Twin Cities Campus

Robotics M.S.

College of Science and Engineering - Adm

College of Science and Engineering

Link to a [list of faculty](#) for this program.

Contact Information:
Minnesota Robotics Institute, Shepherd Laboratories, 100 Union St SE, Minneapolis, MN 55455
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- Program Type: Master's
- Requirements for this program are current for Fall 2021
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Robotics MS program provides a strong foundation in robotics by gathering in a single program the relevant knowledge, expertise, and educational assets such as robot modeling and control, perception using cameras and other sensors, and cognition to reason, plan, and make decisions.

Students who graduate from this regular 2-year masters program will learn the state-of-the-art methods for developing and using robots, be exposed to the cutting-edge technologies and theory forming the basis for the next generation of robots and their applications in areas such as agriculture, underwater exploration, autonomous driving, and manufacturing applications.

Program Delivery

This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have a bachelors degree from an accredited college or university in an engineering field, computer science, physics, or mathematics.

Other requirements to be completed before admission:
Programming experience including basic algorithms and data structures that are normally taught in beginning computer science courses as part of the undergraduate degree, or subsequent work experience is required.

Applicants without some of the background preparation can be admitted, but will be required to complete some of the relevant undergraduate courses in addition to the MS requirements.

The GRE is recommended but not required.

Special Application Requirements:
Applications are accepted on a rolling basis.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

Program Requirements

Plan A: Plan A requires 21 major credits, up to null credits outside the major, and 10 thesis credits.The final exam is oral.

Plan B: Plan B requires 31 major credits and up to null credits outside the major.The final exam is written and oral. A capstone project is required.
Capstone Project: The capstone project is completed in consultation with the faculty, or in collaboration with industry partners.

Plan C: Plan C requires 31 major credits and up to null credits outside the major.The is no final exam.A capstone project is required.
Capstone Project: Plan C students must complete, in consultation with the advisor, one class project totaling 100 hours or two projects of 50 hours each.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

Courses must be taken on the A-F grade basis, unless only offered S/N.

Required courses (9 credits)
 Cognition (3 credits)
  Select 3 credits from the following in consultation with the advisor:
  CSCI 5511 - Artificial Intelligence I (3.0 cr)
  CSCI 5512 - Artificial Intelligence II (3.0 cr)
  CSCI 5521 - Machine Learning Fundamentals (3.0 cr)
  CSCI 5525 - Machine Learning: Analysis and Methods (3.0 cr)
 Perception (3 credits)
  Select 3 credits from the following in consultation with the advisor:
  CSCI 5561 - Computer Vision (3.0 cr)
  EE 5561 - Image Processing and Applications: From linear filters to artificial intelligence (3.0 cr)
 Robot Modeling and Control (3 credits)
  Select 3 credits from the following in consultation with the advisor:
  AEM 5321 - Modern Feedback Control (3.0 cr)
  CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
  CSCI 5552 - Sensing and Estimation in Robotics (3.0 cr)
  EE 5231 - Linear Systems and Control (3.0 cr)
  ME 5286 - Robotics (4.0 cr)

Colloquium (1 credit)
 Take the following:
 ROB 8970 - Robotics Colloquium (1.0 cr)

Electives (11-21 credits)
 Plan A students select 11 credits, Plan B students select 15 to 18 credits, and Plan C students select 21 credits from the following in consultation with the advisor.
 Up to 3 credits of ROB 5994 can be applied to degree requirements. If CSCI 8980 Special Topics is selected, only topics in the areas of robotics, computer vision, and cognition may be used. Other courses may be selected with approval of the advisor and director of graduate studies.
 AEM 5321 - Modern Feedback Control (3.0 cr)
 AEM 5333 - Design-to-Flight: Small Uninhabited Aerial Vehicles (3.0 cr)
 AEM 5451 - Optimal Estimation (3.0 cr)
 AEM 8411 - Advanced Dynamics (3.0 cr)
 AEM 8421 - Robust Multivariable Control Design (3.0 cr)
 AEM 8423 - Convex Optimization Methods in Control (3.0 cr)
 AEM 8495 - Advanced Topics in Aerospace Systems (1.0 - 4.0 cr)
 CSCI 5231 *{Inactive}*(3.0 cr)
 CSCI 5511 - Artificial Intelligence I (3.0 cr)

CSCI 5512 - Artificial Intelligence II (3.0 cr)
CSCI 5521 - Machine Learning Fundamentals (3.0 cr)
CSCI 5523 - Introduction to Data Mining (3.0 cr)
CSCI 5525 - Machine Learning: Analysis and Methods (3.0 cr)
CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
CSCI 5552 - Sensing and Estimation in Robotics (3.0 cr)
CSCI 5561 - Computer Vision (3.0 cr)
CSCI 5609 - Visualization (3.0 cr)
CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
EE 5231 - Linear Systems and Control (3.0 cr)
EE 5235 - Robust Control System Design (3.0 cr)
EE 5239 - Introduction to Nonlinear Optimization (3.0 cr)
EE 5251 - Optimal Filtering and Estimation (3.0 cr)
EE 5391 *{Inactive}*(3.0 cr)
EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
EE 5561 - Image Processing and Applications: From linear filters to artificial intelligence (3.0 cr)
EE 5621 - Physical Optics (3.0 cr)
EE 5622 - Physical Optics Laboratory (1.0 cr)
EE 5624 - Optical Electronics (4.0 cr)
EE 5705 - Electric Drives in Sustainable Energy Systems (3.0 cr)
EE 5707 - Electric Drives in Sustainable Energy Systems Laboratory (1.0 cr)
EE 5940 - Special Topics in Electrical Engineering I (1.0 - 4.0 cr)
EE 8215 - Nonlinear Systems (3.0 cr)
EE 8231 - Optimization Theory (3.0 cr)
EE 5571 - Statistical Learning and Inference (3.0 cr)
EE 8591 - Predictive Learning from Data (3.0 cr)
ME 5241 - Computer-Aided Engineering (4.0 cr)
ME 5243 - Advanced Mechanism Design (4.0 cr)
ME 5248 - Vibration Engineering (4.0 cr)
ME 5286 - Robotics (4.0 cr)
ME 8281 - Advanced Control System Design-1 (3.0 cr)
ME 8283 - Design of Mechatronic Products (4.0 cr)
ME 8285 - Control Systems for Intelligent Vehicle Applications (3.0 cr)
ROB 5994 - Directed Research (1.0 - 3.0 cr)

Plan Options

Plan A (10 credits)
Take 10 thesis credits.
ROB 8777 - Thesis Credits Master's (1.0 - 18.0 cr)

  -OR-

Plan B (3 to 6 credits)
Take at least 3 credits of the following in consultation with advisor:
ROB 8760 - Capstone Project (1.0 - 3.0 cr)