

BIOMEDICAL ENGINEERING B.S.BME.

All students must meet the University Requirements. (<http://catalogue.uvm.edu/undergraduate/academicinfo/degreerequirements>)

The B.S. in Biomedical Engineering trains engineers to work at the interface between engineering and the biomedical sciences. The curriculum is structured into two phases: Foundational and Specialization.

The Foundational Phase establishes a core of math and science, builds a solid foundation in quantitative engineering methods and biomedical sciences, and exposes students to opportunities in biomedical engineering. In the Specialization Phase, students focus their studies in one of three areas:

- Biosensing & Instrumentation
- Cell, Tissue & Organ Biomechanics
- Systems & Network Biology

Specializations involve technical electives that focus on the application of engineering methods to biomedical problems in their specialization area of study.

The B.S. in Biomedical Engineering leverages strong ties between UVM's College of Engineering & Mathematical Sciences and its College of Medicine. This collaboration will provide students unique biomedical opportunities in a professional setting.

BIOMEDICAL ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES

Graduates of the program are expected to:

1. Succeed in careers as practicing biomedical engineers in a wide range of industrial, governmental, and educational work environments;
2. Participate as active and effective members of engineering teams (possibly multi-disciplinary), which may be composed of people of diverse educational and cultural backgrounds;
3. Lead engineering teams in an effective, fair, and responsible manner;
4. Communicate effectively, in both written and oral forms, about their engineering activities and the results of those activities;
5. Educate themselves throughout their careers about advancements within their discipline and the role of their discipline in society in general;
6. Practice their profession in an ethically, socially, and environmentally responsible manner.

PLAN OF STUDY THE CURRICULUM FOR THE B.S. IN BIOMEDICAL ENGINEERING BIOSENSING & INSTRUMENTATION SPECIALIZATION

First Year	Credits	
	Fall	Spring
CHEM 031 General Chemistry 1 ¹	4	
CS 020 Programming for Engineers ¹	3	
ENGR 002 Graphical Communication	2	
ENGR 050 First Year Engineering Seminar	1	
MATH 021 Calculus I ¹	4	
Foundational Writing & Information Literacy	3	
BME 001 Intro to Biomedical Eng Design ²		2
CHEM 032 General Chemistry 2		4
MATH 022 Calculus II ¹		4
MLRS 034 Human Cell Biology		4
PHYS 031 Physics for Engineers I ¹		4
Year Total:	17	18
Sophomore	Credits	
	Fall	Spring
ANPS 019 Ugr Hum Anatomy & Physiology	4	
CE 001 Statics	3	
EE 100 Electrical Engr Concepts	4	
MATH 121 Calculus III	4	
PHYS 125 Physics for Engineers II	3	
ANPS 020 Ugr Hum Anatomy & Physiology		4
BME 081 Biomedical Eng Lab I		2
EE 004 Linear Circuit Analysis II		3
EE 082 Linear Circuits Laboratory II		2
EE 101 Digital Control w/Embedded Sys		4
MATH 271 Adv Engineering Mathematics		3
Year Total:	18	18

Junior	Credits	
	Fall	Spring
BME 151 Fall BME Workshop	1	
EE 120 Electronics I	4	
EE 171 Signals & Systems	4	
MATH 122 Applied Linear Algebra	3	
STAT 151 Applied Probability	3	
Gen Ed Elective ³	3	3
BME 152 Spring BME Workshop		1
Choose 4 Biosensing & Instrumentation (BI) Electives ⁴		12
Year Total:	18	16
Senior		
	Fall	Spring
BME 181 Biomedical Eng Lab II	2	
BME 187 Capstone Design I	3	
Gen Ed Elective ³	3	
Choose 2 BME BI Technical Electives ⁵	6	6
Choose 2 Gen Ed Electives ³		6
BME 188 Capstone Design II		3
Year Total:	14	15
Total Credits in Sequence:	134	

