

MECHANICAL ENGINEERING, BS

Banner Code: EC-BS-ME

Academic Advising

3300 Nguyen Engineering Building
Fairfax Campus

Phone: 703-993-5383
Email: mechengr@gmu.edu
Website: mechanical.gmu.edu

Today, the role of mechanical engineer is ever expanding in order to find innovative solutions for contemporary problems, and to address problems yet to be identified. To meet the growing demands of worldwide energy needs spurred by population growth and dwindling supplies of fossil fuels, for instance, mechanical engineers seek innovations in nuclear energy, bio-fuels, wind, and tidal energies to build an energy portfolio that exploits these seemingly limitless resources. From product design, which spans from biomedical devices to turbo-machinery, to manufacturing, which develops machines and systems needed to process raw materials into these products, an awareness of the benefits of advanced materials for sensing and monitoring the health of these systems and an awareness of the stealth threats to manufacturing brought on by an ever present cyber threat are in the minds of the mechanical engineers. Now more mechanical engineers oversee the operations and management of large systems along with the fiscal and human resources needed to run them.

James Michener once said, "Scientists dream about doing great things. Engineers do them." Mechanical engineers use science to advance technologies and to develop products for the benefit of society, in a discipline which dates back to the earliest of times in civilization. The major in mechanical engineering has three program education objectives, namely:

- Graduates have demonstrated success as a mechanical engineer or their chosen career field;
- Graduates have advanced their educational pursuits through graduate education, professional registration, or similar means;
- Graduates have advanced their careers by engaging in professional society participation and community service outreach.

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

Admissions & Policies

Policies

For policies governing all undergraduate degrees, see AP.5 Undergraduate Policies (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/>).

Change of Major

See Change of Major (<http://catalog.gmu.edu/colleges-schools/engineering-computing/#requirementspoliciestext>) for more information.

Grade Requirements and Advising

Degree requirements include 121 credits distributed in three main areas: mechanical engineering, mathematics and basic science, and humanities and social sciences. Students must complete all math, science and College of Engineering and Computing courses presented as part of the required 121 credits for the degree with a grade of C or better.

Students are required to see their faculty advisor at least once each year to plan their curriculum.

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 Engineering and Computing with evidence of continued failure to make adequate progress toward declaring or completing a College of Engineering and Computing 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: 121

Engineering

Code	Title	Credits
Courses		
ECE 330	Circuit Theory	3
ME 151	Practicum in Engineering	2
ME 211	Statics	3
ME 212	Solid Mechanics	3
ME 221	Thermodynamics	3
ME 231	Dynamics	3
ME 311	Mechanical Experimentation I	1
ME 313	Material Science	3
ME 321	Mechanical Experimentation II	1
ME 322	Fluid Mechanics	3
ME 323	Heat Transfer	3
ME 331	Mechatronics	3
ME 341	Design of Mechanical Elements	3
or ME 342	Design of Thermal Systems	3
ME 352	Entrepreneurship in Engineering	3
ME 432	Systems Dynamics and Controls	4
ME 443	Mechanical Design I	3
ME 444	Mechanical Design II (Mason Core) (http://catalog.gmu.edu/mason-core/) ¹	3
ME 453	Developing the Societal Engineer	2
Total Credits		49

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Mason's writing-intensive and synthesis requirements are satisfied by ME 444 (<https://catalog.gmu.edu/search/?P=ME%20444>) Mechanical Design II (Mason Core) (<https://catalog.gmu.edu/mason-core/>).

Electives

Code	Title	Credits
Students must select 12 upper-level (numbered 300 or above) elective credits ²		12

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Students may select an optional concentration to fulfill a portion of this required elective credit.

Optional Concentrations

Concentration in aerospace engineering and microfabrication are available in the mechanical engineering baccalaureate program. Completion of specific senior-level courses leads to this designation on the student's transcript on graduation.

Concentration in Aerospace Engineering (AENG)

Students must select at least one course from each category.

