



COLLEGE OF ENGINEERING  
**ELECTRICAL & COMPUTER ENGINEERING**  
UNIVERSITY OF MICHIGAN

# **MEng PROGRAM MANUAL**

**Effective for students starting  
Fall 2020 or later**

**EECS BUILDING  
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**1. INTRODUCTION**

The Electrical and Computer Engineering Master of Engineering (MEng) Graduate Program Manual provides information on the requirements for the Master of Engineering degree. The MEng program, which is distinct from the ECE Master of Science (MS) program, is specially designed for students who plan to enter industry after graduation and who have already decided their specialty. The program is highly structured, emphasizes rigorous theory, practical training, engineering projects, industrial skills, communications, project management, leadership, and entrepreneurial training. The curriculum is aligned with emerging application areas of high workforce demand.

The MEng program is part of the Electrical and Computer Engineering Graduate Program, which is one of two graduate programs comprising the Electrical Engineering and Computer Science Department (EECS) at the University of Michigan. Each of the two programs, Computer Science Engineering and Electrical and Computer Engineering have their own areas of research and courses. Students enrolled in Electrical and Computer Engineering are primarily interested in the area of Electrical Engineering, Systems Science, and Computer Engineering.

**MEng Degree Areas**

The MEng program is currently offered in two areas:

- Data Science and Machine Learning
- Autonomous Systems

The program in **Data Science and Machine Learning** focuses on the use of data science and machine learning in modern engineering projects and systems for sensing, control, inference, planning, and decision making. Students will learn to understand the engineering challenges and the skills needed to use data in solving the problem; obtain process data in large-scale complex engineering systems, and apply the resulting analytics to solve the problem.

The program in **Autonomous Systems** focuses on the design and engineering aspects of autonomous systems and operations. Students will gain knowledge in sensors, sensing, signal processing, and control, and apply that knowledge to the broad family of autonomous systems that includes robots, autonomous driving, and any engineering system that can be made to operate independently.

**2. ADMISSION**

Admission to the MEng is through the College of Engineering. Please click here for additional information regarding applying:

<https://ece.engin.umich.edu/academics/graduate-programs/prospective-grad-students/apply-for-meng/>

It is the responsibility of the applicant to make sure the ECE MEng Program receives the completed application form by the specified deadlines.

Students desiring admission to the MEng program should have earned a bachelor's degree in engineering, mathematics, or physical sciences. Admission to the MEng programs requires a completed application, transcripts of all previous academic records, three letters of recommendation, GRE scores, academic statement of purpose, and personal statement.

Students who enter and complete the program will earn a Master of Engineering in ECE degree.

Current UM graduate students in other programs may be eligible to earn a dual degree in the ECE MEng program. Adding an additional ECE Master's degree requires a completed "Add a Degree" application, a letter of recommendation from research advisor, UM transcript, and Master's degree plan of study. Please visit the ECE Graduate Program Office or website for additional information.

### **3. GENERAL ACADEMIC POLICIES**

Courses dropped after the 3rd week of the registration period will receive a "W" on transcript.

After the eighth week of a full term (fourth week of a half term), courses may be dropped or changed to Visit/Audit status only under exceptional circumstances and with the approval of the course instructor, advisor, and the ECE Associate Chair of Graduate Affairs.

You cannot remove courses from your transcript.

Term-specific deadline dates are sent via email each term by the ECE Graduate Program Office and ECE website.

#### **English Proficiency**

Based on English language proficiency test scores (such as the TOEFL), some students will be encouraged to take specific academic writing or speaking courses offered by the English Language Institute (ELI) to support their studies. The ELI courses are typically 1 to 3 credits, and will help students gain capability and confidence in English. These courses will not count toward the degree or GPA.

#### **Enrollment Status**

Regarding courses:

Full-time enrollment is 8 credit hours.

For GSI/GSRA, full time enrollment is 6 credit hours.

ELI courses count towards enrollment status.

Visit/Audit of a class does not count towards enrollment status.

### Regarding tuition:

For 1-8 credits, a student's account is charged an amount for each credit hour.

For 9+ credits, a student's account is charged a single amount for all credits.

### **Grades and GPA Requirement**

All grades are on the College of Engineering scale:

A+	4.0	B+	3.3	C+	2.3	D+	1.3
A	4.0	B	3.0	C	2.0	D	1.0
A-	3.7	B-	2.7	C-	1.7	D-	0.7

Course grade must be B- or better for the credit hours to be counted toward any degree requirement.

The grade point average (GPA) must be at least 3.0, based on a 4.0 scale. A cumulative GPA below a 3.0 will cause the Graduate School to place a notation of "unsatisfactory academic standing" on the student's academic record.

