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.

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

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1111</td>
<td>General Chemistry I</td>
<td>1</td>
</tr>
<tr>
<td>ECE 1010</td>
<td>Introduction to Electrical and Computer Engineering I</td>
<td></td>
</tr>
<tr>
<td>MATH 1231</td>
<td>Single-Variable Calculus I</td>
<td>1</td>
</tr>
<tr>
<td>SEAS 1001</td>
<td>Engineering Orientation</td>
<td></td>
</tr>
<tr>
<td>UW 1020</td>
<td>University Writing</td>
<td>1</td>
</tr>
</tbody>
</table>

Humanities, social science, or non-technical elective

Second semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 1020</td>
<td>Introduction to Electrical and Computer Engineering II</td>
<td></td>
</tr>
<tr>
<td>ECE 1120</td>
<td>C Programming for Electrical and Computer Engineering</td>
<td></td>
</tr>
<tr>
<td>MATH 1232</td>
<td>Single-Variable Calculus II</td>
<td>1</td>
</tr>
<tr>
<td>PHIL 2135</td>
<td>Ethics in Business and the Professions</td>
<td></td>
</tr>
<tr>
<td>PHYS 1021</td>
<td>University Physics I</td>
<td>1</td>
</tr>
<tr>
<td>or PHYS 1025</td>
<td>University Physics I with Biological Applications</td>
<td></td>
</tr>
</tbody>
</table>

Humanities, social science, or non-technical elective

Third semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>APSC 2113</td>
<td>Engineering Analysis I</td>
<td></td>
</tr>
<tr>
<td>ECE 1125</td>
<td>Data Structures and Algorithms for ECE</td>
<td></td>
</tr>
<tr>
<td>ECE 2110</td>
<td>Circuit Theory</td>
<td></td>
</tr>
<tr>
<td>ECE 2120</td>
<td>Engineering Seminar</td>
<td></td>
</tr>
<tr>
<td>Semester</td>
<td>Courses</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td></td>
</tr>
</tbody>
</table>
| **Fourth semester** | 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 |
| **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 |
|  | Two technical electives |
| **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 |
|  | One technical elective  
Two ECE restricted electives |
| **Seventh semester** | ECE 4710: Control Systems Design  
ECE 4920W: Electrical and Computer Engineering Capstone Project Lab II |
|  | Two ECE restricted electives |
| **Eighth semester** | ECE 4610: Electrical Energy Conversion  
ECE 4925W: Electrical and Computer Engineering Capstone Project Lab III |
|  | Three courses from the following:  
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 4662: Power Electronics  
ECE 6699: Energy and Sustainability  
MAE 2131: Thermodynamics  
Telecommunication and network security track |
|  | Four technical electives |

**Bachelor of Science with a Major in Electrical Engineering (STEM)**

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.

- **Artificial intelligence and robotics track**
  - ECE 6210: Machine Intelligence  
  - And two technical elective courses selected from the following with the advisor’s approval:
    - ECE 4730: Robotic Systems  
    - ECE 4735: Machine Intelligence  
    - ECE 6217: Neural Networks and Hardware Implementations  
    - ECE 6850: Pattern Recognition and Machine Learning  
    - Or BME 4835: Introduction to Assistive Robotics

- **Electronics, nanotechnology, and CHIP design track**
  - 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 6221: Introduction to Physical Electronics

- **Sustainable energy and power systems track**
  - Three courses from the following:  
    - ECE 4620: Electrical Power Systems  
    - ECE 4662: Power Electronics  
    - ECE 6699: Energy and Sustainability  
    - MAE 2131: Thermodynamics  
    - Telecommunication and network security track  
    - ECE 3525: Introduction to Embedded Systems

- **Electrical and computer engineering capstone project lab**
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 4415</td>
<td>Introduction to Computer Networks</td>
</tr>
<tr>
<td>ECE 4425</td>
<td>Data Communications Laboratory</td>
</tr>
<tr>
<td>ECE 6160</td>
<td>Secure Computing Systems</td>
</tr>
<tr>
<td>ECE 6565</td>
<td>Network Security</td>
</tr>
<tr>
<td>ECE 6575</td>
<td>Optical Communication Networks</td>
</tr>
<tr>
<td>ECE 6580</td>
<td>Wireless Networks</td>
</tr>
</tbody>
</table>

**General track**

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

1. Course satisfies the University general education requirement ([https://bulletin.gwu.edu/university-regulations/general-education/](https://bulletin.gwu.edu/university-regulations/general-education/)) in math, science, and writing.

2. 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.

3. 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.

4. 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 electrical engineering ([https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-electrical-engineering-ms-computer-engineering/](https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-electrical-engineering-ms-computer-engineering/))