Code	Title	Credits
Aeronautics		
ME 471	Introduction to Aeronautics	3
ME 472	Spacecraft Subsystems	3
ME 473	Space Systems Propulsion	3
ECE 480	Small Spacecraft Engineering	3
Aeronautics		
ME 475	Aeronautics I	3

ME 476	Aeronautics II	3
ME 477	Aircraft Propulsion	3
Total Credits³		12

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Select sections of ME 499 Special Topics in Mechanical Engineering may be applied towards the Aerospace Concentration

Concentration in Microfabrication (MICF)

Code	Title	Credits
ME 466	Advanced Materials Engineering	3
ME 467	Nanosensors	3
ECE 430	Principles of Semiconductor Devices	3
PHYS 385	Materials Science with Applications to Renewable Energy	3
Total Credits		12

Computer Science

Code	Title	Credits
Select one from the following:		4
CS 112	Introduction to Computer Programming (Mason Core) (http://catalog.gmu.edu/mason-core/)	
ENGR 125T	Introduction to Engineering Methods - Transfer (Mason Core) (http://catalog.gmu.edu/mason-core/)	
CS 108 & CS 109	Intro to Computer Programming, Part A (Mason Core) (http://catalog.gmu.edu/mason-core/) and Intro to Computer Programming, Part B	
Total Credits		4

Mathematics and Science

Code	Title	Credits
Select one from the following:		4
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/)	
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/)	
MATH 113	Analytic Geometry and Calculus I (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
or MATH 123 & MATH 124	Calculus with Algebra/Trigonometry, Part A and Calculus with Algebra/Trigonometry, Part B (Mason Core) (http://catalog.gmu.edu/mason-core/)	
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations	3
ME 351	Analytical Methods in Engineering	3

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
Select 3 credits from the list of pre-approved Mathematics and Science Electives (below)		3
Total Credits		32

Mathematics and Science Electives

Code	Title	Credits
BIOL 213	Cell Structure and Function (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
BIOL 309	Oceanography	3
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
CLIM 411	Atmospheric Dynamics	3
CLIM 412	Physical Oceanography	3
CLIM 429	Atmospheric Thermodynamics	3
EVPP 210	Environmental Biology: Molecules and Cells	4
GEOL 412	Physical Oceanography	3
PHYS 262 & PHYS 263	University Physics III (Mason Core) (http://catalog.gmu.edu/mason-core/) and University Physics III Laboratory (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
PHYS 308	Modern Physics	3
PHYS 331	Physics of Renewable Energy	3
MATH 203	Linear Algebra	3
MATH 301	Number Theory	3
MATH 125	Discrete Mathematics I (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
MATH 302	Foundations of Geometry	3
MATH 312	Geometry	3
MATH 313	Introduction to Applied Analysis	3
MATH 314	Advanced Differential Equations	3
MATH 351	Probability	3
MATH 411	Functions of a Complex Variable	3
STAT 344	Probability and Statistics for Engineers and Scientists I	3
STAT 346	Probability for Engineers	3

Communication and Economics

Code	Title	Credits
COMM 100	Public Speaking (Mason Core) (http://catalog.gmu.edu/mason-core/) ¹	3

or COMM 101	Fundamentals of Communication (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
ECON 103	Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/mason-core/)	3

Total Credits 6

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Or completion of the Honors College Curriculum (<https://honorscollege.gmu.edu/>).

Additional Mason Core

Code	Title	Credits
Arts (http://catalog.gmu.edu/mason-core/#arts)		3
Global Understanding (http://catalog.gmu.edu/mason-core/#global)		3
Literature (http://catalog.gmu.edu/mason-core/#literature)		3
Global History (http://catalog.gmu.edu/mason-core/#global-history)		3
Written Communication (http://catalog.gmu.edu/mason-core/#written) ¹		6
Total Credits		18

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Both lower and upper level requirement.

4-Year Plan

Bachelors of Science in Mechanical Engineering 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/>.

Accelerated Master's

Mechanical Engineering, BS/Applied and Engineering Physics, Accelerated MS

Overview

This program allows academically strong undergraduates with a demonstrable commitment to research to obtain the Mechanical Engineering, BS and Applied and Engineering Physics, MS (<http://catalog.gmu.edu/colleges-schools/science/physics-astronomy/applied-engineering-physics-ms/>) degrees by successfully completing 139 credits. Upon completion, students are well-prepared for entering into the professional workforce, or a PhD program in physics or a related engineering discipline.

Admitted students take selected graduate courses after having completed 75 undergraduate credits and are able to use 3-12 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 and complete an additional 18-27 credits to receive the master's degree.

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

Application 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 Admission Policies (<http://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog.

