Industrial Engineering, MSIE (Boston)

Website (https://mie.northeastern.edu/academics/graduate-studies/ms-inde/)

The Department of Mechanical and Industrial Engineering offers comprehensive research and educational programs for students pursuing the Master of Science in Industrial Engineering. Industrial engineering applies mathematical modeling and analytical tools to make better decisions for designing and managing efficient and effective systems. IE is applied in many areas, including healthcare systems, supply chains, logistics and transportation engineering, manufacturing, sustainability, resilient systems, energy systems, and human-in-the loop systems. We partner with organizations ranging from startups to well-established corporations, to government and nongovernment organizations. For example, our supply chain resilience research is trying to understand and mitigate persistent drug shortages in the United States. Our research in healthcare systems engineering uses methods from lean Six Sigma tools to advanced mathematical models to improve system and product reliability and optimize healthcare process quality, delays, cost, efficiency, and effectiveness—national priorities. Recent healthcare applications include improvements in scheduling, readmissions, cost reductions, cancer care, and health services planning. We use stochastic and simulation modeling to study environmental issues related to green manufacturing, product recovery, and end-of-life management. We use data analytics for designing prognostics and preventive strategies for manufacturing operations. Our research and teaching together are designed to develop IE practitioners who can work, innovate, and excel in a variety of businesses. These extensive programs and coursework allow for the selection of a degree that meets a wide variety of personal and professional goals.

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 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 nonthesis 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 advisor 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% 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 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 may also petition to waive a core course by demonstrating evidence of their having passed a similar approved IE or OR graduate course. In such situations, the students must first obtain approval from their academic advisor for the course(s) they are planning to substitute.

Students pursuing study or research under the guidance of a faculty member can choose project option by taking Master's Project (IE 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.

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 Northeastern University in the form of a research, teaching, or tuition assistantship must complete the thesis option (16 semester hours). Students are strongly encouraged to complete 4 semester hours of Master's Project (IE 7945) followed by 4 semester hours of Thesis (IE 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 coursework in their sought program at Northeastern.

Graduate Certificate Options

Students enrolled in a graduate degree program in the College of Engineering have the opportunity to pursue an engineering graduate certificate in addition to or in combination with the MS degree. For more information please refer to Graduate Certificate Programs (https://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs/).

GORDON INSTITUTE OF ENGINEERING LEADERSHIP

Master's Degree in Industrial Engineering with Graduate Certificate in Engineering Leadership

Students may complete a Master of Science in Industrial Engineering in addition to earning a Graduate Certificate in Engineering Leadership (https://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 32-semester-hour degree and certificate will require 16 hours of advisor-approved industrial engineering technical courses. For students who concurrently enroll in the Graduate Certificate in Engineering Leadership, 16 semester hours of the certificate coursework may be applied to the elective requirements of this program's coursework option.

GALANTE ENGINEERING BUSINESS PROGRAM

Master's Degree in Industrial Engineering with Graduate Certificate in Engineering Business

Students may complete a Master of Science in Industrial Engineering in addition to earning a Graduate Certificate in Engineering Business (https://catalog.northeastern.edu/graduate/engineering/mechanical-industrial/engineering-business-graduate-certificate/). Students must apply and be admitted to the Galante Engineering Business Program (http://galante.sites.northeastern.edu/) in order to pursue this option. The program requires the applicant to have earned or be in a program to earn a Bachelor of Science in Engineering from Northeastern or another accredited university/college within the U.S. The integrated 32-semester-hour degree and certificate will require 16 semester hours of the industrial engineering core courses and 16 semester hours from the outlined business-skill curriculum. The coursework, along with participation in cocurricular professional development elements, earn the Graduate Certificate in Engineering Business. (https://mie.northeastern.edu/academics/graduate-studies/cert-enbu/)

