)

This combined major from the College of Engineering and College of Science serves students who wish to develop both a scientific and an engineering mindset to solve problems in bioengineering and biochemistry. The program includes fundamentals and electives in the science of biochemistry; a complete and rigorous bioengineering core; and a series of molecular, cellular, and tissue engineering courses that allow for synthesis of the two. The curriculum aligns well with the coursework required to apply to medical school or other clinical graduate programs and aims to provide the knowledge, skills, and perspective to pursue careers in academia or industry.

Program Educational Objectives

See Accreditation—Department of Bioengineering (https://bioe.northeastern.edu/academics/undergraduate-studies/bioe-accreditation/) for program educational objectives.

Program Requirements

Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

Universitywide Requirements

All undergraduate students are required to complete the Universitywide Requirements (https://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/).

NUpath Requirements

All undergraduate students are required to complete the NUpath Requirements (https://catalog.northeastern.edu/undergraduate/university-academics/nupath/).

NUpath requirements Interpreting Culture (IC), Understanding Societies and Institutions (SI), Engaging Differences and Diversity (DD), and Integrating Knowledge and Skills Through Experience (EX) are not explicitly satisfied by required engineering coursework. Successful completion of a cooperative education experience may fulfill the EX requirement. Students are responsible for satisfying unfulfilled NUpath requirements with general elective coursework.

Engineering Requirements

Code	Title	Hours
Required Engineering		
BIOE 2350	Biomechanics	4
BIOE 2355	Quantitative Physiology for Bioengineers	4
BIOE 2365 and BIOE 2366	Bioengineering Measurement, Experimentation, and Statistics and Lab for BIOE 2365	5
BIOE 3210	Bioelectricity	4
BIOE 3310	Transport and Fluids for Bioengineers	4
BIOE 3380	Biomolecular Dynamics and Control	4
Bioengineering Capstone		
BIOE 4790	Capstone Design 1	4
BIOE 4792	Capstone Design 2	4
Supplemental Credit		
2 semester hours from the following course count toward the engineering requirement:		2
GE 1501	Cornerstone of Engineering 1 [1]	
3 semester hours from the following course count toward the engineering requirement:		3
GE 1502	Cornerstone of Engineering 2 [1]	

Mathematics/Science Requirements

Code	Title	Hours
Required Mathematics/Science		
BIOL 1111 and BIOL 1112	General Biology 1 and Lab for BIOL 1111	5
CHEM 1151 and CHEM 1153	General Chemistry for Engineers and Recitation for CHEM 1151	4
CHEM 2311 and CHEM 2312	Organic Chemistry 1 and Lab for CHEM 2311	5

CHEM 2313 and CHEM 2314	Organic Chemistry 2 and Lab for CHEM 2313	5
MATH 1341	Calculus 1 for Science and Engineering	4
MATH 1342	Calculus 2 for Science and Engineering	4
MATH 2321	Calculus 3 for Science and Engineering	4
MATH 2341	Differential Equations and Linear Algebra for Engineering	4
PHYS 1171 and PHYS 1172 and PHYS 1173	Physics 1 for Bioscience and Bioengineering and Lab for PHYS 1171 and Interactive Learning Seminar for PHYS 1171	5
or PHYS 1151 and PHYS 1152 and PHYS 1153	Physics for Engineering 1 and Lab for PHYS 1151 and Interactive Learning Seminar for PHYS 1151	
PHYS 1175 and PHYS 1176 and PHYS 1177	Physics 2 for Bioscience and Bioengineering and Lab for PHYS 1175 and Interactive Learning Seminar for PHYS 1175	5
or PHYS 1155 and PHYS 1156 and PHYS 1157	Physics for Engineering 2 and Lab for PHYS 1155 and Interactive Learning Seminar for PHYS 1155	
Advanced Biology Elective		
Complete one course in the following range, including any corequisite labs, or equivalent, where applicable (the course may not be an independent research course):		3-5
BIOL 2311 to BIOL 5999		
Advanced Chemistry Elective		
Complete one course in the following range, including any corequisite labs, or equivalent, where applicable (the course may not be an independent research course):		3-5
CHEM 2310 to CHEM 5999		
Supplemental Credit		
1 semester hour from the following course counts toward the mathematics/science requirement:		1
GE 1501	Cornerstone of Engineering 1 [1]	

Concentration in Biochemistry of Molecular and Cellular Design

Code	Title	Hours
Required Courses		
BIOE 5410	Molecular Bioengineering	4
or BIOE 5411	Applied Molecular Bioengineering	
BIOE 5420	Cellular Engineering	4
BIOE 5430	Principles and Applications of Tissue Engineering	4
BIOL 2301 and BIOL 2302	Genetics and Molecular Biology and Lab for BIOL 2301	5
BIOL 3611 and BIOL 3612	Biochemistry and Lab for BIOL 3611	5