Successful applicants majoring in Mechanical Engineering will have completed at least 60 credits toward their undergraduate degree with an overall GPA of at least 3.00, and the following courses with a GPA of 3.00 or better:

Code	Title	Credits
CS 112	Introduction to Computer Programming (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
ME 212	Solid Mechanics	3
ME 231	Dynamics	3
ME 313	Material Science	3
ME 322	Fluid Mechanics	3
ME 323	Heat Transfer	3
ME 351	Analytical Methods in Engineering	3

One or more recommendation letters from one or more research supervisors are also required. Interested applicants majoring in Mechanical Engineering, BS should submit a letter to the undergraduate Mechanical Engineering coordinator and the Physics Graduate Coordinator, respectively, requesting admission along with the aforementioned recommendation letter(s). Contact the Mechanical Engineering undergraduate and the Physics graduate coordinator for further details.

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 Option Requirements

At the beginning of the student's final undergraduate semester, students must submit a bachelor's/accelerated master's transition form (<http://registrar.gmu.edu/forms/>) to the College of Science's Office of Academic and Student Affairs (<https://cos.gmu.edu/about/contact-us/>). Students must begin their master's program in the semester immediately following conferral of the bachelor's degree.

Students must maintain an overall GPA of 3.00 or higher in graduate coursework.

Reserve Graduate Credit

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.

Graduate Course Suggestions

The following list of suggested courses is provided for general reference. To ensure an efficient route to graduation and career-readiness, students

are strongly encouraged to meet with an advisor before registering for graduate-level courses.

Code	Title	Credits
PHYS 510	Computational Physics I	3
PHYS 613	Computational Physics II	3
PHYS 620	Continuum Mechanics	3
PHYS 690	Engineering Thermodynamics	3

Mechanical Engineering, BS/Applied Information Technology, Accelerated MS Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Mechanical Engineering, BS and an Applied Information Technology, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/information-sciences-technology/applied-information-technology-ms/>) in an accelerated time-frame after satisfactory completion of a minimum of 139 credits.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://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 (<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 Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Mechanical Engineering, BS Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits, and additional unit-specific criteria.

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.

The criteria for admission are identical to criteria for admission to the Applied Information Technology, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/information-sciences-technology/applied-information-technology-ms/>) program.

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 Courses

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.

Code	Title	Credits
AIT 524	Database Management Systems	3
AIT 542	Fundamentals of Computing Platforms	3
AIT 664	Information: Representation, Processing and Visualization	3
AIT 512	Algorithms and Data Structures Essentials ¹	3
AIT 580	Analytics: Big Data to Information ²	3

¹ This course should be selected for all concentrations except for the IT Management concentration

² This course should be selected for the IT Management concentration

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. Students are strongly encouraged to meet with a graduate advisor to select reserve graduate credits. 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. At the completion of MS requirements, a master's degree is conferred.

Mechanical Engineering, BS / Bioengineering, Accelerated MS

Overview

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

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

Admission Requirements

Mason undergraduate students majoring in Mechanical Engineering, BS may apply to this option if they have earned 60 undergraduate credits with an overall GPA of at least 3.20, completed all MATH and PHYS requirements, and passed BENG 320 Bioengineering Signals and Systems and BIOL 213 Cell Structure and Function with the grade of C or better. It is also recommended that students take BENG 214 Physiology for Engineers and are proficient in MATLAB. 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 Options Requirement

Students must complete all credits that satisfy requirements for both the BS and MS programs. Students take up to 9 credits of approved MS level BENG courses as part of their undergraduate degree that will

also 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.

Specifically, students are encouraged to take up to three of the following courses to apply towards both their undergraduate and graduate degree.

Code	Title	Credits
BENG 520	Biomedical Data Analytics	3
BENG 521 or BENG 541	Cell and Tissue Engineering Biomaterials	3
BENG 526	Neural Engineering	3
BENG 537 or BENG 538	Medical Image Processing Medical Imaging	3
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

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.

Mechanical Engineering, BS/Civil and Infrastructure Engineering, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Mechanical Engineering, BS and a Civil and Infrastructure Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/civil-environmental-infrastructure/civil-infrastructure-engineering-ms/>). in an accelerated time-frame after satisfactory completion of a minimum of 139 credits.

