

Electrical & Computer Engineering

Master of Science Graduate Program Manual

2026-2027

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Welcome

Dear Students,

As Assistant Chair and Associate Professor in the Department of Electrical and Computer Engineering (ECE), and Director of the MS Programs in ECE at Northwestern University, I am delighted to welcome you to our community.

Northwestern University's master of science programs in Electrical Engineering and Computer Engineering prepare students to lead the next wave of technological innovation. Here, you will explore the grand challenges and transformative opportunities of our time — from artificial intelligence, quantum technologies, and advanced semiconductors to robotics, autonomous systems, and the technologies that will power the future of exploration and human discovery.

Our faculty are internationally recognized pioneers whose work spans disciplines and connects fundamental science with real-world impact. Through collaborations across Northwestern, with national laboratories, and with industry leaders around the globe, you will have the opportunity to contribute to research that is redefining what is possible.

As an MS student, you will join a vibrant community of scholars and innovators, benefit from close mentorship, and gain the knowledge and experience to shape the technologies that will define the decades ahead.

We are excited to support your journey and look forward to seeing the ideas, discoveries, and innovations you will bring to the world. Welcome to Northwestern University!

Sincerely,

David Zaretsky

Assistant Chair & Associate Professor
Director of MS Programs
Department of Electrical & Computer Engineering
Email: david.zaretsky@northwestern.edu

Overview

This manual provides detailed information about the educational opportunities in the electrical engineering program. It includes descriptions of our curricula, milestones, processes, and information about our faculty, facilities, services, and student activities. The handbook is in full compliance with the guidelines provided by The Graduate School (TGS) and often refers to sources available at their website.

Graduate Studies in Electrical and Computer Engineering

Northwestern University offers outstanding graduate study in both Electrical Engineering (EE) and Computer Engineering (CE), providing students with opportunities to pursue research and innovation at the forefront of technology.

Electrical Engineering encompasses a diverse range of research areas that combine foundational depth with technological innovation. These include signals and systems, communications, control, photonics, solid-state electronics, quantum technologies, and advanced device and circuit design. Our faculty are actively engaged in research spanning information processing, intelligent sensing, dynamic system control, and the development of next-generation semiconductor, photonic, and quantum systems.

Computer Engineering is a joint program between the Department of Computer Science and the Department of Electrical and Computer Engineering. CE faculty pursue a broad spectrum of research in computing systems and intelligent technologies, including computer architecture, computer systems, operating systems, compilers, parallel and distributed systems, high-performance computing, data mining, artificial intelligence and machine learning, big data science and applications, integrated circuits and VLSI, mixed-signal circuit design, design automation, formal methods, embedded and real-time systems, mobile and wearable computing, the Internet of Things, cyber-physical systems, database systems, and reconfigurable computing.

The interdisciplinary interests of our faculty foster extensive collaborations across Northwestern, with the Feinberg School of Medicine, leading national laboratories — including Argonne National Laboratory, Fermi National Accelerator Laboratory, Sandia National Laboratories, and Oak Ridge National Laboratory — and industry partners worldwide. This collaborative environment enriches the graduate experience, enabling students to engage in transformative research and make meaningful contributions that extend well beyond the classroom.

Mission Statement

The graduate programs in Electrical & Computer Engineering provide education, technical expertise, skills, mentoring and opportunities to develop graduate students into independent and productive scholars, practitioners, and thought leaders in their chosen

area of specialization. The program offers a firm technical background to prepare graduate students for lifetime careers in academia and industry, guides them in the pursuit of original research and emerging fields, fosters intellectual curiosity, and prepares students for life-long learning to adapt in response to the needs of a rapidly changing world. The program also aims to develop the students' ethos as researchers and scholars, and promotes the effective oral and written communication of scientific concepts.

Learning Objectives and Assessment Strategies

The ECE MS program is designed to provide students with the technical knowledge, problem-solving skills, and professional capabilities needed to succeed in electrical and computer engineering careers. The learning objectives below define the core competencies students are expected to develop through coursework, projects, research experiences, and professional development activities. In alignment with The Graduate School's Assessment Initiative guidelines, these objectives are mapped to program milestones and include the assessment strategies used to evaluate student progress and achievement.

Learning objective(s)	Milestone/ Requirement/ Capacity	Assessment Strategies and Criteria
Demonstrate technical expertise and apply engineering principles to solve complex problems in electrical and computer engineering.	Coursework, technical projects, MS Thesis, MS Project, or other experiential learning activities	Assessment Strategy: Faculty evaluate student performance through coursework, projects, research activities, and degree milestones. Criteria: Successful completion of required coursework; demonstration of technical knowledge; ability to apply engineering concepts, tools, and methods to solve problems.

Design, implement, and evaluate engineering systems, algorithms, or solutions using appropriate methodologies.	MS Thesis, MS Project, course projects, research, and design experiences	Assessment Strategy: Faculty advisors and instructors evaluate technical design, implementation, analysis, and evaluation of student work. Criteria: Defines appropriate objectives; applies suitable methods and tools; demonstrates effective implementation; provides sound analysis and evaluation of results.
Conduct independent inquiry and contribute to technical innovation through research or advanced projects.	MS Thesis, MS Project, research experiences, advanced coursework	Assessment Strategy: Faculty advisors and committees evaluate the quality and impact of research or project outcomes. Criteria: Demonstrates independent problem-solving; develops innovative approaches; applies appropriate technical methodologies; advances understanding or capability within the field.
Communicate technical concepts and engineering results effectively in written and oral formats.	MS Thesis, MS Project report, technical reports, presentations, seminars, and professional communication activities	Assessment Strategy: Faculty evaluate written documents and oral presentations based on technical clarity and effectiveness. Criteria: Organizes technical information effectively; communicates ideas clearly; uses appropriate visual aids; explains methodologies and results; responds effectively to questions.

Apply ethical and professional standards in engineering practice and research.	Coursework, team projects, internships, research activities, and professional development experiences	Assessment Strategy: Faculty evaluate students' ability to consider ethical, societal, and professional responsibilities through coursework, projects, presentations, and experiential learning activities. Criteria: Recognizes ethical considerations in engineering decisions; applies professional standards and best practices; considers the broader societal impact of engineering solutions; demonstrates responsible and inclusive collaboration.
Collaborate effectively in interdisciplinary teams and professional environments.	Team projects, research groups, internships, and professional development activities	Assessment Strategy: Faculty advisors and instructors evaluate collaboration, teamwork, and professional engagement. Criteria: Communicates effectively with collaborators; contributes constructively to teams; manages responsibilities; demonstrates leadership and professionalism.
Develop professional goals and identify pathways for continued growth in engineering careers.	Academic advising, career development activities, internships, research experiences, and professional engagement	Assessment Strategy: Students develop and refine professional goals through advising and career development activities. Criteria: Identifies career objectives; engages in professional development opportunities; leverages academic and experiential learning to achieve career goals.

Personnel

Graduate Advisors

Graduate students are expected to discuss all academic issues with their advisors first, in an open and constructive manner. Help with administrative aspects is provided by the ECE Graduate Affairs Coordinator (Tech Institute Room L359, ecegrad@northwestern.edu) The Graduate Affairs Coordinator can advise students on the best course of action, and promptly take the measures needed toward the successful completion of the student's graduate degree.

In addition, graduate students may discuss questions regarding academic matters, degree requirements, or disputes with advisors or committee members with the Director of the MS Program, Prof. David Zaretsky (david.zaretsky@northwestern.edu).

Finally, sometimes (albeit, infrequently) complex situations arise in academic life that may require the consultation and direct involvement of [The Graduate School](#) (TGS). Additional information on TGS appears in the next section of the handbook.

