MASTER OF SCIENCE IN THE FIELD OF ARTIFICIAL INTELLIGENCE ENGINEERING (ECE)

OVERVIEW

The master of science in AI engineering (ECE) approaches AI fundamentals with an engineering mindset, addressing engineering challenges of AI systems including infrastructure from chips to data centers as well as physical and engineering applications of AI. The program is designed to prepare experts who can keep the AI momentum going with new and robust technical innovations.

The program embodies rigorous foundational AI and engineering and computing hardware and systems knowledge. The curriculum comprises core courses that can be taken by graduate students from physical science and engineering disciplines, then branches out into specialization tracks, including AI computing and systems, smart grids and sustainable AI, and cloud/edge intelligence and security.

ADMISSIONS

Identical to ECE programs: MS Electrical Engineerin (https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/electrical-engineering/#admissionstext)g and MS Computer Engineering (https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/computer-engineering/#admissionstext)

REQUIREMENTS

The following requirements must be fulfilled:

Thesis option—30 credits, including 12 credits in core courses, 12 credits in one focus area, and 6 credits in thesis.

Non-thesis option—30 credits, including 12 credits in core courses, 12 credits in one focus area, and 6 credits in elective courses.

Colloquium requirements

In addition to required coursework, students must attend five in-person, non-credit bearing colloquia as part of their program of study. At least two of the required five must be attended in the first two semesters. Each colloquium attended is verified by a faculty member in attendance. Upon the attendance of five colloquia, the student must submit to the department the colloquium attendance form signed by the faculty advisor prior to applying for graduation.

Code	Title	Credits
Core courses		
For courses (12 credits) selected from the following:		
ECE 6005	Computer Architecture and Design	
ECE 6105	Introduction to High-Performance Computing	
ECE 6210	Machine Intelligence	
ECE 6850	Pattern Recognition and Machine Learning	
ECE 6882	Reinforcement Learning	
Focus area requirement		
Completion of all four courses (12 credits) in any one of the following focus areas:		
AI computing and systems focus area:		
ECE 6125	Parallel Computer Architecture	
ECE 6130	Big Data and Cloud Computing	
ECE 6150	Design of Interconnection Networks for Parallel Computer Architectures	
ECE 6217	Neural Networks and Hardware Implementations	
Smart grids and sustainable AI focus area:		
ECE 6070	Electrical Power Systems	
ECE 6669	Smart Power Grids	
ECE 6690	Power Systems Economics	
ECE 6699	Energy and Sustainability	
Cloud/edge intelligence and security focus area:		
ECE 6035	Introduction to Computer Networks	
ECE 6130	Big Data and Cloud Computing	
ECE 6160	Secure Computing Systems	
ECE 6565	Network Security	
Thesis option		
6 credits taken in the following courses:		
ECE 6998	Thesis Research I	
ECE 6999	Thesis Research II	
Non-thesis option		
Two graduate elective courses (6 credits), which can be a combination of courses in any SEAS department(s), including ECE, and/or any other department(s) of the University, subject to the approval of the advisor.		
The following is a list of recommended elective courses organized by focus area:		
AI computing and systems courses:		

ECE 6015	Stochastic Processes in Engineering
ECE 6030	Device Electronics
ECE 6120	Advanced Microarchitecture
ECE 6160	Secure Computing Systems
ECE 6213	Design of VLSI Circuits
ECE 6214	High-Level VLSI Design Methodology
ECE 6245	Microfabrication and Nanofabrication Technology
ECE 6250	ASIC Design and Testing of VLSI Circuits
ECE 6565	Network Security
ECE 8150	Advanced Topics in Computer Architecture
Smart grids and sustainable AI courses:	
ECE 6010	Linear Systems Theory
ECE 6015	Stochastic Processes in Engineering
ECE 6660	Electric Power Generation
ECE 6610	Electrical Energy Conversion
ECE 6662	Power Electronics
ECE 6666	Power System Transmission, Control, and Security
ECE 6667	Nuclear Power Generation
ECE 6668	Power Distribution Grids
ECE 6670	Power System Protection
ECE 6691	Power Systems Reliability
Cloud/edge intelligence and security courses:	
ECE 6015	Stochastic Processes in Engineering
ECE 6132	Secure Cloud Computing
ECE 6134	Cloud Computing and Security
ECE 6150	Design of Interconnection Networks for Parallel Computer Architectures
ECE 8150	Advanced Topics in Computer Architecture
Other recommended ECE courses:	
ECE 6800	Computational Techniques in Electrical Engineering
ECE 6810	Speech and Audio Processing by Computer
ECE 6815	Multimedia Processing
ECE 6845	Image Synthesis
ECE 6880	Adaptive Signal Processing
Recommended courses outside of ECE:	
BME 6489	Telemedical Robotics and Machine Learning
CSCI 6511	Artificial Intelligence
CSCI 6525	Autonomous Robotics: Manipulation
EMSE 6701	Operations Research Methods
EMSE 6710	Optimization Models and Algorithms
MAE 6245	Robotic Systems