

Electrical and Computer Engineering with Concentration in Microsystems, Materials, and Devices, MSECE

For program contact information, please visit this website (<https://ece.northeastern.edu/academics/graduate-studies/ms-eele/>).

The master's degree program in electrical and computer engineering offers in-depth coursework within the concentration-choice-related areas. The curriculum is integrated and intensive and is built on state-of-the-art research, taught by faculty who are experts in their areas.

EXCLUDED COURSES FOR ALL MSECE CONCENTRATIONS

Students cannot take excluded courses as part of the MSECE program and may not petition to take these courses, as any petition to take these courses will be automatically rejected. Courses from the following subject areas may not count toward any concentration within the MSECE program: CSYE, ENSY, EMGT, INFO, SBSY, TELE. Select CS courses are also excluded from all MSECE concentrations. Please see the program requirements tab and your college administrator for more information.

Graduate Certificate Options

Students enrolled in a master's degree have the opportunity to also pursue one of the many engineering graduate certificate options in addition to or in combination with the MS degree. Students should consult their faculty advisor regarding these options (<http://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs/>).

GORDON INSTITUTE OF ENGINEERING LEADERSHIP

Master's Degree in Electrical and Computer Engineering with Concentration in Microsystems, Materials, and Devices with Graduate Certificate in Engineering Leadership

Students may complete a Master of Science in Electrical and Computer Engineering with Concentration in Microsystems, Materials, and Devices in addition to earning a Graduate Certificate in Engineering Leadership (<http://catalog.northeastern.edu/graduate/engineering/multidisciplinary/engineering-leadership-graduate-certificate/>). Students must apply and be admitted to the Gordon Engineering Leadership Program in order to pursue this option. The program requires fulfillment of the 16-semester-hour curriculum required to earn the Graduate Certificate in Engineering Leadership, which includes an industry-based challenge project with multiple mentors. The integrated 40-semester-hour degree and certificate will require 24 semester hours of advisor-approved microsystems, materials, and devices technical courses.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Fundamental Courses

Code	Title	Hours
Complete at least 8 semester hours from the following:		8
EECE 5606	Micro- and Nanofabrication	
EECE 7201	Solid State Devices	
EECE 7244	Introduction to Microelectromechanical Systems (MEMS)	
EECE 7353	VLSI Design	

Options

Complete one of the following options:

COURSEWORK OPTION

Code	Title	Hours
Depth Courses		
Complete 12 semester hours from the depth course list below. Any fundamental course not used to meet the fundamental course requirement can be used toward the depth course requirement. (p. 1)		12
Breadth Courses		
Complete 8 semester hours from the breadth course list below. (p. 2)		8
Note: Depth courses cannot be taken for breadth.		
Elective		
Complete 4 additional semester hours from either depth or breadth courses.		4

THESIS OPTION

Code	Title	Hours
Thesis		
EECE 7990	Thesis	8
Depth Courses		
Complete 4 semester hours from the depth course list below. Any fundamental course not used to meet the fundamental course requirement can be used toward the depth course requirement. (p. 1)		4
Breadth Courses		
Complete 4 semester hours from the breadth course list below. (p. 2)		4
Note: Depth courses cannot be taken for breadth.		
Elective		
Complete 8 additional semester hours from either depth or breadth courses.		8

Course Lists

In the coursework option, a maximum of two courses may be taken outside of electrical and computer engineering. Thesis track students can take up to three courses outside of electrical and computer engineering.

DEPTH COURSES

Code	Title	Hours
EECE 5161	Thin Film Technologies	
EECE 5606	Micro- and Nanofabrication	
EECE 5647	Nanophotonics	
EECE 5649	Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology	
EECE 5652	Microwave Circuits and Networks	
EECE 5693	Electromagnetic Devices for RF and Wireless Communications	