A student with unsatisfactory academic standing will not be granted a degree, and may change programs and transfer credits only with permission of the admitting program.

### **Honor Code**

All engineering programs at the University of Michigan follow the College of Engineering Honor Code outlining certain standards of ethical conduct. The Honor Council investigates reported violations of the Honor Code. Read more about the policy here: <http://elc.engin.umich.edu/wp-content/uploads/sites/19/2019/03/Honor-Code-Pamphlet-2018.pdf>

### **Petition for Waiver or Modification of Policy or Requirement**

A student may request special permission to adjust the departmental degree requirements or guidelines for a specific reason or circumstances. It is recommended that the student seek the advice of their academic/research advisor before submitting the petition.

A student petitioning for waiver or modification of policy or requirement must complete the Petition Request Form. The student's academic/research advisor must approve this request, and then it is submitted to the ECE Graduate Academic Affairs Committee for final approval.

Link to ECE Petition form: <http://eecs.umich.edu/eecs/graduate/ece/forms/ECE-Petition-Form.pdf>

### **Course Equivalency**

If a student has taken a course elsewhere that is "substantially equivalent" to an EECS course, it may not be necessary to retake the course. The student should consult with their academic and/or research advisor at the earliest opportunity to determine whether or not equivalency is appropriate.

For course equivalency approval, additional supporting documentation is required such as syllabus, course description, homework, etc.

Link to Course Equivalency Request form:

<http://eecs.umich.edu/eecs/graduate/ece/forms/ECE-Equivalency-Request.pdf>

## **Transferring Credits**

Students may be able to transfer internal ECE credits, subject to approval, if the course is the same course required by the MEng program.

## **Graduation**

Graduation for the MEng program is not automatic. A student who has completed the degree requirements must submit a completed plan of study, receive advisor and ECE Graduate Program Coordinator approval, and apply for graduation via the Wolverine Access System.

The last day to apply for graduation for the current semester is the last day of classes (not the final exam period).

## **Converting from MEng to MS**

Students admitted to the MEng program may decide to apply to the Master of Science or doctoral programs. Students who do switch can count up to 12 credits of technical courses (including lab/design) toward the MS or PHD degree, to the ECE MS/PhD program requirement and Rackham Graduate School's residency/candidacy policies.

## **Academic Information for International Students**

### Curricular Practical Training (CPT) for F-1 Students

The intent of CPT is for students to engage in practical job experience that directly relates to their academic program of study. Students must choose their internships carefully with the understanding that any job that is NOT specifically related to the applicant's major area of study, will likely result in the denial of the CPT request.

Students who want to enroll in CPT should go to the ECE Graduate Program Office or website for the CPT instruction form and complete all necessary paperwork.

Credit for CPT (ENGR 998) may not be counted toward any degree requirements.

### Optional Practical Training (OPT) for F-1 Students

OPT is defined in the Federal Regulations as temporary employment directly related to a student's field of study. During OPT, a student remains in F-1 status. The end result of the OPT request process is an Employment Authorization Document (EAD) issued by United States Citizenship and Immigrations Services (USCIS).

Processing OPT applications typically requires 60 to 90 days.

Some STEM students may be eligible for a 17-month extension of OPT.

#### Reduced Course Load (RCL) for F-1 Students

International students who drop below full time status, or who need fewer than 8 credits to complete their program requirements, may apply for RCL through the International Center.

Students who want/need an RCL should go to the ECE Graduate Program Office or website for the RCL instruction form.

Please note that students are eligible for RCL only if they have not yet completed their degree requirements. Due to Federal regulations, students must apply for their degree in the semester in which they complete their degree requirements. If a student wants to remain in the country after completing their requirements, they must apply for OPT. For further information:  
<http://internationalcenter.umich.edu>

## 4. MASTER'S DEGREE REQUIREMENTS

The ECE MEng degree program is a 26-credit program with the following components:

1. At least 12 credits in technical courses, of which at least 9 are from a set of core courses for a selected MEng concentration; the rest from a set of approved non-core courses.
2. At least 4 credits in project and design courses in the same concentration.
3. At least 4 and up to 6 credits in ENTR courses; these are in the areas of entrepreneurship, leadership, communication and project management. This requirement may be waived by the MEng program director or the cognizant faculty, in cases such as continuing education and other warranted circumstances.
4. An optional summer internship, which can count up to 6 credits, corresponding to a 12-week full-time internship.