Core Faculty

Our world-renowned faculty are internationally recognized leaders whose pioneering research spans artificial intelligence and machine learning, computing and systems, intelligent systems, networks and data visualization, and quantum and nanoengineering. Through exceptional teaching, mentorship, and groundbreaking scholarship, they provide students with unparalleled opportunities to engage in discoveries and innovations that are shaping the future of electrical and computer engineering.

The ECE faculty list and profiles can be found on the ECE website at:

<https://www.mccormick.northwestern.edu/electrical-computer/people/faculty.html>

The core Computer Engineering faculty can be found at:

<https://www.mccormick.northwestern.edu/electrical-computer/people/core-computer-engineering-faculty.html>

The core Electrical Engineering faculty can be found at:

<https://www.mccormick.northwestern.edu/electrical-computer/people/core-electrical-engineering-faculty.html>

Affiliated Faculty

In addition to the core ECE faculty, the department maintains strong connections and interactions with other affiliated faculty that are world-renowned experts in their respective fields. The Affiliated Faculty can be found on the ECE website at:

<https://www.mccormick.northwestern.edu/electrical-computer/people/affiliated.html>

Program Resources

The program, the ECE department, the McCormick School of Engineering and Applied Science, and the University offer a wealth of resources to assist graduate students in their academic life.

Graduate Student Progress (GSP) Portal

The [Graduate Student Progress](https://gsp.northwestern.edu/) (GSP) portal (<https://gsp.northwestern.edu/>) is the online portal used to record and manage the student's progress through the graduate program. GSP lists the major program requirements, completed coursework and unofficial transcripts, course plans, advisor, committee members, specializations, etc. GSP can also be used by the student to formally invite faculty members to serve in the student's committee, submit degree completion forms, etc.

Course Planning Resources

Graduate students should regularly check the ECE and other departments' courses webpages when planning the courses to be taken in the subsequent quarters, discuss their course plan with their academic advisor, and populate the data in GSP. The schedule and descriptions for ECE courses can be found online at <https://www.mccormick.northwestern.edu/electrical-computer/courses/>.

Students can register for courses using CAESAR (<https://www.caesar.northwestern.edu/>). Courses approved for credit by The Graduate School are courses with a Career Course of "The Graduate School", as designated in CAESAR.

The Graduate School (TGS)

Every graduate student is assigned a counselor at TGS. The counselor monitors overall academic progress from the standpoint of TGS-based milestones, along with a satisfactory GPA, etc. Please be advised that most of the forms that concern completion of milestones are subject to a final approval by TGS in addition to being approved by the student's academic advisor. TGS is located at 633 Clark Street in Evanston, and its webpage (<https://www.tgs.northwestern.edu/>) contains a wealth of information pertaining to various aspects of students' life.

Northwestern University Graduate Faculty

The faculty of The Graduate School is drawn from the faculties of colleges or schools of the University which have placed the administration of part (or all of the graduate work) under

the control of The Graduate School. Information on membership to the Northwestern University Graduate Faculty can be found at <https://www.tgs.northwestern.edu/about/faculty/>.

Other Resources

Other useful information (e.g., forms, job postings, announcements of visits by companies/recruiters, seminars, etc.) is posted at <https://www.mccormick.northwestern.edu/electrical-computer/resources/>.

Services

In addition to the world-class educational opportunities to work with top faculty while accessing a wealth of facilities, research labs, and libraries for intellectual growth, Northwestern University offers a variety of services which can assist different aspects of student life.

Wildcard

The Wildcard is your photo identification card and can be used in almost every place that needs an identity verification on campus (library, recreational facilities, Norris University Center, campus, intercampus bus transit, etc.). It is issued by the Wildcard office in Norris University Center, underground level, Evanston campus, and at the University Services (support services) office in Abbott Hall, Room 100, Chicago campus. Lost or stolen ID cards are replaced for a fee. Broken or damaged cards will be replaced at no charge (providing the damaged card is returned). For more information, visit <https://www.northwestern.edu/wildcard/>.

Transportation

There are three basic types of services available:

- Shuttle: there are several shuttle buses that operate in each of the Chicago and Evanston campuses (and between the two) upon presentation of a valid Wildcard. Detailed information is available at <https://www.northwestern.edu/userservices/transportation/shuttles/>.
- U-Pass: this is a collaboration between Northwestern and Chicago Transit Authority (CTA) based on Ventra (<https://www.tgs.northwestern.edu/services-support/transportation/upass-faq.html>) a contactless payment fare card and system that serves as a U-Pass. The card is issued at the beginning of every academic year, and can be used 365 days a year on all CTA buses and trains.

Health Services

Northwestern University provides a basic outpatient care and other primary-care services, and there are facilities in both Evanston and Chicago campuses. The Evanston location is at 633 Emerson Street (Searle Building). Per TGS regulations, every graduate student is legally required to have health insurance coverage. One may opt out of this coverage, as long as there is a proof of sufficient alternate coverage for the entire duration of graduate studies. In case of life-threatening or severe emergencies call 911 to summon paramedics, or go to the nearest hospital emergency room. If in need of urgent after-hours medical care, call 847-491-8100. More information can be found at the Health Services website at <https://www.northwestern.edu/healthservice-evanston/>.

Counseling and Psychological Services (CAPS)

CAPS provides a set of core mental health services on campus, including clinical services, educational workshops, and consultation with faculty and staff as needed. Services are free for all students and available on both the Evanston (633 Emerson St) and Chicago campuses (710 N. Lake Shore Drive, Abbott Hall, 5th Floor, Suite 500; 847-491-2151 <https://www.northwestern.edu/counseling/>).

Personal Safety

Students should always be aware of their surroundings and avoid areas that have indication of being a potentially non-safe environment (e.g., poorly lit walkways and alleys at night). The University Police is on duty 24/7 and they are located at 1200 Davis St. in Evanston. In the case of emergency, always dial 911. Note that there are blue-light poles distributed across the University, which can also be used to contact the University police. The non-emergency contact number is 847-491-3456.

Office of International Student and Scholar Services (OISS)

The OISS is available to all the international students and its primary two roles are: (a) to provide guidance and advise for maintaining proper immigration status consistent with the laws of the United States; (b) to ensure compliance with those laws and help the students with various forms, such as OPT (Optional Practical Training) and CPT (Curriculum Practical Training). The OISS is located at 630 Dartmouth Place. More information is available at <https://www.northwestern.edu/international/>. OISS staff can be contacted via phone at 847-491-5613 or via email to intoff@northwestern.edu. Your OISS advisor is assigned by your last/family/surname, please visit the staff page to find yours: <https://www.northwestern.edu/international/about/our-staff/index.html>.

AccessibleNU

Northwestern University and the ECE Department are committed to providing an accessible, supportive and challenging environment for all undergraduate, graduate, professional school, and professional studies students with disabilities who attend the University. AccessibleNU works with our faculty to provide students with disabilities a learning and community environment that affords them full participation, equal access, and reasonable accommodation.

Any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU (accessiblenu@northwestern.edu; 847-467-5530) and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. More information on AccessibleNU can be found at <https://www.northwestern.edu/accessiblenu/>.

Postal Services

Mailboxes maintained by the staff are provided for all graduate students for university-related postal- mail and packages only (not for personal use) and are located in the ECE Main Office. Each student is expected to show their WildCard upon pickup, and may only pick up their own mail, not that of another student. It should be made a matter of a habit to check for such mail at least once a month. Our mailing address is:

Department of Electrical and Computer Engineering
McCormick School of Engineering
2145 Sheridan Road, Rm L359
Evanston, IL 60208, USA

The Graduate School (TGS) Resources

The Graduate School (TGS) offers a wide range of resources to support graduate students' academic, professional, and personal success. These include professional development programs, health and wellness services, academic support, legal assistance, international student services, and family resources such as parental leave and childcare grants. TGS also provides guidance on housing, transportation, and opportunities to engage in the vibrant campus and community life in Evanston and Chicago. Visit www.tgs.northwestern.edu for details on these and other resources.

