# 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 (https://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 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 semester 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.

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Code	Title Credits			
First semester				
CHEM 1111	General Chemistry I			
ECE 1010	Introduction to Electrical and Computer Engineering I			
MATH 1231	Single-Variable Calculus I			
SEAS 1001	Engineering Orientation			
UW 1020	University Writing <sup>1</sup>			
Humanities, social science, or non-technical elective <sup>2</sup>				
Second semester				
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>				
Third semester				
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>			

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	
Fourth semester		
APSC 2114	Engineering Analysis II	
ECE 2115	Engineering Electronics	
ECE 2140	Design of Logic Systems	

ECE 2210 Circuits, Signals, and Systems		And two technical elective courses selected from the following with the advisor's approval:		
Humanities, social science, or non-technical elective <sup>2</sup>		ECE 4730	Robotic Systems	
Fifth semester		ECE 6210	Machine Intelligence	
APSC 3115	Engineering Analysis III	ECE 6217	Neural Networks and Hardware	
ECE 3130	Digital Electronics and Design		Implementations	
ECE 3220	Introduction to Digital Signal Processing	ECE 6850	Pattern Recognition and Machine Learning	
ECE 3315	Fields and Waves I	or BME 4835	Introduction to Assistive Robotics	
ECE 3520	ECE 3520 Microprocessors: Software, Hardware, and Interfacing		Electronics, nanotechnology, and CHIP design track	
Sixth semester		Three courses selected from the following with the advisor's approval:		
ECE 3125	Analog Electronics Design	ECE 4140	VLSI Design and Simulation	
ECE 3135	Digital Design with Field-Programmable Gate Arrays	ECE 4145	Microfabrication and Nanofabrication Technology	
ECE 3410	Communications Engineering	ECE 4150	ASIC Design and Testing of VLSI Circuits	
	Electrical and Computer Engineering Capstone Project Lab I	ECE 4160	Introduction to Nanoelectronics	
ECE 4320	Fields and Waves II	ECE 4435	Photonics and Fiber Optics	
Seventh semester		ECE 6221	Introduction to Physical Electronics	
ECE 4710 Control Systems Design		Sustainable energy and power systems track		
ECE 4920W	Electrical and Computer	ECE 4620	Electrical Power Systems	
Engineering Capstone Project Lab II		And two technical elective courses selected from the following with the advisor's approval:		
One technical elective <sup>3</sup>		ECE 4662	Power Electronics	
Two ECE restricted electives <sup>4</sup>		ECE 6699	Energy and Sustainability	
Eighth semester		MAE 2131	Thermodynamics	
ECE 4610	0 Electrical Energy Conversion		Telecommunication and network security track	
ECE 4925W	Electrical and Computer Engineering Capstone Project Lab III	ECE 3525	Introduction to Embedded Systems	
Humanities, social science, or non-technical elective <sup>2</sup>		ECE 4415	Introduction to Computer Networks	
Two technical electives <sup>3</sup>		ECE 4425	Data Communications Laboratory	
Track requirement		ECE 6160	Secure Computing Systems	
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		ECE 6565	Network Security	
		ECE 6575	Optical Communication Networks	
elective courses or ECE restricted elective courses. <sup>3,4</sup>		ECE 6580	Wireless Networks	
Artificial intelligence and robotics track		General track		
ECE 6210	Machine Intelligence			

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

### **COMBINED PROGRAMS**

## **Combined programs**

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

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

<sup>&</sup>lt;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>&</sup>lt;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>&</sup>lt;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.