Example combinations of these toward program requirement include:

- (i) 18 technical (12 in core, 6 in non-core), 4 in project, 4 in ENTR
- (ii) 18 technical (9 in core, 9 in non-core), 4 in project, 4 in ENTR
- (iii) 15 technical (9 in core, 6 in non-core), 8 in project, 4 in ENTR
- (iv) 12 technical (9 in core, 3 in non-core), 8 in project, 6 in ENTR
- (v) 12 technical (9 in core, 3 in non-core), 4 in project, 4 ENTR, and 6 in internship
- (vi) 12 technical (all in core), 4 in project, 4 ENTR, and 6 in internship

### Program Components Elaboration

Core requirement (at least 13 and up to 22 credits total)

The core requirement consists of the core courses in the selected concentration and the design/project courses in the same concentration. These courses will deliver the technical/engineering foundations for the student, with a significant emphasis on hands-on and project experience, all in the concentration area.

#### Non-core/Electives (up to 9 credits total)

These constitute the flexible component of the program. Approved non-core courses include any “M” course in the ECE Graduate Manual – these are courses that count toward fulfilling a major requirement in one of our existing MS major areas, provided they are not simultaneously listed as a core/lab requirement for a concentration. A course not listed as “M” by the ECE Graduate Manual may count as an accepted non-core course with pre-approval from the MEng program director.

#### Communications and e-ship skills

These have become an increasingly important part of any professional training program and reflect our belief that communications, innovation, leadership and management skills are complementary and even critical to a student’s technical training.

#### Internships

Practical training is recognized as a potentially very critical and beneficial part of a professional degree program and is thus accepted as an option. It is not required, as we do not guarantee such opportunities for all students, particularly international students. To qualify for credit, the student must register for 6 credits of EECS 699. In addition, a report from the student summarizing the internship along with proper documentation from the employer needs to be submitted. An international student is also required to return for the fall term following the summer internship to obtain this credit. The EECS 699 credits may be registered in the fall term following the internship, allowing for the internship credits to be calculated in the fall term’s tuition, with over 9 credits being the same tuition rate. For guidance and questions on registering for EECS 699 please contact the Graduate Program Office.

An MEng student will not receive credit for courses outside the above requirements without pre-approval from the program director.

## **5. SPECIFIC PROGRAM REQUIREMENTS AND POLICIES**

### **All Concentrations**

The following set of entrepreneurship (ENTR) courses are common to all concentrations, along with the semester in which they are offered and the number of credits they carry.

Communications and e-ship (4-6 credits):

- ENTR 407 (Entrepreneurship Hour, F/W/1)
- ENTR 408 (Patent law, F/W/1)



- ENTR 520 (Tech-inspired business models, F/W/3)
- ENTR 530 (Innovation & IP strategy, F/W/3)
- ENTR 550 (Interpersonal skills, F/W/3)
- ENTR 560 (Project mgmt & consulting, F/W/3)
- EECS 406 (High-tech entrepreneurship, F/W/4)

Relevant EECS 598 (Special Topics) courses may be allowed to satisfy any of the requirements noted below per program director's approval.

All course requirements must be letter-graded (A, B, etc.) and may not be marked as satisfactory/unsatisfactory except for the optional requirements.

### **Data Science and Machine Learning Concentration (DS/ML)**

For the DS/ML concentration, the list of accepted courses in each category is as follows.

Core requirement (>=9 credits)

- EECS 501 (Probability and Random Processes, F/W/4)
- EECS 504 (Foundations of CV, F/W/3)
- EECS 505 (Computational DS and ML, F/W/4): this course can count toward either major or design requirement, but not both.
- EECS 542 (Vision Processing, F/W/3)
- EECS 545 (Machine Learning, F/W/3) EECS 551 (Math Methods for SP, F/4)
- EECS 556 (Image Processing, W/3)
- EECS 564 (Estimation, Filtering, and Detection, W/3)
- EECS 568 (Mobile Robotics, W/4)

Accepted non-core courses

An "M" course on the [ECE Course List](#)– these are courses that count toward fulfilling a major requirement in one of our existing MS major areas. A course not listed as "M" by the ECE Graduate Manual may count as an accepted non-core course with pre-approval from the MEng program director.

Project/Design/Lab requirement (>=4 credits):

- Python for Everybody Specialization (5-course sequence on Coursera, taught by C. Severance at SI, F/W/SS/2)
- EECS 505 (Computational DS and ML, F/W/4): this course can count toward either major or design requirement, but not both.
- EECS 605 (Design in DS and ML, F/W/4): this is a required course for the DS/ML concentration.