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

Admission Requirements

Students in the Mechanical Engineering, BS program may apply to this option if they have earned 60 undergraduate credits with an overall GPA of at least 3.30. All other criteria for admission are identical to criteria for admission into the Civil and Infrastructure Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/civil-environmental-infrastructure/civil-infrastructure-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 Option Requirements

Students must complete all credits that satisfy requirements for both the BS and MS programs. Students register for up to 12 credits of overlapping graduate level courses in place of undergraduate technical elective courses.

Students are encouraged to take up to four of the following courses, based on their chosen concentration area in the master's program:

Concentration in Construction Engineering and Management (CEM)

Code	Title	Credits
CEIE 571	Construction Administration	3
CEIE 572	Building Information Modeling	3
CEIE 573	Legal Aspects of the Construction Process	3
CEIE 575	Design for Constructability	3
CEIE 576	Construction Cost Estimating	3

Concentration in Environmental and Water Resources Engineering (EWRE)

Code	Title	Credits
CEIE 540	Water Supply and Distribution	3
CEIE 542	Open Channel Flow	3
CEIE 550	Environmental Engineering Systems	3
CEIE 553	Water and Wastewater Treatment Processes	3
CEIE 557	Remote Monitoring Techniques for Civil Engineering Applications	3

Concentration in Geotechnical Engineering (GEOE)

Code	Title	Credits
CEIE 501	Sustainable Development	3
CEIE 524	Introduction to Bridge Engineering	3
CEIE 531	Earth Retaining Structures and Slope Stability	3
CEIE 532	Foundation Design	3
CEIE 535	Engineering Geology	3

Concentration in Structural Engineering (STRE)

Code	Title	Credits
CEIE 512	Structural Steel Design	3
CEIE 513	Reinforced Concrete Design	3
CEIE 525	Structural Evaluation and Rehabilitation	3
CEIE 532	Foundation Design	3
CEIE 575	Design for Constructability	3

Concentration in Transportation Engineering (TRNE)

Code	Title	Credits
CEIE 560	Public Transportation Systems	3
CEIE 561	Traffic Engineering	3

CEIE 562	Urban Transportation Planning	3
STAT 544	Applied Probability	3

Students also have the option of taking the following one or two additional graduate-level courses for reserve that will only count for the graduate degree program:

Code	Title	Credits
CEIE 601	Infrastructure Modeling	3
CEIE 605	Risk and Uncertainty in Civil Engineering	3

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.

Advising & Plan of Study

Each student is assigned a faculty advisor upon acceptance. Students must meet with their advisors during their first semester and design an approved plan of study. Students are encouraged to seek out their advisor when questions arise and when their plan of study needs to be revised.

Students must have a working background in their selected concentration area. A student lacking these foundations may be required to take one or more foundation courses.

Mechanical Engineering, BS/ Computational Science, Accelerated MS Overview

This option enables enthusiastic, highly qualified, undergraduates to obtain the Mechanical Engineering, BS (<https://mechanical.gmu.edu/>) and the Computational Science, MS (<http://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-sciences-ms/>) within the accelerated time frame of five years. The program requires 139 credits total, allowing students to undertake graduate coursework during their final year in the bachelor's degree. Upon completion of this 139 credit BS/MS combined program, students are exceptionally well prepared for undertaking doctoral studies or entering the professional workforce.

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

Application 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 Admission Policies (<http://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog¹. Application information for this Accelerated Master's program can be found on the Department of Computational and Data Sciences (<http://cos.gmu.edu/cds/academic-programs/>) website. Applicants must have an overall undergraduate GPA of at least 3.00 and have completed at least 60 credits. Additionally, applicants will have completed the following courses with a GPA of 3.00 or better:

Code	Title	Credits
CS 112	Introduction to Computer Programming (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
ME 212	Solid Mechanics	3
ME 231	Dynamics	3
ME 313	Material Science	3
ME 322	Fluid Mechanics	3
ME 323	Heat Transfer	3
ME 351	Analytical Methods in Engineering	3
Total Credits		22

Students must maintain an overall GPA of 3.00 or higher in graduate coursework and should consult with their faculty advisor to coordinate their academic goals within the modeling and simulation or data science emphases of the Computational Science, MS (<http://catalog.gmu.edu/colleges-schools/science/computational-data-sciences/computational-sciences-ms/>).

