BIOENGINEERING, BS

Banner Code: EC-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, computational neuroscience and neurotechnology, biomaterials and nanomedicine, and health care informatics 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 (https://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 (http://catalog.gmu.edu/policies/academic/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 College of Engineering and Computing Coordinator of Undergraduate Advising in 2500 Nguyen Engineering Building.

Change of Major

See Change of Major (http://catalog.gmu.edu/colleges-schools/engineering-computing/#requirementspoliciestext) 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 College of Engineering and Computing 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 College of Engineering and Computing who do not successfully complete a course required for a College of Engineering and Computing major within three attempts will also be terminated.

In addition, students in the College of Education and Computing with evidence of continued failure to make adequate progress toward declaring or completing a Volgenau School major will be terminated from the school. 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 College of Engineering and Computing 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 College of Engineering and Computing major may not register for a College of Engineering and

Computing course without permission of the department offering the course. This applies to all undergraduate courses offered by the College of Engineering and Computing except IT 104 Introduction to Computing (Mason Core) (http://catalog.gmu.edu/mason-core/) and STAT 250 Introductory Statistics I (Mason Core) (http://catalog.gmu.edu/mason-core/).

A student may not declare any major in the College of Engineering and Computing 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 375	Intellectual Property, Regulatory Concepts and Product Development	3
BENG 391	Bioengineering Professional Development	1
BENG 492	Senior Advanced Design Project I (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
BENG 493	RS: Senior Advanced Design Project II	3
Total Credits		40

Biology

Code	Title	Credits
BIOL 213	Cell Structure and Function [1]	4
Total Credits		4

Computer Science

Code	Title	Credits
CS 112	Introduction to Computer Programming (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
or ENGR 125T	Introduction to Engineering Methods - Transfer (Mason Core) (http://catalog.gmu.edu/mason-core/)	
Total Credits		4

Mathematics and Statistics

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (http://catalog.gmu.edu/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 360	Introduction to Statistical Practice 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) (http://catalog.gmu.edu/mason-core/)	3
PHYS 161	University Physics I Laboratory (Mason Core) (http://catalog.gmu.edu/mason-core/)	1
PHYS 260	University Physics II (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
PHYS 261	University Physics II Laboratory (Mason Core) (http://catalog.gmu.edu/mason-core/)	1
Total Credits		8

Communication

Code	Title	Credits
COMM 100	Public Speaking (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
or COMM 101	Fundamentals of Communication (Mason Core) (http://catalog.gmu.edu/mason-core/)	
Total Credits		3

Concentrations

Available Concentrations

- Concentration in Bioengineering Healthcare Informatics (BHI)
- Concentration in Bioengineering Prehealth (BMPH)
- 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) (http://catalog.gmu.edu/mason-core/) and General Chemistry for Engineers Lab (Mason Core) (http://catalog.gmu.edu/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) (http://catalog.gmu.edu/mason-core/)	
SOCI 101	Introductory Sociology (Mason Core) (http://catalog.gmu.edu/mason-core/)	
ECON 103	Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/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 314	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 415	Biomanufacturing	
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 440	Advanced Biomaterials and Biomimetic Devices for Nanomedicine	
BENG 438	Advanced Biomedical Imaging	
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 211	Object-Oriented Programming	
CS 222	Computer Programming for Engineers	
CS 310	Data Structures	
ECE 301	Digital Electronics	
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) (http://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory I (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
CHEM 212 & CHEM 214	General Chemistry II (Mason Core) (http://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory II (Mason Core) (http://catalog.gmu.edu/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) (http://catalog.gmu.edu/mason-core/)	3
SOCI 101	Introductory Sociology (Mason Core) (http://catalog.gmu.edu/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 415	Biomanufacturing	
BENG 421	Cell and Tissue Engineering	
BENG 440	Advanced Biomaterials and Biomimetic Devices for Nanomedicine	
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 314	Pathophysiology and the Role of New Technologies in Human Diseases	
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 General 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) (http://catalog.gmu.edu/mason-core/) and General Chemistry for Engineers Lab (Mason Core) (http://catalog.gmu.edu/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) (http://catalog.gmu.edu/mason-core/)	
SOCI 101	Introductory Sociology (Mason Core) (http://catalog.gmu.edu/mason-core/)	
ECON 103	Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/mason-core/)	
Concentration Specialization		
BENG 413	Molecular Engineering Laboratory	3
BENG 415	Biomanufacturing	3
BENG 421	Cell and Tissue Engineering	3
BENG 440	Advanced Biomaterials and Biomimetic Devices for Nanomedicine	3
Technical Electives		
Select 6 credits from the following:		6
BENG 314	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	
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 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		28

