



Graduate Program Guide

Department of Electrical and Computer Engineering

Northeastern University

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Seattle Campus

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List of Acronyms

Acronym	Meaning
CCSP	Communications, Control, and Signal Processing
COE	College of Engineering
CSYS	Computer Systems and Software
CVLA	Computer Vision, Machine Learning, and Algorithms
ECE	Electrical and Computer Engineering
ELPO	Electromagnetics, Plasma, and Optics
FT	Full-time
GAC	Graduate Affairs Committee
GL	Gordon Leadership
GSE	Graduate School of Engineering
HSMI	Hardware and Software for Machine Intelligence
IIRR	Individual Instruction Registration Request
INSI	Intelligent Networked Systems Institute
IP	In Progress
MGEN	Multidisciplinary Graduate Engineering
MSC	MSECE, course-only track
MSECE	Master of Science in Electrical and Computer Engineering
MSECE+LC	MSECE with Leadership Certificate
MSAI	Master of Science in Artificial Intelligence
MSIoT	Master of Science in Internet of Things
MSMD	Microsystems, materials, and devices
MSSCEN	Master of Science in Semiconductor Engineering
MST	MSECE, course-thesis track
MSWiNE	Master of Science in Wireless and Network Engineering
NU	Northeastern University
NUID	Northeastern University Identification Number
OGS	Office of Global Services
PhD-BE	PhD, BS Entry
PhD-AE	PhD, Advanced Entry
PhDCE	PhD in Computer Engineering
PhDEE	PhD in Electrical Engineering

POWR	Power Systems, Power Electronics, and Motion Control
PT	Part-time
QE	Qualifying Exam
RA	Research Assistant(ship)
ROR	Registration Override Request
SH	Semester Hour
S/U	Satisfactory or Unsatisfactory
TA	Teaching Assistant(ship)

1. General Information

This document provides information about ECE graduate programs at Northeastern University. Graduate students are expected to read this document, be familiar with the rules and procedures, follow them, and consult it when they have questions.

1.1. Graduate Programs and Degrees

The ECE Department offers three graduate programs:

- Master of Science in Electrical and Computer Engineering (MSECE)
- PhD in Electrical Engineering (PhDEE)
- PhD in Computer Engineering (PhDCE)

In partnership with the [Gordon Institute of Engineering Leadership](#), we also offer:

- MSECE with leadership certificate (MSECE+LC).

With the [Intelligent Networked Systems Institute \(INSI\)](#), we co-offer two MS programs:

- Master of Science in Wireless and Network Engineering (WiNE) with (INSI)
- Master of Science in Internet of Things (IoT) with (INSI) and the [Khouri College of Computer Sciences \(Khouri\)](#)

We also participate in joint MS programs led by other departments:

- Master of Science in Artificial Intelligence (MSAI) with Khoury College
- Master of Science in Data Science (MSDS) with the Khoury College
- Master of Science in Robotics (MSROB) with the Mechanical and Industrial Engineering Department ([MIE](#)) in the College of Engineering (COE), [Khouri](#) and the [Institute for Experiential Robotics \(IER\)](#)
- Master of Science in Semiconductor Engineering (MSSCEN) with ([MIE](#))
- Master of Science in Extended Reality (MSXR) with Khoury College, D'Amore-McKim, Bouve College, College of Social Sciences and Humanities, and College of Art, Media and Design

All MS programs can be pursued full-time (FT) or part-time (PT). Applicants with a BS or MS degree in electrical and computer engineering or a closely related field can apply to one of the MS programs or one of the PhD programs. In other words, an MS degree is not required to apply to PhD programs. Both PhD Programs are full-time programs and students are required to register in the Fall, Spring, and Summer Full semesters.

1.2. Graduate Advising

MSC and MST students who do not yet have a research advisor are advised by Graduate Student Services; contact COE ECE Grad Advising at coe-seattle-gradadvising@northeastern.edu. MST students with a research advisor will be academically advised by their research advisor. The MST research advisor can be any tenured, tenure-track, emeritus, affiliated, or adjunct faculty member in ECE. MST students

can change their track to MSC after completing one semester in the ECE Department. MST students who, after two semesters, do not yet have a thesis advisor need to change their track to MSC.

2. The MSECE Program

MSECE graduates gain the analytical and technical knowledge, tools, and skills to address advanced engineering problems in their field by completing fundamental courses, concentration courses in their chosen concentration, and — for the thesis track — a project or thesis. Graduates are able to analyze problems and formulate and design solutions within their concentration, using analytical, numerical, and experimental techniques.

2.1. MSECE Tracks

MSECE applicants select one of the two tracks, the course-thesis track (MST) or the course-only track (MSC), when they apply for admission. Changing track is possible after finishing one semester in the original track. Please refer to Section 14 for details, conditions, and requirements.

