1

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	Introduction to Material Science	5			
and ME 2341	and Lab for ME 2340				
ME 2350	Statics	4			
ME 2355	Mechanics of Materials	5			
and ME 2356	and Lab for ME 2355				
ME 2380	Thermodynamics	4			
and ME 2381	and Recitation for ME 2380				
ME 3455	Dynamics	5			
and ME 3456	and Lab for ME 3455				
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	2 semester hours from the following course count toward the engineering requirement:				
GE 1501	Cornerstone of Engineering 1 1				
3 semester hours from the following course	e 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

2 Mechanical Engineering and Bioengineering, BSME (Boston)

E	BIOE 3210	Bioelectricity	4
E	BIOE 3380	Biomolecular Dynamics and Control	4
E	BIOE 5640	Computational Biomechanics	4
E	Bioengineering Electives		
(Complete 16 semester hours from the cours	e 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 of	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 require	d 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

CodeTitleHoursComplete 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

Hours

Plan of Study

Sample Plans of Study

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

Hours

Spring

4 BIOE 3380

Year	1
Fall	

BIOE 3210

raii	Hours	Spring	Hours	Sulliller 1	Hours	Sullillei 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							
rear 5							

4 ME 4550

Summer 1

Hours

Summer 2

4 Co-op

Hours

0

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).

4	Mechanical Engineering and Bioengineering, BSME (Boston)								
ME 347	75 or 3480		4 BIOE 5640		4 MEIE 4701 (EI, WI, CE)		1		
BIOE el	lective		4 ENCP 2000		1 General elective		4		
BIOE el	lective		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 H	lours: 140								
FOUR Y	YEARS, ONE CO-OP	IN SPRIN	G/SUMMER FIRST HALF						
Year 1									
Fall		Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	
CHEM and CH	1151 IEM 1153		4 BIOL 1111 and BIOL 1112		5 MATH 2321		4 Vacation		

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							

rear 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- Year 1	OPS IN SU	IMMER SECOND HALF/FALL						
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		Со-ор		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	
Со-ор		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	
Со-ор		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	_				
Со-ор		0 MEIE 4702 (EI, WI, CE)		5				
		BIOE elective		4				
		BIOE elective		4				
		0		4				
		General Elective		17				

