

BIOENGINEERING, BS

Banner Code: VS-BS-BIOE

Academic Advising

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Bioengineering, also referred to as biomedical engineering, is the application of engineering tools and approaches to solve problems in biology and medicine. It is a broad and growing field that draws upon rapid advances in technology and computation, as well as, on unprecedented growth in basic biological understanding.

This program provides i) a scientific foundation in math, physics, biology, chemistry and physiology; ii) broad introductions to bioengineering technology platforms of medical imaging, devices, computational biomedical engineering, neurotechnology, biomaterials and nanomedicine followed by a deepening of knowledge in at least one of these areas through a chosen concentration; and iii) translational courses showing how new technologies can be implemented in clinical medicine and be commercialized by industry partners.

Engineering design experiences are built into each year of the curriculum culminating in a senior design project. The impact of engineering, technologies and computer science on biomedicine is immense, and can only be harnessed through integrative multidisciplinary training in Bioengineering. With the growing demand for better health care, the need for bioengineers is expected to be high.

The multidisciplinary training in this field makes graduates competitive for positions in government and in biomedical industry. The BS in Bioengineering also enables students to continue their education in graduate school or medical school.

Accreditation

The bachelor's program in Bioengineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Program Educational Objectives

Graduates of the Bioengineering bachelor's program are expected within 3-5 years of graduation to:

1. Contribute to the development or application of health-related products or processes that are a benefit to society.
2. Continue their formal education by making demonstrable progress toward an advanced degree or professional development milestone.
3. Communicate and perform effectively as members and/or leaders of multidisciplinary teams.

Concentrations

The concentrations in the BS Bioengineering program are:

- Bioengineering Healthcare Informatics (BHI)
- Bioengineering Prehealth (BMPH)
- Biomaterials and Nanomedicine (BNM)
- Biomedical Imaging and Devices (BMID)

- Computational Biomedical Engineering (CBME)
- Neurotechnology and Computational Neuroscience (NTCN)

Admissions & Policies

Policies

For policies governing all undergraduate degrees, see AP.5 Undergraduate Policies.

Advising

All Bioengineering students are required to meet with their departmental academic advisor prior to course registration each semester. Students who are considering bioengineering as their major must meet with the Volgenau School of Engineering Coordinator of Undergraduate Advising in 2500 Nguyen Engineering Building.

Change of Major

See Change of Major for more information.

Writing-Intensive Requirement

Mason's writing-intensive requirement is satisfied by BENG 360 Biomedical Imaging, in which faculty provide feedback on student writing assignments.

Termination from the Major

No math, science, or Volgenau School of Engineering course that is required for the major may be attempted more than three times. Those students who do not successfully complete such a course within three attempts will be terminated from the major. Undeclared students in the Volgenau School who do not successfully complete a course required for a Volgenau School major within three attempts will also be terminated.

In addition, students in the Volgenau School with evidence of continued failure to make adequate progress toward declaring or completing a Volgenau School major will also be terminated. Adequate progress is determined by the major program. For more information, see AP.5.2.4 Termination from the Major (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-2-4>).

Once a student has attempted one of these courses twice unsuccessfully, the third attempt must be no later than the next semester of enrollment, excluding summers. Failure to take the course at that time will result in termination from the major. A third attempt of a Volgenau School of Engineering course requires support by the student's major department as well as permission by the department offering the course. This permission is not guaranteed. If the student is unable to take the course when required, the student may request an extension to a future semester; extensions require approval of the student's advisor, their department, and the Associate Dean for Undergraduate Programs. The deadline for extension requests is the add deadline for the semester in which the course is required.

Students who have been terminated from a Volgenau School of Engineering major may not register for a Volgenau School course without permission of the department offering the course. This applies to all undergraduate courses offered by the Volgenau School except IT 104

Introduction to Computing (Mason Core) and STAT 250 Introductory Statistics I (Mason Core).

