Electrical and Computer Engineering with Concentration in Computer Systems and Software, MSECE

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

The master’s degree programs in electrical and computer engineering offer in-depth course work within the concentration-choice-related areas. The curriculum is integrated and intensive and is built on groundbreaking research, taught by faculty who are experts in their areas.

Excluded Courses for All MSECE Concentrations
You cannot take excluded courses as part of your MSECE program. Please do 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 Computer Systems and Software with Graduate Certificate in Engineering Leadership

Students may complete a Master of Science degree in Electrical and Computer Engineering with Concentration in Computer Systems and Software in addition to earning a Graduate Certificate in Engineering Leadership (http://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs/). 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 computer systems and software technical courses.

Program Requirements
Complete all courses and requirements listed below unless otherwise indicated.

Options
Complete one of the following options:

COURSE WORK OPTION

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A maximum of two courses may be taken outside of Electrical and Computer Engineering.</td>
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Depth Courses
Complete 20 semester hours from the depth course list below. (p. 1)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>CS 5200</td>
<td>Database Management Systems</td>
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</tr>
<tr>
<td>CS 5600</td>
<td>Computer Systems</td>
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</tr>
<tr>
<td>CS 6410</td>
<td>Compilers</td>
<td></td>
</tr>
<tr>
<td>CS 6510</td>
<td>Advanced Software Development</td>
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<tr>
<td>EECE 5552</td>
<td>Assistive Robotics</td>
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</tr>
<tr>
<td>EECE 5638</td>
<td>Compilers for Modern Computer Architectures</td>
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<tr>
<td>EECE 5640</td>
<td>High-Performance Computing</td>
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</tr>
<tr>
<td>EECE 5643</td>
<td>Simulation and Performance Evaluation</td>
<td></td>
</tr>
<tr>
<td>EECE 5699</td>
<td>Computer Hardware and System Security</td>
<td></td>
</tr>
<tr>
<td>EECE 7205</td>
<td>Fundamentals of Computer Engineering</td>
<td></td>
</tr>
<tr>
<td>EECE 7352</td>
<td>Computer Architecture</td>
<td></td>
</tr>
<tr>
<td>EECE 7353</td>
<td>VLSI Design</td>
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</tr>
<tr>
<td>EECE 7368</td>
<td>High-Level Design of Hardware-Software Systems</td>
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<tr>
<td>EECE 7377</td>
<td>Scalable and Sustainable System Design</td>
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</tr>
<tr>
<td>EECE 7390</td>
<td>Computer Hardware Security</td>
<td></td>
</tr>
<tr>
<td>EECE 7398</td>
<td>Special Topics (Advanced Computer Architecture)</td>
<td></td>
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</table>

Breadth Courses
Complete 8 semester hours from the breadth course list below or other EECE courses chosen in consultation with a faculty adviser. (p. 2)

Note: Depth courses cannot be taken for breadth.

Elective
Complete 4 semester hours of either depth or breadth courses.

THESIS OPTION

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<tr>
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<tr>
<td>EECE 7990</td>
<td>Thesis</td>
<td>8</td>
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Depth Courses
Complete 12 semester hours from the depth course list below. (p. 1)

Note: Depth courses cannot be taken for breadth.

Elective
Complete 8 additional semester hours from either depth or breadth courses.

Course Lists

DEPTH COURSES

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CS 5200</td>
<td>Database Management Systems</td>
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<tr>
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<tr>
<td>EECE 5552</td>
<td>Assistive Robotics</td>
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<tr>
<td>EECE 5638</td>
<td>Compilers for Modern Computer Architectures</td>
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<tr>
<td>EECE 5640</td>
<td>High-Performance Computing</td>
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<tr>
<td>EECE 5643</td>
<td>Simulation and Performance Evaluation</td>
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<td>Computer Hardware and System Security</td>
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<td>Fundamentals of Computer Engineering</td>
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<tr>
<td>EECE 7398</td>
<td>Special Topics (Advanced Computer Architecture)</td>
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</tbody>
</table>
### EECE Courses

