

## Minor in Robotics

**Offered by:** Sibley School of Mechanical and Aerospace Engineering, Electrical and Computer Engineering, Computer Science

**Administered by:** MAE undergraduate coordinator, 125 Upson Hall

**Eligibility:** All undergraduates except those completing minors in ECE, MechE, or CS.

### **Educational Objectives:**

The robotics minor covers the fundamentals of designing, building and programming robots, and in addition requires students to dive deeper in a specific area of robotics.

### **Requirements:**

- 1) Six distinct courses including at least three from Group A and three from a single category within Group B, must be completed.
- 2) ME majors may not count MAE 3780 if it is used to satisfy the ME circuits requirement
- 3) Students may petition to use one semester of independent research (minimum 3 credits of CS 4999 or ECE 4999 or INFO 4900 or MAE 4900) in lieu of one group B course. Such petitions must include a short description of the project and a note from the faculty advisor commenting on the robotics aspect of the project.

**Academic Standards:** A grade of C or better in each course.

### **GROUP A: Fundamentals – choose three**

CS 4750/5750, ECE 4770, MAE 4760: Foundations of Robotics  
MAE 4180/5180, CS 4758/5758, ECE 4180/5772: Autonomous Mobile Robots  
MAE 3780/3783: Mechatronics  
ECE 3400: Intelligent Physical Systems  
CS 4700: Foundations of Artificial Intelligence  
INFO 4410/6420 / CS 4754: Human-Robot Interaction  
MAE 4810/5810: Robot Perception  
ECE 4160/5160, MAE4190/5190: Fast Robots

### **GROUP B: Specialization – choose three in one category**

#### **Intelligence**

CS 4750/5750, ECE 4770, MAE 4760: Foundations of Robotics  
CS 4780/5780: Machine Learning for Intelligent Systems  
CS 6751 / MAE 6730: Robot Manipulation  
MAE 6770: Formal Methods for Robotics  
MAE 6790: Intelligent Sensor and Planning Control  
ECE 6970: Bio-Inspired Coordination of Multi-Agent Systems  
CS 4700: Foundations of Artificial Intelligence  
MAE 4180/5180, CS 4758/5758, ECE 4180/5772: Autonomous Mobile Robots  
MAE 6710: Human-Robot Interaction  
CS 6756: Learning for Robot Decision Making  
CS 4789: Introduction to Reinforcement Learning

### **Modelling, Dynamics, and Control**

CS 4750/5750, ECE 4770, MAE 4760: Foundations of Robotics  
MAE 4730/5730: Intermediate Dynamics  
MAE 4710/5710: Applied Dynamics  
MAE 4780/5780: Feedback Control Systems  
ECE 4160/5160, MAE4190/5190: Fast Robots  
CS 6751 / MAE 6730: Robot Manipulation  
MAE 6760: Model based estimation  
MAE 6770: Formal Methods for Robotics  
MAE 6780: Multivariable Control Theory

### **Perception**

CS 4670 / 5670: Introduction to Computer Vision OR ECE 5470: Computer Vision  
CS 6670: Computer Vision  
MAE 4810/5810: Robot Perception  
MAE 6790: Intelligent Sensor and Planning Control  
MAE 4180/5180, CS 4758/5758, ECE 4180/5772: Autonomous Mobile Robots  
ECE 4320/MAE 4320: Integrated Micro Sensors and Actuators: Bridging the Physical and Digital Worlds  
ECE 4160/5160, MAE4190/5190: Fast Robots  
MAE 6760: Model based estimation

### **Systems and Design**

MAE 3780: Mechatronics  
ECE 3400: Intelligent Physical Systems  
ECE 4320/MAE 4320: Integrated Micro Sensors and Actuators: Bridging the Physical and Digital Worlds  
ECE 4760: Designing with Microcontrollers  
INFO 4410/6420 / CS 4754: Human-Robot Interaction  
INFO 4320: Rapid Prototyping and Physical Computing  
DEA 5210: Interaction Design Studio  
INFO 4420: HCI Design Studio  
ECE 4160/5160, MAE4190/5190: Fast Robots  
ECE 5725: Design with Embedded Operating Systems  
DEA 6210: Architectural Robotics  
MAE 6710: Human-Robot Interaction  
ECE 5960: Micro and Nano Robotics  
ECE 5960: Micro and Nano Robotics  
INFO 5755, INFO 6755, CS 5755: Mobile HRI