Examples of course choices and pathways to completion are as follows (numbers in parentheses denote credit hour counts):

Example 1: all courses, no internship; 4-credit ENTR; 23-credit core

- Fall: 501 (4), 545 (3), 505 (4), ENTR 407 (1) – 12 total
- Winter: 542 (3), 556 (3), 605 with Python (6), ENTR 550 (3) – 15 total

Example 2: all courses, no internship; 4-credit ENTR; 16-credit core; 7-credit minor

- Fall: 545 (3), 505 (4), a 1st course in VLSI (3), ENTR 550 (3) – 13 total
- Winter: 542 (3), 605 with Python (6), a 2nd course in VLSI (4), ENTR 407 (1) – 14 total

Example 3: mix; 4-credit ENTR; 16-credit core; 6-credit internship\*

- Fall: 545 (3), 505 (4), ENTR 407 (1) – 8 total
- Winter: 542 (3), 605 with Python (6), ENTR 550 (3) – 12 total
- SS: qualified internship: EECS 699 (6)

\* *International students on F1/J1 visas are required to be enrolled in courses on campus during their last term of study.*

Example 4 mix (for international students); 4-credit ENTR;  $\geq 16$ -credit core; 6-credit intern

- Fall: 545 (3), 505 (4), ENTR 407 (1) – 8 total
- Winter: 542 (3), 605 with Python (6) – 9 total
- SS: qualified internship: EECS 699 (6)
- Fall: another ECE course (3), ENTR 550 (3) – 6 total

## **Autonomous Systems (AS)**

For the AS concentration, the list of accepted courses in each category is as follows.

Core requirement ( $\geq 9$  credits):

- EECS 460 (Control Sys Analysis & Design, F/W/4)
- EECS 501 (Probability & Random Processes, F/W/4)
- EECS 504 (Foundations of CV, F/W/3)
- EECS 505 (Computational DS & ML, F/W/4)
- EECS 542 (Vision Processing, F/W/3)
- EECS 551 (Mathematical Methods for SP, F/4)
- EECS 556 (Image Processing, W/3)
- EECS 560 (Linear Systems Theory, F/W/4)
- EECS 567 (Intro to Robotics, F/3)
- EECS 561 (Design of Digital Control Systems, W/3)
- EECS 562 (Nonlinear Sys Control, W/3)
- EECS 563 (Hybrid Control, F/3)
- EECS 564 (Estimation, Filtering, and Detection, W/3)
- EECS 565 (Linear Feedback Control Systems, W/3)

Accepted non-core courses

An “M” course on the [ECE Course List](#)– these are courses that count toward fulfilling a major requirement in one of our existing MS major areas. A course not listed as “M” by the ECE Graduate Manual may count as an accepted non-core course with pre-approval from the MEng program director.

Project/Design/Lab requirement ( $\geq 4$  credits)

- EECS 452 (DSP Design Lab, F/W/4)
- EECS 461 (Embedded Control Systems, F/W/4)
- EECS 464 (Hands-on Robotics, W/4)

Examples of course choices and pathways to completion are as follows:

Example 1: all courses, no internship; 4-credit ENTR; 22-credit core

- Fall: 560 (4), 542 (3), 505 (4), ENTR 407(1) – 12 total
- Winter: 565 (or 562/563) (3), two of (461, 452, 464) (8), ENTR 550 (3) – 14 total

Example 2: all courses, no intern; 4-credit ENTR; 23-credit core

- Fall: 501 (4), 460 (4), 505 (4), ENTR 407 (1) – 13 total
- Winter: 556 or 564 (3), two of (461, 452, 464) (8), ENTR 550 (3) – 14 total

Example 3: mix; 4-credit ENTR;  $\geq 15$ -credit core; 6-credit intern

- Fall: 560 (4), 505 (4), ENTR 407 (1) – 9 total
- Winter: 565 (3), one of (461, 452, 464) (4), ENTR 550 (3) – 10 total
- SS: qualified internship EECS 699 (6)
- Fall: another ECE course (3-4)

## 6. STUDENT HANDBOOKS AND INTERNET RESOURCES

The Michigan Engineering College Bulletin is among the numerous UM publication available online. The Michigan Engineering College Bulletin gives details about the graduate degree requirements imposed by the College, and should be consulted by all graduate students. All EECS course descriptions are available in the bulletin as well. The bulletin can be accessed at: <https://bulletin.engin.umich.edu>

College of Engineering: <http://www.engin.umich.edu/college/>

UM Wolverine Access: <https://wolverineaccess.umich.edu/>

UM Registrar: <http://ro.umich.edu>

Student Financial Services: <http://www.finance.umich.edu/finops/student/>

CoE Honor Code: <http://ossa.engin.umich.edu/honor-council/>  
Student Rights and Responsibilities:  
<https://oscr.umich.edu/article/statement-student-rights-and-responsibilities>