2.2. MSECE Concentrations

MSECE applicants select one of the eight concentrations listed below at admission:

1. Computer Systems and Software (CSYS)
2. Computer Vision, Machine Learning, and Algorithms (CVLA)
3. Hardware and Software for Machine Intelligence (HSMI)

A concentration change is possible after a student's semester in the ECE Department, by filing a petition. Details can be found in Section 7. Petition and Registration Override Procedures)

2.3. Description of MSECE Concentrations

Computer Systems and Software (CSYS)

This concentration prepares students for careers in microprocessor design and verification, embedded hardware and software development, performance analysis and modeling, advanced computer system design, and operating system design. Coursework covers computer architecture, simulation and performance evaluation, VLSI design, fault-tolerant computing, operating systems, and embedded design. Students learn to design and implement hardware and software systems — microprocessors, graphics processors, high-performance computing, CAD tools, CMOS design rules, compilers, computer arithmetic, resilient computation, advanced logic design, and hardware/software co-design.

Computer Vision, Machine Learning, and Algorithms (CVLA)

This concentration prepares students for careers in vision systems, big-data analytics and mining, image processing, visualization systems and software, and algorithmic problem-

solving. Coursework covers computer vision, algorithmic approaches, machine learning, pattern recognition, big-data analytics and visualization, generative AI and large language models. Students study machine learning, neural networks, deep and reinforcement learning, image motion and tracking, the algorithmic foundations of robotics, parallel and high-performance algorithms, the human visual system and visual cognition, localization, mapping and navigation, and clustering and regression analysis.

Hardware and Software for Machine Intelligence (HSMI)

This concentration prepares multifaceted systems engineers who bridge theory, software, and hardware. As AI solutions become more prevalent, practitioners must be fluent not only in the theoretical and software aspects of technology but also in the real-world hardware considerations that any solution must address. Graduates are skilled in developing machine-intelligence (MI) systems through hardware–software co-design of efficient, real-time, high-performance, distributed MI implementations that meet security and safety requirements

2.4. The MSECE Graduate Curriculum

MSECE students, and PhD-BE students completing their MSECE requirements, must understand three course categories:

Fundamental Courses

Each concentration has four essential courses that provide fundamental, concentration-specific knowledge. Students must complete at least two of these four.

Concentration Courses

These courses provide depth of knowledge in one of the three MSECE concentrations. Concentration courses for each concentration are listed starting in section 12. Fundamental, Concentration and Excluded Courses. Concentration courses can be found in the [Northeastern Catalog](#) as well. Note that fundamental courses are a subset of concentration courses and some courses belong to multiple concentrations.

Which courses count depends on matriculation year: a course listed as a concentration course in the GPG for a student's matriculation year, or any later year, counts as a concentration course. Concentration courses may be offered by ECE or a different department. No petition is required to register for a listed concentration course, ECE or non-ECE.

A non-ECE course that is not on the list may still count as a concentration course if its subject matter is closely related to the student's concentration — but only after a petition is filed and approved before registration.

Excluded Courses

These courses cannot be selected as part of the MSECE program and, therefore, cannot be petitioned. These are generally non-ECE courses. Please see Section 12 for the list of excluded courses.

3. Checklist for MSECE Course-only Track (MSC) Students

Use this checklist to track your progress toward the MSECE course-only track:

1. Read this document thoroughly. If in doubt, contact your academic advisor in GSE. You need 32 SH of graduate-level coursework to graduate; details below.
2. **Fundamental Course Requirements:** Take at least two (8SH) of the four fundamental courses listed from your concentration in Section 12.
3. **Concentration Requirements:** Take and successfully complete at least six concentration courses for your concentration (24 SH) — see Section 12 or the NU Catalog for your matriculation year. Any fundamental course you take also counts as a concentration course.
4. Non-ECE courses are capped at 3 (12 SH) for CSYS, CVLA, and HSMI students. If you cannot register for a planned non-ECE course, contact that department directly.
5. You may register once in EECE 6400 (Special Problems in ECE, 1–4 SH) in your MSECE program. Registration in this course requires the approval of a faculty member. If no section of EECE 6400 is available under the name of the approving faculty member, the student should fill out a Registration Override Request ([ROR](#)) to request the creation of a section. If there is a section in the schedule, the student can register after submitting and receiving the approval of an override form (see Section 7).
6. Course-only track students may register once in 4 SH of EECE 7945 (Master's Project) as part of their concentration courses. Registration in this course requires the approval of a faculty member. Any tenured, tenure-track, affiliated, research, or teaching ECE faculty can serve as your project advisor (see the [ECE faculty directory](#)). If no section of this course exists under the name of the approving faculty member, the student should complete an [ROR](#) to request the creation of a section. If a section already exists in the schedule, the student can register after submitting and receiving the approval of an override for (see Section 7).
7. Up to 9 SH of graduate-level coursework can be transferred from other institutions, subject to approval of the Graduate Affairs Committee (GAC) and requires filing a petition (see Section 7 on how to file a petition). Transfer courses require a grade of at least B and must not have counted towards a previous degree. For more details, see Section 15.

