OPERATIONS RESEARCH

www.coe.neu.edu/degrees/interdisciplinary-engineering

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Operations research (OR) deals with the application of scientific methods to decision making. Students have an opportunity to learn how to develop and solve mathematical and computer models of systems using optimization and statistical methods. OR graduates work in a wide variety of fields, such as transportation, supply chain operations, communications and computer operations, manufacturing, finance, and healthcare. The OR program is offered jointly by the Department of Mechanical and Industrial Engineering (MIE) and the Department of Mathematics, thus achieving a unique balance of theory and application.

Master of Science Degrees

REQUIREMENTS

To be eligible for admission to any of the Master of Science (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 course work (exclusive of any preparatory courses) with a minimum GPA of 3.000. Students may pursue any program either on a full- or part-time basis; however, certain restrictions may apply as described below.

Students who receive financial support from the university in the form of a research, teaching, or tuition assistantship must complete an 8-semester-hour thesis. Other students may choose to complete a thesis, project, or pursue their degree on a coursework-only (also known as nonthesis) basis. Students who complete the thesis option must make a presentation at a thesis defense before approval by the department.

SPECIAL COURSE REQUIREMENTS

All MIE MS students in thesis or project options (excluding MS students in engineering management and Gordon Engineering Leadership programs), who have entered in or after the fall 2012 semester, must complete MEIE 6800 Technical Writing and MEIE 6850 Research Seminar in Mechanical and Industrial Engineering, preferably during their first year of full-time study. If appropriate, part-time students may petition the graduate affairs committee to waive these requirements. Students in combined BS/MS programs who entered in or after fall 2014 must take MEIE 6850 as part of their course work requirement, while MEIE 6800 is optional for these students.

All MIE graduate students are also required to complete a brief online session on Responsible Conduct of Research and Plagiarism in one of these courses. The outcome of the online session will be filed with the student’s records.

ACADEMIC AND RESEARCH ADVISORS

All nonthesis students are advised by the academic advisor designated for their respective concentration or program. Thesis-option MS students must find a research advisor within their first year of study and may have thesis reader(s) at the discretion of their research advisor. The research advisor must be a full-time faculty or affiliated member of the MIE department; otherwise, a petition must be filed and approved by the MIE graduate affairs committee. If the research advisor is outside the MIE department, a faculty member with 50 percent or more appointments in the MIE department must be chosen as co-advisor. Thesis-option students are advised by the academic advisor of their concentration before they select their research advisor(s).

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 course work requirements and research activities of the department as well as with general policies, procedures, and expectations.

In order to receive proper guidance with their course work needs, all MS students are strongly encouraged to complete and submit a signed Plan of Study (PS) to the department before enrolling in second-semester courses. This form helps the students in managing their course work as well as helping the department to plan for offering the requested courses. The PS form may be modified at any time as the students proceed in their degree programs. However, requests for changes in PS must be processed before the requested change actually takes place. A revised PS form must also be approved and signed by the student’s academic advisor.

Operations research students must select all required course work, typically consisting of six or more courses, from the list below. Each student’s academic advisor must approve all courses prior to registration. Students may not use any courses taken without the approval of the academic advisor toward the 32-semester-hour minimum requirement. However, students may petition the MIE graduate affairs committee to substitute no more than one (4-semester-hour) graduate-level course from outside the approved list of electives. This may include independent study. An independent study must be approved by the research advisor (for thesis option) and academic advisor (for nonthesis option). The petition must clearly state the reason for taking the course; a brief description of the goals; as well as the expected outcomes, deliverables, and grading scheme.
Course Work Option

Select one of the following options:

OPTIONS

Select one of the following options:

Course Work Option

Complete four of the following courses:

Course

Work Only

With Project

With Thesis

IE 6200
Engineering Probability and Statistics
4 SH

IE 6200
or MATH 7241
Probability 1
4 SH

OR 7245
Network Analysis and Advanced Optimization
4 SH

or MATH 7234
Optimization and Complexity
4 SH

OR 7230
Probabilistic Operation Research
4 SH

OR MATH 7341
Probability 2
4 SH

OR 6205
Deterministics Operations Research
4 SH

NORTHEASTERN UNIVERSITY
IE 7215  Simulation Analysis  4 SH
IE 7275  Data Mining in Engineering  4 SH
IE 7280  Statistical Methods in Engineering  4 SH
IE 7285  Statistical Quality Control  4 SH
IE 7290  Reliability Analysis and Risk Assessment  4 SH
IE 7315  Human Factors Engineering  4 SH
INFO 6205  Program Structure and Algorithms  4 SH
INFO 6210  Data Management and Database Design  4 SH
MATH 7232  Combinatorial Analysis  4 SH
MATH 7233  Graph Theory  4 SH
MATH 7342  Mathematical Statistics  4 SH
MATH 7346  Time Series  4 SH
MATH 7347  Statistical Decision Theory  4 SH
MATH 7349  Stochastic Calculus and Introduction to No-Arbitrage Finance  4 SH
OR 7235  Inventory Theory  4 SH
OR 7240  Integer and Nonlinear Optimization  4 SH
OR 7245  Network Analysis and Advanced Optimization  4 SH
OR 7250  Multi-Criteria Decision Making  4 SH
OR 7260  Constraint Programming  4 SH
OR 7310  Logistics, Warehousing, and Scheduling  4 SH

**Thesis Option**

**THESIS**
Requires 8 semester hours:
- OR 7990  Thesis  1 to 8 SH
- MEIE 6800  Technical Writing Seminar  0 SH
- MEIE 6850  Research Seminar in Mechanical and Industrial Engineering  0 SH

**ELECTIVES**
Complete two of the following courses:
- CS 5800  Algorithms  4 SH
- CS 6140  Machine Learning  4 SH
- CS 7805  Theory of Computation  4 SH
- CSYE 6200  Concepts of Object-Oriented Design  4 SH
- CSYE 6210  Component Software Development  4 SH
- EECE 7313  Pattern Recognition  4 SH
- EECE 7360  Combinatorial Optimization  4 SH
- EMGT 5220  Engineering Project Management  4 SH
- EMGT 5300  Engineering/Organizational Psychology  4 SH
- EMGT 6225  Economic Decision Making  4 SH
- EMGT 6305  Financial Management for Engineers  4 SH
- IE 5400  Healthcare Systems Modeling and Analysis  4 SH
- IE 5500  Systems Engineering in Public Programs  4 SH
- IE 5617  Lean Concepts and Applications  4 SH
- IE 5620  Mass Customization  4 SH
- IE 5630  Biosensor and Human Behavior Measurement  4 SH
- IE 6300  Manufacturing Methods and Processes  4 SH
- IE 7200  Supply Chain Engineering  4 SH
- IE 7215  Simulation Analysis  4 SH
- IE 7275  Data Mining in Engineering  4 SH
- IE 7280  Statistical Methods in Engineering  4 SH
- IE 7285  Statistical Quality Control  4 SH
- IE 7290  Reliability Analysis and Risk Assessment  4 SH
- IE 7315  Human Factors Engineering  4 SH
- INFO 6205  Program Structure and Algorithms  4 SH
- INFO 6210  Data Management and Database Design  4 SH
- MATH 7232  Combinatorial Analysis  4 SH
- MATH 7233  Graph Theory  4 SH
- MATH 7342  Mathematical Statistics  4 SH
- MATH 7346  Time Series  4 SH
- MATH 7347  Statistical Decision Theory  4 SH
- MATH 7349  Stochastic Calculus and Introduction to No-Arbitrage Finance  4 SH
- OR 7235  Inventory Theory  4 SH
- OR 7240  Integer and Nonlinear Optimization  4 SH
- OR 7245  Network Analysis and Advanced Optimization  4 SH
- OR 7250  Multi-Criteria Decision Making  4 SH
- OR 7260  Constraint Programming  4 SH
- OR 7310  Logistics, Warehousing, and Scheduling  4 SH

**Leadership Challenge Project**
- OR 7440  Leadership Challenge Project  2 SH

**Engineering Leadership Option**
- Students completing this option receive the graduate certificate in engineering leadership in addition to the master’s degree.

**LEADERSHIP**
- ENLR 5121  Engineering Leadership  1 2 SH
- ENLR 5122  Engineering Leadership  2 2 SH

**FOUNDATIONS**
- ENLR 5131  Scientific Foundations of Engineering  1 2 SH
- ENLR 5132  Scientific Foundations of Engineering  2 2 SH

**PROJECT**
- OR 7440  Operations Research Engineering Leadership Challenge Project  1 4 SH
- OR 7442  Operations Research Engineering Leadership Challenge Project  2 4 SH

**PROGRAM CREDIT/GPA REQUIREMENTS**
32 total semester hours required
Minimum 3.000 GPA required

Note that these pages are extracted from the full Graduate Catalog, please refer to it for complete details.