ELECTRICAL ENGINEERING (TRADITIONAL AND ONLINE M.S. WITH SEMICONDUCTOR CONCENTRATION)

Admission Requirements

Admission to these programs is contingent upon admission to the Graduate School (http://bulletins.wayne.edu/graduate/generalinformation/admission/). All applicants whose B.S. degree is not from an ABET-accredited college or university are required to submit additional pertinent information, including results of the general test of the Graduate Record Examination (GRE), publications, and/or inventions.

Students with B.S. degrees from selected science and engineering undergraduate programs not specifically related to this discipline may be admitted into the master's program after completing a sequence of undergraduate courses designed to prepare them for the graduate curriculum.

ECE AGRADE Program

Outstanding undergraduates in the ECE department who meet eligibility criteria may enroll in the ECE AGRADE program. This program allows students to count up to 16 credits towards both the B.S. and M.S. degrees, enabling students to complete the B.S. and M.S. degrees within 5 years of full-time study. More information about eligibility, degree requirements, course selections, and policies may be found on the department's website (https://engineering.wayne.edu/ece/programs/agrade.php).

Interdisciplinary Physics-ECE AGRADE Program

Outstanding seniors in Physics (both Applied Physics option and Fundamental Physics option) who meet eligibility criteria may apply for the cross-college AGRADE program between the Physics undergraduate program (College of Liberals Arts and Sciences) and Electrical Engineering (EE) Master's programs (College of Engineering). The Physics-ECE AGRADE program allows students to count up to 16 credits of selected graduate courses towards a B.S. degree in physics as well as an M.S. degree in Electrical Engineering. This enables students to complete both degrees within 5 years of full-time study. More information about eligibility, degree requirements, course elections, and academic policies may be found on the department's website (https:// engineering.wayne.edu/ece/programs/agrade.php).

Requirements – Traditional Program

The Master of Science in Electrical Engineering degree requires a minimum of thirty credits. It is offered under plan Plan A: Thesis (p. 1), which includes a six credit thesis, or Plan C: Coursework (p. 2). For either plan, students may choose from courses in one or more areas of specialization within the ECE curriculum.

All course work must be completed in accordance with the regulations of the Graduate School (http://bulletins.wayne.edu/graduate/generalinformation/academic-regulations/) and the College of Engineering (http://bulletins.wayne.edu/graduate/college-engineering/academicregulations/).

Plan A: Thesis

Code	litie Credits
Required courses	
Select 4 ECE grad	uate courses in Major Area - Electrical Engineering,
including at least	one at 7000 level. '
ECE 5100	Quantitative Physiology
ECE 5280	Introduction to Cyber-Physical Systems
ECE 5330	Modeling and Control of Power Electronics and Electric Vehicle Powertrains
ECE 5340	Advanced Energy Storage Systems for Electrification of Vehicles
ECE 5350	Alternative Energy Sources and Conversions
ECE 5410	Power Electronics and Control
ECE 5425	Robotic Systems I
ECE 5430	Electric Energy Systems Engineering
ECE 5440	Traditional and Machine Learning-Based Computer-Controlled Systems
ECE 5460	Stochastic Processes in Engineering
ECE 5470	Control Systems II
ECE 5550	Solid State Electronics
ECE 5560	Analysis and Design of Analog Integrated Circuits
ECE 5575	Introduction to Micro and Nano Electro Mechanical Systems (MEMS/NEMS)
ECE 5580	Advanced Nanoelectronics
ECE 5620	Embedded System Design
ECE 5650	Computer Networking and Network Programming
ECE 5675	Sensors and Sensor Instrumentation
ECE 5680	Computer-Aided Logical Design and FPGAs
ECE 5690	Introduction to Digital Image Processing
ECE 5700	Digital Communications
ECE 5770	Digital Signal Processing
ECE 5870	Optical Communication Networks
ECE 5880	Introduction to Microwave Engineering
ECE 5960	Introduction to VLSI Systems
ECE 6570	Smart Sensor Technology I: Design
ECE 7030	Mathematical Methods in Engineering I
ECE 7100	Mathematical Modeling in Impact Biomechanics
ECE 7420	Nonlinear Control Systems
ECE 7425	Robotics Systems II
ECE 7430	Discrete Event Systems with Machine Learning
ECE 7440	Optimal Control with Machine Learning and Applications
ECE 7530	Advanced Digital VLSI Design
ECE 7570	Smart Sensor Technology II: Characterization and Fabrication
ECE 7650	Scalable and Secure Internet Services and Architecture
ECE 7680	Advanced Digital Image Processing and Applications
ECE 7690	Fuzzy Systems and Machine Learning
ECE 7700	Statistical Communication Theory
ECE 7730	Telematics
ECE 7850	Photonics
ECE 7860	Operation and Control of Modern Power Systems
Elective courses	

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The combined number of credits for Required and Elective courses must be at least 24.

