ROBOTICS ENGINEERING

The Electrical and Computer Engineering Department offers a program **totaling 30 credit hours**, leading to the degree of Master of Science in Engineering (Robotics Engineering). Students desiring admission to the program must have earned a Bachelor's degree in Robotics, Electrical, Computer, Mechanical, Industrial and Manufacturing Systems Engineering and Computer Science with an overall GPA of 3.0 or higher. Students whose undergraduate background is in other fields may be given conditional admission and would be required to take preparatory courses in the aforementioned fields as described in section V.

The MSE-Robotics Engineering program can be completed entirely on campus or online, or by taking a combination of on-campus and online courses. Students admitted to the program are required to take courses as specified below. All students should be familiar with the ECE Graduate Student Handbook.

Students must maintain a cumulative GPA of 3.0 or higher in every semester. Courses in which grades of C- or below have been earned cannot be used to fulfill degree requirements. Students may be placed on probation if their cumulative GPA falls below 3.0. A minimum cumulative GPA of 3.0 is required to be eligible to receive the MSE (RE) degree.

Students eligible to pursue the Robotics Engineering 4+1 option may double-count up to 9 credits of 500-level or above electrical engineering elective, core, or cognate courses taken during their junior or senior years toward their undergraduate Robotics Engineering major. Robotics Engineering 4+1 students must maintain 3.2 CGPA (for their undergraduate degree) and complete two 300-level courses with a B minimum.

Program Requirements

Code	Title	Credit Hours
Core Courses		**9**
Required [1]		
ECE 500	Math Mthds for Elec & Comp Eng	
ECE 545	Intro Robot Syst [3]	
Select ONE course from the following:		
ECE 543	Kinem, Dynam Control Robots	
ECE 544	Mobile Robots	
Specialization Courses (Select 3 courses from the following lists) [2]		**9**
The following are suggested specialization areas. All three courses may be taken from one area of specialization or a combination of any of the areas. Students are free to develop their own area of specialization by selecting from any of the graduate courses listed in the ECE course list (see catalog).		
Sensing and Processing		
ECE 555	Stochastic Processes	
ECE 580	Digital Signal Processing [3]	
ECE 582	Intro to Statistical DSP	
ECE 584	Speech Processes	
ECE 586	Digital Image Processing	
ECE 587	Sel Top:Image Proc/Mach Vision	
ECE 588	Robot Vision [3]	
IMSE 606	Advanced Stochastic Processes	
ECE 642	Robotic Embed Sys	
Systems and Control		
ECE 552	Fuzzy Systems	
ECE 560	Modern Control Theory [3]	
ECE 565	Digital Control Systems	
ECE 567	Nonlinear Control Systems	
ECE 643	Humanoids	
ECE 644	Advanced Robotics	
ECE 665	Optimal Control Systems	
ECE 661	Sys Ident and Adaptive Control	
Machine Learning and Reasoning		
ECE 528	Cloud Computing [3]	
ECE 537	Data Mining	
ECE 552	Fuzzy Systems	
ECE 574	Adv Sftwr Techng in Eng Appl	
ECE 5752	Reconfigurable Computing	
ECE 579	Intelligent Systems [3]	
ECE 5831	Pat Rec & Neural Netwks	
Autonomous Vehicles		
ECE 531	Intelligent Vehicle Systems	
ECE 532	Auto Sensors and Actuators [3]	
ECE 533	Active Automotive Safety Sys	
ECE 535	Mob Dev & Ubiqys Comp Sys [3]	
ECE 554	Embedded Systems	
ECE 566	Mechatronics	
ECE 5701	Intro to Wireless Comm	
ECE 577	Engineering in Virtual World	
ECE 679	Adv Intelligent Sys	
Professional Electives		**6**
Select six credit hours		
Cognates		**6**
Select 6 credit hours		
Total Credit Hours		**30**

1. Required courses must be taken in the first year.
2. These are partial lists and will be expanded and updated from time to time. For a complete list of ECE courses please view the “Course Descriptions” later in this *Catalog*.
3. Simultaneous credit toward the BSE Robotics Engineering major and MSE Robotics Engineering for students admitted to the 4+1 option. Please see the College's website for admission requirements and program details.

Professional Electives (6 credit hours)

Students may complete the professional elective requirements in several ways:

1. Elect the thesis ECE 699 (6 credits) to work under the supervision of a faculty advisor;
2. Take directed study by ECE 591 (3 credits), and one ECE course at the graduate level;
3. Complete ECE 505 and ECE 510 as directed by ECE Department if undergraduate degree is not in a related discipline;
4. Take two additional ECE courses at the graduate level.

Cognates (6 credit hours)

Students are required to select 6 credit hours of graduate-level courses from other non-ECE engineering disciplines, such as:

- Automotive Engineering (AENG)
- Computer Information Science (CIS)
- Engineering Management (EMGT)
- Industrial and Manufacturing Systems Engineering (IMSE)
- Mechanical Engineering (ME)

Students may also select any 500-level course from the mathematics & statistics department (MATH, STAT), **excluding** math subject courses for educators (MATH 508, 5386, 5387, 543, 544, 5440, 5441, 5442, 5443, 5445, 545, 546, 549, 586, 591).

Additional cognate options may be approved by the ECE department.

Enrollment in cognate courses may be dependent on prior authorization from both the non-ECE Department and the ECE department. Please confirm your cognate course selections with the ECE Department, **via e-mail,** prior to registering.

Preparatory Courses

Students with inadequate background in Robotics, Electrical, or Computer Engineering may be required to meet with the department graduate advisor to determine the need for preparatory courses.

For further information contact:

Department of Electrical and Computer Engineering
University of Michigan-Dearborn, 4901 Evergreen Road
Room 2050 IAVS, Dearborn, MI 48128-2406
Tel: 313-593-5420
E-mail: umd-ecegrad@umich.edu

Learning Goals

1. A strong background in theories and a good knowledge of the latest technologies in the robotics engineering discipline.
2. An ability to conduct research in advanced engineering fields. The students will possess appropriate skills in formulating problems, designing experiments, collecting, processing, analyzing and interpreting data, designing a system, component, or process to meet desired requirements, and evaluating the system performances.
3. An ability to learn the latest research advancement, use advanced techniques and modern engineering tools in engineering practice, evaluate different strategies to derive a feasible solution.