4. Checklist for MSECE Thesis Track (MST) Students

Use this checklist to track your progress toward the MSECE thesis-course track:

1. If you do not have a research advisor, contact your GSE advisor. To graduate, you must complete 24 SH of graduate-level coursework plus 8 SH of thesis. The details are given below.
2. Find a thesis advisor - any tenured, tenure-track, teaching, research and affiliated ECE faculty member whose interests match yours and who agrees to serve as your thesis advisor. A list of ECE faculty can be found in the [ECE directory](#). After finding a research advisor, they will be your

faculty advisor. The deadline for finding a research advisor is one year after your matriculation at NU. If you cannot find a research advisor, you need to file a petition to change to MSECE course-only track (MSC). For details see Section 11.

3. **Fundamental Course Requirements:** Refer to the list of “fundamental courses” for your concentration. You will need to take at least two fundamental courses (8SH).
4. **Concentration Requirements:** Take and successfully complete at least six concentration courses (24 SH) for your concentration. see Section 22 or the NU Catalog for your matriculation year. Any fundamental course that you take, and your 8 SH of thesis work (EECE 7945 and EECE 7990), also count as concentration courses.
5. Non-ECE courses are capped at three (12 SH) for all concentrations. If you cannot register for a planned non-ECE course, contact that department directly.
6. Students may register once in EECE 6400 (Special Problems in ECE, 1–4 SH) in their MSECE program with the approval of a faculty member. If no section of EECE 6400 exists under the name of the approving faculty member, the student should fill out a Registration Override Request ([ROR](#)) to request the creation of a section. If there is a section in the schedule, the student can register after submitting and receiving the approval of an override form (see Section 7. Petition and Registration Override Procedures).
7. A maximum of 9 SH of graduate-level coursework can be transferred from other institutions. Transfer credit is subject to approval of the Graduate Affairs Committee (GAC) and requires filing a petition (see Section 7. Petition and Registration Override Procedures on how to file a petition). You need to have a grade of at least B in transfer courses. Courses previously counted towards obtaining a degree cannot be transferred. For more details, see Section 17.
8. **Thesis Requirements:** First, you must register for EECE 7945 (MS Project), then EECE 7990 (MS Thesis) in a subsequent semester, with the same advisor. Both require the approval of a faculty member. If there is no section of EECE 7945 or EECE 7990 available under the name of the approving faculty member, the student should fill out an [ROR](#) to request the creation of a section. If there is a section in the schedule, the student can register after submitting and receiving the approval of an override form (see Section 17).

Note 1: If you have not successfully defended your thesis after completing EECE 7945 and EECE 7990, register for EECE 7996 (MS Thesis Continuation, 0 SH). If no section exists under your advisor’s name, file an [ROR](#); otherwise submit an override request (Section 17). A [signature page](#) is required upon completing the MS thesis.

Note 2: Before defending, form a Thesis Committee with your advisor with at least three members, at least two of whom are ECE faculty. A letter grade is assigned to EECE 7945 on successful completion, and to EECE 7990 upon a successful defense. Announce your defense date and location at least one week in advance, using this [form](#).

Note 3: LATEX templates for writing MS thesis can be downloaded from [here](#). Microsoft Word templates are also available on the COE website. Ask your graduate advisor if you need assistance.

Note 4: If a student is unable to continue working with their original faculty member, they may transition to course-only track and either enroll in a remaining content courses to satisfy program requirements, or – if they have not already done so, register for EECE 6400 – Special Problems counting it toward their

Concentration requirement. EECE 6400 may only be taken once.

5. The MS in Artificial Intelligence (MSAI)

The MS in Artificial Intelligence gives students a comprehensive foundation in the algorithms, theory, and practical applications of a rapidly evolving field, preparing them to design, develop, and deploy AI systems across high-demand sectors. The core curriculum builds a solid grounding in both the theoretical and practical sides of AI.

Computer Vision concentration: Students gain the knowledge and skills to drive innovation at the intersection of emerging vision systems and AI, applying machine learning to image enhancement and restoration, object recognition, navigation, graphics rendering, and pattern classification.

Checklist for successful completion of the MSAI:

- Complete 32 SH of coursework.
- Complete at least 16 SH of Core Requirements from the approved list.
- Complete at least 8 SH of Concentration Courses from the approved list.
- Complete at least 4 SH of Elective courses from the approved list.
- Capstone: Complete EECE 7945 (Master's Project) with a supervising faculty member.