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EECE 5698	Special Topics in Electrical and Computer Engineering (Introduction to Organic and Printed Electronics)	EECE 5170	Introduction to Multiferroics Materials and Systems
EECE 5698	Special Topics in Electrical and Computer Engineering (Photonic Devices for Communication Systems)	EECE 5550	Mobile Robotics
EECE 5698	Special Topics in Electrical and Computer Engineering (Introduction to Quantum Engineering)	EECE 5552	Assistive Robotics
EECE 7201	Solid State Devices	EECE 5554	Robotics Sensing and Navigation
EECE 7240 and EECE 7248	Analog Integrated Circuit Design and Lab for EECE 7240	EECE 5576	Wireless Communication Systems
EECE 7242	Integrated Circuits for Mixed Signals and Data Communication	EECE 5580	Classical Control Systems
EECE 7244	Introduction to Microelectromechanical Systems (MEMS)	EECE 5610	Digital Control Systems
EECE 7245	Microwave Circuit Design for Wireless Communication	EECE 5626	Image Processing and Pattern Recognition
EECE 7247	Radio Frequency Integrated Circuit Design	EECE 5638	Compilers for Modern Computer Architectures
EECE 7250	Power Management Integrated Circuits	EECE 5639	Computer Vision
EECE 7284	Optical Properties of Matter	EECE 5640	High-Performance Computing
EECE 7296	Electronic Materials	EECE 5641	Introduction to Software Security
EECE 7297	Advanced Magnetic Materials—Magnetic Devices	EECE 5642	Data Visualization
EECE 7353	VLSI Design	EECE 5643	Simulation and Performance Evaluation
EECE 7398	Special Topics (Low Power Integrated Circuits Design)	EECE 5644	Introduction to Machine Learning and Pattern Recognition
EECE 7398	Special Topics (Advanced Radio Frequency Passive Technologies)	EECE 5645	Parallel Processing for Data Analytics
EECE 7399	Preparing High-Stakes Written and Oral Materials (Only for PhD and MS Thesis students)	EECE 5665	Signal Processing for Global Navigation Satellite Systems
EECE 7400	Special Problems in Electrical and Computer Engineering	EECE 5666	Digital Signal Processing
EECE 7674	Master's Project (MS Thesis students cannot take this course)	EECE 5680 and EECE 5681	Electric Drives and Lab for EECE 5680
		EECE 5682	Power Systems Analysis 1
		EECE 5684 and EECE 5685	Power Electronics and Lab for EECE 5684
		EECE 5688	Analysis of Unbalanced Power Grids
		EECE 5697	Acoustics and Sensing
		EECE 5698	Special Topics in Electrical and Computer Engineering (Reinforcement Learning)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Electric Vehicles)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Network Programming)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Networks: Technology, Economics, Social Interactions)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Design and Prototyping of Optical Systems for Engineering Applications)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Feedback Control Systems: Applications to Unmanned Aerial Vehicles)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Advanced Network Management)
		EECE 5698	Special Topics in Electrical and Computer Engineering (Hardware and System Security)
BREADTH COURSES			
Code	Title	Hours	
CS 5100	Foundations of Artificial Intelligence		
CS 5200	Database Management Systems		
CS 5600	Computer Systems		
CS 6200	Information Retrieval		
CS 6220	Data Mining Techniques		
CS 6410	Compilers		
CS 6510	Advanced Software Development		
CS 6760	Privacy, Security, and Usability		
CS 7800	Advanced Algorithms		
CY 5770	Software Vulnerabilities and Security		
CY 6740	Network Security		
CY 6750	Cryptography and Communications Security		
EECE 5115	Dynamical Systems in Biological Engineering		
EECE 5155	Wireless Sensor Networks and the Internet of Things		

EECE 5698	Special Topics in Electrical and Computer Engineering (Electromagnetic Devices)
EECE 7105	Optics for Engineers
EECE 7150	Autonomous Field Robotics
EECE 7200	Linear Systems Analysis
EECE 7202	Electromagnetic Theory 1
EECE 7203	Complex Variable Theory and Differential Equations
EECE 7204	Applied Probability and Stochastic Processes
EECE 7205	Fundamentals of Computer Engineering
EECE 7211	Nonlinear Control
EECE 7213	System Identification and Adaptive Control
EECE 7214	Optimal and Robust Control
EECE 7215	Introduction to Distributed Intelligence
EECE 7224	Power Systems State Estimation
EECE 7226	Modeling and Simulation of Power System Transients
EECE 7228	Advanced Power Electronics
EECE 7270	Electromagnetic Theory 2
EECE 7271	Computational Methods in Electromagnetics
EECE 7275	Antennas and Radiation
EECE 7310	Modern Signal Processing
EECE 7323	Numerical Optimization Methods
EECE 7336	Digital Communications
EECE 7337	Information Theory
EECE 7345	Big Data and Sparsity in Control, Machine Learning, and Optimization
EECE 7346	Probabilistic System Modeling and Analysis
EECE 7352	Computer Architecture
EECE 7364	Mobile and Wireless Networking
EECE 7368	High-Level Design of Hardware-Software Systems
EECE 7370	Advanced Computer Vision
EECE 7374	Fundamentals of Computer Networks
EECE 7376	Operating Systems: Interface and Implementation
EECE 7377	Scalable and Sustainable System Design
EECE 7390	Computer Hardware Security
EECE 7393	Analysis and Design of Data Networks
EECE 7397	Advanced Machine Learning
EECE 7398	Special Topics (Deep Learning Embedded Systems)
EECE 7398	Special Topics (Wireless Network Systems and Applications)
EECE 7398	Special Topics (Security in Large-Scale Learning-Enabled Systems)
EECE 7398	Special Topics (Legged Robots)
EECE 7398	Special Topics (Advanced Computer Architecture)

EECE 7398	Special Topics (Power System Constrained Optimization)
EECE 7398	Special Topics (Advances in Deep Learning)
EECE 7399	Preparing High-Stakes Written and Oral Materials
ENGR 5670	Sustainable Energy: Materials, Conversion, Storage, and Usage
MATH 7233	Graph Theory
ME 7247	Advanced Control Engineering

EXCLUDED COURSES FOR ALL MSECE CONCENTRATIONS

Please see your college administrator for more information.

Code	Title	Hours
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Courses from the following subject areas may not count toward any concentration within the MSECE program:

CSYE, ENSY, EMGT, INFO, SBSY, TELE

The following CS courses may not count toward any concentration within the MSECE program:

CS 5010	Programming Design Paradigm
CS 5330	Pattern Recognition and Computer Vision
CS 5340	Computer/Human Interaction
CS 5520	Mobile Application Development
CS 5610	Web Development
CS 5700	Fundamentals of Computer Networking
CS 5800	Algorithms
CS 6350	Empirical Research Methods
CS 6710	Wireless Network

Program Credit/GPA Requirements

32 total semester hours required
Minimum 3.000 GPA required