ECE Departmental Resources

Graduate students are expected to discuss all academic issues with their advisers first, in an open and constructive manner. Further help with academic issues is provided by the ECE Graduate Student Affairs Coordinator (Tech, Rm L359; ecegrad@northwestern.edu). The staff in the Graduate Office is experienced and can advise you on the course of action and promptly take the measures needed towards successful completion of your degree.

Mailboxes maintained by the staff are provided for all graduate students for university-related postal mail and packages only (not for personal use) and are located in the ECE Main Office (L359). Each student is expected to show their Wildcard upon pickup, and may only pick up their own mail, not that of another student. It should be made a matter of a habit to check for such mail at least once a month.

The information about our courses is available at: <https://www.mccormick.northwestern.edu/electrical-computer/courses/>

Graduate students should make it a habit of checking the above webpage when planning the courses to be taken in the subsequent quarters, and then proceed with a discussion with the respective academic advisers, and populating the data in the [Graduate Student Progress](#) (GSP) portal.

Other useful information (e.g., forms, job posting, announcements of visits by companies/recruiters, etc.) can be found at: <https://www.mccormick.northwestern.edu/electrical-computer/>

ECE organizes various social events throughout the academic year for which announcements via email are made regularly.

Nondiscrimination Statement

Northwestern University does not discriminate or permit discrimination by any member of its community against any individual on the basis of race, color, religion, national origin, sex, pregnancy, sexual orientation, gender identity, gender expression, parental status, marital status, age, disability, citizenship status, veteran status, genetic information, reproductive health decision making, or any other classification protected by law in matters of admissions, employment, housing, or services or in the educational programs or activities it operates.

Harassment, whether verbal, physical, or visual, that is based on any of these characteristics is a form of discrimination. Further prohibited by law is discrimination against any employee and/or job applicant who chooses to inquire about, discuss, or disclose their own compensation or the compensation of another employee or applicant.

Northwestern University complies with federal and state laws that prohibit discrimination based on the protected categories listed above, including Title IX of the Education Amendments of 1972. Title IX requires educational institutions, such as Northwestern, to prohibit discrimination based on sex (including sexual harassment) in the University's educational programs and activities, including in matters of employment and admissions. In addition, Northwestern provides reasonable accommodations to qualified applicants, students, and employees with disabilities and to individuals who are pregnant.

Any alleged violations of this policy or questions with respect to nondiscrimination or reasonable accommodations should be directed to Northwestern's The Office of Civil

Rights and Title IX Compliance, 1800 Sherman Avenue, Suite 4-500, Evanston, Illinois 60208, 847-467-6165, TitleIXCoordinator@northwestern.edu.

Questions specific to sex discrimination (including sexual misconduct and sexual harassment) should be directed to Northwestern's Title IX Coordinator in the The Office of Civil Rights and Title IX Compliance, 1800 Sherman Avenue, Suite 4-500, Evanston, Illinois 60208, 847-467-6165, TitleIXCoordinator@northwestern.edu.

A person may also file a complaint with the Department of Education's Office for Civil Rights regarding an alleged violation of Title IX by calling 800-421-3481 or visiting <https://www2.ed.gov/about/offices/list/ocr/complaintintro.html>. Inquiries about the application of Title IX to Northwestern may be referred to Northwestern's Title IX Coordinator, the United States Department of Education's Assistant Secretary for Civil Rights, or both.

General Admission Requirements

The primary objective of the ECE Department's graduate admission process is to evaluate an applicant's academic preparation, qualifications, and potential for success in their intended program of study. Admission to the ECE MS program is highly selective and competitive, with enrollment limited to maintain a high-quality educational experience and appropriate faculty and program resources.

MS applicants are admitted for a **Fall Quarter start only**. The application deadline is typically in the last week of February for enrollment in the following Fall Quarter.

Applicants are typically expected to hold a bachelor's degree in electrical engineering, computer engineering, computer science, or a related discipline from an accredited institution. Applicants with other academic backgrounds may also be considered if they demonstrate sufficient preparation for graduate-level study in ECE.

The specific undergraduate preparation expected depends on the student's intended area of study. Applicants may be required to complete additional preparatory coursework if their prior academic background does not include sufficient preparation in relevant areas. Any such requirements will be communicated at the time of admission and may include expectations regarding successful completion of the required coursework.

Additional information about the graduate application process at Northwestern University is available through The Graduate School (TGS):
<https://www.tgs.northwestern.edu/admission/>

Financial Aid

The ECE Department encourages MS students, especially from industry, to apply. However, the Department does not provide financial support to MS students. Such

students can be supported by a company, government, or an external fellowship, or be self-supported. **MS students are not eligible for teaching assistantships or research assistantships.**

Student Responsibilities

It is the responsibility of each graduate student to ensure that all the requirements of The Graduate School (TGS) and the ECE Department are met, given the program he or she selects; that necessary examinations are properly scheduled; and that deadlines dependent on current Northwestern University calendars are observed. The current procedures and degree requirements of the ECE Graduate Programs are detailed in this Manual.

Students should always consult with the ECE Graduate Student Affairs Coordinator (Tech, L359, ecegrad@northwestern.edu) first to execute procedures, confirm requirements, and obtain paperwork for exams and various other procedures. In addition, students are strongly urged to consult regularly with their faculty advisers.

Official notices about degree program progress, financial aid and other important notices are sent to each student's official email and mailboxes.

Students are responsible for checking their official Northwestern email account (@u.northwestern.edu) on a regular basis, no less than once a week.

Students are responsible for checking their official department mailbox on a regular basis, no less than once per month.

Disclaimer

Northwestern University reserves the right to change without notice any statement in this publication concerning, but not limited to, rules, policies, tuition, fees, curricula, and courses.

MS Program

This section discusses the details of the academic aspects of obtaining an MS degree with the ECE department. Unless otherwise specified, all the items pertain to both Electrical Engineering (EE) and Computer Engineering (CE) majors.

Recommended Background and Preparation

The ECE MS programs welcome students from a wide range of academic backgrounds, including electrical engineering, computer engineering, computer science, biomedical engineering, mechanical engineering, physics, astronomy, mathematics, and related fields. Students bring diverse perspectives and technical expertise that enrich the interdisciplinary nature of the program.

To be successful in the MS program, students should have a foundational understanding of core concepts relevant to their intended area of study. The specific background preparation depends on whether the student is pursuing the MS in Electrical Engineering or the MS in Computer Engineering. Students who do not have an undergraduate degree in ECE or a closely related field may need to complete additional preparation or prerequisite coursework to successfully engage with graduate-level courses.

Students from related disciplines, such as computer science, applied mathematics, physics, or other engineering fields, may possess many of these skills through alternative coursework or professional experience. The ECE MS program values diverse academic pathways and works with students to identify any additional preparation needed to support their success. The depth of preparation required will depend on the student's selected specialization and graduate coursework.

Students who are uncertain whether their academic background aligns with the expectations of their intended program are encouraged to consult with the Director of the Master's Program.

