# M.S. IN ELECTRICAL AND COMPUTER ENGINEERING

## Overview

The Electrical and Computer Engineering Department offers the Degree of Master of Science in Electrical and Computer Engineering (M.S.E.C.E.) with a thesis option (24 course credit hours and 6 thesis credit hours) or a non-thesis option (30 course credit hours and no thesis credit hours).  The M.S.E.C.E. program offers a general ECE track and two concentrations: Artificial Intelligence (AI) and Cybersecurity.

## Admissions Requirements

Admission to MS degree programs in the College of Engineering (CoE) at the University of Miami is competitive. A qualified applicant needs a strong academic record, as evidenced by their grades in relevant coursework (traditionally a cumulative gpa of 3.0 or higher). Additionally, prospective international students should have acceptable scores on TOEFL or ILETS exams (English proficiency exams for international students only), as well as comprehensive letters of recommendation. Transfer of credits from other institutes complies with the rules of the graduate school. Many of our applicants have research experiences that have resulted in publication.

Traditionally a BS degree in engineering is required for admission into one of our MS programs. Students who do not have a degree in an Engineering field can still apply and will be considered by the admission committee, but if admitted pre-requisite coursework is traditionally required before being fully admitted into MS studies with us.

## Graduation Requirements

### The M.S.E.C.E. program with the non-thesis option complies in full with the CoE degree requirements

- An approved integrated program with a minimum of 30 credit hours with an average grade of B or better and no grade below C.
- At least 12 course credit hours must be at the 700-level.
- In addition, the **Cybersecurity concentration** and the **AI concentration** require a 3-credit-hour graduating project.

### The M.S.E.C.E. program with the thesis option, complies with the following CoE degree requirements

- An approved integrated program with a minimum of 30 credit hours with an average grade of B or better and no grade below C.
- At least 6 of the course credit hours must be at the 700 level
- 6 credit hours of the required 30 must be earned in thesis work.

In addition to the CoE degree requirements, the M.S.E.C.E. program with the thesis option requires the following:

- Appointment of a Thesis Defense Committee comprised of at least 3 members: the Chair of the committee is the Research Advisor who must have RF/GF status within ECE; at least one other member (excluding the Research Advisor) must have RF/GF status within ECE; at least one member must be from outside ECE.

## Admission Requirements

Applicants must submit:

1. Excellent performance in all coursework and certificate programs (traditionally cumulative gpa > 3.0)
2. Comprehensive letters of recommendation (3 required)
3. Acceptable scores on TOEFL or ILETS exams (English proficiency exams for international students only)

Important Notice: the GRE is no longer required for MS applicants.

A BS degree in engineering is usually required for admission into a MS program. We will also consider students who do not have an engineering degree, but may ask them to take pre-requisite coursework to meet our admission requirements.

International students are required to submit additional information about English proficiency, transcript evaluation and visa requirements (https://www.coe.miami.edu/academics/admissions/international-applicants/).

## Curriculum Requirements: General ECE Option

Any 600-level and 700-level ECE courses and courses in other departments with the approval of the academic advisor.

| Code | Title | Credit Hours |
| --- | --- | --- |
| **Electives** | | |
| Any 600- or 700-Level ECE Courses | | 24 |
| **Select Thesis or Non-Thesis Option** | | **6** |

| | | |
|---|---|---|
| Thesis Option: | | |
| ECE 810 | Master's Thesis | |
| ECE 820 | Research in Residence | |
| ECE 825 | Continuous Registration--Master's Study | |
| Non-Thesis Option: | | |
| Any 600- or 700-Level ECE Courses | | |
| **Total Credit Hours** | | **30** |

## Curriculum Requirements: Concentration in AI

| Code | Title | Credit Hours |
|---|---|---|
| **Required Courses** | | |
| ECE 637 | Principles of Artificial Intelligence | 3 |
| ECE 648 | Machine Learning | 3 |
| ECE 653 | Neural Networks | 3 |
| **Electives** | | **18** |
| ECE 640 | Digital Speech and Audio Processing | |
| ECE 677 | Data Mining | |
| ECE 730 | Statistical Learning | |
| ECE 735 | Fundamentals of Network Science | |
| ECE 738 | Computer Vision | |
| ECE 753 | Pattern Recognition and Neural Networks | |
| CSC 650 | Computational Neuroscience | |
| CSC 749 | Automated Reasoning | |
| CSC 752 | Autonomous Robotic Systems | |
| **Capstone Course** | | |
| ECE 78# | (Advanced Problems in AI (NEW COURSE)) | 3 |
| **Total Credit Hours** | | **30** |