MS Project Requirements: Registration requires a faculty member's approval. If no section exists under the approving faculty member's name, file an [ROR](#) to have one created; if a section already exists, register after submitting and receiving an approved override.

6. TA/HCA Polices, Expectations, Support and Training

6.1 TA/HCA Onboarding and Training

- Initial Onboarding:** Faculty should meet with TAs and HCAs at the beginning of the semester to clearly define responsibilities, followed by an email outlining expected tasks and timelines.
- Training Materials:** Faculty provide lab assignments for review in advance, supply additional materials as needed (e.g., code templates, solutions, grading rubrics), involve lab technicians in training to ensure proper equipment handling, and when delegating grading furnish TAs/HCAs with complete solutions and rubrics
- Ongoing Training:** Regular TA/HCA meetings (1-2 times per week) to prepare for upcoming lab sessions. TAs and HCAs complete lab assignments in advance (approximately 2 hours per week) and should attend weekly office hours.

- D. **Professional Standards:** Faculty maintain patience, courtesy, reasonable flexibility on deadlines, and clear, professional communication in all interactions with TAs and HCAs.

6.2. TA/HCA Role Expectations

Eligibility and Compensation

- A. **Teaching Assistants (TAs):** PhD students only, support course instruction and assessment
- B. **Hourly Course Assistants (HCAs):** MS or undergraduate students only, not on Co-op, Paid hourly: 10, 15, or 20 hours per week (competitive positions), valuable work experience for CV/resume building and developing public speaking and professional skills

Core Responsibilities (Both TA and HCA's)

A. **Office Hours**

- Hold regular office hours at specified times and locations
- Provide 1:1 or group academic support to students
- Serve as a more approachable resource for students

B. **Course Material Preparation**

- Prepare course materials in advance
- Build projects and examples for class demonstrations
- Assist with laboratory setup and instructional materials

C. **Student Support**

- Act as a buffer between students and professors
- Respond to student questions in a timely manner
- Provide opportunities for student engagement

D. **Attend course lectures**

- If required by the course instructor

TAs Specifically: may lead labs or discussion sections, administer exams and quizzes, hold full grading responsibility, and monitor student progress throughout the semester.

HCAs Specifically: focus on peer support and course-material development, with limited grading responsibility. (Undergraduate HCAs are discouraged from grading other undergraduates' work.) The emphasis is on building teaching and mentoring experience.

6.4 Expected Learning Outcomes

Accountability and self-management: strong organization and time management; consistent office hours; ongoing communication with the supervisor about workload; effective multitasking and prioritization; prompt responses to requests (grading, meetings, Canvas updates); ownership of assigned work; proactively seeking and offering help; adherence to the course outline and schedule; punctuality and reliability.

Oral and written communication: effective communication across diverse audiences; accurate, enthusiastic delivery of course content; active listening; courtesy and patience; clear communication calibrated to the audience; constructive feedback to colleagues on request; composure under stress.

Quality of work: thorough, accurate, well-organized work; consistent deadlines; prompt responses; high, consistent performance; openness to constructive criticism; FERPA-compliant confidentiality; respect for academic integrity and university policy; clear assignment instructions; preparedness for each session.

Subject knowledge and learning ability: quick uptake of new course content; interest in teaching pedagogy; timely, accurate answers to student questions; comfort with relevant technologies (Canvas, PowerPoint, Excel, lab hardware/software); staying current in the field.

Teaching and presentation ability: effective monitoring and evaluation of student progress; appropriate use of approved materials; competent exam/lab administration; creating opportunities for engagement; a team-oriented attitude; attendance at required sessions; strong working relationships across diverse groups; responsiveness to student perspectives.

Professional development benefits: both TAs and HCAs gain practical teaching and mentoring experience, professional communication skills, public-speaking opportunities, time-management expertise, experience with diverse student populations, and credentials for future academic or professional positions.

7. Petition and Registration Override Procedures

- Petitions/overrides for taking courses must be filed and approved **before** registration in the course.
- Filing a petition/override does not mean that it will be approved, you need to receive the approval to go ahead.
- Please file your petitions/overrides well in advance. Processing a petition/override takes at least 5 business days.

To file a petition or overrides form go to the [Graduate Forms](#) page and click on the relevant link to file a petition or override request. Make sure that you attach your transcripts to your petitions. Petitions without a transcript will not be processed.

The Graduate school uses Adobe Signature for all forms. Students must complete and submit the form to the Assistant Director of Academic Programs. PhD students and MS-Thesis students should also copy their research advisor (if applicable). If approved, the form will be sent to the Graduate School for review. When the form is complete, a copy will be emailed to the student for their records, and a copy will be placed in their student e-folder. For questions contact the Graduate School at coe-seattle-gradadvising@northeastern.edu

8. Probation Policies and Procedures

See the College of Engineering's [Probation Policies](#) page for details.