Electrical Engineering Background Preparation

Students pursuing the MS in Electrical Engineering should have familiarity with foundational electrical engineering concepts. Recommended preparation includes coursework or equivalent knowledge in several of the following areas:

- Fundamentals of Circuits
- Signals and Systems
- Electronics
- Solid-State Devices and Semiconductor Physics

- Electromagnetics and Photonics
- Probability and Random Processes

Computer Engineering Background Preparation

Students pursuing the MS in Computer Engineering should have familiarity with foundational concepts in computer hardware, software, and systems. Recommended preparation includes coursework or equivalent knowledge in the following areas:

- Digital Logic and Computer Organization
- Computer Systems and Operating Systems Concepts
- Computer Programming and Software Development
- Data Structures and Algorithms
- Embedded Systems and Computer Architecture

Advising

Each MS student is assigned an academic advisor upon admission, Director of MS Studies, Prof. David Zaretsky. However, the student's preferences and interests may change, especially if they elect to follow the project or thesis degree plan, which typically entails the completion of one or more 590 research units. This may require the student's transition to a new research advisor, who will likely also advise on courses to take. Such a transition involves the following steps:

1. The student first obtains the formal agreement of a Core or Affiliated Electrical Engineering faculty to serve as the student's MS Thesis or Project advisor;
2. The student notifies the current assigned advisor and the ECE Graduate Affairs Coordinator;
3. The ECE Graduate Affairs Coordinator records the advisor change in the [Graduate Student Progress](#) (GSP) portal.

Each MS student should consult with their advisor before registering online for courses on CAESAR. Failure to do so could result in poor course selection that would delay completion of the student's MS degree, or even result in academic probation due to poor grades. All courses should be listed and updated quarterly in [GSP](#).

Course Requirements

To obtain an Master of Science degree in Electrical Engineering or Computer Engineering, the student must successfully complete a total of **12 course units**, with the following requirements met (common for all MS options). The choice of courses must represent a coherent program of study that prepares the student for advanced work in a specific field.

General Requirements
• The student must complete a total of 12 course units made up of 6 Core and 6 Electives. • Only 300-level or higher courses are counted towards the degree (excluding 399 and undergraduate courses). • At least 9 courses must be eligible for TGS credit. • At least 3 units at the 400-level or above (excluding 499 Independent Projects and 590 Research) • Except for 590 Research, all courses must be taken for a quality letter grade (i.e., ABC, not P/N). • Any course taken for P/N credit is not included in calculating the grade-point average (GPA). • All coursework must be completed with a composite grade-point average of B (GPA 3.0) or higher. • Courses may not be repeated for credit, except 499, 590, and Special Topics courses with different sections (e.g. ECE 395/495, CS 396/496, CS 397/497, etc.) • Courses completed for undergraduate credit cannot be repeated or counted for graduate credit. • The course study plan must be approved by the student's advisor prior to registration.
Core Courses (6 units)
• 6 Units of ECE courses (ELEC_ENG or COMP_ENG). • 499 Projects and 590 Research are not included. • For EE Students: At least 3 units of ELEC_ENG must be completed. • For CE Students: At least 3 units of COMP_ENG must be completed. Up to 3 units of CS courses may be petitioned to count with approval by the Director of Master's Program.
Elective Courses (6 units)
• 6 Units of elective courses. • At least 3 units of ECE or CS courses must be completed (ELEC_ENG, COMP_ENG or COMP_SCI). • At most 3 units of courses outside of ECE and CS, with approval by the Director of Master's Program. • At most 3 units of 499 Projects. • At least 1 unit, and at most 2 units of 590 Research may count towards your MS Project elective units. • At least 1 unit, and at most 3 units of 590 Research may count towards your MS Thesis elective units.

ECE Specializations

The master's program offers great flexibility in shaping your education based on your academic and career objectives. You can choose to focus your studies on twelve (12) [specializations](#) listed below, or you can create a custom program to gain exposure in any number of areas of interest. Upon completing your degree you will receive a certificate from the ECE Department declaring that you have completed the specialization in your major. At this time, specializations will not appear on your academic transcript.

- [Artificial Intelligence & Machine Learning](#)
- [Computer Vision & Image Processing](#)

- [Cybersecurity](#)
- [Embedded Systems](#)
- [High-Performance Computing](#)
- [Internet of Things & Edge Computing](#)
- [Network & Communication Systems](#)
- [Photonics & Optoelectronics](#)
- [Quantum Computing, Sensing & Communications](#)
- [Robotics & Autonomous Systems](#)
- [Semiconductors](#)
- [Sustainable Energy & Low-Power Design](#)

Each specialization provides a list of recommended core and elective courses from which to build your education and career path. In order to complete a specialization, you must complete the following requirements:

1. Declare your specialization in the GSP portal.
2. Submit a study plan in GSP.
3. Complete 6 units in your specialization, at least 3 must be in the core section.

Graduate Minor Programs

Students enrolled in the full-time master's programs have the option of earning a certificate in a minor to complement their Master's in Electrical Engineering and enhance their credentials and marketability. Generally, each minor program requires 3 units, which are applied towards your 6 elective requirements for the master's program. Since these units may be outside of the ECE Department, they require approval of the Director of the Master's Program. You can learn more about the Minor programs on the [McCormick Graduate Study website](#). Applications are generally accepted annually for students beginning in the Fall Quarter.

- **Minor in Artificial Intelligence:** The Graduate Minor in Artificial Intelligence enables master's students to develop in-demand expertise in AI and machine learning that complements their primary field of study. The three-course minor consists of coursework in machine learning foundations, applied and advanced AI methods, and a flexible elective that allows students to explore AI within their own disciplinary interests. [Learn more about the minor in artificial intelligence.](#)

- **Minor in Cybersecurity:** The Graduate Minor in Cybersecurity provides master's students with a comprehensive understanding of the technical, legal, managerial, and strategic dimensions of cybersecurity. Through a three-unit curriculum that integrates topics such as information security, cyber forensics, risk management, policy, and leadership, students develop the interdisciplinary perspective and decision-making skills needed to lead cybersecurity initiatives and manage technology risk in modern organizations. [Learn more about the minor in cybersecurity.](#)
- **Minor in Engineering Management:** The Graduate Minor in Engineering Management enables master's students to complement their technical expertise with essential leadership and business skills. Through a focused three-course curriculum consisting of foundational coursework in engineering management and managerial decision-making, together with a flexible elective, students develop competencies in areas such as analytics, operations, innovation, project management, and product strategy. The minor prepares graduates to lead interdisciplinary teams, make data-driven decisions, and bridge the gap between technology and organizational objectives. [Learn more about the minor in engineering management.](#)
- **Minor in Entrepreneurship:** The Graduate Minor in Entrepreneurship equips master's students with the mindset, skills, and network needed to launch new ventures and drive innovation within established organizations. The three-course minor combines hands-on entrepreneurial experiences with flexible elective coursework, enabling students to develop expertise in opportunity identification, product development, commercialization, and venture creation. Through this interdisciplinary curriculum, students gain practical tools for translating ideas and research into real-world impact. [Learn more about the minor in entrepreneurship.](#)
- **Minor in Scientific Computing:** The Graduate Minor in Scientific Computing provides master's students with a strong foundation in programming, numerical algorithms, and computational methods for solving modern engineering and scientific problems. Through a three-course curriculum consisting of core study in numerical methods and flexible electives in specialized computational techniques and high-performance computing, students develop the skills to create, analyze, and effectively apply advanced scientific software and simulations. The minor equips graduates with both practical computational expertise and a deeper understanding of the capabilities and limitations of modern numerical tools. [Learn more about the minor in scientific computing.](#)
- **Minor in Space Engineering:** The Graduate Minor in Space Engineering provides master's students with an interdisciplinary foundation in the technologies and systems that enable operations in space and other remote, extreme environments. The three-course minor includes introductory coursework in space engineering, a space-focused project experience, and a flexible elective that allows students to

connect their primary field of study with emerging applications in areas such as autonomous systems, communications, materials, energy, and advanced manufacturing. [Learn more about the minor in space engineering.](#)

