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-elee/).

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, DAMG, INFO, 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 (https://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 (https://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

- Concentrations and course offerings may vary by campus and/or by program modality. Please consult with your advisor or admissions coach for the course availability each term at your campus or within your program modality.
- Certain options within the program may be *required* at certain campuses or for certain program modalities. Please consult with your advisor or admissions coach for requirements at your campus or for your program modality.

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
Concentration Courses		
Complete 16 semester hours from the concentration course list below. Any fundamental course not used to meet the fundamental course requirement can be used toward the concentration course requirement.		16
Electives		
Complete 8 semester hours from either concentration or breadth courses.		8

THESIS OPTION

Code	Title	Hours
Thesis		
EECE 7945	Master's Project	4
EECE 7990	Thesis	4
In addition to completing the thesis course, students must successfully complete the thesis submission process, including securing Committee and Graduate School of Engineering signatures and submission of an electronic copy of their MS Thesis to ProQuest.		
Concentration Courses		
Complete 8 semester hours from the concentration course list below. Any fundamental course not used to meet the fundamental course requirement can be used toward the concentration course requirement.		8
Electives		
Complete 8 semester hours from either concentration 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.

CONCENTRATION COURSES

Code	Title	Hours
EECE 5161	Thin Film Technologies	
EECE 5606	Micro- and Nanofabrication	
EECE 5608	Magnetic Materials for Next-Generation Electronics	
EECE 5647	Nanophotonics	
EECE 5649	Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology	
EECE 5651	Introduction to Photonic Devices	
EECE 5652	Microwave Circuits and Systems	
EECE 5698	Special Topics in Electrical and Computer Engineering (Biomedical Microsystems)	
EECE 5698	Special Topics in Electrical and Computer Engineering (Introduction to Organic and Printed Electronics)	
EECE 5698	Special Topics in Electrical and Computer Engineering (Magnetic Materials and Devices for Microwave Engineering)	
EECE 5698	Special Topics in Electrical and Computer Engineering (Photonic Devices for Communication Systems)	
EECE 7201	Solid State Devices	
EECE 7240 and EECE 7248	Analog Integrated Circuit Design and Lab for EECE 7240	
EECE 7242	Integrated Circuits for Mixed Signals and Data Communication	
EECE 7244	Introduction to Microelectromechanical Systems (MEMS)	
EECE 7245	Microwave Circuit Design for Wireless Communication	
EECE 7247	Radio Frequency Integrated Circuit Design	
EECE 7248	Lab for EECE 7240	
EECE 7250	Power Management Integrated Circuits	
EECE 7284	Optical Properties of Matter	
EECE 7296	Electronic Materials	
EECE 7353	VLSI Design	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advanced Radio Frequency Passive Technologies)	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advances in Communication Electronics)	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Biomedical Microsystems)	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Low Power Integrated Circuits Design)	

EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Photonic Circuit Design for Information Processing)
EECE 7400	Advanced Special Problems in Electrical and Computer Engineering

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	
EECE 5115	Dynamical Systems in Biological Engineering	
EECE 5155	Wireless Sensor Networks and the Internet of Things	
EECE 5170	Introduction to Multiferroics Materials and Systems	
EECE 5550	Mobile Robotics	
EECE 5552	Assistive Robotics	
EECE 5554	Robotics Sensing and Navigation	
EECE 5576	Wireless Communication Systems	
EECE 5580	Classical Control Systems	
EECE 5610	Digital Control Systems	
EECE 5626	Image Processing and Pattern Recognition	
EECE 5639	Computer Vision	
EECE 5640	High-Performance Computing	
EECE 5641	Introduction to Software Security	
EECE 5642	Data Visualization	
EECE 5643	Simulation and Performance Evaluation	
EECE 5644	Introduction to Machine Learning and Pattern Recognition	
EECE 5645	Parallel Processing for Data Analytics	
EECE 5665	Signal Processing for Global Navigation Satellite Systems	
EECE 5666	Digital Signal Processing	
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)
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 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 7390	Computer Hardware Security
EECE 7393	Analysis and Design of Data Networks
EECE 7397	Advanced Machine Learning
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Deep Learning Embedded Systems)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Wireless Network Systems and Applications)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Security in Large-Scale Learning-Enabled Systems)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Legged Robots)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advanced Computer Architecture)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Power System Constrained Optimization)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advances in Deep Learning)
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
Courses from the following subject areas may not count toward any concentration within the MSECE program:		
CSYE, DAMG, INFO, 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