## Curriculum Requirements: Concentration in Cybersecurity

| Code | Title | Credit Hours |
|---|---|---|
| ECE 676 | Internet and Intranet Security | 3 |
| CSC 609 | Data Security and Cryptography | 3 |
| ECE 673 | Information Assurance | 3 |
| **Electives** | | **18** |
| ECE 633 | Random Signals and Noise | |
| ECE 634 | Communication Networks | |
| ECE 674 | Agent Technology | |
| ECE 675 | Digital Forensics | |
| ECE 677 | Data Mining | |
| ECE 678 | Network Security | |
| ECE 735 | Fundamentals of Network Science | |
| ECE 753 | Pattern Recognition and Neural Networks | |
| CSC 632 | Introduction to Parallel Computing | |
| CSC 732 | Parallel Algorithms | |
| **Capstone Course** | | |
| ECE 785 | Capstone in Cyber-Security or Artificial Intelligence (NEW COURSE) | 3 |
| **Total Credit Hours** | | **30** |

## Sample Plan of Study
## General ECE Option

| Year One | | |
|---|---|---|
| **Fall** | | **Credit Hours** |
| 600- or 700-level ECE course | | 3 |
| 600- or 700-level ECE course | | 3 |
| 600- or 700-level ECE course | | 3 |
| | **Credit Hours** | **9** |
| **Spring** | | |
| 600- or 700-level ECE course | | 3 |
| 600- or 700-level ECE course | | 3 |
| 600- or 700-level ECE course | | 3 |
| | **Credit Hours** | **9** |
| **Year Two** | | |
| **Fall** | | |
| 600- or 700-level ECE course | | 3 |
| 600- or 700-level ECE course | | 3 |
| 600- or 700-level ECE course | | 3 |
| | **Credit Hours** | **9** |
| **Spring** | | |
| 600- or 700-level ECE course | | 3 |
| | **Credit Hours** | **3** |
| | **Total Credit Hours** | **30** |

## Concentration in AI

| Year One | | |
|---|---|---|
| **Fall** | | **Credit Hours** |
| ECE 637 | Principles of Artificial Intelligence | 3 |
| Elective | | 3 |
| Elective | | 3 |
| | **Credit Hours** | **9** |
| **Spring** | | |
| ECE 648 | Machine Learning | 3 |
| Elective | | 3 |
| Elective | | 3 |
| | **Credit Hours** | **9** |
| **Year Two** | | |
| **Fall** | | |
| ECE 653 | Neural Networks | 3 |
| Elective | | 3 |
| Elective | | 3 |
| | **Credit Hours** | **9** |
| **Spring** | | |
| Advanced Problems in AI (Capstone Course, topics vary) | | 3 |
| | **Credit Hours** | **3** |
| | **Total Credit Hours** | **30** |

## Concentration in Cybersecurity

| Year One | | |
|---|---|---|
| **Fall** | | **Credit Hours** |
| ECE 676 | Internet and Intranet Security | 3 |
| CSC 609 | Data Security and Cryptography | 3 |
| Elective | | 3 |
| | **Credit Hours** | **9** |
| **Spring** | | |
| ECE 673 | Information Assurance | 3 |
| Elective | | 3 |
| Elective | | 3 |
| | **Credit Hours** | **9** |
| **Year Two** | | |
| **Fall** | | |
| Elective | | 3 |
| Elective | | 3 |
| Elective | | 3 |
| | **Credit Hours** | **9** |
| **Spring** | | |
| ECE 785 | Capstone in Cyber-Security or Artificial Intelligence | 3 |
| | **Credit Hours** | **3** |
| | **Total Credit Hours** | **30** |

## Mission

The MS program in the Department of Electrical and Computer Engineering is designed to prepare students for both of the following:

- Advanced academic degrees leading to successful careers in teaching and research; and
- Rewarding and productive careers in industrial and government research positions.

## Student Learning Outcomes

- The graduate will be able to exhibit broad understanding and mastery of the basic corpus of knowledge representing the discipline. They should be able to apply in their work 1) advanced mathematical principle and 2) advanced knowledge of science and engineering.
- The student will leave the university with the ability to apply critical thinking to complex engineering problems. This means that they should be able to 1) identify advanced engineering problems and address then, and 2) demonstrate proficiency in critically analyzing and solving advanced engineering problems.
- The students will demonstrate proficiency in conveying the results of their work both in terms of written communication and convincing oral presentation.