- ¹ Pre-Engineering Technical (PET) requirement: PET courses must be completed with C- or better by the third semester of enrollment in order to continue in engineering coursework.
- ² First-Year Design Experience: Transfer students without applicable transfer credit have the option of either taking BME 001 or replacing the credits with engineering course work at the 100-level or higher.
- ³ General Education: Fifteen credits of approved Gen Ed Electives, including the University diversity requirement (three credits of D1 and three additional credits of D1 or D2) and the University sustainability requirement (SU).
- ⁴ Biosensing & Instrumentation Electives: Any 100-level or higher EE course. CE, ENGR, ME, CS, MATH, STAT and life sciences courses with approval of BME advisor. At least 6 hours must be 100-level or above engineering courses.

⁵ BME BI Technical Electives: BIOC 212, CE 359*, CS 256, CS 302*, CS 352*, EE 207, EE 210, EE 213, EE 227, EE 228, EE 275, EE 278, EXMS 240, HLTH 135, MATH 300*, MATH 303*, ME 201, ME 208, ME 209, ME 285, ME 312*, MLRS 140, MLRS 175, MPBP 323*, PATH 101, RMS 213, RMS 250, STAT 200 & STAT 211. Other courses may be pre-approved by advisor and program head. At least 9 credits must be at the 200-level or above. Note that 300-level courses (*) require instructor permission for undergraduate enrollment.

CELL, TISSUE & ORGAN BIOMECHANICS SPECIALIZATION

First Year	Credits	
	Fall	Spring
CHEM 031 General Chemistry 1 ¹	4	
CS 020 Programming for Engineers	3	
ENGR 002 Graphical Communication	2	
ENGR 050 First Year Engineering Seminar	1	
MATH 021 Calculus I ¹	4	
Foundational Writing & Information Literacy	3	
BME 001 Intro to Biomedical Eng Design ²		2
CHEM 032 General Chemistry 2		4
MATH 022 Calculus II ¹		4
MLRS 034 Human Cell Biology		4
PHYS 031 Physics for Engineers I ¹		4
Year Total:	17	18
Sophomore		
	Fall	Spring
ANPS 019 Ugr Hum Anatomy & Physiology	4	
CE 001 Statics	3	
EE 100 Electrical Engr Concepts	4	
MATH 121 Calculus III	4	
PHYS 125 Physics for Engineers II	3	
ANPS 020 Ugr Hum Anatomy & Physiology		4
BME 081 Biomedical Eng Lab I		2
MATH 271 Adv Engineering Mathematics		3
ME 012 Dynamics		3

ME 014 Mechanics of Solids		3
ME 040 Thermodynamics		3
Year Total:	18	18
Junior		
	Fall	Spring
BME 151 Fall BME Workshop	1	
MATH 122 Applied Linear Algebra	3	
ME 101 Materials Engineering	3	
ME 143 Fluid Mechanics	3	
STAT 143 Statistics for Engineering	3	
Gen Ed Elective ³	3	3
BME 152 Spring BME Workshop		1
Choose 4 Cell, Tissue & Organ (CTO) Biomechanics Electives ⁴		12
Year Total:	16	16
Senior		
	Fall	Spring
BME 181 Biomedical Eng Lab II	2	
BME 187 Capstone Design I	3	
Gen Ed Elective ³	3	
Choose 2 BME CTO Technical Electives ⁵	6	6
Choose 2 Gen Ed Electives ³		6
BME 188 Capstone Design II		3
Year Total:	14	15
Total Credits in Sequence:		132

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² First-Year Design Experience: Transfer students without applicable transfer credit have the option of either taking BME 001 or replacing the credits with engineering course work at the 100-level or higher.

³ General Education: Fifteen credits of approved Gen Ed Electives, including the University diversity requirement (three credits of D1 and three additional credits of D1 or D2) and the University sustainability requirement (SU).

⁴ Cell, Tissue & Organ Biomechanics Electives: Any 100-level or higher ME course. CE, EE, ENGR, CS, MATH, STAT and life sciences courses with approval of BME advisor. At least 6 hours must be 100-level or above engineering courses.

