

Mechanical Engineering with Concentration in Mechatronics, MSME

While pursuing a Master of Science (MS) in Mechanical Engineering (<https://mie.northeastern.edu/academics/graduate-studies/ms-mece/>), students may choose mechatronics as a concentration. The term mechatronics is a combination of the words mechanics and electronics. Mechatronics is a multidisciplinary approach to product design and development, merging the principles of electrical, mechanical, computer, material, chemical, and industrial engineering. The mechatronics and systems research cluster in the MIE department is concerned with systems that are typically composed of traditional mechanical and electrical components but are rendered “intelligent” by the incorporation of sensors, actuators, and computer control systems. Our primary focus in mechatronics and systems is on intelligent and integrated systems and machines along with their practical applications ranging from manufacturing systems and robotic platforms to biological systems. Our research and teaching together are designed to prepare students to understand and exploit mechatronics to enable their future engineering innovations.

GENERAL DEGREE REQUIREMENTS

To be eligible for admission to any of the MS degree programs, a prospective student must hold a Bachelor of Science degree in engineering, science, mathematics, or an equivalent field. Students in all master’s degree programs must complete a minimum of 32 semester hours of approved coursework (exclusive of any preparatory courses) with a minimum grade-point average (GPA) of 3.000. Students can complete a master’s degree by pursuing any of one of the three tracks: coursework option, project option, and thesis option. Specific degree requirements for each of these tracks can be found under the Program Requirements tab. Students may pursue any program either on a full-time or part-time basis; however, certain restrictions may apply.

ACADEMIC AND RESEARCH ADVISORS

All non-thesis students are advised by the faculty advisor designated for their respective concentration or program. Students willing to pursue the thesis option must first find a research advisor within their first year of study. The research advisor will guide the students’ thesis work, and thesis reader(s) may be assigned at the discretion of their research advisor. The research adviser must be a full-time or jointly appointed faculty. If the research advisor is outside the MIE department, before the thesis option can be approved, a faculty member with 51 percent or more appointments in the MIE department must be chosen as co-advisor, and a petition must be filed and approved by the co-advisor and the MIE Graduate Affairs Committee. Thesis option students are advised by the faculty advisor of their concentration before they select their research advisor(s). The research advisor and co-advisor must serve as thesis readers.

PLAN OF STUDY AND COURSE SELECTION

It is recommended that all new students attend orientation sessions held by the MIE department and the Graduate School of Engineering to acquaint themselves with the coursework requirements and research activities of the department as well as with the general policies, procedures, and expectations.

In order to receive proper guidance with their coursework needs, all MS students are strongly encouraged to complete and submit a fully signed Plan of Study (PS) to the department before enrolling in second-semester courses. This form not only helps the students manage their coursework but it also helps the department to plan for requested course offerings. The PS form may be modified at any time as the students progress in their degree programs.

Students pursuing study or research under the guidance of a faculty member can choose project option by taking Master’s Project (ME 7945). An MS project must be petitioned to the MIE Graduate Affairs Committee and approved by both the faculty member (instructor for Master’s Project) and the student’s academic advisor. The petition must clearly state the reason for taking the project course; a brief description of the goals; as well as the expected outcomes, deliverables, and grading scheme.

Students pursuing coursework option may petition the MIE Graduate Affairs Committee to substitute up to a 4-semester-hour Independent Study (ME 7978). An independent study must be approved by the academic advisor. The petition must clearly state the instructor; the reason for taking the course; a brief description of the goals; as well as the expected outcomes, deliverables, and grading scheme. When taking thesis or project options, the independent study course cannot be taken.

OPTIONS FOR MS STUDENTS (COURSEWORK ONLY, PROJECT, OR THESIS)

Students accepted into any of the MS programs in the MIE department can choose one of the three options: coursework only, project, or thesis. Please see the Program Requirements tab on the top menu of this page for more information. MS students who want to pursue project or thesis options must find, within the first year of their study, a faculty member or a research advisor who will be willing to direct and supervise a mutually agreed research project or MS thesis. Moreover, students who receive financial support from the university in the form of a research, teaching, or tuition assistantship must complete 8 semester hours of thesis. Students are strongly encouraged to complete their 8 semester hours of Thesis (ME 7990) over two consecutive semesters.

Students who complete the thesis option must make a presentation of their thesis before approval by the department. The MS thesis presentation shall be publicly advertised at least one week in advance and all faculty members and students may attend and participate. If deemed appropriate by the research advisor, other faculty members may be invited to serve as thesis readers to provide technical opinions and judge the quality of the thesis and presentation.