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

Code	Title	Credits
CS 211	Object-Oriented Programming	
CS 222	Computer Programming for Engineers	
CS 310	Data Structures	
ECE 301	Digital Electronics	
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) (http://catalog.gmu.edu/mason-core/) and General Chemistry for Engineers Lab (Mason Core) (http://catalog.gmu.edu/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) (http://catalog.gmu.edu/mason-core/)	
SOCI 101	Introductory Sociology (Mason Core) (http://catalog.gmu.edu/mason-core/)	
ECON 103	Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/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 314	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 327	Cellular, Neurophysiological, and Pharmacological Neuroscience	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 415	Biomanufacturing	
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 440	Advanced Biomaterials and Biomimetic Devices for Nanomedicine	
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 211	Object-Oriented Programming	
CS 222	Computer Programming for Engineers	
CS 310	Data Structures	
ECE 301	Digital Electronics	
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) (http://catalog.gmu.edu/mason-core/) and General Chemistry for Engineers Lab (Mason Core) (http://catalog.gmu.edu/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) (http://catalog.gmu.edu/mason-core/)	
SOCI 101	Introductory Sociology (Mason Core) (http://catalog.gmu.edu/mason-core/)	

ECON 103	Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/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 314	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 415	Biomanufacturing	
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 440	Advanced Biomaterials and Biomimetic Devices for Nanomedicine	
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 211	Object-Oriented Programming	
CS 222	Computer Programming for Engineers	
CS 310	Data Structures	
ECE 301	Digital Electronics	
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) (http://catalog.gmu.edu/mason-core/) and General Chemistry for Engineers Lab (Mason Core) (http://catalog.gmu.edu/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) (http://catalog.gmu.edu/mason-core/)	
SOCI 101	Introductory Sociology (Mason Core) (http://catalog.gmu.edu/mason-core/)	
ECON 103	Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/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 314	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 395	RS: Mentored Research in Bioengineering	
BENG 413	Molecular Engineering Laboratory	
BENG 415	Biomanufacturing	
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 440	Advanced Biomaterials and Biomimetic Devices for Nanomedicine	
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 211	Object-Oriented Programming	
CS 222	Computer Programming for Engineers	
CS 310	Data Structures	
ECE 301	Digital Electronics	
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 (http://catalog.gmu.edu/mason-core/) requirements not fulfilled by major requirements. BENG 492 Senior Advanced Design Project I (Mason Core) (http://catalog.gmu.edu/mason-core/) and BENG 493 RS: Senior Advanced Design Project II are approved to meet the Synthesis/Capstone requirement.

Code	Title	Credits
Written Communication (http://catalog.gmu.edu/mason-core/#written)		6
Literature (http://catalog.gmu.edu/mason-core/#literature)		3
Arts (http://catalog.gmu.edu/mason-core/#arts)		3
Western Civilization/World History (http://catalog.gmu.edu/mason-core/#western-civilization-world-history)		3
Global Understanding (http://catalog.gmu.edu/mason-core/#global-understanding)		3
Total Credits		18

4-Year Plan

Bachelor of Science in Bioengineering Sample Plan of Study

Detailed four year plans and degree planning checklists can be found at https://advising.gmu.edu/current-student/majors-at-mason/.

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. Only one course may be repeated to raise the GPA.

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 or a Mason ASSIP research experience or at least 60 certified research project hours in a Mason bioengineering lab.
- Successful completion of three credits of BENG 5XX/6XX level courses. With permission of the Department of Bioengineering, 5XX/6XX level courses from other College of Engineering and Computing 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 (any)/Statistical Science, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program (BAM) and obtain an undergraduate BS degree and the Statistical Science, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/statistical-science-ms/) in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program.

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 (http://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

No specific undergraduate BS degree is required. Students enrolled in any BS degree may apply to the accelerated Statistical Science, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/statistical-science-ms/) program **if such an accelerated** Statistical Science, MS (http://catalog.gmu.edu/colleges-

schools/engineering-computing/school-computing/statistics/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.**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of 3.0.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific prerequisites.

Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the Statistical Science, MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- Completion of Mason's requirements for undergraduate degree conferral (graduation) and completion of application for graduation.
- An overall GPA of 3.00.
- Completion of the following Mason courses each with a grade of C or better.

Code	Title	Credits
MATH 213	Analytic Geometry and Calculus III	3
MATH 203	Linear Algebra	3
or MATH 321	Abstract Algebra	
STAT 250	Introductory Statistics I (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
or STAT 344	Probability and Statistics for Engineers and Scientists I	
STAT 346	Probability for Engineers	3
or MATH 351	Probability	
STAT 362	Introduction to Computer Statistical Packages	3

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, students complete all credits satisfying degree requirements for the BS and MS programs, with up to twelve credits overlap chosen from the following graduate courses:

Code	Title	Credits
STAT 544	Applied Probability	3
STAT 554	Applied Statistics I	3
STAT 560	Biostatistical Methods	3
STAT 574	Survey Sampling I	3
STAT 663	Statistical Graphics and Data Exploration I	3

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.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) policies.