⁵ BME CTO Technical Electives: CS 256, EXMS 240, HLTH 135, ME 201, ME 207, ME 208, ME 209, ME 285, ME 312*, MLRS 140, MLRS 175, MMG 223, MMG 231, MMG 232, MMG 233, MPBP 323*, PATH 101, PHRM 201, PHRM 240, PHRM 272, RMS 213, RMS 250, STAT 200 & STAT 211. Other courses may be pre-approved by advisor and program head. At least 9 credits must be at the 200-level or above. Note that 300-level courses (*) require instructor permission for undergraduate enrollment.

SYSTEMS & NETWORK BIOLOGY SPECIALIZATION

First Year	Credits	
	Fall	Spring
CHEM 031 General Chemistry 1 ¹	4	
CS 020 Programming for Engineers ¹	3	
ENGR 002 Graphical Communication	2	
ENGR 050 First Year Engineering Seminar	1	
MATH 021 Calculus I ¹	4	
Foundational Writing & Information Literacy	3	
BME 001 Intro to Biomedical Eng Design ²		2
CHEM 032 General Chemistry 2		4
MATH 022 Calculus II ¹		4
MLRS 034 Human Cell Biology		4
PHYS 031 Physics for Engineers I ¹		4
Year Total:	17	18
Sophomore		
	Fall	Spring
ANPS 019 Ugr Hum Anatomy & Physiology	4	
CE 001 Statics	3	
EE 100 Electrical Engr Concepts	4	
MATH 121 Calculus III	4	

PHYS 125 Physics for Engineers II	3	
ANPS 020 Ugr Hum Anatomy & Physiology		4
BME 081 Biomedical Eng Lab I		2
CS 064 Discrete Structures		3
CS 110 Intermediate Programming		4
MATH 271 Adv Engineering Mathematics		3
Year Total:	18	16
Junior		
	Credits	
	Fall	Spring
BME 151 Fall BME Workshop	1	
CS 124 Data Structures & Algorithms	3	
EE 171 Signals & Systems	4	
MATH 122 Applied Linear Algebra	3	
STAT 143 Statistics for Engineering	3	
Gen Ed Elective ³	3	3
BME 152 Spring BME Workshop		1
Choose 4 Systems & Network Biology (SNB) Electives ⁴		12
Year Total:	17	16
Senior		
	Credits	
	Fall	Spring
BME 181 Biomedical Eng Lab II	2	
BME 187 Capstone Design I	3	
Gen Ed Elective ³	3	
Choose 2 BME SNB Technical Electives ⁵	6	6
Choose 2 Gen Ed Electives ³		6
BME 188 Capstone Design II		3
Year Total:	14	15
Total Credits in Sequence:		
		131

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² First-Year Design Experience: Transfer students without applicable transfer credit have the option of either taking BME 001 or replacing the credits with engineering course work at the 100-level or higher.

³ General Education: Fifteen credits of approved Gen Ed Electives, including the University diversity requirement (three credits of D1 and three additional credits of D1 or D2) and the University sustainability requirement (SU).

⁴ Systems & Network Biology Electives: CE, EE, ENGR, ME, CS, MATH, STAT and life/physical sciences courses with the approval of BME advisor. At least 9 hours must be 100-level or above engineering courses.

⁵ BME SNB Technical Electives: BIOC 212, CE 359*, CS 256, CS 302*, CS 352*, EE 207, EE 210, EE 213, MATH 266, MATH 268, MATH 300*, MATH 303*, ME 201, ME 208, ME 209, ME 285, ME 312*, MMG 223, MMG 231, MMG 232, MMG 233, MPBP 323*, PATH 101, PHRM 201, PHRM 240, PHRM 272, STAT 200 & STAT 211. Other courses may be pre-approved by advisor and program head. At least 9 credits must be at the 200-level or above. Note that 300-level courses (*) require instructor permission for undergraduate enrollment.