Mechanical Engineering and Bioengineering, BSME (Boston)

Overview

This combined major from the Department of Mechanical and Industrial Engineering and Department of Bioengineering provides a rigorous curriculum for students willing to learn and integrate the foundations of mechanical engineering and bioengineering toward solving multidisciplinary problems arising at the intersection of these two engineering disciplines. The combined major weaves mechanics, materials, and thermofluids courses of mechanical engineering with a set of core and elective bioengineering courses from biomechanics, biostatistics, signals, and systems, to biomaterials, biomedical imaging, and design of biomedical devices and implants.

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 fulfills the EX requirement. Students are responsible for satisfying unfulfilled NUpath requirements with general elective coursework.

Mechanical Engineering Requirements

Code	Title	Hours
Required Mechanical Engineering		
ME 2340 and ME 2341	Introduction to Material Science and Lab for ME 2340	5
ME 2350	Statics	4
ME 2355 and ME 2356	Mechanics of Materials and Lab for ME 2355	5
ME 2380 and ME 2381	Thermodynamics and Recitation for ME 2380	4
ME 3455 and ME 3456	Dynamics and Lab for ME 3455	5
ME 3475	Fluid Mechanics	4
or ME 3480	International Applications of Fluid Mechanics	
ME 4550	Mechanical Engineering Design	4
ME 4570	Thermal Systems Analysis and Design	4
Senior Capstone Design Project		
MEIE 4701	Capstone Design 1	1
MEIE 4702	Capstone Design 2	5
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]	

Bioengineering

Code	Title	Hours
Required Bioengineering Courses		
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 3380	Biomolecular Dynamics and Control	4
BIOE 5640	Computational Biomechanics	4
Bioengineering Electives		
Complete 16 semester hours from the course list below:		16
BIOE 5115	Dynamical Systems in Biological Engineering	
BIOE 5235	Biomedical Imaging	
or BIOE 5648	Biomedical Optics	
BIOE 5250	Regulatory and Quality Aspects of Medical Device Design	
BIOE 5410	Molecular Bioengineering	
or BIOE 5411	Applied Molecular Bioengineering	
BIOE 5420	Cellular Engineering	
BIOE 5430	Principles and Applications of Tissue Engineering	
BIOE 5440	The Cell as a Machine	
BIOE 5630	Physiological Fluid Mechanics	
BIOE 5650	Multiscale Biomechanics	
BIOE 5660	Integrative Mechanobiology	
BIOE 5800	Systems, Signals, and Controls for Bioengineers	
BIOE 5810	Design of Biomedical Instrumentation	
BIOE 5820	Biomaterials	
BIOE 5850	Design of Implants	

Supporting Courses: Mathematics/Science

Complete all mathematics/science courses with a minimum of 30 semester hours.

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
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 1151 and PHYS 1152 and PHYS 1153	Physics for Engineering 1 and Lab for PHYS 1151 and Interactive Learning Seminar for PHYS 1151	5
PHYS 1155 and PHYS 1156 and PHYS 1157	Physics for Engineering 2 and Lab for PHYS 1155 and Interactive Learning Seminar for PHYS 1155	5
Supplemental Credit		
1 semester hour from the following course counts toward the mathematics/science requirement:		1
GE 1501	Cornerstone of Engineering 1 [1]	

Professional Development

Code	Title	Hours
GE 1000	First-Year Seminar	1
ENCP 2000	Introduction to Engineering Co-op Education	1
ENCP 3000	Professional Issues in Engineering	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 in each course:		
ENGW 1111	First-Year Writing	4
ENGW 3302	Advanced Writing in the Technical Professions	4
or ENGW 3315	Interdisciplinary Advanced Writing in the Disciplines	

Required General Electives

Code	Title	Hours
Complete 8 semester hours of academic, nonremedial, nonrepetitive courses.		8

Integrative Courses

Code	Title	Hours
These courses are already required above and also fulfill the integrative requirement.		
MEIE 4701	Capstone Design 1	
MEIE 4702	Capstone Design 2	

Major GPA Requirement

2.000 minimum GPA required in ME, IE, and MEIE courses

2.000 minimum GPA required in BIOE courses

Program Requirement

140 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).

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 and CHEM 1153 (ND)	4	BIOL 1111 and BIOL 1112	5	MATH 2321 (FQ)	4	Vacation	
ENGW 1111 (WF)	4	GE 1502 (ER)	4	ME 2350	4		
GE 1000	1	MATH 1342 (FQ)	4				
GE 1501	4	PHYS 1151 and PHYS 1152 and PHYS 1153 (ND)	5				
MATH 1341 (FQ)	4						
	17		**18**		**8**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2365 and BIOE 2366 (AD, WI)	5	BIOE 2355	4	Vacation		Vacation	
MATH 2341	4	ME 2340 and ME 2341 (WI)	5				
ME 2355 and ME 2356	5	ME 2380 and ME 2381	4				
PHYS 1155 and PHYS 1156 and PHYS 1157 (ND)	5	General elective	4				
	19		**17**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 3210	4	BIOE 3380	4	ME 4550	4	Co-op	0