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 undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a BS in Bioengineering and a MS in Bioengineering (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/bioengineering/bioengineering-ms/) in an accelerated time-frame after satisfactory completion of a minimum of 140 credits.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

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 (https://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Students majoring in Bioengineering, BS will be considered for admission into the BAM Pathway after completion of a minimum of 60 undergraduate credits with an overall GPA of at least 3.0 and have completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Bioengineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/bioengineering/bioengineering-ms/) program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the Bioengineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/bioengineering/bioengineering-ms/) program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- A GPA of 3.0 or better in their 60 highest-level credits
- Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students must complete all credits that satisfy requirements for both the BS and MS programs, with up to four classes (twelve credits) overlap chosen from the following graduate courses:

Code	Title	Credits
BENG 520	Biomedical Data Analytics	3
BENG 521	Cell and Tissue Engineering	3
or BENG 541	Biomaterials	
BENG 526	Neural Engineering	3
BENG 537	Medical Image Processing	3
or BENG 538	Medical Imaging	
BENG 501	Bioengineering Research Methods	3
BENG 514	Pathophysiology and the Role of New Technologies in Human Diseases	3
BENG 575	Intellectual Property, Regulatory Concepts and Product Development	3

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 program. The graduate courses may be counted as Technical Electives or Concentration Core courses towards the Bioengineering, BS program requirements with approval by the academic advisor of the BS program and the program director of the MS program (or the bioengineering department chair).

While still in undergraduate status, a maximum of six 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. These reserve credits can be chosen from the list of graduate level courses given above with approval by the academic advisor of the BS program and the program director of the MS program (or the bioengineering department chair).

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees policies.

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. At the completion of MS requirements, a MS degree is conferred.

Bioengineering, BS/Biostatistics, Accelerated MS

Overview:

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program (BAM) and obtain the Bioengineering, BS and the Biostatistics, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/biostatistics-ms/) in an accelerated time-frame after satisfactory completion of a minimum of 146 credits.

Admitted students are able to use up to 6 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7) for policies related to this program.

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 (https://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements:

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.0.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific prerequisites.

Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the Biostatistics, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/biostatistics-ms/) program if they meet the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- Completion of Mason's requirements for undergraduate degree conferral (graduation) and completion of application for graduation.
- An overall GPA of at least 3.0.
- Completion of the following Mason courses each with a grade of C or better.

Code	Title	Credits
MATH 213	Analytic Geometry and Calculus III	3
BENG 320	Bioengineering Signals and Systems	3

Accelerated Pathway Requirements:

To maintain the integrity and quality of both the undergraduate and graduate degree programs, students complete all credits that satisfy requirements for the BS and MS programs. Students can take up to six credits of the following approved graduate level courses listed below as part of their undergraduate degree that will also be applied to the graduate degree.

Code	Title	Credits
BENG 501	Bioengineering Research Methods	3
STAT 554	Applied Statistics I	3
STAT 560	Biostatistical Methods	3

STAT 663	Statistical Graphics and Data Exploration I	3

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 program. The graduate courses may be counted as Technical Electives toward Bioengineering, BS program requirements, with approval of the Bioengineering Department undergraduate coordinator.

While still in undergraduate status, a maximum of six 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.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees policies.

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/). At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Data Analytics Engineering, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a BS in Bioengineering and MS in Data Analytics Engineering (http://catalog.gmu.edu/colleges-schools/engineering-computing/data-analytics-engineering-ms/) with a concentration in Bioengineering in an accelerated time-frame.

See AP.6.7 Bachelor's/Accelerated Master's Degrees for policies related to this program.

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 (http://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in the Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Students majoring in the Bioengineering, BS will be considered for admission into the BAM Pathway after completion of a minimum of 60 undergraduate credits with an overall GPA of at least 3.0. 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 (http://catalog.gmu.edu/colleges-schools/engineering-computing/data-analytics-engineering-ms/) program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites

Accelerated Master's Admission Requirements

Students already admitted in the BAM Pathway will be admitted to the Data Analytics Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/data-analytics-engineering-ms/) program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- A GPA of 3.0 or better in their 60 highest-level credits
- Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students must complete all credits that satisfy requirements for both the BS and MS programs, with up to three classes (nine credits) overlap depending on their bioengineering concentration chosen from the following graduate courses:

Code	Title	Credits
AIT 580	Analytics: Big Data to Information	3
BENG 501	Bioengineering Research Methods	3
CS 504	Principles of Data Management and Mining (in place of BENG 420)	3
OR 531	Analytics and Decision Analysis	3
STAT 515	Applied Statistics and Visualization for Analytics	3
Total Credits		15

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 program. The graduate courses may be counted as Technical Electives or, in the case of CS 504 Principles of Data Management and Mining, for BENG 420 Biomedical Data Analytics towards the Bioengineering, BS program requirements with approval by the academic advisors of both the BS and MS programs.

