

# BACHELOR OF SCIENCE WITH A MAJOR IN ELECTRICAL ENGINEERING (STEM)

Electrical engineering provides the technological foundation for the modern information society. Almost every modern technological advance made today can be traced to the work of electrical engineers. Students in George Washington University's electrical engineering program discover the basics of electrical engineering design, allowing them to take their place alongside the engineers who make daily advances in sustainable energy, telecommunications, healthcare, defense, and other sectors. The program's contemporary curriculum is complemented by well-staffed and well-equipped laboratories. Students can access real-world projects through internships and gain practical design sequence experiences by being prepared in a wide variety of technical fields. Graduates have gone on to have careers at Tesla, Intel, Google, AT&T, Qualcomm, NASA, and Cisco.

## Double major

SEAS and non-SEAS students interested in pursuing the BS in electrical engineering as a double major should see the requirements under SEAS Regulations (<http://bulletin.gwu.edu/engineering-applied-science/#seasregulationstext>) in this Bulletin.

This is a STEM designated program.

Visit the program website (<http://www.ece.seas.gwu.edu/bachelor-science-electrical-engineering/>) for additional information.

## ADMISSIONS

For more information on the admission process, please visit the Office of Undergraduate Admissions website. Applications may be submitted via the Common Application.

Supporting documents not submitted online should be mailed to:  
Office of Undergraduate Admissions  
The George Washington University  
800 21st Street NW, Suite 100  
Washington DC 20052

Contact for questions:  
[gwadm@gwu.edu](mailto:gwadm@gwu.edu) or 202-994-6040

## REQUIREMENTS

The following requirements must be fulfilled:

129 credits as outlined below in required and elective courses, including completion of a 3-course, 9-credit specialized track.

A minimum technical GPA of 2.2 and SEAS GPA of 2.0. A student's technical GPA is calculated using all technical engineering courses outlined in the fifth, sixth, seventh, and eighth semesters of the curriculum.

## Recommended program of study

The program of study lists all course requirements in the sequence for the degree. Students should review this information carefully and consult their advisor before changing the sequence of any courses.

Code	Title	Credits
<b>First semester</b>		
CHEM 1111	General Chemistry I <sup>1</sup>	
ECE 1010	Introduction to Electrical and Computer Engineering I	
MATH 1231	Single-Variable Calculus I <sup>1</sup>	
SEAS 1001	Engineering Orientation	
UW 1020	University Writing <sup>1</sup>	
Humanities, social science, or non-technical elective <sup>2</sup>		
<b>Second semester</b>		
ECE 1020	Introduction to Electrical and Computer Engineering II	
ECE 1120	C Programming for Electrical and Computer Engineering	
MATH 1232	Single-Variable Calculus II <sup>1</sup>	
PHIL 2135	Ethics in Business and the Professions	
PHYS 1021	University Physics I <sup>1</sup>	
	or PHYS 1025	University Physics I with Biological Applications
Humanities, social science, or non-technical elective <sup>2</sup>		
<b>Third semester</b>		
APSC 2113	Engineering Analysis I	
ECE 1125	Data Structures and Algorithms for ECE	
ECE 2110	Circuit Theory	
ECE 2120	Engineering Seminar	
MATH 2233	Multivariable Calculus <sup>1</sup>	
PHYS 1022	University Physics II <sup>1</sup>	
	or PHYS 1026	University Physics II with Biological Applications
<b>Fourth semester</b>		
APSC 2114	Engineering Analysis II	
ECE 2115	Engineering Electronics	