A student may not declare any major in the Volgenau School of Engineering if the student has previously met the termination criteria for that major at any time, regardless of what the student's major was at the time the courses were taken.

Requirements

Degree Requirements

Total credits: 122-134

Students must complete each BENG, BIOL, CHEM, CS, ECE, ME course presented as part of the required credits for the degree with a grade of C or better.

Required Courses

Bioengineering

Code	Title	Credits
BENG 101	Introduction to Bioengineering	3
BENG 214	Physiology for Engineers	3
BENG 230	Continuum Biomechanics and Transport I	3
BENG 240	Biomaterials	3
BENG 241	Biomechanics and Biomaterials Laboratory	1
BENG 320	Bioengineering Signals and Systems	3
BENG 330	Computational Methods in Bioengineering	3
BENG 331	Computational Methods in Bioengineering Laboratory	1
BENG 350	Neural System Designs	3
BENG 360	Biomedical Imaging	3
BENG 370	Bioinstrumentation and Devices I	3
BENG 371	Bioinstrumentation and Devices Laboratory	1
BENG 391	Bioengineering Professional Development	1
BENG 414	Pathophysiology and the Role of New Technologies in Human Diseases	3
BENG 475	Intellectual Property, Regulatory Concepts and Product Development	3
BENG 492	Senior Advanced Design Project I (Mason Core)	3
BENG 493	RS: Senior Advanced Design Project II (Mason Core)	3
Total Credits		43

Biology

Code	Title	Credits
BIOL 213	Cell Structure and Function (Mason Core) 1	4
Total Credits		4

Computer Science

Code	Title	Credits
CS 112	Introduction to Computer Programming (Mason Core)	4
Total Credits		4

Mathematics and Statistics

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core)	4
MATH 114	Analytic Geometry and Calculus II ²	4
MATH 203	Linear Algebra ³	3
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations ²	3
STAT 350	Introductory Statistics II	3
Total Credits		20

¹ All students in the Bioengineering program are required to register for the specific section of BIOL 213.

² All students in the Bioengineering program need a grade of B- or better in MATH 114 and MATH 214, which are a pre-requisite requirement for some BENG courses

³ All students in the Bioengineering program are required to register for the specific section of MATH 203 that includes a 1-hour recitation with Matlab applications.

Physics

Code	Title	Credits
PHYS 160	University Physics I (Mason Core)	3
PHYS 161	University Physics I Laboratory (Mason Core)	1
PHYS 260	University Physics II (Mason Core)	3
PHYS 261	University Physics II Laboratory (Mason Core)	1
Total Credits		8

Communication

Code	Title	Credits
COMM 100	Public Speaking (Mason Core)	3
or COMM 101	Fundamentals of Communication (Mason Core)	
Total Credits		3

Concentrations

Available Concentrations

- Concentration in Bioengineering Healthcare Informatics (BHI)
- Concentration in Bioengineering Prehealth (BPH)
- Concentration in Biomaterials and Nanomedicine (BNM)
- Concentration in Biomedical Imaging and Devices (BMID)
- Concentration in Computational Biomedical Engineering (CBME)
- Concentration in Neurotechnology and Computational Neuroscience (NTCN)

Select one concentration and complete all requirements therein.

Concentration in Bioengineering Healthcare Informatics (BHI)