9. Coop and Internship Policies and Procedures

Coop and internship are forms of CPT (Curricular Practical Training) that allow full-time students to integrate a practical learning experience into their graduate program. For details, see the [Graduate Coop](#) page.

10. Policies and Procedures for Course Transfer

MS Programs (MSECE, MSRobo) students can transfer up to 9 SH, 14SH, and 4SH (or equivalent) respectively, from other institutions, respectively. (4 SH of course work is defined as 45 hours of lecture). Credit transfer requires:

- a grade of at least B (or equivalent) in the course.
- The course was not part of the requirements of a degree received by the student in the past.
- The course will be reviewed by the Graduate Affairs Committee as a valid graduate-level course.
- The credit was earned within five academic years of matriculation.

The request a transfer file a petition (section 10) with your the transcript showing the grade and term, the detailed syllabus of the course, and evidence the course was not counted towards a degree (noted on the transcript).

11. Policies and Procedures for Requesting Change in the Graduate Program

Changes to your graduate program generally require completing at least one semester at Northeastern, giving you time to make an informed decision. The one exception — a change from full-time to part-time, or vice versa — can be requested during the first semester but does not apply to F-1 visa holders.

- Change from FT to PT or PT to FT. This is the only change that can be petitioned during the first semester. To request this change you need to file a Standard Petition (Section 7).
- Change of concentration for MS students (MSC and MST): Requires a minimum 3.00 cumulative GPA. Students cannot apply if they have passed more than 16 SH (Introduction to Cooperative Education does not count toward this 16 SH limit). Students must have completed 4 SH with grade A, or 8 SH with an average grade of 3.5 or better in the target concentration. To request a change in your concentration, complete the Change of Concentration form [here](#). After approval, file a petition for the change (Section 7).
- Change from MST to MSC: This is done by filing a petition (see Section 7) after finishing at least one semester at NU.
- Change from MSC to MST: In addition to filing a petition (see Section 7) the student needs the approval of an ECE faculty (tenured/tenure track, emeritus, affiliated, or adjunct) to be their thesis advisor. Either the signature of the advisor must be on the petition or a letter from the advisor must be attached to the form.

For International Students Only: An approved change of program requires that a new I-20 be issued. It is the student's responsibility to initiate the I-20 process. Instructions are provided on the official admission acceptance letter. Direct questions to OGS.

Plus-One Students: may request a change in their concentration through their PlusOne advisor.

12. Fundamental, Concentration and Excluded Courses

Each subsection below lists the four fundamental courses and the full set of concentration courses for one of the seven MSECE concentrations. Fundamental courses are a subset of concentration courses; a course may appear under more than one concentration.

Computer Systems and Software (CSYS)

Fundamental Courses:

Course	Credits
EECE 5640 High Performance Computing	4 SH
EECE 7205 Fundamentals of Computer Engineering	4 SH
EECE 7352 Computer Architecture	4 SH
EECE 7376 Operating Systems: Interface and Implementation	4 SH

Concentration Courses:

Course	SH	Notes
EECE 5552 Principles of Assistive Robotics	4	
EECE 5640 High Performance Computing	4	
EECE 5643 Simulation and Performance Evaluation	4	
EECE 5698 Special Topics: Cyber-Physical Security of IoT Systems in the Age of AI	4	
EECE 5698 Special Topics: Field Programmable Gate Arrays in the Cloud	4	
EECE 5698 Special Topics: Nano-Computing System Design	4	
EECE 5699 Computer Hardware and System Security	4	
EECE 6400 Special Problems in ECE	4	(For MSECE students only)
EECE 7205 Fundamentals of Computer Engineering	4	
EECE 7352 Computer Architecture	4	
EECE 7353 VLSI Design	4	
EECE 7368 High-Level Design of Hardware & Software Systems	4	
EECE 7376 Operating Systems: Interface and Implementation	4	
EECE 7390 Computer Hardware Security	4	
EECE 7398 Special Topics: Advanced Computer Architecture	4	
EECE 7398 Special Topics: Compilers	4	
CS 5200 Database Systems Management	4	
CS 5500 Foundations of Software Engineering	4	
CS 5600 Computer Systems	4	
CS 6410 Compilers	4	
CS 6510 Advanced Software Development	4	
CS 6650 Building Scalable Distributed Systems	4	

Computer Vision, Machine Learning, and Algorithms (CVLA)

Fundamental Courses:

Course	SH
EECE 5554 Robotics Sensing and Navigation	4
EECE 5644 Introduction to Machine Learning and Pattern Recognition	4
EECE 7205 Fundamentals of Computer Engineering	4
EECE 7352 Computer Architecture	4