Professional Development

Code	Title	Hours
Professional Development		
ENCP 2000	Introduction to Engineering Co-op Education	1
ENCP 3000	Professional Issues in Engineering	1
GE 1000	First-Year Seminar	1
Additional Required Courses		
1 semester hour from the following course counts toward the professional development requirement:		1
GE 1501	Cornerstone of Engineering 1 [1]	
1 semester hour from the following course counts toward the professional development requirement:		1
GE 1502	Cornerstone of Engineering 2 [1]	

Writing Requirements

Code	Title	Hours
A grade of C or higher is required:		
ENGW 1111	First-Year Writing	4
or ENGW 1102	First-Year Writing for Multilingual Writers	
ENGW 3302	Advanced Writing in the Technical Professions	4
or ENGW 3307	Advanced Writing in the Sciences	
or ENGW 3315	Interdisciplinary Advanced Writing in the Disciplines	

Required General Electives

Code	Title	Hours
Complete 12 semester hours of academic, nonremedial, nonrepetitive courses.		12

Integrative Course

Code	Title	Hours
This course is already required above and also fulfills the integrative requirement:		
BIOE 4790	Capstone Design 1	4

Major GPA Requirement

Minimum 2.000 GPA required in BIOE coursework

Program Requirement

137 total semester hours required

[1] Students can substitute Engineering Design (GE 1110) and Engineering Problem Solving and Computation (GE 1111) for Cornerstone of Engineering 1 (GE 1501) and Cornerstone of Engineering 2 (GE 1502) in approved situations.

Plan of Study

Sample Plans of Study

FOUR YEARS, ONE CO-OP IN SUMMER SECOND HALF/FALL

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)	4	GE 1502 (ER)	4	PHYS 1155 or 1175 (ND)	3	Vacation	
CHEM 1153	0	MATH 1342 (FQ)	4	PHYS 1156 or 1176 (AD)	1		
ENGW 1111 (WF)	4	PHYS 1171 or 1151 (ND)	3	PHYS 1157 or 1177	1		
GE 1000	1	PHYS 1172 or 1152 (AD)	1	General elective	4		
GE 1501	4	PHYS 1173 or 1153	1				
MATH 1341 (FQ)	4	General elective	4				
	17		**17**		**9**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2355	4	BIOE 2350	4	Vacation		Vacation	
BIOE 2365 (AD, WI)	4	BIOL 2301 (ND)	4				
BIOE 2366	1	BIOL 2302 (AD)	1				
BIOL 1111	4	CHEM 2311	4				
BIOL 1112	1	CHEM 2312	1				
MATH 2341	4	MATH 2321 (FQ)	4				
		ENCP 2000	1				
	18		**19**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 3380	4	BIOE 3210	4	BIOE 3310	4	Co-op	0
BIOE 5430, 5410, or 5420	4	BIOE 5410, 5420, or 5430	4	BIOE 4790 (EI, CE, WI)	4		

CHEM 2313	4	BIOE 5420, 5410, or 5430	4				
CHEM 2314	1	BIOL 3611	4				
General elective	4	BIOL 3612	1				
	17		**17**		**8**		**0**

Year 4

Fall	Hours	Spring	Hours
Co-op	0	BIOE 4792 (EI, CE, WI)	4
		ENCP 3000	1
		Advanced BIOL elective	4
		Advanced CHEM elective	4
		ENGW 3302, 3307, or 3315 (WD)	4
	0		**17**

Total Hours: 139

FOUR YEARS, ONE CO-OP IN SPRING/SUMMER FIRST HALF

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)	4	GE 1502 (ER)	4	PHYS 1155 or 1175 (ND)	3	Vacation	
CHEM 1153	0	MATH 1342 (FQ)	4	PHYS 1156 or 1176 (AD)	1		
ENGW 1111 (WF)	4	PHYS 1171 or 1151 (ND)	3	PHYS 1157 or 1177	1		
GE 1000	1	PHYS 1172 or 1152 (AD)	1	General elective	4		
GE 1501	4	PHYS 1173 or 1153	1				
MATH 1341 (FQ)	4	General elective	4				
	17		**17**		**9**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2355	4	BIOE 2350	4	Vacation		Vacation	
BIOE 2365 (AD, WI)	4	BIOL 2301 (ND)	4				
BIOE 2366	1	BIOL 2302 (AD)	1				
BIOL 1111	4	CHEM 2311	4				
BIOL 1112	1	CHEM 2312	1				
MATH 2341	4	MATH 2321 (FQ)	4				
ENCP 2000	1						
	19		**18**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 3310	4	Co-op	0	Co-op	0	BIOE 3210	4
BIOE 3380	4					BIOE 4790 (EI, CE, WI)	4
BIOE 5410, 5420, or 5430	4						
CHEM 2313	4						
CHEM 2314	1						
	17		**0**		**0**		**8**