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Core Requirements

Code	Title	Hours
IE 6200	Engineering Probability and Statistics	4
OR 6205	Deterministic Operations Research	4
Complete 8 semester hours from the following:		8
IE 5400	Healthcare Systems Modeling and Analysis	
or IE 5500	Systems Engineering in Public Programs	
or IE 7350	Sociotechnical Systems: Computational Models for Design and Policy	
IE 7200	Supply Chain Engineering	
IE 7215	Simulation Analysis	
IE 7275	Data Mining in Engineering	
IE 7315	Human Factors Engineering	
or IE 6500	Human Performance	

Options

Complete one of the following options:

COURSEWORK OPTION

Code	Title	Hours
Complete 16 semester hours from the course list below.		16

PROJECT OPTION

Code	Title	Hours
IE 7945	Master's Project	4
Complete 12 semester hours from the course list below.		12

THESIS OPTION [1]

Code	Title	Hours
IE 7945	Master's Project	4
IE 7990	Thesis	4
Complete 8 semester hours from the course list below.		8
In addition to completing the thesis course, students must successfully complete the thesis submission process, including securing committee and Graduate School of Engineering signatures and submission of an electronic copy of their MS thesis to ProQuest.		

Course List

Any course in the following list will serve as an elective course, provided the student satisfies prerequisites and program requirements. Students can take electives outside this list with prior approval from the faculty advisor.

Code	Title	Hours
Computer Systems Engineering		
CSYE 7280	User Experience Design and Testing	
Data Analytics		
DA 5020	Collecting, Storing, and Retrieving Data	
Data Architecture Management		
DAMG 6210	Data Management and Database Design	
Engineering Management		
EMGT 5220	Engineering Project Management	
EMGT 5300	Engineering/Organizational Psychology	
EMGT 6225	Economic Decision Making	
EMGT 6305	Financial Management for Engineers	
General Engineering		
GE 5010	Customer-Driven Technical Innovation for Engineers	
GE 5100	Product Development for Engineers	
Industrial Engineering		
IE 5137	Computational Modeling in Industrial Engineering	
IE 5617	Lean Concepts and Applications	
IE 6300	Manufacturing Systems Design	
IE 6400	Foundations for Data Analytics Engineering	
IE 6600	Computation and Visualization for Analytics	
IE 6700	Data Management for Analytics	
IE 7270	Intelligent Manufacturing	
IE 7275	Data Mining in Engineering	
IE 7280	Statistical Methods in Engineering	
IE 7285	Statistical Quality Control	
IE 7290	Reliability Analysis and Risk Assessment	
IE 7295	Applied Reinforcement Learning in Engineering	
IE 7300	Statistical Learning for Engineering	
IE 7315	Human Factors Engineering	
IE 7350	Sociotechnical Systems: Computational Models for Design and Policy	
Operations Research		
OR 6500	Metaheuristics and Applications	
OR 7230	Probabilistic Operation Research	
OR 7235	Inventory Theory	
OR 7240	Integer and Nonlinear Optimization	
OR 7245	Network Analysis and Advanced Optimization	
OR 7270	Convex Optimization and Applications	

OR 7310	Logistics, Warehousing, and Scheduling
Supply Chain Management	
SCHM 6213	Global Supply Chain Strategy
SCHM 6214	Sourcing and Procurement
SCHM 6215	Supply Chain Analytics
SCHM 6221	Sustainability and Supply Chain Management
SCHM 6223	Managing Healthcare Supply Chain Operations

Or any IE or OR courses

Optional Co-op Experience

Code	Title	Hours
Complete the following. Students must complete ENCP 6100 to qualify for co-op experience:		
ENCP 6100	Introduction to Cooperative Education	1
ENCP 6964	Co-op Work Experience	0
or ENCP 6954	Co-op Work Experience - Half-Time	
or ENCP 6955	Co-op Work Experience Abroad - Half-Time	
or ENCP 6965	Co-op Work Experience Abroad	

Program Credit/GPA Requirements

32 total semester hours required (33 with optional co-op)
Minimum 3.000 GPA required

[1] Thesis option is required for all students who receive financial support from the university in the form of a research, teaching, or tuition assistantship.