MASTER OF SCIENCE IN THE FIELD OF ELECTRICAL ENGINEERING

The Master of Science in electrical engineering, which is offered by the Department of Electrical and Computer Engineering, is designed to help students understand and apply the principles of electrical engineering to diverse areas such as communications, power and energy, and nanotechnology. It exposes students to the fundamentals of cutting edge topics such as sensors and Internet-of-Things, sustainable energy, wireless and optical networking, and telecommunications security. Students must choose from one of five areas of focus: (a) Applied Electromagnetics; (b) Communications and Networks; (c) Electrical Power and Energy; (d) Electronics, Photonics, and MEMS; or (e) Signal and Image Processing, Systems, and Controls.

Specific admission requirements are shown on the Graduate Program Finder (http://www.gwu.edu/all-graduate-programs).

More information is available on the departmental website (https://www.ece.seas.gwu.edu/master-science-electrical-engineering).

For additional online program information, visit the online program website (https://engineering.gwu.edu/online-programs/ms-in-electrical-engineering).

REQUIREMENTS

The following requirements must be fulfilled:

30 credits are required for the degree. Non-thesis and thesis options are available. For the thesis option, 6 of these credits are taken in ECE 6998 and ECE 6999. For either option, the student must select one focus area from the chart below and complete the specified number of credits for that area.

Colloquium requirement: In addition to required coursework, students must attend five non-credit bearing colloquia as part of their program of study. Each colloquium attended is verified by a faculty member also in attendance. After attending five colloquia, the student must submit to the department prior to applying for graduation a colloquium attendance form signed by the faculty advisor.

Communications and Networks

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 6015</td>
<td>Stochastic Processes in Engineering</td>
<td></td>
</tr>
<tr>
<td>ECE 6035</td>
<td>Introduction to Computer Networks</td>
<td></td>
</tr>
<tr>
<td>ECE 6510</td>
<td>Communication Theory</td>
<td></td>
</tr>
</tbody>
</table>

At least two of the following:

- ECE 6500 Information Theory
- ECE 6505 Error Control Coding
- ECE 6520 Mobile and Wireless Communication Systems
- ECE 6525 Satellite Communication Systems
- ECE 6530 Electronic Warfare
- ECE 6550 Network Architectures and Protocols
- ECE 6560 Network Performance Analysis
- ECE 6565 Telecommunications Security
- ECE 6570 Telecommunications Security Protocols
- ECE 6575 Optical Communication Networks
- ECE 6580 Wireless Networks
- ECE 6590 Propagation Modeling in Wireless Communications

For thesis option

- ECE 6998 Thesis Research
- ECE 6999 Thesis Research

Electives*

Non-thesis option—15 credits in elective courses; thesis option—9 credits in elective courses. For either option, at least 3 credits must come from outside of the area of focus list.

Electrical Power and Energy

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 6060</td>
<td>Electric Power Generation</td>
<td></td>
</tr>
</tbody>
</table>

At least two of the following:

- ECE 6010 Linear Systems Theory
- ECE 6020 Applied Electromagnetics
- ECE 6025 Signals and Transforms in Engineering

At least three of the following:

- ECE 6610 Electrical Energy Conversion
- ECE 6620 Electrical Power Systems
- ECE 6662 Power Electronics
## Master of Science in the Field of Electrical Engineering

### Power System Transmission, Control, and Security
- ECE 6666
### Nuclear Power Generation
- ECE 6667
### Power Distribution Grids
- ECE 6668
### Smart Power Grids
- ECE 6669
### Power System Protection
- ECE 6670
### Power Systems Economics
- ECE 6690
### Power Systems Reliability
- ECE 6691
### Energy and Sustainability
- ECE 6699

### For thesis option
- ECE 6998 Thesis Research
- ECE 6999 Thesis Research

### Electives*

Non-thesis option—12 credits in elective courses; thesis option—6 credits in elective courses. For either option, at least 3 credits must come from outside of the area of focus list.