Total Hours: 140

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

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6

CHEM 1131 and CHEM 1132 and CHEM 1132 and CHEM 1132 and CHEM 1134 and CHEM 1132 and CHEM 1134 and CHEM 1132	Year 1								
and GHEM 11131	Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	
GE 1000	CHEM 1151 and CHEM 1153				5 Vacation		Vacation		
A PHYS 1151 and PHYS 1153 Sample	ENGW 1111		4 GE 1502		4				
MATH 1341 4 17 18 0 0 0 0 Year 2 Fall Mours Spring Mours Summer 1 Hours Summer 2 Hours 1806 2366	GE 1000		1 MATH 1342		4				
New	GE 1501		and PHYS 1152		5				
Fail Moura Spring Moura Summer 1 Moura Summer 2 Moura	MATH 1341		4						
Fail Hours Spring Hours Summer Hours Summer 2 Hours Summer 2 Hours Summer 3 Hours			17		18		0		0
BIOC 2365	Year 2								
ENOR 2000 1 ENOR 2000 1 ME 2350 4 ME 2350 4 ME 2350 7 ME 2350 7 ME 2350 7 ME 2350 8 ME	Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	
MATH 2321 4 ME 2350 4 ME 2350 5 and PHYS 1155 and PHYS 1156 and PHYS 1157 19 0 0 0 0 0 0 Year 3 Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours ME 2355 5 0-op 0 0 0-op 0 ME 3475 or 3480 4 Add ME 2336 MATH 2321 4 General Elective 4 Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours Wear 4 Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours Wear 4 Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours Wear 4 Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours Wear 4 Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours BIGE 2355 4 C-op 0 0 0 ENGW 3302 4 And ME 3456 BIGE 2355 4 G-op 0 0 ENGW 3302 4 And ME 3456 BIGE 2356 4 G-op 0 0 ENGW 3302 4 BIGE 2356 4 G-op 0 0 ENGW 3302 4 BIGE 2356 4 G-op 0 0 ENGW 3302 4 BIGE 2356 5 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 2340 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 6 G-op 0 0 ENGW 3302 4 ME 4570 7 G-op 0 0 ENGW 3302 4 ME 4570 7 G-op 0 0 ENGW 3302 4 ME 4570 8 G-op	BIOE 2365 and BIOE 2366		5 Co-op		0 Co-op		0 Vacation		
ME 2350	ENCP 2000		1						
PHYS 1155 and PHYS 1156 and PHYS 1157 5 and PHYS 1157 19 0 0 0 0 Year 3 Fall Hours Summer 1 Hours Summer 2 Hours More ME 2355 and ME 2356 5 Co-op 0 Co-op 0 ME 3475 or 3480 4 ME 2356 and ME 2380 and ME 2380 and ME 2381 4	MATH 2321		4						
and PHYS 1156 and PHYS 1157	ME 2350		4						
Fall Hours Spring Hours Summer 1 Hours Summer 2 Hours ME 2355 5 Co-op 0 Co-op 0 ME 3475 or 3480 4 ME 2385 5 Co-op 0 Co-op 0 ME 3475 or 3480 4 ME 2380 4 Co-op 8 BIOE 3210 4 ME 2380 4 Co-op 8 FINE COLOR STAND 8 ME 2381 4 Co-op 8 FINE COLOR STAND 8 ME 2381 7 Co-op 8 FINE COLOR STAND 9 8 Secretal Elective 7 Format Porp 8 7 8 8 8 8 8 8 8 8 8 8 8 9 8 9	PHYS 1155 and PHYS 1156 and PHYS 1157		5						
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ME 2380	Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	
MATH 2381 AGeneral Elective 7 7 7 8 7 8 7 8 7 8 7 8 7 8 8	ME 2355 and ME 2356		5 Co-op		0 Co-op		0 ME 3475 or 3480		4
Semental Elective	ME 2380 and ME 2381		4				BIOE 3210		4
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 5640 4 MEIE 4701 1 BIOE 5640 4 0 0 9 Year 5 Fall Hours Spring Hours Hours Hours MEIE 4702 4 ME 4570 4 BIOE Elective 4 <td>MATH 2341</td> <td></td> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	MATH 2341		4						
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BioE Elective 4 BIOE 5640 17 0 0 0 9 Year 5 Fall Hours Spring Hours MEIE 4702 5 BIOE Elective 4 ME 4570 BIOE 3380 4 General Elective 4 BIOE 3380 5 INE 2340 5 and ME 2341 BIOE Elective 4 BIOE Elective 4 BIOE Elective 4 BIOE Bloe Sake Skale	ME 3455 and ME 3456		5 Co-op		0 Co-op		0 ENGW 3302		4
BIOE 5640 4 17 0 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 BIOE Elective 4	BIOE 2355		4				ME 4550		4
17 0 0 9 Year 5 Fall Hours 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 and ME 2341 BioE Elective 4	BioE Elective		4				MEIE 4701		1
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	BIOE 5640		4						
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			17		0		0		9
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	Year 5								
ME 4570 4 BIOE Elective 4 BIOE 3380 4 General Elective 4 ENCP 3000 1 ME 2340 and ME 2341 5 BIOE Elective 4	Fall	Hours	Spring	Hours					
BIOE 3380 4 General Elective 4 ENCP 3000 1 ME 2340 sind ME 2341 5 BioE Elective 4	MEIE 4702		5 BIOE Elective		4				
ENCP 3000 1 ME 2340 5 and ME 2341 BioE Elective 4	ME 4570		4 BIOE Elective		4				
and ME 2341 BioE Elective 4	BIOE 3380		4 General Elective		4				
	ENCP 3000				5				
18 17	BioE Elective		4						
			18		17				

Total Hours: 140