- **Minor in Synthetic Biology:** The Graduate Minor in Synthetic Biology provides master's students with an interdisciplinary foundation for understanding and engineering biological systems. Through a three-course curriculum comprising two core courses in the principles and practice of synthetic biology and a flexible elective, students explore biological function across multiple scales — from molecules and networks to cells, communities, and ecosystems. The minor emphasizes the fundamental physical and chemical principles underlying biological systems while equipping students with the knowledge and tools to design innovative biological solutions to pressing societal challenges. [Learn more about the minor in synthetic biology.](#)

Academic Policies and Degree Requirements

Transfer of Credit

To transfer a course, a student must submit a petition to the Director of Master's Program in Electrical Engineering along with supporting evidence. The supporting evidence should include documentation of the course content (e.g., syllabus, slide decks, assignments, projects) and an official transcript that shows the grade received for the course. The student should identify which Northwestern University course they petition for a waiver. The coordinator of the corresponding course at Northwestern University will review the petition and make a recommendation. The transfer of credit is ultimately subject to the approval of the student's advisor (MS Thesis Research advisor, MS Project advisor, or academic advisor, for MS degree options A, B, C, respectively) and the Director of Master's Program in EE. The following requirements also apply:

- At most three (3) of the required 12 units may be waived, based on graduate-level courses taken previously elsewhere.
- Only coursework that has not been applied to a completed degree will be considered for transfer credit for an MS degree.
- For a course to be transferred, it must substantially match a course at Northwestern University that counts toward the 12-unit requirement.

The student must consult with their advisor before registering for courses. Failure to do so could result in poor course selection that would delay completion of the student's MS degree, or even result in academic probation due to poor grades or missed coursework completion deadlines.

ECE Course Credit Waivers

An MS student may petition to have **at most three** course credits waived, based on the student's graduate level courses taken previously elsewhere. Only coursework that has **not** been applied to a completed degree will be considered for transfer credit for a MS degree. A petition for such a waiver must include complete documentation (e.g., syllabus, assignments, projects, etc.) of the content of a graduate level course from the student's previous institution that most closely matches the ECE Department course credit to be waived. The student must also provide an official transcript, sent directly to the department, that shows the grade received for each course used for transfer credit.

The coordinator of this ECE Department course will review the petition and make a recommendation. All such waivers are ultimately subject to the approval of the advisor, the ECE Research Group, and the ECE Director of Master's Program.

TGS Degree Requirements

All MS students must satisfy The Graduate School's requirements for obtaining the Master of Science degree, outlined at <https://www.tgs.northwestern.edu/about/policies/masters-degree-requirements.html>. This handbook presents **program-specific** requirements that are in addition to, or further elaborate upon, the requirements established by TGS, and **may go beyond TGS minimums**. A complete description of TGS' requirements, academic policies and procedures for graduate study at Northwestern University, can be found at <https://catalogs.northwestern.edu/tgs/academic-policies-procedures/>.

MS Degree Study Plans

Students pursuing the MS degree in Electrical Engineering must complete one of three degree plans: **Plan A (MS Thesis)**, **Plan B (MS Project)**, or **Plan C (MS Courses Only)**. Students declare their intended degree plan in the Graduate Student Progress (GSP) system when submitting their MS Study Plan. The MS Study Plan must be submitted no later than **May 1 of the student's first academic year** (typically the Spring Quarter of the third academic quarter).

All students must satisfy the common MS degree requirements described in the [Course Requirements](#) section. Students selecting the MS Thesis or MS Project option must identify a faculty Research Advisor and complete the additional requirements associated with their selected plan. Students who do not select a Thesis or Project option will complete the MS Courses Only plan.

Students pursuing the MS Thesis or MS Project options should establish their faculty advising relationship early. Research Advisors provide guidance on research direction, degree progress, and completion of the thesis or project requirements. Advisor and committee information must be recorded in the Graduate Student Progress (GSP) system.

Each degree plan has specific completion requirements and time limits. Students are responsible for completing all degree requirements within the established timeline. Students requiring additional time must submit a petition for an extension according to ECE MS program policies.

Plan A: MS Thesis

The MS Thesis option is intended for students who wish to complete a formal research thesis demonstrating substantial original research contributions. Students pursuing this option must identify a faculty Research Advisor, establish a thesis committee, complete required research credits, and successfully defend their thesis.

MS Thesis Research Advisor

Students pursuing the MS Thesis option must first obtain the agreement of a faculty member to serve as their MS Thesis Research Advisor.

The MS Thesis Research Advisor should:

- Be a member of the Northwestern University Graduate Faculty.
- Have an appointment in the ECE Department.

If a student wishes to conduct thesis research outside of ECE, the student must obtain approval from the Director of the MS Program and include at least one ECE faculty member on their thesis committee.

Declaring a Thesis MS Degree Plan

Students must complete the following steps to declare the MS Thesis option:

- Obtain agreement from a faculty member to serve as the MS Thesis Research Advisor.
- Declare “MS Thesis” as the degree plan when submitting the MS Study Plan in the Graduate Student Progress (GSP) system.
- Invite the faculty advisor to serve as the Research Advisor through GSP. The faculty member must formally accept the invitation in GSP.
- Establish an MS Thesis Committee in consultation with the Research Advisor.
- Complete a minimum of 1 unit and a maximum of 3 units of EE/CE 590 research towards their MS Thesis requirements.

MS Thesis Committee

The MS Thesis Committee evaluates the student's thesis research, written thesis document, and oral defense. The MS Thesis Committee must satisfy the following requirements:

- Consist of at least two members of the Northwestern University Graduate Faculty.
- Include at least one ECE faculty member.
- Include the MS Thesis Research Advisor as the committee chair.

Students should establish their thesis committee as early as possible to allow sufficient time for research guidance, feedback, and review of the thesis document. The committee must be established no later than one week before the thesis defense. Failure to establish a committee in a timely manner may delay degree completion.

Written Thesis Requirements

A successful MS Thesis requires a written thesis document approved by the MS Thesis Committee.

- The thesis must demonstrate evidence of original research and be approved by the MS Thesis Committee.
- The thesis format must conform to The Graduate School dissertation formatting guidelines: <https://www.tgs.northwestern.edu/academic-policies-procedures/dissertation-publication/dissertation-formatting-requirements.html>
- There is no required thesis length. Historically, MS theses are approximately 30 pages in the double-spaced graduate school thesis format; however, the MS Thesis Committee may specify additional content, format, or length requirements.
- The student must provide a complete draft of the thesis to the MS Thesis Committee for review.
- Following committee review, the student must complete any requested revisions and obtain final approval of the thesis.
- **The approved thesis must be submitted to the ECE Department through the required submission process prior to graduation.**

Oral Defense

An oral defense of the thesis research is encouraged as an opportunity for the student to present and discuss their work with the MS Thesis Committee. The decision to require an oral defense is determined by the MS Thesis Committee.

- If required by the committee, the oral defense will be evaluated by the MS Thesis Committee and may be conducted in person or via video conferencing.
- The defense typically includes a 30–60 minute presentation followed by a question-and-answer session.
- Students should coordinate with their committee to schedule sufficient time for the presentation, discussion, and evaluation.

Research Credits

Under the MS Thesis study plan, students may apply a minimum of 1 unit and up to a maximum of 3 units of EE/CE 590 Research toward the 6-unit elective requirement for the MS degree.

Time Limits

All requirements for the MS Thesis degree, including coursework, completion of the thesis, approval by the MS Thesis Committee, and submission of the final thesis document, must be completed by the end of the **7th academic quarter** (typically the Spring Quarter of the second year of study).