ECE 2140 Design of Logic Systems

ECE 2210 Circuits, Signals, and Systems

Humanities, social science, or non-technical elective <sup>2</sup>

**Fifth semester**

APSC 3115 Engineering Analysis III

ECE 3130 Digital Electronics and Design

ECE 3220 Introduction to Digital Signal Processing

ECE 3315 Fields and Waves I

ECE 3520 Microprocessors: Software, Hardware, and Interfacing

**Sixth semester**

ECE 3125 Analog Electronics Design

ECE 3135 Digital Design with Field-Programmable Gate Arrays

ECE 3410 Communications Engineering

ECE 3915W Electrical and Computer Engineering Capstone Project Lab I

ECE 4320 Fields and Waves II

**Seventh semester**

ECE 4710 Control Systems Design

ECE 4920W Electrical and Computer Engineering Capstone Project Lab II

One technical elective <sup>3</sup>

Two ECE restricted electives <sup>4</sup>

**Eighth semester**

ECE 4610 Electrical Energy Conversion

ECE 4925W Electrical and Computer Engineering Capstone Project Lab III

Humanities, social science, or non-technical elective <sup>2</sup>

Two technical electives <sup>3</sup>

**Track requirement**

Students complete one specialized track of three courses (for a minimum of 9 credits) from the options listed below. Requirements for the track can be completed using technical elective courses or ECE restricted elective courses. <sup>3,4</sup>

Track 1: Electronics, nanotechnology, and chip design

Three courses selected from the following with the advisor's approval:

ECE 4140 VLSI Design and Simulation

ECE 4145 Microfabrication and Nanofabrication Technology

ECE 4150 ASIC Design and Testing of VLSI Circuits

ECE 4160 Introduction to Nanoelectronics

ECE 4435 Photonics and Fiber Optics

ECE 4535 Computer Architecture and Design

ECE 6221 Introduction to Physical Electronics

Track 2: Artificial intelligence and robotics

ECE 6210 Machine Intelligence

And two technical elective courses selected from the following with the advisor's approval:

ECE 4730 Robotic Systems

ECE 4535 Computer Architecture and Design

ECE 6217 Neural Networks and Hardware Implementations

ECE 6850 Pattern Recognition and Machine Learning

ECE 6882 Reinforcement Learning

BME 4835 Introduction to Assistive Robotics

Track 3: Telecommunication and network security

Three courses selected from the following with the advisor's approval:

ECE 3525 Introduction to Embedded Systems

ECE 4415 Introduction to Computer Networks

ECE 4425 Data Communications Laboratory

ECE 6160 Secure Computing Systems

ECE 6565 Network Security

ECE 6575 Optical Communication Networks

ECE 6580 Wireless Networks

Track 4: Sustainable energy and power systems

ECE 4620 Electrical Power Systems

And two technical elective courses selected from the following with the advisor's approval:

ECE 4662	Power Electronics
ECE 6699	Energy and Sustainability
MAE 2131	Thermodynamics

Track 5: Electrical engineering general track

Three technical elective courses selected with the advisor's approval to align with track's overall academic goals.

<sup>1</sup> Course satisfies the University general education requirement (<http://bulletin.gwu.edu/university-regulations/general-education/>) in math, science, and writing.

<sup>2</sup> All electrical and computer engineering students take five courses to satisfy the ECE humanities and social science/non-technical requirement. Three of these courses—one in humanities and two in social sciences—must be on the University general education requirement list; one course must be PHIL 2135 (or NSC 4176 for students in the NROTC Program); and one course can be in the humanities/social sciences, or a non-technical course related to public health, safety, and welfare; global cultural, social, environmental, and economic factors; or innovation, entrepreneurship, and creativity. For the last category, students can consider taking DNSC 1051, DNSC 4404, EMSE 4410, ISTM 4223, MGT 3300, MGT 3301, MGT 3302, MGT 3303, or MGT 4003. The non-technical course cannot focus on scientific/mathematical approaches or technology. All courses selected to satisfy this requirement must be taken for a minimum of 3 credits and approved by the advisor.

<sup>3</sup> Three 3-credit technical elective courses must be selected with the approval of the advisor from upper-division undergraduate (2000 to 4000 level) or graduate courses in engineering, computer science, mathematics, physical sciences, or biological sciences. Exceptions must be approved by the advisor. Technical elective courses can be used to fulfill the track requirement. See above.

<sup>4</sup> The two ECE restricted electives must be selected with the approval of the advisor from ECE courses at the 3000 level or above. Exceptions must be approved by the advisor. ECE elective courses can be used to fulfill the track requirement. See above.

## COMBINED PROGRAMS

### Combined programs

- Dual Bachelor of Science with a major in electrical engineering and Master of Science in the field of computer engineering (<http://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-electrical-engineering-ms-computer-engineering/>)
- Dual Bachelor of Science with a major in electrical engineering and Master of Science in the field of electrical engineering (<http://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-ms-electrical-engineering/>)