Year 4

Fall	Hours	Spring	Hours
BIOE 4792 (EI, CE, WI)	4	BIOE 5420, 5410, or 5430	4
BIOE 5430, 5410, or 5420	4	Advanced BIOL elective	4
BIOL 3611	4	Advanced CHEM elective	4
BIOL 3612	1	General elective	4
ENCP 3000	1		

ENGW 3302, 3307, or 3315 (WD)	4		
	18	**16**	

Total Hours: 139

FIVE YEARS, THREE CO-OPS IN SUMMER SECOND HALF/FALL

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)	4	GE 1502 (ER)	4	Vacation		Vacation	
CHEM 1153	0	MATH 1342 (FQ)	4				
ENGW 1111 (WF)	4	PHYS 1171 or 1151 (ND)	3				
GE 1000	1	PHYS 1172 or 1152 (AD)	1				
GE 1501	4	PHYS 1173 or 1153	1				
MATH 1341 (FQ)	4	General elective	4				
	17		**17**		**0**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2365 (AD, WI)	4	BIOE 2355	4	Vacation		Co-op	0
BIOE 2366	1	BIOL 2301 (ND)	4				
BIOL 1111	4	BIOL 2302 (AD)	1				
BIOL 1112	1	CHEM 2311	4				
MATH 2321 (FQ)	4	CHEM 2312	1				
PHYS 1175 or 1155 (ND)	3	ENCP 2000	1				
PHYS 1176 or 1156 (AD)	1	MATH 2341	4				
PHYS 1177 or 1157	1						
	19		**19**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	BIOE 2350	4	BIOE 3310	4	Co-op	0
		BIOE 3380	4	BIOL 3611	4		
		CHEM 2313	4	BIOL 3612	1		
		CHEM 2314	1				
		ENGW 3302, 3307, or 3315 (WD)	4				
	0		**17**		**9**		**0**

Year 4

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	BIOE 3210	4	BIOE 4790 (EI, CE, WI)	4	Co-op	0
		BIOE 5410, 5420, or 5430	4	General elective	4		
		ENCP 3000	1				
		Advanced BIOL or CHEM elective	4				
		General elective	4				
	0		**17**		**8**		**0**

Year 5

Fall	Hours	Spring	Hours
Co-op	0	BIOE 4792 (EI, CE, WI)	4
		BIOE 5420, 5410, or 5430	4
		BIOE 5430, 5410, or 5420	4

		Advanced BIOL or CHEM elective	4
	0		**16**

Total Hours: 139

FIVE YEARS, THREE CO-OPS IN SPRING/SUMMER FIRST HALF

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)	4	GE 1502 (ER)	4	Vacation		Vacation	
CHEM 1153	0	MATH 1342 (FQ)	4				
GE 1000	1	PHYS 1171 or 1151 (ND)	3				
GE 1501	4	PHYS 1172 or 1152 (AD)	1				
ENGW 1111 (WF)	4	PHYS 1173 or 1153	1				
MATH 1341 (FQ)	4	General elective	4				
	17		**17**		**0**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2365 (AD, WI)	4	Co-op	0	Co-op	0	Vacation	
BIOE 2366	1						
BIOL 1111	4						
BIOL 1112	1						
ENCP 2000	1						
MATH 2321 (FQ)	4						
PHYS 1175 or 1155 (ND)	3						
PHYS 1176 or 1156 (AD)	1						
PHYS 1177 or 1157	1						
	20		**0**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2350	4	Co-op	0	Co-op	0	BIOE 3210	4
BIOE 2355	4					CHEM 2313	4
CHEM 2311	4					CHEM 2314	1
CHEM 2312	1						
MATH 2341	4						
	17		**0**		**0**		**9**

Year 4

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 3310	4	Co-op	0	Co-op	0	BIOE 4790 (EI, CE, WI)	4
BIOE 3380	4					General elective	4
BIOL 2301 (ND)	4						
BIOL 2302 (AD)	1						
ENGW 3302, 3307, or 3315 (WD)	4						
	17		**0**		**0**		**8**

Year 5

Fall	Hours	Spring	Hours
BIOE 4792 (EI, CE, WI)	4	BIOE 5420, 5410, or 5430	4
BIOE 5410, 5420, or 5430	4	BIOE 5430, 5410, or 5420	4
BIOL 3611	4	Advanced BIOL elective	4
BIOL 3612	1	Advanced CHEM elective	4
ENCP 3000	1		

General elective	4	
	18	**16**

Total Hours: 139