While still in undergraduate status, a maximum of six 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. These reserve credits can be chosen from the list of graduate level courses given above with approval by the academic advisors of both the BS and MS programs.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees policies.

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 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. At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Operations Research, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Bioengineering, BS and an Operations Research, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) in an accelerated time-frame after satisfactory completion of a minimum of 140 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

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 (https://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Bioengineering, BS students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

Accelerated Master's Admission Requirements

The criteria for admission are identical to criteria for admission to the Operations Research, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 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 choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

- Students selecting up to two courses (6 credits) of approved master's level courses may select from the Bioengineering courses given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master's level courses may select at most two courses from the Bioengineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master's degree regardless of the graduate-level concentration chosen in the Operations Research, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/). The undergraduate version of these courses, if any, may *not* be applied toward the Operations Research, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/). Credit may not be received for both the undergraduate and graduate version of these courses.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/) program.
- Students must pay attention to the prerequisites required for a course, and the master's degree concentration that the course may satisfy.

Select from the following Bioengineering courses:

Code	Title	Credits
Required course:		
BENG 575	Intellectual Property, Regulatory Concepts and Product Development	
Select at most one from the following Bioengineering courses:		
BENG 501	Bioengineering Research Methods	
BENG 514	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 520	Biomedical Data Analytics	
BENG 521	Cell and Tissue Engineering	
or BENG 541	Biomaterials	
BENG 526	Neural Engineering	

BENG 537	Medical Image Processing
or BENG 538	Medical Imaging

Select the remaining from the following Systems Engineering and Operations Research courses:

Code	Title	Credits
SYST 521	Network Analysis	
OR 538	Analytics for Financial Engineering and Econometrics	
OR 541	Operations Research: Deterministic Models (Core)	
OR 542	Operations Research: Stochastic Models (Core)	
OR 568	Applied Predictive Analytics (Core)	
OR 588	Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives	

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.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

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. At the completion of MS requirements, a master's degree is conferred.

Bioengineering, BS/Systems Engineering, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Bioengineering, BS and a Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) in an accelerated time-frame after satisfactory completion of a minimum of 140 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

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 (https://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Bioengineering, BS students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

Accelerated Master's Admission Requirements

The criteria for admission are identical to criteria for admission to the Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) program. Students already admitted in the BAM Pathway will be admitted to the Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 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 choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

- Students selecting up to two courses (6 credits) of approved master's level courses may select from the Bioengineering courses given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master's level courses may select at most two courses from the Bioengineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master's degree regardless of the graduate-level concentration chosen in the Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) program. The undergraduate version of these courses, if any, may *not* be applied toward the Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-

operations-research/systems-engineering-ms/). Credit may not be received for both the undergraduate and graduate version of these courses.

- Except for the courses marked as core, any course chosen from either course list can be used to satisfy SYST 505 Systems Engineering Principles core requirement in the Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) program.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) program.
- Students must pay attention to the prerequisites required for a course, and the master's degree concentration that the course may satisfy.

Select from the following Bioengineering courses:

Code	Title	Credits
Required course:		
BENG 575	Intellectual Property, Regulatory Concepts and Product Development	
Select at most one from the following Bioengineering courses:		
BENG 501	Bioengineering Research Methods	
BENG 514	Pathophysiology and the Role of New Technologies in Human Diseases	
BENG 520	Biomedical Data Analytics	
BENG 521	Cell and Tissue Engineering	
or BENG 541	Biomaterials	
BENG 526	Neural Engineering	
BENG 537	Medical Image Processing	
or BENG 538	Medical Imaging	

Select the remaining from the following Systems Engineering and Operations Research courses:

Code	Title	Credits
SYST 510	Systems Definition and Cost Modeling (Core)	
SYST 514	Systems Thinking	
SYST 520	System Engineering Design (Core)	
SYST 530	Systems Engineering Management I (Core)	
SYST 542	Decision Support Systems Engineering	
SYST 573	Decision and Risk Analysis	
SYST 538	Analytics for Financial Engineering and Econometrics	
SYST 560	Introduction to Air Traffic Control	
SYST 563	Evidence-Based Systems Engineering	
SYST 568	Applied Predictive Analytics	
SYST 584	Heterogeneous Data Fusion	
SYST 588	Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives	

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.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

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. At the completion of MS requirements, a master's degree is conferred.