Concentration Courses:

Course	SH
EECE 5360 Combinatorial Optimization	4
EECE 5512 Networked XR System	4
EECE 5550 Mobile Robotics	4
EECE 5554 Robotics Sensing and Navigation	4
EECE 5555 Formal Methods for Robotics and Control	4
EECE 5612 Statistical Inference: An Introduction for Engineers and Data Analysts	4
EECE 5614 Reinforcement Learning and Decision Making Under Uncertainty	4
EECE 5626 Image Processing and Pattern Recognition	4
EECE 5639 Computer Vision	4
EECE 5640 High Performance Computing	4
EECE 5642 Data Visualization	4
EECE 5644 Introduction to Machine Learning and Pattern Recognition	4
EECE 5645 Parallel Processing for Data Analytics	4
EECE 5668 Large Language Models	4
EECE 5698 Special Topics: Autonomous AI Agent Systems: Design and Engineering	4
EECE 5698 Special Topics: Cyber-Physical Security of IoT Systems in the Age of AI	4
EECE 5698 Special Topics: Formal Methods of Dynamical Systems	4
EECE 5698 Special Topics: Robot System Server	4
EECE 5698 Special Topics: Visual Sensing & Computing Co-Design Edge Machine Perception	4
EECE 6400 Special Problems in ECE	4
EECE 7150 Autonomous Field Robotics	4
EECE 7204 Applied Probability and Stochastic Processes	4
EECE 7205 Fundamentals of Computer Engineering	4
EECE 7215 Introduction to Distributed Intelligence	4
EECE 7223 Riemannian Optimization	4
EECE 7268 Verifiable Machine Learning	4
EECE 7311 Two-Dimensional Signal and Image Processing	4
EECE 7315 Digital Image Processing	4
EECE 7323 Numerical Optimization Methods	4
EECE 7337 Information Theory	4
EECE 7345 Big Data and Sparsity in Control, Machine Learning and Optimization	4
EECE 7346 Probabilistic System Modeling and Analysis	4
EECE 7352 Computer Architecture	4
EECE 7370 Advanced Computer Vision	4
EECE 7373 Machine Learning with Small Data	4
EECE 7397 Advanced Machine Learning	4
EECE 7398 Special Topics: Advances in Deep Learning	4

EECE 7398 Special Topics: Bayesian Filtering and Tracking	4
EECE 7398 Special Topics: Deep Learning for Embedded Systems	4
EECE 7398 Special Topics: Distributed Intelligence	4
EECE 7398 Special Topics: Flexible Robotics	4
EECE 7398 Special Topics: Human Centered Computing	4
EECE 7398 Special Topics: Model-Based Deep Learning for Signal and Image Processing	4
EECE 7398 Special Topics: Security in Large-Scaled Learning-Enabled Systems	4
CS 5100 Foundations of Artificial Intelligence	4
CS 6200 Information Retrieval	4
CS 6220 Data Mining Techniques	4
CS 7800 Advanced Algorithms	4
DS 5110 Essentials of Data Science	4
DS 5983 Topics in Data Science	4

Hardware, Software, for Machine Intelligence (HSMI)

Fundamental Courses:

Course	SH
EECE 5644 Introduction to Machine Learning and Pattern Recognition	4 SH
EECE 7205 Fundamentals of Computer Engineering	4 SH
EECE 7352 Computer Architecture	4 SH
EECE 7353 VLSI Design	4 SH

Concentration Courses:

Course	SH
EECE 5512 Networked XR System	4 SH
EECE 5550 Mobile Robotics	4 SH
EECE 5552 Assistive Robotics	4 SH
EECE 5554 Robotics Sensing and Navigation	4 SH
EECE 5555 Formal Methods for Robotics and Control	4 SH
EECE 5612 Statistical Inference: An Introduction for Engineers and Data Analysts	4 SH
EECE 5614 Reinforcement Learning and Decision Making under Uncertainty	4 SH
EECE 5639 Computer Vision	4 SH
EECE 5640 High-Performance Computing	4 SH
EECE 5641 Introduction to Software Security (Students taking EECE 5641 can't receive credit for CY 5770)	4 SH
EECE 5642 Data Visualization	4 SH
EECE 5643 Simulation and Performance Evaluation	4 SH
EECE 5644 Introduction to Machine Learning and Pattern Recognition	4 SH
EECE 5645 Parallel Processing for Data Analytics	4 SH