For students planning to graduate, the Director of the MS Program will require confirmation from the MS Thesis Committee approximately **one month before the end of the quarter** that the student is making satisfactory progress and is on track to complete all degree requirements by the end of the quarter. This confirmation should include progress toward completion of the thesis, any required oral defense, and final thesis submission requirements.

Students should consult the Office of the Registrar's [academic calendar](#) for degree completion deadlines for each quarter.

Plan B: MS Project

The MS Project option is intended for students who wish to complete a substantial technical project under the guidance of a faculty Research Advisor. Students pursuing this option complete a project involving the application of existing theories, methods, tools, or experimental techniques and document their results in a formal project report. Students pursuing this option must identify a faculty Research Advisor, establish a project committee, complete required research credits, and successfully complete their project requirements.

MS Project Research Advisor

Students pursuing the MS Project option must first obtain the agreement of a faculty member to serve as their MS Project Research Advisor.

The MS Project Research Advisor should:

- Be a member of the Northwestern University Graduate Faculty.
- Have an appointment in the ECE Department or be affiliated with the ECE Department.

Students may also pursue an MS Project under the guidance of a faculty member outside of ECE. In such cases:

- The student must obtain approval from the Director of the MS Program.
- The MS Project Committee must include either an ECE faculty member or the Director of the MS Program to provide ECE oversight.

Declaring a Project MS Degree Plan

Students must complete the following steps to declare the MS Project option:

- Obtain agreement from a faculty member to serve as the MS Project Research Advisor.
- Declare “MS Project” as the degree plan when submitting the MS Study Plan in the Graduate Student Progress (GSP) system.
- Invite the faculty advisor to serve as the Research Advisor through GSP. The faculty member must formally accept the invitation in GSP.
- Establish an MS Project Committee in consultation with the Research Advisor.
- Complete a minimum of 1 unit and a maximum of **2 units** of EE/CE 590 Research toward their MS Project requirements.

MS Project Committee

The MS Project Committee evaluates the student’s project report and overall project completion. The MS Project Committee must satisfy the following requirements:

- Consist of at least two members of the Northwestern University Graduate Faculty.
- Include at least one ECE faculty member or the Director of the MS Program.
- Include the MS Project Research Advisor as the committee chair.

Students should establish their project committee as early as possible to allow sufficient time for guidance, feedback, and review of the project report. The committee must be established no later than one week before the project presentation or final evaluation. Failure to establish a committee in a timely manner may delay degree completion.

Project Requirements

A successful MS Project requires completion of a substantial technical project and submission of a written project report approved by the MS Project Committee.

The project requirements include:

- Completion of a technical project demonstrating the application of engineering principles, methods, tools, or techniques.
- Submission of all project deliverables, which may include software, source code, hardware implementations, experimental results, datasets, documentation, or other artifacts as determined by the MS Project Research Advisor and MS Project Committee.
- Submission of a written technical report documenting the project objectives, methodology, implementation, results, and conclusions.
- Review and approval of the project report by the MS Project Committee.
- Completion of any revisions or additional requirements requested by the MS Project Committee.

There is no required format or length for the project report. The format and content requirements are determined by the MS Project Research Advisor and MS Project Committee. As a guideline, project reports are typically approximately 15–20 pages in length, although the committee may require a different level of detail based on the scope and complexity of the project.

Research Credits

Under the MS Project study plan, students may apply a minimum of 1 unit and up to a maximum of 2 units of EE/CE 590 Research toward the 6-unit elective requirement for the MS degree.

Time Limits

All requirements for the MS Project degree, including coursework, completion of the project deliverables, approval of the project report by the MS Project Committee, and submission of the final project report, must be completed by the end of the **6th academic quarter** (typically the Winter Quarter of the second year of study).

For students planning to graduate, the Director of the MS Program will require confirmation from the MS Project Committee approximately **one month before the end of the quarter** that the student is making satisfactory progress and is on track to complete all degree requirements by the end of the quarter. This confirmation should include progress toward completion of the project deliverables, project report, any required presentation or evaluation, and final submission requirements.

Students should consult the Office of the Registrar's [academic calendar](#) for degree completion deadlines for each quarter.

Plan C: MS Courses Only

The MS Courses Only option is designed for students who wish to complete a structured program of graduate coursework without pursuing a thesis or project. Students must complete the required MS curriculum and select courses that form a coherent program of study aligned with their academic and professional goals.

Advisers

Students pursuing the MS Courses Only option are advised by the Director of the MS Program. Students are encouraged to meet regularly with the Director of the MS Program to plan their coursework and ensure that their selected courses satisfy degree requirements and support their academic objectives.

Students should record the appropriate program advisor in the Graduate Student Progress (GSP) system:

- **MS Electrical Engineering students:** Director of the MS Program, David Zaretsky, and the Director of Graduate Studies in Electrical Engineering, Randy Freeman.
- **MS Computer Engineering students:** Director of the MS Program, David Zaretsky, and the Director of Graduate Studies in Computer Engineering, Jie Gu.

Students are responsible for ensuring that their selected coursework satisfies all MS degree requirements, including course level requirements, specialization requirements (if applicable), and unit requirements.

Research Credits

Under the Course-based MS Degree plan, 590 Research credits **do not count** toward the 12-unit requirement for the MS degree, as these credits are reserved for MS Project and Thesis degrees. If a student switches from the MS Project or Thesis plan to the Courses plan, any 590 units previously taken will not apply towards their degree requirements.

Time Limits

All requirements for the MS Courses Only degree must be satisfactorily completed before the end of the **5th academic quarter** (typically the Fall Quarter of the second year of study).

Students who do not complete the MS Courses Only requirements within the established timeline must submit a petition for an extension in accordance with ECE MS Program policies. Students who do not receive an approved extension may be placed on academic probation for up to two academic quarters. Following this period, the ECE MS Program may recommend dismissal from the program.

Changing the MS Study Plan

Students may declare an MS Study Plan at any point through GSP. Once a study plan has been selected, any subsequent change requires the student to notify the Graduate Affairs Coordinator by email, with an explanation of the requested change from both the student and the faculty research advisor. If the change is approved, the degree completion timeline will be adjusted to reflect the new study plan, and no additional extensions will be granted beyond the revised timeline.

Students should carefully consider the implications of changing study plans. In particular, transitioning from the MS Thesis or MS Project pathway to the Course MS pathway will result in any completed EE/CE 590 Research units no longer counting toward degree requirements, as research credits cannot be applied toward the coursework requirements of the Course MS option.

Degree Completion

To complete the MS degree, students must complete the following steps:

- Submit a Study Plan in GSP.
- Complete the allocation of courses in GSP. The Director of MS Studies will validate the program and course requirements are fulfilled.
- Complete the Application for Degree (AFD) in GSP
- Complete the Master's Degree Completion (MDC) form in GSP
- Complete the Exit Interview, which will be sent by the Graduate Affairs Coordinator via email.
- Due dates for the aforementioned forms can be found on the university's [Academic Calendar](#)

- **For Coursework students:** in the section for Committee Members, students should enter the name of the Director of Master's Program, Prof. David Zaretsky, as the Chair. In either the Co-Chair or Member box, students should enter the name of the Director of Graduate Studies for Electrical Engineering, Randy Freeman, or for Computer Engineering, Jie Gu.
- **For Project and Thesis students:** in the section for Committee Members, students should enter the names of their research advisers. The MS Director will check with the committee chair that all documents and deliverables were submitted. The MS thesis must also be uploaded by form submission to the department.

Enrollment Options to Maintain Student Status

Students pursuing the MS Thesis or MS Project pathways may need to maintain student status while completing degree requirements outside of traditional classroom enrollment. Special registration courses, such as **TGS 512 – Continuous Registration**, are intended only for students who have completed their required coursework and are actively progressing toward completion of their thesis or project.