Code	Title	Credits
Chemistry		
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture (Mason Core) and General Chemistry for Engineers Lab (Mason Core)	4
CHEM 310	Survey of Organic Chemistry	3
Social and Behavioral Science		
Choose one of the following:		3
PSYC 100	Basic Concepts in Psychology (Mason Core)	
SOCI 101	Introductory Sociology (Mason Core)	
ECON 103	Contemporary Microeconomic Principles (Mason Core)	
Concentration Specialization		
HAP 360	Introduction to Health Information Systems	3
HAP 361	Health Databases	3
or IT 214	Database Fundamentals	
HAP 464	Electronic Health Record Configuration and Data Analysis	3
Technical Electives		
Select 6 credits from the following:		6
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	
BENG 390	Engineering Design and Fabrication	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 417	Bioengineering World Health	
BENG 420	Biomedical Data Analytics	
BENG 421	Cell and Tissue Engineering	
BENG 426	Neural Engineering	
BENG 429	Mason-Inova Applied Technologies	
BENG 430	Continuum Biomechanics and Biotransport II	
BENG 434	Computational Modelling of Neurons and Networks	
BENG 435	Multi-scale Modeling and Simulation in Biomedicine	
BENG 437	Medical Image Processing	
BENG 438	Advanced Biomedical Imaging	
BENG 441	Nanomedicine and Drug Delivery	
BENG 451	Translation and Entrepreneurship in Bioengineering	
BENG 470	Bioinstrumentation and Devices II	
BENG 487	Neuroinformatics	
BENG 499	Special Topics in Bioengineering	
BENG 501	Bioengineering Research Methods	
BENG 526	Neural Engineering	
BENG 538	Medical Imaging	
BENG 541	Biomaterials	

BENG 550	Advanced Biomechanics	
Total Credits		25

Students may choose to substitute one of the technical electives with one of the following:

Code	Title	Credits
CS 310	Data Structures	
ECE 305	Electromagnetic Theory	
ECE 421	Classical Systems and Control Theory	
ME 313	Material Science	
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	
BIOL 311	General Genetics	
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	
PSYC 372	Biopsychology	
HAP 440	Mobile Health	
HAP 459	Health Data Standards and Interoperability	

Concentration in Bioengineering Prehealth (BMPH)

Code	Title	Credits
Biology		
BIOL 483	General Biochemistry	4
or CHEM 463	General Biochemistry I	
Chemistry		
CHEM 211 & CHEM 213	General Chemistry I (Mason Core) and General Chemistry Laboratory I (Mason Core)	4
CHEM 212 & CHEM 214	General Chemistry II (Mason Core) and General Chemistry Laboratory II (Mason Core)	4
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	5
CHEM 314 & CHEM 318	Organic Chemistry II and Organic Chemistry Lab II	5
Psychology and Sociology		
PSYC 100	Basic Concepts in Psychology (Mason Core)	3
SOCI 101	Introductory Sociology (Mason Core)	3
Technical Electives		
Select 9 credits from the following:		9
Computational Biomedical Engineering Specialization		
BENG 420	Biomedical Data Analytics	
BENG 430	Continuum Biomechanics and Biotransport II	
BENG 435	Multi-scale Modeling and Simulation in Biomedicine	
BENG 550	Advanced Biomechanics	
Biomedical Imaging and Devices Specialization		
BENG 437	Medical Image Processing	
BENG 438	Advanced Biomedical Imaging	
BENG 470	Bioinstrumentation and Devices II	

BENG 538	Medical Imaging	
Biomaterials and Nanomedicine Specialization		
BENG 413	Molecular Engineering Laboratory	
BENG 421	Cell and Tissue Engineering	
BENG 441	Nanomedicine and Drug Delivery	
BENG 541	Biomaterials	
Neurotechnology & Computational Neuroscience Specialization		
BENG 426	Neural Engineering	
BENG 429	Mason-Inova Applied Technologies	
BENG 434	Computational Modelling of Neurons and Networks	
BENG 487	Neuroinformatics	
BENG 526	Neural Engineering	
Research and Design Specialization		
BENG 390	Engineering Design and Fabrication	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 417	Bioengineering World Health	
BENG 499	Special Topics in Bioengineering	
BENG 501	Bioengineering Research Methods	
Total Credits		37

Note: Students under the Bioengineering PreHealth Concentration should take BIOL 311 (Genetics) as an additional Biology Technical Elective Course.