List of eligible elective courses:

-'	St of engible elec		
	ECE 5000-7999 Computer Engi 3 cr., repeatable ECE 7995 (repe (1 cr., repeatable	including courses in the Electrical Engineering, or neering major area, ECE 5990 Directed Study (1 – e up to 3 cr.), Special Topics courses ECE 5995 and atable up to 12 cr.), Industrial Internship ECE 6991 le up to 3 cr.).	
	Non-ECE courses: Up to 6 credits of elective credits may be taken in other WSU departments or transferred from another institution, including following:		
	BME, ME, CHE, research, or int	MSE or EVE 5000-7999 excluding directed study, ernship.	
	Selected classe	es offered by the College of Engineering:	
	EGR 5995	Special Topics in Engineering	
	Selected classe	es offered by Department of Computer Science:	
	CSC 5825	Introduction to Machine Learning and Applications	
	CSC 7825	Machine Learning	
	Selected classe	es offered by Department of Industrial Engineering:	
	IE 7220	Advanced Statistical Methods	
	IE 7710	Stochastic Processes	
	PHY 5000-7999 research, and d	excluding directed study, physics for teachers, irected study, or internship.	
	Selected classe	es offered by the Department of Mathematics:	
	MAT 5600	Introduction to Analysis I	
	MAT 5610	Introduction to Analysis II	
	MAT 5710	Introduction to Stochastic Processes	
	MAT 5870	Methods of Optimization	
	MAT 7600	Real Analysis I	
	MAT 7610	Real Analysis II	
	STA 5030	Statistical Computing and Data Analysis	
	STA 6830	Design of Experiments	
	STA 6840	Applied Regression Analysis	
Π	nesis course		
	ECE 8999	Master's Thesis Research and Direction (This course can be taken either as a single 6-credit course during the last term in the program or as repeated courses, totaling 6 credits, during last two terms.)	
	Special Topics of	courses ECE 5995 and ECE 7995, depending on the	

 Special Topics courses ECE 5995 and ECE 7995, depending on the courses subjects, may also be counted as courses in Major Area – upon approval by Graduate Program Director.

Plan C: Coursework

Title

Code

Credits

Required courses Select 5 ECE graduate courses in Major Area - Electrical Engineering, including at least 2 at 7000 level. ¹

ECE 5100	Quantitative Physiology
ECE 5280	Introduction to Cyber-Physical Systems
ECE 5330	Modeling and Control of Power Electronics and Electric Vehicle Powertrains
ECE 5340	Advanced Energy Storage Systems for Electrification of Vehicles
ECE 5350	Alternative Energy Sources and Conversions
ECE 5410	Power Electronics and Control
ECE 5425	Robotic Systems I