Students considering enrollment in any non-classroom registration option must consult with their academic advisor, research advisor (if applicable), and ECE Graduate Student Services staff prior to registration.

TGS 512 - Continuous Registration

TGS 512 does not count toward the 12 units required for any ECE MS degree. It is intended only for students who have completed all required coursework and need to maintain student status while completing approved MS Thesis or MS Project research activities.

TGS 512 places students **in full-time student status**. Because it is a final registration option for students completing degree requirements, students may only enroll in TGS 512 *only after all coursework requirements have been completed*. Students enrolled in TGS 512 may not register for any additional courses. The only allowable enrollment after TGS 512 is EE/CE 590 Research, as needed to complete approved MS Thesis or MS Project requirements.

Additional information regarding TGS 512:

- Students enrolled in TGS 512 must continue to make satisfactory progress toward degree completion in collaboration with their research advisor.
- Students registered in TGS 512 maintain student status, including visa status where applicable, defer student loan repayment, retain access to their NetID, WildCARD, and university email account, and maintain access to most university facilities.

- Students enrolled in TGS 512 are not eligible to enroll in coursework. Any remaining degree requirements must be completed through approved EE/CE 590 Research activities associated with their MS Thesis or MS Project.
- Tuition for TGS 512 is \$100 per quarter. Students enrolled in TGS 512 are not assessed the TGS Activity Fee and therefore are not eligible for services associated with that fee.
- Students enrolled in TGS 512 are required to maintain health insurance coverage but are not eligible for the university health insurance subsidy.

TGS 512 Eligibility Requirements

To enroll in TGS 512 as part of the MS Thesis or MS Project pathway, students must meet all of the following requirements:

- Complete all required letter-graded coursework for the MS degree.
- Formally declare their intent to pursue the MS Thesis or MS Project pathway in GSP and submit an approved study plan outlining remaining degree requirements and research objectives.
- Establish an active research committee in GSP prior to advancing in the Thesis or Project pathway.
- Complete at least 1 unit of EE/CE 590 Research to demonstrate active participation in research activities.
- Receive approval from both the Research Advisor and the Director of the MS Program.
- Submit a completed TGS 512 approval form, signed by both the Research Advisor and Director of the MS Program, through GSP. ECE MS students may require a permission number to enroll in TGS 512.

Important Considerations

Students should carefully plan their final quarter enrollment, particularly international students who must maintain compliance with visa requirements. Since TGS 512 changes enrollment to full-time status, international students should consult with their academic advisor and the International Office before adjusting enrollment status, especially if they transition from part-time enrollment in a final quarter to full-time enrollment through TGS 512.

The Director of the MS Program may grant exceptions to these requirements in documented extenuating circumstances, provided that the academic integrity and intended purpose of the MS Thesis or MS Project pathway are maintained.

Progress Evaluation

Student progress in the MS Thesis and MS Project pathways is evaluated through multiple milestones:

- **Research Enrollment and Evaluation:** Completion of at least 1 unit of EE/CE 590, with performance evaluated by the Research Advisor based on research engagement and progress.
- **Study Plan and Milestones:** Review and approval of a formal study plan and progress toward defined research objectives.
- **Research Committee Oversight:** Ongoing guidance and evaluation from the established research committee.
- **Final Deliverable:** Successful completion and evaluation of the MS Thesis or Project, including required written documentation and, where applicable, an oral defense or presentation.
- **TGS 512 Approval Review:** Verification that continued enrollment through TGS 512 is supported by demonstrated research progress and approved by both the Research Advisor and Director of the MS Program.

Combined BS/MS Program for Northwestern University Students

The combined BS/MS program allows qualified Northwestern University undergraduate students to begin graduate-level coursework while completing their bachelor's degree, providing an accelerated pathway toward a Master of Science degree in Electrical Engineering or Computer Engineering. Students admitted to the BS/MS program must satisfy the prerequisite coursework requirements for their intended MS program, in addition to meeting all standard requirements for the corresponding MS degree.

Students interested in pursuing the BS/MS option should review the requirements below for their intended program. If you are uncertain whether your academic background satisfies the prerequisites, please contact the Director of the Master's Program to discuss your preparation.

More information about the ECE BS/MS program can be found on the ECE website:

<https://www.mccormick.northwestern.edu/electrical-computer/academics/undergraduate/combined-bs-ms.html>

BS/MS in Electrical Engineering

Northwestern undergraduate students pursuing an MS in Electrical Engineering must successfully complete any three (3) of the following ECE foundational courses, or their equivalent:

- ELEC_ENG 221: Fundamentals of Circuits
- ELEC_ENG 222: Fundamentals of Signals and Systems
- ELEC_ENG 223: Fundamentals of Solid State Engineering
- ELEC_ENG 224: Fundamentals of Electromagnetics and Photonics
- ELEC_ENG 225: Fundamentals of Electronics
- ELEC_ENG 302: Probabilistic Systems

All other requirements for the MS degree in Electrical Engineering apply.

BS/MS in Computer Engineering

Northwestern undergraduate students pursuing an MS in Computer Engineering must successfully complete the following foundational courses, or their equivalents:

- COMP_ENG 203: Introduction to Computer Engineering, or
COMP_ENG 303: Advanced Digital Design
- COMP_ENG 205: Fundamentals of Computer System Software, or
COMP_SCI 213: Introduction to Computer Systems
- COMP_SCI 211: Fundamentals of Computer Programming II

All other requirements for the MS degree in Computer Engineering apply.

Transfer to a Different MS Program

Students admitted to an ECE MS program are expected to complete the program of study to which they applied and were admitted. During the admissions process, applications are carefully reviewed by the admissions committee, and students are admitted based on their demonstrated preparation and potential for success in their selected program.

Any request to transfer to a different MS program must be submitted through CollegeNet as a formal transfer application. Approval is not automatic and is subject to review by the appropriate program leadership.

Transfer Between ECE MS Programs

Transfers between the MS in Electrical Engineering and MS in Computer Engineering programs are generally supported when the student's academic background and career objectives align with the requested program. However, students must still complete the formal CollegeNet transfer application process and receive approval from both programs.

Transfer requests will be evaluated based on the student's academic progress, preparation for the requested degree program, and ability to successfully complete the revised course of study.

Transfer to or from Other Northwestern MS Programs

ECE MS programs have limited capacity and admit a small percentage of applicants each year. As a result, transfers involving another Northwestern graduate program require additional review and are only considered in exceptional cases. Students requesting to transfer into an ECE MS program from another department, or from an ECE MS program into another department, must provide a clear academic justification for the transfer and demonstrate that the requested program is an appropriate fit.

Transfer Eligibility and Timing

Transfer requests are reviewed only after the student has demonstrated academic success in their current program, typically after completing at least one quarter of graded coursework. Requests may be submitted beginning in the second quarter of enrollment and, if approved, will generally take effect no earlier than the following quarter.

Students should submit transfer requests as early as possible and no later than the date by which degree plans are declared (May 1 of the academic year of admission). Requests submitted after this deadline may require additional review by the student's advisor, the ECE Graduate Committee, and the Director of the Master's Program.

Students who have not completed coursework in their admitted program will not normally be considered for transfer until they have successfully completed at least one quarter of graded work in that program.

Students pursuing the MS Thesis or MS Project pathways must provide additional documentation, including confirmation from the proposed research advisor that they are willing to supervise the student's multi-quarter research project. The student must also provide a clear justification for the transfer that is supported by the proposed advisor.

Transfer Review Process

Transfer requests should be submitted through CollegeNet and must include supporting documentation and letters of recommendations as requested by the program. Requests

will be reviewed by the appropriate Graduate Program Director(s), with input from the student's current advisor and proposed advisor when applicable.