ME 3475 or 3480	4	BIOE 5640	4	MEIE 4701 (EI, WI, CE)	1		
BIOE elective	4	ENCP 2000	1	General elective	4		
BIOE elective	4	ME 3455 and ME 3456	5				
		ME 4570	4				
		ENCP 3000	1				
	16		**19**		**9**		**0**

Year 4

Fall	Hours	Spring	Hours
Co-op	0	ENGW 3302 or 3315 (WD)	4
		MEIE 4702 (EI, WI, CE)	5
		BIOE elective	4
		BIOE elective	4
	0		**17**

Total Hours: 140

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

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 and CHEM 1153	4	BIOL 1111 and BIOL 1112	5	MATH 2321	4	Vacation	
ENGW 1111	4	GE 1502	4	ME 2350	4		
GE 1000	1	MATH 1342	4				
GE 1501	4	PHYS 1151 and PHYS 1152 and PHYS 1153	5				
MATH 1341	4						
	17		**18**		**8**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2365 and BIOE 2366	5	BIOE 2355	4	Vacation		Vacation	
ME 2355 and ME 2356	5	ME 2380 and ME 2381	4				
MATH 2341	4	General Elective	4				
PHYS 1155 and PHYS 1156 and PHYS 1157	5	ME 3455 and ME 3456	5				
	19		**17**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ME 3475 or 3480	4	Co-op	0	Co-op	0	ME 4550	4
BIOE 3210	4					MEIE 4701	1
BioE Elective	4					ENGW 3302 or 3315	4
ENCP 2000	1						
BIOE 3380	4						
	17		**0**		**0**		**9**

Year 4

Fall	Hours	Spring	Hours
MEIE 4702	5	BioE Elective	4
ENCP 3000	1	BioE Elective	4
ME 4570	4	ME 2340 and ME 2341	5
BIOE 5640	4	General Elective	4

BioE Elective	4
	18

	17

Total Hours: 140

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

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 and CHEM 1153 (ND)	4	BIOL 1111 and BIOL 1112	5	Vacation		Vacation	
ENGW 1111 (WF)	4	GE 1502 (ER)	4				
GE 1000	1	MATH 1342 (FQ)	4				
GE 1501	4	PHYS 1151 and PHYS 1152 and PHYS 1153 (ND)	5				
MATH 1341 (FQ)	4						
	17		**18**		**0**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2365 and BIOE 2366 (AD, WI)	5	ME 2355 and ME 2356	5	Vacation		Co-op	0
MATH 2321 (FQ)	4	ME 2380 and ME 2381	4				
ME 2350	4	MATH 2341	4				
PHYS 1155 and PHYS 1156 and PHYS 1157 (ND)	5	General elective	4				
		ENCP 2000	1				
	18		**18**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	BIOE 2355	4	ME 3475 or 3480	4	Co-op	0
		BIOE 3210	4	ENGW 3302 or 3315 (WD)	4		
		ME 2340 and ME 2341 (WI)	5				
		ME 3455 and ME 3456	5				
	0		**18**		**8**		**0**

Year 4

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	BIOE 3380	4	MEIE 4701 (EI, WI, CE)	1	Co-op	0
		BIOE 5640	4	BioE Elective	4		
		ME 4570	4	ME 4550	4		
		BIOE elective	4				
		ENCP 3000	1				
	0		**17**		**9**		**0**

Year 5

Fall	Hours	Spring	Hours
Co-op	0	MEIE 4702 (EI, WI, CE)	5
		BIOE elective	4
		BIOE elective	4
		General Elective	4
	0		**17**

Total Hours: 140

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

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 and CHEM 1153	4	BIOL 1111 and BIOL 1112	5	Vacation		Vacation	
ENGW 1111	4	GE 1502	4				
GE 1000	1	MATH 1342	4				
GE 1501	4	PHYS 1151 and PHYS 1152 and PHYS 1153	5				
MATH 1341	4						
	17		**18**		**0**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOE 2365 and BIOE 2366	5	Co-op	0	Co-op	0	Vacation	
ENCP 2000	1						
MATH 2321	4						
ME 2350	4						
PHYS 1155 and PHYS 1156 and PHYS 1157	5						
	19		**0**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ME 2355 and ME 2356	5	Co-op	0	Co-op	0	ME 3475 or 3480	4
ME 2380 and ME 2381	4					BIOE 3210	4
MATH 2341	4						
General Elective	4						
	17		**0**		**0**		**8**

Year 4

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ME 3455 and ME 3456	5	Co-op	0	Co-op	0	ENGW 3302	4
BIOE 2355	4					ME 4550	4
BioE Elective	4					MEIE 4701	1
BIOE 5640	4						
	17		**0**		**0**		**9**

Year 5

Fall	Hours	Spring	Hours
MEIE 4702	5	BIOE Elective	4
ME 4570	4	BIOE Elective	4
BIOE 3380	4	General Elective	4
ENCP 3000	1	ME 2340 and ME 2341	5
BioE Elective	4		
	18		**17**

Total Hours: 140