CHANGE OF PROGRAM/CONCENTRATION

Students enrolled in any of the MIE department programs or concentrations may change their current program or concentration no sooner than the beginning of their second full-time semester of study. In order for the program or concentration change request to be considered by the MIE Graduate

Affairs Committee, the student must not be in the first semester of their current program, must have a 3.300 GPA, and have completed at least 8 semester hours of required course work in their sought program at Northeastern.

GRADUATE CERTIFICATE OPTIONS

Students enrolled in a master's degree have the opportunity to also pursue one of the many engineering graduate certificate options in addition to or in combination with the MS degree. Students should consult their faculty advisor regarding these options (<http://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs/>).

GORDON INSTITUTE OF ENGINEERING LEADERSHIP

Master's Degree in Mechanical Engineering with a Concentration in Mechatronics with Graduate Certificate in Engineering Leadership

Students may complete a Master of Science in Mechanical Engineering with a Concentration in Mechatronics in addition to earning a Graduate Certificate in Engineering Leadership (<http://catalog.northeastern.edu/graduate/engineering/multidisciplinary/engineering-leadership-graduate-certificate/>). Students must apply and be admitted to the Gordon Engineering Leadership Program in order to pursue this option. The program requires fulfillment of the 16-semester-hour curriculum required to earn the Graduate Certificate in Engineering Leadership, which includes an industry-based challenge project with multiple mentors. The integrated 36-semester-hour degree and certificate will require 20 hours of advisor-approved mechatronics technical courses.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Core Requirements

| Code | Title | Hours |
|---|---|-------|
| Mathematics Competency | | |
| Complete the following course: | | |
| ME 6200 | Mathematical Methods for Mechanical Engineers 1 | 4 |
| Mechanics Competency | | |
| Complete 4 semester hours from the following or other advisor-approved courses: | | |
| ME 5250 | Robot Mechanics and Control | 4 |
| ME 5650 | Advanced Mechanics of Materials | |
| ME 5655 | Dynamics and Mechanical Vibration | |
| ME 5657 | Finite Element Method | |
| Mechatronics Concentration | | |
| Complete 8 semester hours from the following or other advisor-approved courses: | | |
| ME 5245 | Mechatronic Systems | 8 |
| ME 5659 | Control Systems Engineering | |
| Electrical Competency | | |
| Complete 4 semester hours from the following or other advisor-approved courses: | | |
| EECE 5610 | Digital Control Systems | 4 |
| EECE 5666 | Digital Signal Processing | |
| EECE 5680 and EECE 5681 | Electric Drives and Lab for EECE 5680 | |
| EECE 5684 and EECE 5685 | Power Electronics and Lab for EECE 5684 | |
| ME 6260 | Introduction to Microelectromechanical Systems (MEMS) | |

Options

Complete one of the following options:

COURSEWORK OPTION

| Code | Title | Hours |
|--|-------|-------|
| Complete 12 semester hours from the course list. | | 12 |

PROJECT OPTION

| Code | Title | Hours |
|---|------------------|-------|
| ME 7945 | Master's Project | 4 |
| Complete 8 semester hours from the course list. | | 8 |

THESIS OPTION

| Code | Title | Hours |
|---|---------------------|--------------|
| ME 7990 | Thesis ¹ | 8 |
| Complete 4 semester hours from the course list. | | 4 |

Course List

| Code | Title | Hours |
|-------------|--|--------------|
| CIVE 5373 | Transportation Systems: Analysis and Planning | |
| CIVE 5699 | Special Topics in Civil Engineering (Vibration-Based Structural Health Monitoring) | |
| CIVE 7342 | System Identification | |
| CS 5335 | Robotic Science and Systems | |
| CS 5340 | Computer/Human Interaction | |
| CS 7150 | Deep Learning | |
| EECE 5115 | Dynamical Systems in Biological Engineering | |
| EECE 5550 | Mobile Robotics | |
| EECE 5552 | Assistive Robotics | |
| EECE 5554 | Robotics Sensing and Navigation | |
| EECE 5576 | Wireless Communication Systems | |
| EECE 5606 | Micro- and Nanofabrication | |
| EECE 5644 | Introduction to Machine Learning and Pattern Recognition | |
| EECE 7242 | Integrated Circuits for Mixed Signals and Data Communication | |
| IE 5640 | Data Mining for Engineering Applications | |
| IE 6700 | Data Management for Analytics | |
| IE 7315 | Human Factors Engineering | |
| IE 7615 | Neural Networks and Deep Learning | |
| ME 5240 | Computer Aided Design and Manufacturing | |
| ME 5250 | Robot Mechanics and Control | |
| ME 5665 | Musculoskeletal Biomechanics | |
| ME 7247 | Advanced Control Engineering | |

Or any other ME or MATL course

Program Credit/GPA Requirements

32 total semester hours required

Minimum 3.000 GPA required

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Required for all students who receive financial support from the university in the form of a research, teaching, or tuition assistantship.