

# Electrical and Computer Engineering with Concentration in Electromagnetics, Plasma, and Optics, 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 Electromagnetics, Plasma, and Optics with Graduate Certificate in Engineering Leadership

Students may complete a Master of Science in Electrical and Computer Engineering with Concentration in Electromagnetics, Plasma, and Optics 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 electromagnetics, plasma, and optics 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:		
EECE 5170	Introduction to Multiferroics Materials and Systems	8
EECE 5693	Electromagnetic Devices for RF and Wireless Communications	
EECE 7202	Electromagnetic Theory 1	
EECE 7203	Complex Variable Theory and Differential Equations	

### Options

Complete one of the following options:

#### COURSEWORK OPTION

Code	Title	Hours
A maximum of two courses may be taken outside of Electrical and Computer Engineering.		
<b>Depth Courses</b>		
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. 2)		12
<b>Breadth Courses</b>		
Complete 8 semester hours from the breadth course list below. (p. 2)		8
Note: Depth courses cannot be taken for breadth.		
<b>Elective</b>		
Complete 4 additional semester hours from either depth or breadth courses.		4

**THESIS OPTION**

Code	Title	Hours
A maximum of three courses may be taken outside of Electrical and Computer Engineering.		
<b>Thesis</b>		
EECE 7990	Thesis	8
<b>Depth Courses</b>		
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. 2)		4
<b>Breadth Courses</b>		
Complete 4 semester hours from the breadth course list below. (p. 2)		4
Note: Depth courses cannot be taken for breadth.		
<b>Elective</b>		
Complete 8 additional semester hours from either depth or breadth courses.		8

**Course Lists****DEPTH COURSES**

Code	Title	Hours
EECE 5170	Introduction to Multiferroics Materials and Systems	
EECE 5693	Electromagnetic Devices for RF and Wireless Communications	
EECE 5697	Acoustics and Sensing	
EECE 5698	Special Topics in Electrical and Computer Engineering (Photonic Devices for Communication Systems)	
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 (Introduction to Quantum Engineering)	
EECE 7105	Optics for Engineers	
EECE 7202	Electromagnetic Theory 1	
EECE 7203	Complex Variable Theory and Differential Equations	
EECE 7270	Electromagnetic Theory 2	
EECE 7271	Computational Methods in Electromagnetics	
EECE 7275	Antennas and Radiation	
EECE 7284	Optical Properties of Matter	
EECE 7293	Modern Imaging	
EECE 7296	Electronic Materials	
EECE 7297	Advanced Magnetic Materials—Magnetic Devices	
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advanced Radio Frequency Passive Technologies)	
EECE 7399	Preparing High-Stakes Written and Oral Materials (Only for PhD and MS Thesis students)	
EECE 7400	Special Problems in Electrical and Computer Engineering	
EECE 7674	Master's Project (MS Thesis students cannot take this course)	

**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 5161	Thin Film Technologies
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 5606	Micro- and Nanofabrication
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 5647	Nanophotonics
EECE 5649	Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology
EECE 5652	Microwave Circuits and Systems
EECE 5665	Signal Processing for Global Navigation Satellite Systems
EECE 5666	Digital Signal Processing
EECE 5670	Sustainable Energy: Materials, Conversion, Storage, and Usage
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 5698	Special Topics in Electrical and Computer Engineering (Network Programming)
EECE 5698	Special Topics in Electrical and Computer Engineering (Electric Vehicles)
EECE 5698	Special Topics in Electrical and Computer Engineering (Biomedical Microsystems)
EECE 5698	Special Topics in Electrical and Computer Engineering (GNSS Signal Processing)
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 (Reinforcement Learning)
EECE 5698	Special Topics in Electrical and Computer Engineering (Introduction to Organic and Printed Electronics)
EECE 5698	Special Topics in Electrical and Computer Engineering (Networks: Technology, Economics, Social Interactions)
EECE 5698	Special Topics in Electrical and Computer Engineering (Hardware and System Security)
EECE 5698	Special Topics in Electrical and Computer Engineering (Advanced Network Management)
EECE 7150	Autonomous Field Robotics
EECE 7200	Linear Systems Analysis
EECE 7201	Solid State Devices
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

4 Electrical and Computer Engineering with Concentration in Electromagnetics, Plasma, and Optics, MSECE

EECE 7224	Power Systems State Estimation
EECE 7226	Modeling and Simulation of Power System Transients
EECE 7228	Advanced Power Electronics
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 7250	Power Management Integrated Circuits
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 7353	VLSI Design
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 (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 (Low Power Integrated Circuits Design)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Advances in Deep Learning)
EECE 7398	Advanced Special Topics in Electrical and Computer Engineering (Security in Large-Scale Learning-Enabled Systems)
EECE 7399	Preparing High-Stakes Written and Oral Materials
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, 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