

# COMPUTER ENGINEERING, BS

**Banner Code:** VS-BS-CPE

## Academic Advising

MSN 1G5  
4400 University Drive  
Fairfax, VA 22030

Phone: 703-993-1569

Email: [ece@gmu.edu](mailto:ece@gmu.edu)

Website: <https://ece.gmu.edu/undergraduate-studies/bachelors-programs/bs-computer-engineering>

The field of computer engineering can be described as a blend of electrical engineering and computer science. It is an amalgam of the computer hardware orientation of an electrical engineering program and the operating systems and languages of a computer science program. Computer engineers are involved in research, development, design, production, and operation of a wide variety of digital systems, from integrated circuits to computer systems and large-scale computer networks. Reflecting the industry trend to integrate hardware and software development, the computer engineering program is built around software running on advanced hardware that can simulate and assist in the design of new digital systems. Advanced software, such as VHDL, and software tools, such as logic and system design tools by Mentor Graphics and Cadence Design Systems, can be used to model hardware and hardware functionality from the system and architecture level down to the gate level and include relations to integrated circuit fabrication technology. Design and testing methodology involving these tools is taught in the program.

The computer engineering program is staffed by 33 full-time professors, including fellows of IEEE or other professional societies, and several part-time professors.

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

## Career Opportunities

Career opportunities exist in engineering research and development, product design, digital system design and integration, engineering management, engineering consultancy, technical sales, and patent law, among others. The program provides a strong preparation for graduate study.

## Specializations

The curriculum provides a strong background in the fundamentals of computer engineering. A number of technical elective specializations are offered, ranging from strongly hardware-oriented to strongly software-oriented ones. These include robotics and embedded systems, computer networks, signal processing, and integrated circuits. The curriculum includes 9 credits of senior technical electives, and 3 credits of senior advanced design project, which may be used for specialization in one of these technical areas.

## Additional Information

The requirements for the degree may be satisfied on a full-time or part-time basis. Cooperative education provides students the opportunity to integrate paid career-related work experience with classroom learning.

Academic credit towards the completion of major requirements cannot be given for co-op experience. In addition to the usual financial aid available to all students through the Office of Student Financial Aid, computer engineering majors are eligible to apply through the ECE Department for scholarships provided by professional societies and industrial organizations, including the Armed Forces Communications and Electronics Association and the Institute of Electrical and Electronics Engineers.

## Admissions & Policies

### Policies

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

### Writing-Intensive Requirement

Mason's writing-intensive requirement is satisfied by the following group of three courses: ECE 333 Linear Electronics I, ECE 445 Computer Organization, and ECE 491 Engineering Seminar in which faculty provide feedback on student writing assignments. Drafts and revisions are required.

### Change of Major

See Change of Major for more information.

### 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. For more information, see AP.5.2.4 Termination from the Major.

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. 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.

## Double Major and Minor Programs for Computer Engineering and Electrical Engineering

Computer Engineering majors and Electrical Engineering majors can earn degrees with double majors in a number of disciplines. Computer Engineering and Computer Science are frequently combined. Electrical Engineering has been combined with Computer Engineering, Computer Science, Physics, or Math. Details are available in the department brochures or at the Volgenau School website (<http://volgenau.gmu.edu>). There are several minors available for students in the ECE Department including the Mechanical Engineering minor.

### Grade Requirements

All computer engineering students are strongly encouraged to see their major faculty advisor each semester before course registration.

Students must complete each ECE, ENGR, BENG, CS, MATH, PHYS and STAT course presented as part of the required 126 credits for the degree with a grade of C or better.

Students must also complete any course required by the program that is a prerequisite to another course applicable to the degree with a grade of C or better.

## Requirements

### Degree Requirements

Total credits: 126

#### Electrical and Computer Engineering

ECE 101	Introduction to Electrical and Computer Engineering	3
ECE 201	Introduction to Signals and Systems	3
ECE 220	Continuous-Time Signals and Systems	3
ECE 285	Electric Circuit Analysis I <sup>1</sup>	3
ECE 286	Electric Circuit Analysis II <sup>1</sup>	3
ECE 331	Digital System Design	3
ECE 332	Digital Electronics and Logic Design Lab	1
ECE 333	Linear Electronics I	3
ECE 334	Linear Electronics Lab I	1
ECE 445	Computer Organization	3
ECE 447	Single-Chip Microcomputers	4
ECE 448	FPGA and ASIC Design with VHDL	4
ECE 465	Computer Networking Protocols	3
ECE 491	Engineering Seminar	1
ECE 492	Senior Advanced Design Project I (Mason Core) <sup>2</sup>	1
ECE 493	RS: Senior Advanced Design Project II (Mason Core)	2
Total Credits		41

<sup>1</sup> Note that ECE 285 Electric Circuit Analysis I/ECE 286 Electric Circuit Analysis II courses taken at Mason prior to fall 2013 or transferred to Mason prior to fall 2014 do NOT meet the circuits analysis requirement. Students who fit in either category need to contact the department as soon as possible to discuss their options.