EECE 5668 Large Language Models	4 SH
EECE 5698 Special Topics: Autonomous AI Agent Systems: Design and Engineering	4 SH
EECE 5698 Special Topics: Cyber-Physical Security of IoT Systems in the Age of AI	4 SH
EECE 5698 Special Topics: Field Programmable Gate Arrays in the Cloud	4 SH
EECE 5698 Special Topics: Formal Methods for Dynamical Systems	4 SH
EECE 5698 Special Topics: Robot System Server	4 SH
EECE 5698 Special Topics: Visual Sensing & Computing Co-Design Edge Machine Perception	4 SH
EECE 5699 Computer Hardware and System	4 SH
EECE 7150 Autonomous Field Robotics	4 SH
EECE 7204 Applied Probability and Stochastic Processes	4 SH
EECE 7205 Fundamentals of Computer Engineering	4 SH
EECE 7215 Introduction to Distributed Intelligence	4 SH
EECE 7268 Verifiable Machine Learning	4 SH
EECE 7323 Numerical Optimization Methods	4 SH
EECE 7337 Information Theory	4 SH
EECE 7345 Big Data and Sparsity in Control, Machine Learning, and Optimization	4 SH
EECE 7346 Probabilistic System Modeling and Analysis	4 SH
EECE 7352 Computer Architecture	4 SH
EECE 7353 VSLI Design	4 SH
EECE 7368 High-Level Design of Hardware-Software Systems	4 SH
EECE 7370 Advanced Computer Vision	4 SH
EECE 7373 Machine Learning with Small Data	4 SH
EECE 7390 Computer Hardware Security	4 SH
EECE 7393 Analysis and Design of Data Networks	4 SH
EECE 7397 Advanced Machine Learning	4 SH
EECE 7398 Special Topics: Advances in Deep Learning	4 SH
EECE 7398 Special Topics: Bayesian Filtering and Tracking	4 SH
EECE 7398 Special Topics: Deep Learning Embedded Systems	4 SH
EECE 7398 Special Topics: Flexible Robotics	4 SH
EECE 7398 Special Topics: Human Centered Computing	4 SH
EECE 7398 Special Topics: Legged Robotics	4 SH
EECE 7398 Special Topics: Model-Based Deep Learning for Signal and Image Processing	4 SH
IE 5360 Digital Manufacturing	4 SH
CS 5180 Reinforcement Learning and Sequential Decision Making	4 SH
CS 5335 Robotic Science and Systems	4 SH
CS 7340 Theory and Methods in Human Computer Interaction	4 SH
MATH 7233 Graph Theory	4 SH

Only MSECE+LC students can take EECE 7440 and EECE 7442. They should coordinate with the Gordon Institute of Engineering Leadership.

Excluded Courses for All Concentrations

Excluded courses **cannot be used toward the MSECE program** and cannot be petitioned - any petition to take these courses will be automatically rejected. PhD students can register in excluded courses, if their advisor recommends, but if they want to receive an MSECE degree on their way to PhD, they cannot count these courses as part of their MSECE course requirements.

Excluded courses fall into three groups:

1. Courses offered by the Software Engineering and Information Systems (SEIS) program with prefixes INFO, DAMG, CSYE, TELE
2. Courses offered by the engineering leadership programs ALIGN courses in the Khoury College of Computer Sciences.
3. The following CS courses:

Course	Credits
CS 5010 Programming Design Paradigm	4SH
CS 5320 Digital Image Processing	4SH
CS 5330 Pattern Recognition and Computer Vision	4SH
CS 5340 Computer/Human Interaction	4SH
CS 5520 Mobile Application Development	4SH
CS 5610 Web Development	4SH
CS 5700 Computer Networks	4SH
CS 5800 Algorithms	4SH
CS 6140 Machine Learning	4SH
CS 6350 Empirical Research Methods	4SH
CS 6710 Wireless Networks	4SH
EECE 5314 Intro to Linear Algebra and Probability in Data Science 4	4SH

Excluded Courses do not apply to MSROB.

13. Master of Science in Artificial Intelligence (MSAI)

Core Requirements

Course	Title	SH
EECE 5644	Machine Learning and Pattern Recognition	4 SH
or DADS 7275	Machine Learning and Data Analytics	4 SH
DS 5020	Introduction to Linear Algebra and Probability for Data Science	4 SH
or DADS 5200	Mathematics of Machine Learning	4 SH

CS 5130	Applied Programming and Data Processing for AI	—
CS 5100	Foundations of Artificial Intelligence	4 SH

Concentration Course List

Course	Title	SH
EECE 5639	Computer Vision	4 SH
EECE 5642	Data Visualization	4 SH
EECE 7370	Advanced Computer Vision	4 SH

Elective Course List

Course	Title	SH
EECE 5550	Mobile Robotics	4 SH
EECE 5554	Robotics Sensing and Navigation	4 SH
EECE 5614	Reinforcement Learning and Decision Making Under Uncertainty	4 SH
EECE 5640	High Performance Computing	4 SH
EECE 5645	Parallel Processing for Data Analytics	4 SH
EECE 6400	Special Problems in Electrical and Computer Engineering	1–4 SH
EECE 7397	Advanced Machine Learning	4 SH
EECE 7398	Special Topics: Machine Learning with Small Data	4 SH