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

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GRE-general scores are waived for graduates of BS degrees from any program in the College of Science or the Volgenau School of Engineering at George Mason University.

Accelerated Option Requirements

Students must complete all credits that satisfy requirements for both the BS and MS programs, with up to twelve credits overlap chosen from the following courses:

Code	Title	Credits
CSI 500	Computational Science Tools	3
CSI 501	Introduction to Scientific Programming	3
CSI 600	Quantitative Foundations for Computational Sciences	3
Select one course from the following options:		3
Any CDS, CSI, or CSS-prefixed courses numbered 500-689, or		
STAT 544	Applied Probability	
STAT 554	Applied Statistics I	
Total Credits		12

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 AP6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

Mechanical Engineering, BS/Data Analytics Engineering, Accelerated MS Overview

Highly-qualified students in the Mechanical Engineering, BS program have the option of applying to the accelerated Data Analytics Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/data-analytics-engineering-ms/>) program.

For more detailed information, see AP6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>).

Admission Requirements

Students in the Mechanical Engineering, BS program may apply to the accelerated Data Analytics Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/data-analytics-engineering-ms/>) program if they have earned 60 undergraduate credits with an overall GPA of at least 3.30.

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 Option Requirements

Students must complete all credits that satisfy requirements for the BS and MS programs, with up to twelve credits overlap chosen from the following courses:

Code	Title	Credits
AIT 580	Analytics: Big Data to Information	3
CS 504	Principles of Data Management and Mining	3
OR 531	Analytics and Decision Analysis	3
STAT 515	Applied Statistics and Visualization for Analytics	3

All graduate course prerequisites must be completed prior to enrollment. Each 500-level course must be completed with a grade of B or better to apply toward the MS program. The graduate courses selected for overlap must be approved by the academic advisors of both the BS and MS programs. The graduate courses may be counted as Electives toward the Mechanical Engineering, BS program requirements, with approval of the Mechanical Engineering Department.

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.

Mechanical Engineering, BS/Electrical Engineering, Accelerated MS Overview

The university offers highly-qualified students in the Mechanical Engineering, BS the option of obtaining an accelerated Electrical

Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/electrical-engineering-ms/>).

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

Admission Requirements

Students in the Mechanical Engineering, BS program may apply for this option if they have earned 60 undergraduate credits, with an overall GPA of at least 3.0, and passed MATH 203 Linear Algebra and STAT 346 Probability for Engineers, or their equivalents, with the grade C or better. Criteria for admission are identical to criteria for admission to the Electrical Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/electrical-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 Option Requirements

Students must complete all credits that satisfy the requirements for the BS and MS programs, with up to 9 credits overlapping.

Students take up to 9 credits of 500-level ECE (<http://catalog.gmu.edu/courses/ece/>) or SYST (<http://catalog.gmu.edu/courses/syst/>) courses as part of their technical electives or substitutes for required courses in the Mechanical Engineering, BS program.

Specifically, students are encouraged to take up to three of the following courses:

Code	Title	Credits
ECE 521	Linear Systems and Control	3
ECE 527	Learning From Data	3
ECE 528	Introduction to Random Processes in Electrical and Computer Engineering	3
ECE 539	Neural Engineering	3
ECE 580	Small Spacecraft Engineering	3
SYST 521	Network Analysis	3

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.

Mechanical Engineering, BS/Operations Research, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Mechanical Engineering, BS and an Operations Research, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/>

<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/electrical-engineering-ms/>) in an accelerated time-frame after satisfactory completion of a minimum of 139 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.

Mechanical Engineering, 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 combined Mechanical Engineering course list and Systems Engineering and Operations Research course list 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 Mechanical Engineering 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 at most two from the following Mechanical Engineering courses:

Code	Title	Credits
ME 521	Energy Transfer	
ME 531	Energy Transmission	
ME 541	Power Generation	
ME 542	Energy Utilization	

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.

Mechanical Engineering, BS/Systems Engineering, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Mechanical Engineering, 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 139 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/#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 (<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 Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Mechanical Engineering, 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 combined Mechanical Engineering course list and Systems Engineering and Operations Research course list 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 Mechanical Engineering 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 at most two from the following Mechanical Engineering courses:

Code	Title	Credits
ME 521	Energy Transfer	
ME 531	Energy Transmission	

ME 541	Power Generation
ME 542	Energy Utilization

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 (<http://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.