# Energy Systems, MSEneS (Online)

The Master of Science in Energy Systems (https://mie.northeastern.edu/academics/graduate-studies/ms-enes/) integrates engineering, business, and policy into a high-level signature, multidisciplinary graduate program. Energy systems students have an opportunity to learn how to leverage business skills and public policy knowledge to accomplish their engineering goals. This program is ideal for the engineer or technical business major who is interested in pursuing an industrial or public-planning-based career.

The program's mission is to educate students in current and future energy systems technologies, to integrate energy-related technologies with the economics and financial considerations required to implement them, and to develop leadership and decision-making skills to implement energy systems in either the private or public sectors of the global market. The program will expose students to a combination of academic and corporate experience in energy systems.

The program curriculum features a multidisciplinary range of electives from five different academic colleges at Northeastern University. The curriculum is flexibly designed with a set of four core courses in engineering knowledge and finance in addition to four electives. The core courses help relate these electives back to energy-related engineering concepts including power strategies, energy renewal, sustainable energy solutions, energy storage, energy conversion, and energy efficiency. By integrating concepts across these disciplines, our students learn that implementing energy solutions requires an economic solution as well as an engineering one.

Students are exposed to business educators and practicing professionals and have the opportunity to participate in a six-month co-op experience. Practicing professionals with experience in the industry who have successfully implemented energy systems or devices and policies are actively involved in the program as adjunct professors and invited speakers. Through this curriculum and interaction with practitioners, students should be prepared to effectively integrate energy system development over a broad spectrum of technologies with the financial requirements to successfully implement them and to compete in the global energy market.

Successful graduates of the program will be involved in the decision making or policy planning that will deliver minimally polluting, energy-efficient systems to the global market. They will have the base training necessary to lead efforts within companies to plan and implement new energy-generation investments, realize energy-efficiency improvements specifically at the system level, and participate in energy and environmental markets such as cap-and-trade systems.

## 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.

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

## 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 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 (https://catalog.northeastern.edu/graduate/engineering/graduate-certificate-programs/).

## GORDON INSTITUTE OF ENGINEERING LEADERSHIP

**Master's Degree in Energy Systems with Graduate Certificate in Engineering Leadership**

Students may complete a Master of Science in Energy Systems 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 36-semester-hour degree and certificate will require 20 hours of advisor-approved energy systems technical courses. For students who concurrently enroll in the Graduate Certificate in Engineering Leadership, 12 semester hours of the certificate coursework may be applied to the elective requirements of this program's coursework option.

## Program Requirements

### Core Requirements

Complete all courses and requirements listed below unless otherwise indicated.

| Code | Title | Hours |
|---|---|---|
| **Required Courses** | | |
| EMGT 6225 | Economic Decision Making | 4 |
| EMGT 6305 | Financial Management for Engineers | 4 |
| or FINA 6309 | Foundations of Accounting and Finance | |
| ENSY 5000 | Fundamentals of Energy System Integration | 4 |
| ENSY 5700 | Renewable Energy Development | 4 |

### Restricted Electives

| Code | Title | Hours |
|---|---|---|
| Complete a minimum of 8 semester hours from the following: | | 8 |
| CHME 5621 | Electrochemical Engineering | |
| ENSY 5100 | Hydropower | |
| ENSY 5200 | Energy Storage Systems | |
| ENSY 5500 | Smart Grid | |
| ENSY 5585 | Wind Energy Systems | |
| ENSY 5650 | Geologic Energy Systems for Energy Generation and Carbon Sequestration | |
| ENSY 5800 | Applications of Artificial Intelligence in Energy Systems | |
| MATL 6270 | Principles, Devices, and Materials for Energy Storage and Energy Harvesting | |
| ME 5685 | Solar Thermal Engineering | |
| ME 6200 | Mathematical Methods for Mechanical Engineers 1 | |

### 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 | |

### Other Electives

| Code | Title | Hours |
|---|---|---|
| An additional 8 semester hours can either be taken from the list above or from the following list below or by approval of program director: | | 8 |
| CHEM 5614 | Electroanalytical Chemistry | |
| CHEM 5651 | Materials Chemistry of Renewable Energy | |
| EECE 5670 | Sustainable Energy: Materials, Conversion, Storage, and Usage | |
| EECE 5680 | Electric Drives | |
| EECE 5682 | Power Systems Analysis 1 | |
| EECE 5684 | Power Electronics | |
| EMGT 5220 | Engineering Project Management | |

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|---|---|
| ENSY 7945 | Master's Project |
| ME 5690 | Gas Turbine Combustion |
| ME 7270 | General Thermodynamics |
| ME 7300 | Combustion and Air Pollution |
| PPUA 5264 | Energy Democracy and Climate Justice: Technology, Policy, and Social Change |
| SBSY 5200 | Sustainable Engineering Systems for Buildings |

## Online Course List

All required courses and many electives are offered as online courses.

## Program Credit/GPA Requirements

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