

# MECHANICAL ENGINEERING, BS

**Banner Code:** VS-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.

### Change of Major

See Change of Major 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

Volgenau School of Engineering 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 Volgenau School of Engineering course that is required for the major may be attempted more than three times. Those students who do not successfully complete such a course within three attempts will be terminated from the major. Undeclared students in the Volgenau School who do not successfully complete a course required for a Volgenau School major within three attempts will also be terminated.

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

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

Students who have been terminated from a Volgenau School of Engineering major may not register for a Volgenau School course without permission of the department offering the course. This applies to all undergraduate courses offered by the Volgenau School except IT 104 Introduction to Computing (Mason Core) and STAT 250 Introductory Statistics I (Mason Core).

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

## Requirements

### Degree Requirements

Total credits: 121

### Engineering

Code	Title	Credits
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 or ME 342	Design of Mechanical Elements Design of Thermal Systems	3
ME 352	Entrepreneurship in Engineering	3
ME 432	Control Engineering	4
ME 443	Mechanical Design I	3
ME 444	Mechanical Design II (Mason Core)	3
ME 453	Developing the Societal Engineer	2
<b>Technical Electives</b>		
Select 12 credits from the following:		12
ME 431	Systems Dynamics	
ME 454	Project Mgmt for Engineers	
ME 471	Introduction to Astronautics	
ME 498	Independent Study in Mechanical Engineering <sup>1</sup>	
ME 499	Special Topics in Mechanical Engineering <sup>1</sup>	
Total Credits		61

<sup>1</sup> May be repeated for credit.

## Mathematics and Science

Code	Title	Credits
Select one from the following:		
CHEM 211 & CHEM 213	General Chemistry I (Mason Core) and General Chemistry Laboratory I (Mason Core)	4
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture and General Chemistry for Engineers Lab	4
MATH 113	Analytic Geometry and Calculus I (Mason Core)	4
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)	3
PHYS 161	University Physics I Laboratory (Mason Core)	1
PHYS 260	University Physics II (Mason Core)	3
PHYS 261	University Physics II Laboratory (Mason Core)	1
Select 3 credits from the list of pre-approved mathematics/ science electives		3
Total Credits		32

## Mathematics and Science Electives

Code	Title	Credits
BIOL 213	Cell Structure and Function (Mason Core)	4
BIOL 309	Introduction to Oceanography	3
CHEM 212 & CHEM 214	General Chemistry II (Mason Core) and General Chemistry Laboratory II (Mason Core)	4
CHEM 300	Chemistry of Semiconductor Processing	3
CHEM 333	Physical Chemistry for the Life Sciences I	3
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) and University Physics III Laboratory (Mason Core)	4
PHYS 331	Fundamentals of Renewable Energy	3
MATH 203	Linear Algebra	3
MATH 290	Introduction to Advanced Mathematics	3
MATH 301	Number Theory	3
MATH 302	Foundations of Geometry	3
MATH 312	Geometry	3
MATH 313	Introduction to Applied Analysis	3
MATH 314	Introduction to Applied Mathematics	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

## Computer Science

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

## Communication and Economics

Code	Title	Credits
COMM 100 or COMM 101	Public Speaking (Mason Core) Fundamentals of Communication (Mason Core)	3
ECON 103	Contemporary Microeconomic Principles (Mason Core)	3
Total Credits		6

## Additional Mason Core

Code	Title	Credits
Arts		3
Global Understanding		3
Literature		3
Western Civilization/World History		3

Written Communication <sup>1</sup>	6
Total Credits	18

<sup>1</sup> Both lower and upper level requirement.

## Writing Intensive Requirement

Mason's writing-intensive requirement is satisfied by ME 444 Mechanical Design II (Mason Core).

## Capstone Experience Requirement

Mason's synthesis requirement for mechanical engineering majors is satisfied by ME 444 Mechanical Design II (Mason Core).

## 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 (<https://catalog.gmu.edu/colleges-schools/engineering/mechanical/mechanical-engineering-bs>) and Applied and Engineering Physics, MS degrees by successfully completing 145 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 during their senior year and 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 and complete an additional 24 credits to receive the master's degree.

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

#### 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 section of this catalog.

Successful applicants majoring in Mechanical Engineering will have completed at least 90 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)	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 (<https://catalog.gmu.edu/colleges-schools/engineering/mechanical/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.

#### 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.

### Mechanical Engineering, BS/Computational Science, Accelerated MS

#### Overview

This option enables enthusiastic, highly qualified, undergraduates to obtain the Mechanical Engineering, BS (<https://catalog.gmu.edu/colleges-schools/engineering/mechanical/mechanical-engineering-bs>) and the Computational Science, MS within the accelerated time frame of five years. The program requires 144 credits total, allowing students to undertake graduate coursework during their final year in the bachelor's degree. Upon completion of this 144 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. For policies governing all graduate degrees, see AP.6 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 section of this catalog<sup>1</sup>. 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 90 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)	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.

<sup>1</sup> 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.

### Reserve Graduate Credit

While in undergraduate status, a student may take a maximum of six graduate credits as reserve graduate credits and apply those credits to a master's program. Reserve graduate credits are not counted toward the 120 credits required in the undergraduate degree.

## Mechanical Engineering, BS/Operations Research, Accelerated MS

### Overview

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

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

### Admission Requirements

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

Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

### Accelerated Options Requirement

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

### Degree Conferral

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

## Mechanical Engineering, BS/Systems Engineering, Accelerated MS

### Overview

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

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

### Admission Requirements

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

### Accelerated Options Requirement

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

### Degree Conferral

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