ROBOTICS (M.S. WITH A MAJOR IN INDUSTRIAL AUTOMATION)

Admission Requirements

Applicants must meet requirements for admission to the Graduate School (http://bulletins.wayne.edu/graduate/general-information/academic-regulations/). Students must have a bachelor's degree or the equivalent in engineering from an accredited college or university. Students from all science, technology, engineering and math (STEM) disciplines will be considered for admission.

All applicants must be admitted to the Graduate School, the College of Engineering (http://bulletins.wayne.edu/graduate/college-engineering/academic-regulations/), and a department within the college, meeting all applicable admission requirements, including a minimum grade point average of 2.75 for regular admission and 2.5 to 2.74 for qualified admission. Professional experience will be considered in admission.

Program Requirements

The program requires students to complete a minimum of thirty credits using master's degree Plan A (24 course credits plus a 6 credit master's thesis) or Plan C (30 credits of coursework). Plan A is intended for students planning to go on to pursue a Doctoral degree. All courses must be graduate-level courses offered within the College of Engineering. The program requires applicants to *declare one of three majors*:

- ***Industrial Automation***, hosted by the Engineering Technology (ET)
- ***Intelligent Control***, hosted by the Electrical and Computer Engineering (ECE)
- ***Smart Mobility***, hosted by the Computer Science (CSC)

The M.S. in Robotics requires competency in three foundational areas for all three majors. *A student must take one of the two courses in each of the 3 foundational areas*. In addition to fulfilling the general scholarship requirements of the Division, all course work must be completed in accordance with the regulations of the Graduate School (http://bulletins.wayne.edu/graduate/general-information/academic-regulations/) and the College of Engineering (http://bulletins.wayne.edu/graduate/college-engineering/academic-regulations/).

Industrial Automation

Code	Title	Credits
Foundational Areas (Please select one course from each area)		**10**
Robot Software & Programming		
CSC 6110	Software Engineering	
or ET 5600	Python: Industrial Applications	
Robot Architectures		
CSC/ECE 5280	Introduction to Cyber-Physical Systems	
or ET 5100	Fundamentals of Mechatronics and Industrial Applications	
Robot Sensing, Perception, Planning, Dynamics & Control		
ECE 5425	Robotic Systems I	
or MIT 5700	Industrial Robots Modeling and Simulation	
Departmental Requirement		**4**
ET 7430	Methods of Engineering Analysis	
Electives		**16**
EET 5720	Computer Networking Applications	
EET 5730	Embedded Systems Networking	
ET 5110	Advanced Programmable Controllers and Industrial Applications	
ET 5800	Industrial Robots Programming	
ET 5870	Engineering Project Management	
ET 7300	Advanced Battery Systems for Electric-drive Vehicles	
ET 7800	Industrial Robots Dynamics and Control	
MCT 5150	Hybrid Vehicle Technology	
MCT 5210	Energy Sources and Conversion	
MIT 5500	Machine Tool Laboratory	
MIT 7700	Robotics and Flexible Manufacturing	
ET 7999	Master's Project	
Total Credits		**30**

Intelligent Control

Code	Title	Credits
Foundational Areas (Please select one course from each area)		**10**
Robot Software & Programming		
CSC 6110	Software Engineering	
or ET 5600	Python: Industrial Applications	
Robot Architectures		
CSC/ECE 5280	Introduction to Cyber-Physical Systems	
or ET 5100	Fundamentals of Mechatronics and Industrial Applications	
Robot Sensing, Perception, Planning, Dynamics & Control		
ECE 5425	Robotic Systems I	
or MIT 5700	Industrial Robots Modeling and Simulation	
Departmental Requirements		**8**
ECE 5470	Control Systems II	
ECE 7425	Robotics Systems II	
Electives		**12**
ECE 5330	Modeling and Control of Power Electronics and Electric Vehicle Powertrains	
ECE 5440	Traditional and Machine Learning-Based Computer-Controlled Systems	
ECE 5620	Embedded System Design	
ECE 5675	Sensors and Sensor Instrumentation	
ECE 5690	Introduction to Digital Image Processing	
ECE 5770	Digital Signal Processing	
ECE 5960	Introduction to VLSI Systems	
ECE 6570	Smart Sensor Technology I: Design	
ECE 7420	Nonlinear Control Systems	
ECE 7430	Discrete Event Systems with Machine Learning	
ECE 7440	Optimal Control with Machine Learning and Applications	
ECE 7530	Advanced Digital VLSI Design	
ECE 7690	Fuzzy Systems and Machine Learning	
ECE 8999	Master's Thesis Research and Direction	
Total Credits		**30**

Smart Mobility

Code	Title	Credits
Foundational Areas (Please select one course from each area)		**10**
Robot Software & Programming		
CSC 6110	Software Engineering	

	or ET 5600	Python: Industrial Applications
Robot Architectures		
	CSC/ECE 5280	Introduction to Cyber-Physical Systems
	or ET 5100	Fundamentals of Mechatronics and Industrial Applications
Robot Sensing, Perception, Planning, Dynamics & Control		
	ECE 5425	Robotic Systems I
	or MIT 5700	Industrial Robots Modeling and Simulation
Department Requirement		**3**
	CSC 5100	Introduction to Mobility
Electives		**17**
	CSC 5250	Network, Distributed, and Concurrent Programming
	CSC 5270	Computer Systems Security
	CSC 5825	Introduction to Machine Learning and Applications
	CSC 5870	Computer Graphics I
	CSC 6280	Real-Time and Embedded Operating Systems
	CSC 6800	Artificial Intelligence I
	CSC 6860	Digital Image Processing and Analysis
	CSC 6870	Computer Graphics II
	CSC 7991	Advanced Topics in Computer Science *
	CSC 8990	Graduate Seminar
	CSC 8999	Master's Thesis Research and Direction
Total Credits		**30**

* CSC 7991 should be taken with the topic area, Embedded Wireless Networking for Cyber-Physical Systems. Students should consult an advisor before choosing this course as an elective.

Online Program

The Online Master's of Science in Robotics-Industrial Automation Program is designed to promote greater depth of understanding in Robotics with an emphasis on Industrial Automation. The Program facilitates advanced coverage in specialized topics and develops rigorous analytical skills preparing graduates to advance their expertise and perform more sophisticated and independent work.

This Master of Science degree is offered under the following option:

Plan C (Coursework): The proposed degree will require the completion of a minimum of thirty credits of course work (14 required + 16 elective credits within the Division). Some students can also take advantage of two 3-credit hours of internship credit (14 required+6 internship+10 elective credits). The degree can be completed in one year (2 semesters and a summer).

Code	Title	Credits
Required courses		
ET 7430	Methods of Engineering Analysis	4
ET 5600	Python: Industrial Applications	3
ET 5100	Fundamentals of Mechatronics and Industrial Applications	3
MIT 5700	Industrial Robots Modeling and Simulation	4
Elective courses		
Select 16 credits from the following:		16
ET 5110	Advanced Programmable Controllers and Industrial Applications	
ET 5800	Industrial Robots Programming	
ET 5870	Engineering Project Management	
ET 7300	Advanced Battery Systems for Electric-drive Vehicles	
EET 5720	Computer Networking Applications	
MIT 7700	Robotics and Flexible Manufacturing	
MCT 5210	Energy Sources and Conversion	
MCT 5150	Hybrid Vehicle Technology	
ET 5995	Special Topics in Engineering Technology I (Topics should be chosen in consultation with an advisor.)	
ET 5500	Graduate Industrial Internship	
Total Credits		**30**