	ECE 5430	Electric Energy Systems Engineering
	ECE 5440	Traditional and Machine Learning-Based Computer-Controlled Systems
	ECE 5460	Stochastic Processes in Engineering
	ECE 5470	Control Systems II
	ECE 5550	Solid State Electronics
	ECE 5560	Analysis and Design of Analog Integrated Circuits
	ECE 5575	Introduction to Micro and Nano Electro Mechanical Systems (MEMS/NEMS)
	ECE 5580	Advanced Nanoelectronics
	ECE 5620	Embedded System Design
	ECE 5650	Computer Networking and Network Programming
	ECE 5675	Sensors and Sensor Instrumentation
	ECE 5680	Computer-Aided Logical Design and FPGAs
	ECE 5690	Introduction to Digital Image Processing
	ECE 5700	Digital Communications
	ECE 5770	Digital Signal Processing
	ECE 5870	Optical Communication Networks
	ECE 5880	Introduction to Microwave Engineering
	ECE 5960	Introduction to VLSI Systems
	ECE 6570	Smart Sensor Technology I: Design
	ECE 7030	Mathematical Methods in Engineering I
	ECE 7100	Mathematical Modeling in Impact Biomechanics
	ECE 7420	Nonlinear Control Systems
	ECE 7425	Robotics Systems II
	ECE 7430	Discrete Event Systems with Machine Learning
	ECE 7440	Optimal Control with Machine Learning and Applications
	ECE 7530	Advanced Digital VLSI Design
	ECE 7570	Smart Sensor Technology II: Characterization and Fabrication
	ECE 7650	Scalable and Secure Internet Services and Architecture
	ECE 7680	Advanced Digital Image Processing and Applications
	ECE 7690	Fuzzy Systems and Machine Learning
	ECE 7700	Statistical Communication Theory
	ECE 7730	Telematics
	ECE 7850	Photonics
	ECE 7860	Operation and Control of Modern Power Systems
Ele	ective courses	
Th m	e combined nur ust be at least 3	nber of credits for Required and Elective courses 0.
list of eligible elective courses:		
	ECE 5000-7999 Computer Engi 3 cr., repeatable ECE 7995 (repe	including courses in the Electrical Engineering, or neering major area, ECE 5990 Directed Study (1 – e up to 3 cr.), Special Topics courses ECE 5995 and eatable up to 12 cr.), Industrial Internship ECE 6991
	Non-FCE course	e up to 5 GLJ. es: 1 In to 6 credits of elective credits may be taken
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Non-ECE courses: Up to 6 credits of elective credits may be taken in other WSU departments or transferred from another institution, including following:

BME, ME, CHE, MSE or EVE 5000-7999 excluding directed study, research, or internship.

Selected classes offered by the College of Engineering:

EGR 5995 Special Topics in Engineering (repeatable up to 3 cr.)

Selected classe	es offered by Department of Computer Science:
CSC 5825	Introduction to Machine Learning and Applications
CSC 7825	Machine Learning
Selected classe	es offered by Department of Industrial Engineering:
IE 7220	Advanced Statistical Methods
IE 7710	Stochastic Processes
PHY 5000-7999 research, and d	excluding directed study, physics for teachers, lirected study, or internship.
Selected classe	es offered by Department of Mathematics:
MAT 5600	Introduction to Analysis I
MAT 5610	Introduction to Analysis II
MAT 5710	Introduction to Stochastic Processes
MAT 5870	Methods of Optimization
MAT 7600	Real Analysis I
MAT 7610	Real Analysis II
STA 5030	Statistical Computing and Data Analysis
STA 6830	Design of Experiments
STA 6840	Applied Regression Analysis

¹ Special Topics courses ECE 5995 and ECE 7995, depending on the courses subjects, may also be counted as courses in Major Area – upon approval by Graduate Program Director.

Requirements – Online Program

The online Master of Science in Electrical Engineering is offered with a concentration in Semiconductor Engineering. Semiconductor engineering focuses on developing technologies for manufacturing semiconductor devices in electronic circuits. The expertise spans from materials level research to device fabrication and chip packaging. Semiconductor technology is a critical driver of innovation in multiple industries ranging from computing, defense and automotive.

The program must be completed under Master's Degree Plan C, and it requires a minimum of thirty credits in course work. The online program also allows students to obtain six internship credits through an optional industrial internship experience. The internship activity should be in an area related to semiconductor engineering including but not limited to, design, validation, manufacturing, system integration, product development or applications.

Code

Credits

The coursework-only plan requires a minimum of five courses from the core group (two courses must be at the 7000-level). The 6-credit internship option requires a minimum of four courses from the core group (one course must be at the 7000-level)

Title

Core Courses		
ECE 5550	Solid State Electronics	
ECE 5560	Analysis and Design of Analog Integrated Circuits	
ECE 5580	Advanced Nanoelectronics	
ECE 5575	Introduction to Micro and Nano Electro Mechanical Systems (MEMS/NEMS)	
ECE 5675	Sensors and Sensor Instrumentation	
ECE 5680	Computer-Aided Logical Design and FPGAs	
ECE 5960	Introduction to VLSI Systems	
ECE 7530	Advanced Digital VLSI Design	
ECE 7566	Advanced Mixed Signal Integrated Circuits	
Elective Courses		
ECE 5340	Advanced Energy Storage Systems for Electrification of Vehicles	

ECE 5350	Alternative Energy Sources and Conversions
ECE 5410	Power Electronics and Control
ECE 5620	Embedded System Design
ECE 5995	Special Topics in Electrical and Computer Engineering I (Topics should be chosen in consultation with program advisor.)
ECE 7570	Smart Sensor Technology II: Characterization and Fabrication