

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.

Visit the department website (<https://www.ece.seas.gwu.edu/master-science-electrical-engineering/>) for additional information.

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

Code	Title	Credits
Required		
ECE 6015	Stochastic Processes in Engineering	
ECE 6035	Introduction to Computer Networks	
ECE 6510	Communication Theory	
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 6760	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

Code	Title	Credits
Required		
ECE 6060	Electric Power Generation	
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	
ECE 6666	Power System Transmission, Control, and Security	

ECE 6667	Nuclear Power Generation
ECE 6668	Power Distribution Grids
ECE 6669	Smart Power Grids
ECE 6670	Power System Protection
ECE 6690	Power Systems Economics
ECE 6691	Power Systems Reliability
ECE 6699	Energy and Sustainability

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.

Applied Electromagnetics

Code	Title	Credits
Required		
ECE 6020	Applied Electromagnetics	
ECE 6710	Microwave Engineering	
ECE 6715	Antennas	
ECE 6720	Remote Sensing	
At least one of the following:		
ECE 6725	Electromagnetic Radiation and Scattering	
ECE 6730	Waves in Random Media	
ECE 6735	Numerical Electromagnetics	
ECE 6745	Analysis of Nonlinear and Multivalued Devices	
ECE 6750	Modern Radar Systems	
ECE 6760	Propagation Modeling in Wireless Communications	
ECE 6765	Photonics and Fiber Optics	
ECE 6770	Applied Magnetism	

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.

Electronics, Photonics, and MEMS

Code	Title	Credits
Required		
ECE 6030	Device Electronics	
At least four of the following:		
ECE 6213	Design of VLSI Circuits	
ECE 6214	High-Level VLSI Design Methodology	
ECE 6215	Introduction to MEMS	
ECE 6216	RF/VLSI Circuit Design	
ECE 6218	Advanced Analog VLSI Circuit Design	
ECE 6221	Introduction to Physical Electronics	
ECE 6240	VLSI Design and Simulation	
ECE 6245	Micro- and Nanofabrication Technology	
ECE 6250	ASIC Design and Testing of VLSI Circuits	
ECE 6260	Introduction to Nanoelectronics	

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
Required		
ECE 6015	Stochastic Processes in Engineering	

At least four of the following:

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

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.

*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 found on the Department of Electrical and Computer Engineering Master's Degree requirements (<https://www.ece.seas.gwu.edu/graduate-programs/>) webpage.