#### Electronics, Photonics, and MEMS

### Code | Title | Credits
---|---|---
ECE 6030 | Device Electronics | Required
ECE 6015 | Stochastic Processes in Engineering | Required
ECE 6710 | Microwave Engineering | Required
ECE 6715 | Antennas | Required
ECE 6720 | Remote Sensing | Required
ECE 6725 | Electromagnetic Radiation and Scattering | Required
ECE 6730 | Waves in Random Media | Required
ECE 6735 | Numerical Electromagnetics | Required
ECE 6745 | Analysis of Nonlinear and Multivalued Devices | Required
ECE 6750 | Modern Radar Systems | Required
ECE 6760 | Propagation Modeling in Wireless Communications | Required
ECE 6765 | Photonics and Fiber Optics | Required
ECE 6770 | Applied Magnetism | Required
ECE 6998 | Thesis Research | For thesis option
ECE 6999 | Thesis Research | For thesis option

### For thesis option
- ECE 6998 Thesis Research
- ECE 6999 Thesis Research

### Electives*

Non-thesis option—15 credits in elective courses; thesis option—9 credits in elective courses. For either option, at least 3 credits must come from outside of the area of focus list.

#### Signal and Image Processing, Systems and Controls

### Code | Title | Credits
---|---|---
ECE 6015 | Stochastic Processes in Engineering | Required
At least four of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 6005</td>
<td>Computer Architecture and Design</td>
</tr>
<tr>
<td>ECE 6010</td>
<td>Linear Systems Theory</td>
</tr>
<tr>
<td>ECE 6025</td>
<td>Signals and Transforms in Engineering</td>
</tr>
<tr>
<td>ECE 6666</td>
<td>Power System Transmission, Control, and Security</td>
</tr>
<tr>
<td>ECE 6800</td>
<td>Computational Techniques in Electrical Engineering</td>
</tr>
<tr>
<td>ECE 6810</td>
<td>Speech and Audio Processing by Computer</td>
</tr>
<tr>
<td>ECE 6815</td>
<td>Multimedia Processing</td>
</tr>
<tr>
<td>ECE 6820</td>
<td>Real-Time Digital Signal Processing</td>
</tr>
<tr>
<td>ECE 6825</td>
<td>Computer Control Systems</td>
</tr>
<tr>
<td>ECE 6830</td>
<td>System Optimization</td>
</tr>
<tr>
<td>ECE 6835</td>
<td>Nonlinear Systems</td>
</tr>
<tr>
<td>ECE 6840</td>
<td>Digital Image Processing</td>
</tr>
<tr>
<td>ECE 6842</td>
<td>Image Engineering</td>
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<tr>
<td>ECE 6845</td>
<td>Image Synthesis</td>
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<tr>
<td>ECE 6850</td>
<td>Pattern Recognition</td>
</tr>
<tr>
<td>ECE 6855</td>
<td>Digital Signal Processing Techniques</td>
</tr>
<tr>
<td>ECE 6860</td>
<td>Compression Techniques for Data, Speech, and Video</td>
</tr>
<tr>
<td>ECE 6865</td>
<td>Statistical Signal Estimation</td>
</tr>
<tr>
<td>ECE 6875</td>
<td>Wavelets and Their Applications</td>
</tr>
<tr>
<td>ECE 6880</td>
<td>Adaptive Signal Processing</td>
</tr>
<tr>
<td>ECE 6885</td>
<td>Computer Vision</td>
</tr>
</tbody>
</table>

For thesis option

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<tr>
<td>ECE 6998</td>
<td>Thesis Research</td>
</tr>
<tr>
<td>ECE 6999</td>
<td>Thesis Research</td>
</tr>
</tbody>
</table>

**Electives**

Non-thesis option—15 credits in elective courses; thesis option—9 credits in elective courses. For either option, at least 3 credits must come from outside of the area of focus list.

*Normally, no more than two courses taken outside the Department of Electrical and Computer Engineering may be counted toward the requirements for the degree. Courses taken outside the department must have prior approval from the student's faculty advisor. In addition, no more than three 3000- or 4000-level ECE courses that have been approved for graduate credit may be counted toward the requirements for the degree.

**Educational Planner**

In consultation with an academic advisor, each student must develop an Educational Planner through DegreeMAP that governs the student’s plan of study. The Educational Planner should be established soon after matriculation and must be completed before the end of the student’s first semester. The Educational Planner must be approved by the advisor.

Additional program requirements can be found on the Department of Electrical and Computer Engineering Master’s Degree Requirements webpage.