Capstone

Course	Title	SH
EECE 7945	Master's Project	4. SH

14. Grading Guide for Special Graduate Courses

These courses require registration override signed by the instructor/advisor:

Course #	Course Title	Credits	Grading	Comments
EECE 6400*	Special Problems in ECE	4 SH	A to C- or F	Can be taken once as a MSECE or PhD-BE student.
EECE 7400*	Special Problems in ECE	4 SH	A to C- or F	Can only be taken once as a PhD-AE student.
EECE 7945*	Master's Project	4 SH	A to C- or F	Can only be taken once in MSECE program or as the first part of MST.

EECE 7990*	Master's Thesis	4 SH	A to C– or F	Can only be taken once. Second part of MST track.
EECE 7996* (can only be taken once)	Master's Thesis Continuation	0 SH	S/U	For students who, after completion of EECE 7945 and EECE 7990, have not yet defended their MS thesis. Does NOT maintain FT status – counts as PT* equivalent

Please note the following:

- During an internship, students must be enrolled in either:
 - ENGR 9700 (Full-time Internship, 0 SH, FT** equivalent), or
 - ENGR 9702 (Part-time Internship, 0 SH, PT* equivalent) plus 4 SH of coursework, or one of: EECE 9986 (Research), EECE 9990 (Dissertation 1), EECE 9991 (Dissertation 2), or EECE 9996 (Dissertation Continuation) — each 0 SH, FT** equivalent.
- To register for an ENGR course, contact coe-phd-gradadvising@northeastern.edu.
- Students on Co-op must enroll in EECE 6964 (Coop Work Experience, 0 SH, FT** equivalent) or EECE 6954 (0 SH, PT* equivalent).
- In summer, register for these courses under Full Summer, not Summer 1 or 2.
- Continuing PhD students who have passed EECE 9991 must register for EECE 9996 (0 SH, FT equivalent) every semester.

(*) If a section exists under the advisor's name, register by filing an override form with the instructor/advisor's signature. If no such section exists, complete a [Registration Override Form](#) to request one, or contact their Program Contact. Taken alone, a starred course does not confer FT status

— combine it with another course to reach 8 SH for the semester.

(**) Registration in this course is equivalent to full-time registration.

15. Course Registration Frequently Asked Questions

If you run into a registration issue, check here first. For anything else, contact your academic advisor

Q: I received a registration error.

A: Please complete a [Registration Override Request](#). Be sure to include your transcripts to the request.

Q: I received a "College" error when registering for a CS or CY course.

A: Khoury students have priority to these courses, as ECE students are given priority to EECE courses. You will need to fill out the [Khoury Elective Form](#) for these courses.

Q: I need to register for a MS Project, MS Thesis, or Research course.

A: Please fill out an [Override Request Form](#). This grants access to register and inform the Program Contact to create a section if needed.

Q: I have questions regarding tuition, financial aid, or financial holds.

A: Please contact Student Financial Services: sfs@northeastern.edu

Q: Can I audit a course?

A: Generally yes, at the instructor's discretion. You can download an [audit form](#) from the Registrar's website, have the instructor sign off if they approve, and then you can bring it directly to the Registrar. Please note that auditing courses is permitted in the Fall and Spring semesters, but not in the summer.

16. Useful Links

General Information

- [Academic Integrity Policies](#)
- [Code of Student Conduct](#)
- [COE Coop Eligibility Page](#)
- [COE Policies and Procedures](#)
- [COE Probation Policies](#)
- [Course Descriptions](#)
- [ECE Department website](#)
- [ECE Graduate Studies website](#)
- [Gordon Leadership Program](#)
- [Graduate School of Engineering](#)
- [NU Graduate Catalog](#)
- [NU Graduate Student Government](#)
- [Official University Academic Calendars](#)
- [Registrar's Office](#)
- [University Health and Counseling Services](#)
- [Office of Global Services \(OGS\)](#)

Forms

1. [Announcement form for MS Thesis Defense, PhD Proposal Review, or Dissertation Defense](#)
2. [COE Forms \(petition, registration override, ...\)](#)
3. [PhD Dissertation Proposal Review Form](#)
4. [PhD Proposal Review Approval Form](#)
5. [Individual Instruction Registration Request](#)
6. [LATEX templates for MS thesis and PhD Dissertation](#)
7. [PhD Committee Form](#)
8. [PhD Committee Form – Submission Link](#)
9. [PhD Research Advisor Form](#)
10. [PhD Research Advisor Form- Submission Link](#)
11. [Qualifying Exam Proposal Form](#)
12. [Various ECE Forms](#)