#### EECE 7400: Special Problems in Electrical and Computer Engineering

#### EECE 7399: Preparing High-Stakes Written and Oral Materials (Only for PhD and MS Thesis students)

#### EECE 7674: Master's Project (MS Thesis students cannot take this course)

### Breadth Courses

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 5100</td>
<td>Foundations of Artificial Intelligence</td>
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<td>CS 6200</td>
<td>Information Retrieval</td>
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<tr>
<td>CS 6220</td>
<td>Data Mining Techniques</td>
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<tr>
<td>CS 6760</td>
<td>Privacy, Security, and Usability</td>
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<tr>
<td>CS 7800</td>
<td>Advanced Algorithms</td>
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<tr>
<td>CY 5770</td>
<td>Software Vulnerabilities and Security</td>
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<tr>
<td>CY 6740</td>
<td>Network Security</td>
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<tr>
<td>CY 6750</td>
<td>Cryptography and Communications Security</td>
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<tr>
<td>EECE 5115</td>
<td>Dynamical Systems in Biological Engineering</td>
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<tr>
<td>EECE 5155</td>
<td>Wireless Sensor Networks and the Internet of Things</td>
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<tr>
<td>EECE 5161</td>
<td>Thin Film Technologies</td>
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<tr>
<td>EECE 5170</td>
<td>Introduction to Multiferroics Materials and Systems</td>
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<tr>
<td>EECE 5550</td>
<td>Mobile Robotics</td>
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<tr>
<td>EECE 5554</td>
<td>Robotics Sensing and Navigation</td>
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<tr>
<td>EECE 5576</td>
<td>Wireless Communication Systems</td>
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<td>EECE 5580</td>
<td>Classical Control Systems</td>
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<tr>
<td>EECE 5606</td>
<td>Micro- and Nanofabrication</td>
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<td>EECE 5610</td>
<td>Digital Control Systems</td>
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<tr>
<td>EECE 5626</td>
<td>Image Processing and Pattern Recognition</td>
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<td>EECE 5639</td>
<td>Computer Vision</td>
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<tr>
<td>EECE 5641</td>
<td>Introduction to Software Security</td>
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<tr>
<td>EECE 5642</td>
<td>Data Visualization</td>
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<tr>
<td>EECE 5644</td>
<td>Introduction to Machine Learning and Pattern Recognition</td>
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<tr>
<td>EECE 5645</td>
<td>Parallel Processing for Data Analytics</td>
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<tr>
<td>EECE 5647</td>
<td>Nanophotonics</td>
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<tr>
<td>EECE 5649</td>
<td>Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology</td>
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<tr>
<td>EECE 5652</td>
<td>Microwave Circuits and Networks</td>
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<tr>
<td>EECE 5666</td>
<td>Digital Signal Processing</td>
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</tr>
<tr>
<td>EECE 5680 and EECE 5681</td>
<td>Electric Drives and Lab for EECE 5680</td>
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<tr>
<td>EECE 5682</td>
<td>Power Systems Analysis 1</td>
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<tr>
<td>EECE 5684 and EECE 5685</td>
<td>Power Electronics and Lab for EECE 5684</td>
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<tr>
<td>EECE 5688</td>
<td>Analysis of Unbalanced Power Grids</td>
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</tr>
<tr>
<td>EECE 5697</td>
<td>Acoustics and Sensing</td>
<td></td>
</tr>
<tr>
<td>EECE 5698</td>
<td>Special Topics in Electrical and Computer Engineering (Biomedical Microsystems)</td>
<td></td>
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</tbody>
</table>

### EECE 5698: Special Topics in Electrical and Computer Engineering

- (Network Programming)
- (Networks: Technology, Economics, Social Interactions)
- (GNSS Signal Processing)
- (Feedback Control Systems: Applications to Unmanned Aerial Vehicles)
- (Electromagnetic Devices)
- (Advanced Network Management)
- (Optics for Engineers)
- Autonomous Field Robotics
- Linear Systems Analysis
- Solid State Devices
- Electromagnetic Theory 1
- Complex Variable Theory and Differential Equations
- Applied Probability and Stochastic Processes
- Nonlinear Control
- System Identification and Adaptive Control
- Optimal and Robust Control
- Power Systems State Estimation
- Modeling and Simulation of Power System Transients
- Advanced Power Electronics
- Analog Integrated Circuit Design and Lab for EECE 7240
- Integrated Circuits for Mixed Signals and Data Communication
- Introduction to Microelectromechanical Systems (MEMS)
- Microwave Circuit Design for Wireless Communication
- Radio Frequency Integrated Circuit Design
- Power Management Integrated Circuits
- Electromagnetic Theory 2
- Computational Methods in Electromagnetics
- Antennas and Radiation
- Optical Properties of Matter
- Modern Imaging
- Electronic Materials
- Advanced Magnetic Materials—Magnetic Devices
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 7364  Mobile and Wireless Networking
EECE 7370  Advanced Computer Vision
EECE 7374  Fundamentals of Computer Networks
EECE 7393  Analysis and Design of Data Networks
EECE 7397  Advanced Machine Learning
EECE 7398  Special Topics (Wireless Network Systems and Applications)
EECE 7398  Special Topics (Power System Constrained Optimization)
EECE 7398  Special Topics (Legged Robots)
EECE 7398  Special Topics (Advances in Deep Learning)
EECE 7398  Special Topics (Advanced Radio Frequency Passive Technologies)
EECE 7399  Preparing High-Stakes Written and Oral Materials
ENGR 5670  Sustainable Energy: Materials, Conversion, Storage, and Usage
MATH 7233  Graph Theory

EXCLUDED COURSES FOR ALL MSECE CONCENTRATIONS
Please see your college administrator for more information.

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td></td>
<td>Courses from the following subject areas may not count toward any concentration within the MSECE program:</td>
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<tr>
<td></td>
<td>CSYE, ENSY, EMGT, INFO, SBSY, TELE</td>
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<tr>
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<td>The following CS courses may not count toward any concentration within the MSECE program:</td>
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<tr>
<td>CS 5010</td>
<td>Programming Design Paradigm</td>
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</tr>
<tr>
<td>CS 5330</td>
<td>Pattern Recognition and Computer Vision</td>
<td></td>
</tr>
<tr>
<td>CS 5340</td>
<td>Computer/Human Interaction</td>
<td></td>
</tr>
<tr>
<td>CS 5520</td>
<td>Mobile Application Development</td>
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<tr>
<td>CS 5610</td>
<td>Web Development</td>
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</tr>
<tr>
<td>CS 5700</td>
<td>Fundamentals of Computer Networking</td>
<td></td>
</tr>
<tr>
<td>CS 5800</td>
<td>Algorithms</td>
<td></td>
</tr>
<tr>
<td>CS 6350</td>
<td>Empirical Research Methods</td>
<td></td>
</tr>
<tr>
<td>CS 6710</td>
<td>Wireless Network</td>
<td></td>
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</table>

Program Credit/GPA Requirements
32 total semester hours required
Minimum 3.000 GPA required