Concentration in Biomaterials and Nanomedicine (BNM)

Code	Title	Credits
Chemistry		
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture (Mason Core) and General Chemistry for Engineers Lab (Mason Core)	4
CHEM 310	Survey of Organic Chemistry	3
Social and Behavioral Science		
Choose one of the following:		3
PSYC 100	Basic Concepts in Psychology (Mason Core)	
SOCI 101	Introductory Sociology (Mason Core)	
ECON 103	Contemporary Microeconomic Principles (Mason Core)	
Concentration Specialization		
BENG 413	Molecular Engineering Laboratory	3
BENG 421	Cell and Tissue Engineering	3
BENG 441	Nanomedicine and Drug Delivery	3
Technical Electives		
Select 6 credits from the following:		6
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	
BENG 390	Engineering Design and Fabrication	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 417	Bioengineering World Health	
BENG 420	Biomedical Data Analytics	
BENG 426	Neural Engineering	
BENG 429	Mason-Inova Applied Technologies	

BENG 430	Continuum Biomechanics and Biotransport II	
BENG 434	Computational Modelling of Neurons and Networks	
BENG 435	Multi-scale Modeling and Simulation in Biomedicine	
BENG 437	Medical Image Processing	
BENG 438	Advanced Biomedical Imaging	
BENG 451	Translation and Entrepreneurship in Bioengineering	
BENG 470	Bioinstrumentation and Devices II	
BENG 487	Neuroinformatics	
BENG 499	Special Topics in Bioengineering	
BENG 501	Bioengineering Research Methods	
BENG 538	Medical Imaging	
BENG 526	Neural Engineering	
BENG 541	Biomaterials	
BENG 550	Advanced Biomechanics	
Total Credits		25

Students may choose to substitute one of the technical electives with one of the following:

Code	Title	Credits
CS 310	Data Structures	
ECE 305	Electromagnetic Theory	
ECE 421	Classical Systems and Control Theory	
ME 313	Material Science	
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	
BIOL 311	General Genetics	
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	
PSYC 372	Biopsychology	

Concentration in Biomedical Imaging and Devices (BMID)

Code	Title	Credits
Chemistry		
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture (Mason Core) and General Chemistry for Engineers Lab (Mason Core)	4
CHEM 310	Survey of Organic Chemistry	3
Social and Behavioral Science		
Choose one of the following:		3
PSYC 100	Basic Concepts in Psychology (Mason Core)	
SOCI 101	Introductory Sociology (Mason Core)	
ECON 103	Contemporary Microeconomic Principles (Mason Core)	
Concentration Specialization		
BENG 420	Biomedical Data Analytics	3
Select 6 credits from the following:		6
BENG 437	Medical Image Processing	

BENG 438	Advanced Biomedical Imaging	
BENG 470	Bioinstrumentation and Devices II	
BENG 538	Medical Imaging	
Technical Electives		
Select 6 credits from the following:		6
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	
BENG 390	Engineering Design and Fabrication	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 417	Bioengineering World Health	
BENG 421	Cell and Tissue Engineering	
BENG 426	Neural Engineering	
BENG 429	Mason-Inova Applied Technologies	
BENG 430	Continuum Biomechanics and Biotransport II	
BENG 434	Computational Modelling of Neurons and Networks	
BENG 435	Multi-scale Modeling and Simulation in Biomedicine	
BENG 441	Nanomedicine and Drug Delivery	
BENG 451	Translation and Entrepreneurship in Bioengineering	
BENG 487	Neuroinformatics	
BENG 499	Special Topics in Bioengineering	
BENG 501	Bioengineering Research Methods	
BENG 526	Neural Engineering	
BENG 541	Biomaterials	
BENG 550	Advanced Biomechanics	
Total Credits		25

Students may choose to substitute one of the technical electives with one of the following:

Code	Title	Credits
CS 310	Data Structures	
ECE 305	Electromagnetic Theory	
ECE 421	Classical Systems and Control Theory	
ME 313	Material Science	
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	
BIOL 311	General Genetics	
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	
PSYC 372	Biopsychology	