<sup>2</sup> Students who would like to complete a more challenging senior design project have the option of enrolling in ECE 392 Engineering Design Studio to gain a semester head start in the design process.

### Computer Science

CS 112	Introduction to Computer Programming (Mason Core)	4
CS 211	Object-Oriented Programming	3
CS 222	Computer Programming for Engineers	3
CS 310	Data Structures	3
CS 471	Operating Systems	3
Total Credits		16

### Mathematics and Statistics

MATH 113	Analytic Geometry and Calculus I (Mason Core)	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 125	Discrete Mathematics I (Mason Core)	3
MATH 203	Linear Algebra	3
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations	3
STAT 346	Probability for Engineers	3
Total Credits		23

### Physics

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
PHYS 262	University Physics III (Mason Core)	3
Total Credits		11

### Engineering

ENGR 107	Introduction to Engineering (Mason Core)	2
Total Credits		2

### Technical Electives

Students must choose one of the four technical specialization areas listed below. All three of the technical electives totaling 9 credit hours must be selected from within the chosen specialization area. With the prior approval of the ECE department, students may also create a custom specialization area and select a set of technical electives, including non-ECE courses, to apply to the custom specialization area. Graduate courses listed within the specialization areas can only be taken with prior approval of the department. The decision to approve taking graduate courses listed within the specialization areas is based on a review of the student's academic record.

#### Specialization Areas

##### Robotics and Embedded Systems

Select three from the following:		9
ECE 350	Embedded Systems and Hardware Interfaces	
ECE 370	Robot Design	

ECE 421	Classical Systems and Control Theory	
ECE 446	Device Driver Development	
ECE 450	Introduction to Robotics	
ECE 470	Introduction to Humanoid Robotics	
ECE 510	Real-Time Concepts	
ECE 530	Sensor Engineering	

Total Credits 9

### Computer Networks

Select three from the following: 9

ECE 460	Communication and Information Theory	
ECE 462	Data and Computer Communications	
ECE 463	Digital Communications Systems	
IT 466	Network Security II	

Total Credits 9

### Signal Processing

Select three from the following: 9

ECE 320	Signals and Systems II	
ECE 410	Applications of Discrete-Time Signal Processing	
ECE 460	Communication and Information Theory	
ECE 535	Digital Signal Processing	

Total Credits 9

### Integrated Circuits

Select three from the following: 9

ECE 430	Principles of Semiconductor Devices	
ECE 431	Digital Circuit Design	
ECE 433	Linear Electronics II	
ECE 565	Introduction to Optical Electronics	

Total Credits 9

### English, Communication, and Economics

ENGH 302 Advanced Composition (Mason Core) 3  
(Natural Sciences and Technology section)

COMM 100 Public Speaking (Mason Core) 3  
or COMM 101 Interpersonal and Group Interaction (Mason Core)

ECON 103 Contemporary Microeconomic Principles 3  
(Mason Core)

Total Credits 9

### Additional Mason Core

Students must complete all Mason Core requirements not fulfilled by major requirements. Mason Core courses should be selected from the department's list of approved courses. The Synthesis Mason Core requirement is satisfied by ECE 492 Senior Advanced Design Project I (Mason Core) plus ECE 493 RS: Senior Advanced Design Project II (Mason Core). All students must submit at least 24 credits of social science and humanities coursework, which is normally satisfied by the 24 credits of Mason Core social science and humanities courses listed here and in previous sections.

Written Communication<sup>1</sup> 3

Literature 3

Arts 3

Western Civilization/World History 3

Global Understanding 3

Total Credits 15

<sup>1</sup> Lower-level.

## Accelerated Master's

### Computer Engineering, BS/Computer Engineering, Accelerated MS

#### Overview

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

Students in the Computer Engineering, BS program may apply to this option if they have earned 90 undergraduate credits with an overall GPA of 3.25. Criteria for admission are identical to criteria for admission to the Computer Engineering, MS program.

#### Accelerated Option Requirements

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

Students take 6 credits of 500-level courses as part of their technical electives or substitutes for required courses as part of their 126-credit undergraduate program. The specific courses that may be taken and applied to the accelerated program will be specified by the ECE Department.

Students admitted to the accelerated program must maintain an overall GPA of at least 3.25 during the entire BS/MS program and present a GPA of at least 3.25 for the 24 credits of graduate work submitted for the MS degree.

Students may take additional graduate-level courses as part of their BS technical electives with advisor approval. These additional graduate-level courses will not count toward the MS degree.

#### Degree Conferral

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