Factors considered during the review include, but are not limited to:

- Academic performance and progress in the current MS program.
- Preparation and qualifications for success in the requested program, including relevant coursework, transcripts, and professional experience.
- The academic and professional rationale for requesting the transfer.
- Alignment between the student's goals and the requested program of study.
- Faculty support, including commitment from a potential research advisor for students pursuing a Thesis or Project option.

Approval of a transfer is not guaranteed. Students should consult with their academic advisor and the ECE Graduate Affairs Coordinator before submitting a transfer request to discuss the process and potential implications for degree completion timelines.

Part-time Graduate Program

Graduate students who are US citizens or permanent residents may pursue their MS studies in the ECE Department on a part-time basis. The United States government does not give student visas to those enrolled part time.

Students should discuss any details with their academic advisor and email the ECE Graduate Affairs Coordinator for further information.

Pursuing a Ph.D. After Being Admitted to the MS Program

MS students interested in pursuing a Ph.D. at Northwestern University must apply through the standard Ph.D. admissions process. Admission to the ECE MS program does not guarantee admission to any Northwestern Ph.D. program.

Students interested in continuing to a Ph.D. are encouraged to discuss their plans early with their academic advisor, research advisor (if applicable), and the Directors of Graduate Programs in Electrical Engineering and Computer Engineering. Successful Ph.D. applicants typically demonstrate strong academic performance, research experience, and alignment with faculty research areas.

Students should plan their MS coursework and research activities accordingly, including opportunities to engage in faculty research and complete an MS Thesis or Project when appropriate.

Special Policies and Procedures

Internships and Professional Development During Graduate Study

MS students may participate in internships, off-campus research experiences, service-learning projects, entrepreneurial activities, and other professional development opportunities that complement their graduate education. These experiences can provide valuable industry exposure, professional skills, networking opportunities, and practical application of engineering knowledge.

Students interested in these opportunities should consult with their academic advisor and the McCormick Engineering Career Development office to ensure that the activity aligns with program requirements and University policies.

Additional career development resources are available through McCormick Engineering Career Development: <https://www.mccormick.northwestern.edu/career-development/for-students/>

Approved professional development activities may be supported through enrollment in the following zero-credit Career Development (CRDV) courses, with appropriate advisor approval:

- **CRDV_411 – Engineering Internship Program:** Supports approved engineering internship experiences.
- **CRDV_412 – Projects in Service Learning:** Supports approved service-learning and community-based engineering projects.
- **CRDV_413 – Engineering Research Project:** Supports approved external engineering research experiences.
- **CRDV_414 – Career Development for Student Entrepreneurs:** Supports students developing or managing startup ventures through structured mentorship and professional development.

CRDV courses:

- Do not count toward MS degree requirements.
- Maintain full-time enrollment status when approved and properly registered.
- Are graded on an S/U (Satisfactory/Unsatisfactory) basis.
- Require appropriate documentation and approval prior to enrollment.

International students must consult the Office of International Student and Scholar Services (OISS) and McCormick Engineering Career Development before beginning any off-campus employment, internship, research activity, or entrepreneurial activity to ensure compliance with visa regulations.

Curricular Practical Training (CPT) and Optional Practical Training (OPT)

International students participating in an off-campus internship or employment opportunity directly related to their field of study must obtain **Curricular Practical Training (CPT)** authorization before beginning the activity. “Off-campus” refers to any employment or internship activity outside of Northwestern University.

Information regarding CPT requirements and application procedures is available through OISS: <https://www.northwestern.edu/international/living-working/student-employment/index.html>

Students should begin the CPT process early, as authorization must be obtained before employment begins. Engaging in employment without proper authorization may violate visa regulations.

International students seeking employment authorization after completing their MS degree must apply for **Optional Practical Training (OPT)** through OISS.

Students should begin planning for OPT well in advance of graduation. OPT applications should be submitted according to OISS deadlines, and students are encouraged to meet with OISS early to ensure sufficient time to complete required documentation.

Additional information regarding OPT is available through OISS: <https://www.northwestern.edu/international/international-students/student-employment/opt-f1-students/>

OPT requests should be coordinated with OISS and the Director of the MS Program according to University procedures.

Leaves of Absence

Students who need to temporarily interrupt their graduate studies may request a Leave of Absence in accordance with The Graduate School (TGS) policies.

Approved Leaves of Absence may adjust a student’s program timeline and degree completion milestones as appropriate.

Additional information regarding Leave of Absence requirements, policies, and procedures is available through TGS: <https://catalogs.northwestern.edu/tgs/academic-policies-procedures/>

Academic Integrity

All ECE MS students are expected to conduct their academic work and research with the highest standards of integrity and professionalism. Students must comply with the academic integrity policies established by Northwestern University, The Graduate School (TGS), and the McCormick School of Engineering.

Relevant policies and guidelines are available at:

- Northwestern University Academic Integrity Policy:
<https://www.northwestern.edu/provost/policies/academic-integrity/principles.html>
- The Graduate School Academic Integrity Policy:
<https://www.tgs.northwestern.edu/academic-policies-procedures/policies/academic-integrity.html>
- McCormick School of Engineering Academic Integrity Policy:
<https://www.mccormick.northwestern.edu/students/academic-integrity.html>

Academic misconduct includes, but is not limited to, cheating, plagiarism, unauthorized collaboration, and misrepresentation of academic or research work. Students found responsible for academic misconduct may be subject to disciplinary action, including academic penalties, probation, or dismissal from the program.

Students should be particularly mindful of academic integrity in programming and design-based courses. Unless explicitly permitted by the course instructor:

- Submitted code, designs, reports, and other deliverables must represent the student's own work.
- Copying or adapting another person's work, including code from classmates, online sources, or public repositories, is not permitted.
- Students may not share their solutions or completed work with others in a manner that enables academic misconduct.
- Collaboration must follow the guidelines provided by the instructor.

Suspected violations of academic integrity will be referred to the appropriate University process for review and adjudication. Consequences may include a reduced assignment grade, failure in a course, academic probation, or other sanctions depending on the severity of the violation.

Probation, Exclusion, and Appeal Process

ECE MS students are expected to maintain satisfactory academic progress and good academic standing throughout their program. A student may be placed on probation for failure to meet the academic, professional, or administrative requirements of the ECE MS program or The Graduate School (TGS).

Reasons for probation may include:

- Failure to meet academic standards (e.g., cumulative GPA below 3.0).
- Failure to make satisfactory progress toward degree completion, including coursework, thesis, project, or other program requirements.
- Failure to meet established program milestones or completion timelines.
- Violations of academic integrity or professional conduct standards.
- Failure to fulfill required administrative responsibilities related to degree progress.

Students placed on probation will be notified of the requirements necessary to return to good academic standing. Failure to satisfy probation requirements may result in additional actions, including extended probation or recommendation for exclusion (dismissal) from The Graduate School and the ECE MS program.

Students who require additional time to complete degree requirements may petition for an extension with appropriate justification and supporting documentation. Extensions do not waive degree requirements, and students must continue to make satisfactory progress toward completion.

Students may appeal academic decisions according to the policies and procedures established by The Graduate School.

Additional information regarding TGS policies on satisfactory academic progress, probation, exclusion, and appeals is available at:
<https://www.tgs.northwestern.edu/academic-policies-procedures/policies/satisfactory-academic-progress.html>

Conflict Resolution

Conflicts between MS students and faculty or the department are exceedingly rare. If one occurs, and good faith efforts to resolve informally are unsuccessful, please see the following for the formal processes for documenting and resolving conflicts.

<https://www.tgs.northwestern.edu/services-support/dealing-with-student-faculty-conflicts/index.html>