Concentration in Computational Biomedical Engineering (CBME)

Code	Title	Credits
Chemistry		
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture (Mason Core) and General Chemistry for Engineers Lab (Mason Core)	4
CHEM 310	Survey of Organic Chemistry	3

Social and Behavioral Science		
Choose one of the following:		3
PSYC 100	Basic Concepts in Psychology (Mason Core)	
SOCI 101	Introductory Sociology (Mason Core)	
ECON 103	Contemporary Microeconomic Principles (Mason Core)	

Concentration Specialization		
BENG 420	Biomedical Data Analytics	3
BENG 430	Continuum Biomechanics and Biotransport II	3
BENG 435	Multi-scale Modeling and Simulation in Biomedicine	3

Technical Electives		
Select 6 credits from the following:		6
BENG 390	Engineering Design and Fabrication	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 417	Bioengineering World Health	
BENG 421	Cell and Tissue Engineering	
BENG 426	Neural Engineering	
BENG 429	Mason-Inova Applied Technologies	
BENG 434	Computational Modelling of Neurons and Networks	
BENG 437	Medical Image Processing	
BENG 438	Advanced Biomedical Imaging	
BENG 441	Nanomedicine and Drug Delivery	
BENG 451	Translation and Entrepreneurship in Bioengineering	
BENG 470	Bioinstrumentation and Devices II	
BENG 487	Neuroinformatics	
BENG 499	Special Topics in Bioengineering	
BENG 501	Bioengineering Research Methods	
BENG 526	Neural Engineering	
BENG 538	Medical Imaging	
BENG 541	Biomaterials	
BENG 550	Advanced Biomechanics	
Total Credits		25

Students may choose to substitute one of the technical electives with one of the following:

Code	Title	Credits
CS 310	Data Structures	
ECE 305	Electromagnetic Theory	
ECE 421	Classical Systems and Control Theory	
ME 313	Material Science	
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	
BIOL 311	General Genetics	
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	
PSYC 372	Biopsychology	

Concentration in Neurotechnology and Computational Neuroscience (NTCN)

Code	Title	Credits
Chemistry		
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture (Mason Core) and General Chemistry for Engineers Lab (Mason Core)	4
CHEM 310	Survey of Organic Chemistry	3
Social and Behavioral Science		
Choose one of the following:		3
PSYC 100	Basic Concepts in Psychology (Mason Core)	
SOCI 101	Introductory Sociology (Mason Core)	
ECON 103	Contemporary Microeconomic Principles (Mason Core)	
Concentration Specialization		
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	3
Select 6 credits from the following:		6
BENG 426	Neural Engineering	
BENG 429	Mason-Inova Applied Technologies	
BENG 434	Computational Modelling of Neurons and Networks	
BENG 487	Neuroinformatics	
BENG 526	Neural Engineering	
Technical Electives		
Select 6 credits from the following:		6
BENG 390	Engineering Design and Fabrication	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 417	Bioengineering World Health	
BENG 420	Biomedical Data Analytics	
BENG 421	Cell and Tissue Engineering	
BENG 430	Continuum Biomechanics and Biotransport II	
BENG 435	Multi-scale Modeling and Simulation in Biomedicine	
BENG 437	Medical Image Processing	
BENG 438	Advanced Biomedical Imaging	
BENG 441	Nanomedicine and Drug Delivery	
BENG 451	Translation and Entrepreneurship in Bioengineering	
BENG 470	Bioinstrumentation and Devices II	
BENG 499	Special Topics in Bioengineering	
BENG 501	Bioengineering Research Methods	
BENG 538	Medical Imaging	
BENG 541	Biomaterials	
BENG 550	Advanced Biomechanics	
Total Credits		25

Students may choose to substitute one of the technical electives with one of the following:

Code	Title	Credits
CS 310	Data Structures	
ECE 305	Electromagnetic Theory	
ECE 421	Classical Systems and Control Theory	
ME 313	Material Science	
BIOL 305 & BIOL 306	Biology of Microorganisms and Biology of Microorganisms Laboratory	
BIOL 311	General Genetics	
CHEM 313 & CHEM 315	Organic Chemistry I and Organic Chemistry Lab I	
PSYC 372	Biopsychology	

Additional Mason Core

Students must complete all Mason Core requirements not fulfilled by major requirements. BENG 492 Senior Advanced Design Project I (Mason Core) and BENG 493 RS: Senior Advanced Design Project II (Mason Core) are approved to meet the Synthesis/Capstone requirement.

Code	Title	Credits
Written Communication		6
Literature		3
Arts		3
Western Civilization/World History		3
Total Credits		15

Honors**Honors in the Major**

The Department of Bioengineering offers an Honors Program that creates a community of outstanding scholars in bioengineering who share a commitment to learning, service, and leadership. The Program is based on the bioengineering curriculum, and is distinct from the University Honors Curriculum.

Eligibility

Entry to the Honors Program is by invitation, extended to students with a declared major in Bioengineering who have completed a minimum of 30 credit hours at Mason with a minimum cumulative GPA of 3.50 and a minimum GPA of 3.20 in each prior semester.

Honors Requirements

The Honors Program is challenging and designed for the highly motivated student with interests in any of the bioengineering concentrations. Honors students must satisfy requirements in addition to those of the normal BS degree in bioengineering, including:

- Successful completion of BENG 395 RS: Mentored Research in Bioengineering
- Six credits must be earned by taking a combination of BENG 5XX/6XX level courses. With permission of the Department of Bioengineering, 5XX/6XX level courses from other Volgenau School of Engineering programs may be considered.

Once admitted to the Honors Program, students must remain in good standing and maintain a minimum cumulative GPA of 3.50 and a

minimum GPA of 3.20 in each semester for all courses counting toward the BS degree in bioengineering, maintain continuous enrollment working towards the degree, and abide by the Mason Honor Code.

Accelerated Master's

BS (selected)/Statistical Science, Accelerated MS

Overview

Highly-qualified students in BS programs have the option of applying to the accelerated Statistical Science, MS program.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

No specific undergraduate BS degree is required. Students enrolled in any BS degree may apply to the accelerated Statistical Science, MS program **if such an accelerated Statistical Science, MS pathway is allowable from the student's BS program, which will be determined by the academic advisors of both the BS and MS programs**; and if they have earned 90 undergraduate credits with an overall GPA of 3.00. Students must have successfully completed the following Mason courses each with a grade of C or better prior to admission to the accelerated program:

Code	Title	Credits
MATH 213	Analytic Geometry and Calculus III	3
MATH 203 or MATH 321	Linear Algebra Abstract Algebra	3
STAT 250 or STAT 344	Introductory Statistics I (Mason Core) Probability and Statistics for Engineers and Scientists I	3
STAT 346 or MATH 351	Probability for Engineers Probability	3
STAT 362	Introduction to Computer Statistical Packages	3

Accelerated Option Requirements

Students must complete all credits satisfying degree requirements for the BS and MS programs, with 6 credits overlap chosen from the following courses: STAT 515 Applied Statistics and Visualization for Analytics, STAT 544 Applied Probability, STAT 554 Applied Statistics I, STAT 560 Biostatistical Methods, and STAT 574 Survey Sampling I. (Credit may not be received for both STAT 474 and STAT 574; nor for both STAT 460 and STAT 560.) The graduate courses selected for overlap must be approved by the academic advisors of both the BS and MS programs. All graduate course prerequisites must be completed prior to enrollment. Each graduate course must be completed with a grade of B or better to apply toward the MS degree.

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master's program. Reserve graduate credits do not apply to the undergraduate degree.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and Graduate Recruitment and Enrollment Services. At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Bioengineering, Accelerated MS

Overview

Highly-qualified students in the Bioengineering, BS (<https://catalog.gmu.edu/colleges-schools/engineering/bioengineering/bioengineering-bs>) have the option of obtaining an accelerated Bioengineering, MS (<https://catalog.gmu.edu/colleges-schools/engineering/bioengineering/bioengineering-ms>).

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Mason undergraduate students majoring in Bioengineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.20 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Bioengineering, MS (<https://catalog.gmu.edu/colleges-schools/engineering/bioengineering/bioengineering-ms>) program.

Accelerated Options Requirement

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 credits) of approved MS level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisor of both the BS and MS programs and by the Bioengineering department chair. For undergraduate Bioengineering technical electives, the students may choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

Degree Conferral

Students are recommended to meet with the Bioengineering academic advisor one year before and must apply to the program one semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a MS degree is conferred.

Bioengineering, BS/Biostatistics, Accelerated MS

Overview:

Highly-qualified students in Bioengineering, BS have the option of obtaining an accelerated Biostatistics, MS. Students in an accelerated degree program must fulfill all university requirements for the master's degree.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<https://catalog.gmu.edu/policies/academic/graduate-policies>).

Admission Requirements:

Students enrolled in a BS degree in Bioengineering may apply to this option if they have earned 90 undergraduate credits with an overall GPA of 3.00. Students must have successfully completed MATH 213 Analytic Geometry and Calculus III and BENG 320 Bioengineering Signals and Systems. Criteria for admission are identical to criteria for admission to the Biostatistics, MS program

Accelerated Option Requirements:

Students must complete all requirements for the BS and MS programs, with 6 credits overlap.

Students register for the following 500-level courses, which will also count towards the technical elective requirements of their undergraduate degree:

Code	Title	Credits
BENG 501	Bioengineering Research Methods	3
STAT 554	Applied Statistics I	3

Note:

Students are permitted to take additional graduate basic courses in their undergraduate programs. In such cases, those classes cannot be counted toward requirements for the MS.

Degree Conferral:

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form (<https://registrar.gmu.edu/forms>) that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Data Analytics Engineering, Accelerated MS

Overview

Highly-qualified students in the Bioengineering, BS have the option of obtaining an accelerated Data Analytics Engineering, MS with a concentration in Bioengineering.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Students in the Bioengineering, BS program may apply to this option if they have earned 95 undergraduate credits with an overall GPA of at least 3.30. Students must have successfully completed CS 222 Computer Programming for Engineers and BENG 320 Bioengineering Signals and Systems. Criteria for admission are identical to criteria for admission to the Bioengineering concentration of the Data Analytics Engineering, MS program.

Accelerated Option Requirements

Students must complete all requirements for the BS and MS programs, with 6 credits overlap.

Students register for 6 credits of 500-level basic courses in place of the corresponding BENG 400-level courses required for the undergraduate degree requirements. Specifically, students must register for:

Code	Title	Credits
BENG 501	Bioengineering Research Methods	3
CS 504	Principles of Data Management and Mining (in place of BENG 420)	3
Total Credits		6

Note:

Students are permitted to take additional graduate basic courses in their undergraduate programs. In such cases, those classes cannot be counted toward requirements for the MS.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Operations Research, Accelerated MS

Overview

Highly-qualified students in the Bioengineering, BS have the option of obtaining an accelerated Operations Research, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Mason undergraduate students majoring in Bioengineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Operations Research, MS program.

Accelerated Options Requirement

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 credits) of approved master's level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may chose the graduate version of such elective courses to replace the corresponding undergraduate courses.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Systems Engineering, Accelerated MS

Overview

Highly-qualified students in the Bioengineering, BS have the option of obtaining an accelerated Systems Engineering, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

Admission Requirements

Mason undergraduate students majoring in Bioengineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Systems Engineering, MS program.

Accelerated Options Requirement

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 credits) of approved master's level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may chose the graduate version of such elective courses to replace the corresponding undergraduate courses.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.