

M.S. IN MECHANICAL ENGINEERING

<http://www.coe.miami.edu/dept-mac/>

Overview

General requirements for the M.S. degree are listed under the Engineering heading of this section and in the general information of this Bulletin.

Admission Requirements

Students applying for acceptance to degree status must comply with the general requirements of the Graduate School. General requirements for the M.S. degree are listed under the Engineering heading of this section and in the general information of this Bulletin

1. One academic year, or equivalent, spent in full time graduate study will be the minimum time necessary for a student to fulfill the requirements for the degree of Master of Science in Mechanical Engineering.
2. The student is required to complete only graduate-level courses, 600-level or 700-level, to fulfill the course requirement.
3. Both a 30 credit hour thesis option and a 30 credit hour non-thesis option are available.
 - a. **M.S. with Thesis Option:** The student is required to complete 24 credits of course work and 6 credits of thesis in their chosen area of specialization. The thesis involves research-type work completed under the supervision or guidance of a faculty advisor. At the completion of the thesis, the student is required to write a thesis and make an acceptable oral presentation of the thesis before a committee of three faculty members that includes the faculty thesis advisor as the Chair of the committee. The faculty advisor is required to be from the Department of Mechanical and Aerospace Engineering.
 - b. **M.S. with Non-Thesis Option:** The student is required to complete 27 credits of course work and 3 credits of an independent project in an area of his/her interest under the supervision of a faculty advisor. The faculty advisor is required to be from the Department of Mechanical and Aerospace Engineering. After completing the project, the student is required to submit a project report to the faculty advisor and also make an oral presentation of the project before two faculty members, including the faculty advisor. The student will receive a grade for the project. The independent project credits do not count toward the required minimum of two 700-level courses to be completed as part of the total expected credits of coursework required in their chosen option.
 - c. **M.S. with Management Option:** This is a Non-Thesis Option in which a student completes 15 credits from Mechanical and Aerospace Engineering courses and 12 credits from the general area of Management, and 3 project-based credits. The independent project credits do not count toward the required minimum of two 700-level courses to be completed as part of the total expected credits of coursework required in their chosen option. The courses in Management area can be taken either from the School of Business, if available, or from the Department of Industrial Engineering. The student will select the courses in consultation with his/her faculty advisor. The faculty advisor is required to be from the Department of Mechanical and Aerospace Engineering. An undergraduate degree in engineering is required.
4. Students can also concentrate their studies in **Additive Manufacturing**, providing students hands-on training in methods to design, analyze, and fabricate complex structures using state-of-art additive manufacturing printing facilities. This area of study is designed for students who want to further their career by enhancing their analytical and practical skills, critical thinking and problem solving strategies.
 - a. Special areas of study include: Advanced material science and mechanics of materials, Computer Aided Design (CAD) for novel structural design and Finite Element Methods (FEM) for structural optimization and stress analysis, and Algorithm design for the additive manufacturing process.

Curriculum Requirements

M.S. in Mechanical Engineering (Thesis and Non-Thesis Options)

| Code | Title | Credit Hours |
|---|--|--------------|
| MAE Electives | | |
| At least two 700-level MAE courses ^{1,3} | | 6 |
| Other MAE Electives ^{2,3} | | 18 |
| Thesis or Non-Thesis Option | | |
| MAE 810 | Master's Thesis | 6 |
| MAE 751 | Master's Project (and additional MAE Elective) | |
| Total Credit Hours | | 30 |

¹ If no 700-level courses are available in the chosen area of interest of the student during their stay in the M.S. program, the requirement of 700-level course(s) can be waived with the recommendation of their faculty advisor.

² Any M.S. student can take a maximum of two 600-level or 700-level courses from other Engineering Department(s) or other Departments such as Mathematics and Computer Science with the approval of his/her faculty advisor. The student is expected to state his reasons for taking the outside departmental course and get his/her faculty advisor's approval before registering for the course(s). The only exception is that a course from Industrial Engineering Department needs to be a course that involves lectures for the entire duration of the semester instead of those that are conducted over weekends for only 4-to-6 weeks of the semester.

³ A maximum of only one course is allowed among 600-level or 700-level courses of the MAE Department that are designated as “Special Topics” or “Special Problems” that do not have scheduled lecture classes for the entire duration of the semester.

Curriculum Requirements

M.S. in Mechanical Engineering (Management Option)

| Code | Title | Credit Hours |
|---|--|--------------|
| MAE Electives | | |
| At least two 700-level MAE courses | | 6 |
| Other MAE Electives | | 9 |
| General Management Electives | | 12 |
| These may be taken from the Miami Herbert Business School or Department of Industrial Engineering | | |
| Selected in consultation with faculty advisor ¹ | | |
| Non-Thesis Option | | |
| MAE 751 | Master's Project (and additional MAE Elective) | 3 |
| Total Credit Hours | | 30 |

¹ The faculty advisor is required to be from the Department of Mechanical and Aerospace Engineering. An undergraduate degree in engineering is required.

Curriculum Requirements

MS in Mechanical Engineering: Additive Manufacturing Concentration

| Code | Title | Credit Hours |
|------------------------------------|--|--------------|
| Core Courses | | |
| MAE 601 | Methods of Engineering Analysis | 3 |
| MAE 631 | Scientific and Engineering Foundations of Additive Manufacturing | 3 |
| MAE 632 | Additive Manufacturing of Engineering Materials | 3 |
| MAE 730 | Mechanical Systems Optimization | 3 |
| MAE 762 | CAD and FEM for Stress Analysis of 3D Printed Structures | 3 |
| MAE 733 | Additive Manufacturing Lab | 3 |
| MAE Electives | | 6 |
| MAE 607 | Advanced Mechanics of Solids | |
| MAE 616 | Introduction to Composite Materials | |
| MAE 608 | Intermediate Heat Transfer | |
| MAE 602 | Vibrations | |
| MAE 605 | Design for Manufacturability | |
| MAE 690 | Special Topics | |
| Thesis or Non-Thesis Option | | 6 |
| MAE 810 | Master's Thesis | |
| MAE 751 | Master's Project (and additional MAE Elective) | |
| Total Credit Hours | | 30 |

Sample Plan of Study

M.S. in Mechanical Engineering (Thesis Option)

| Year One | | Credit Hours |
|-----------------------|---------------------------------|--------------|
| Fall | | |
| MAE 601 | Methods of Engineering Analysis | 3 |
| MAE Fall Elective 1 | | 3 |
| MAE Fall Elective 2 | | 3 |
| Credit Hours | | 9 |
| Spring | | |
| MAE Spring Elective 3 | | 3 |
| MAE Spring Elective 5 | | 3 |

| | | |
|---------------------------|-----------------|-----------|
| MAE Spring Elective 4 | | 3 |
| Credit Hours | | 9 |
| Year Two | | |
| Fall | | |
| MAE Fall Elective 6 | | 3 |
| MAE Fall Elective 7 | | 3 |
| Credit Hours | | 6 |
| Spring | | |
| MAE 810 | Master's Thesis | 6 |
| Credit Hours | | 6 |
| Total Credit Hours | | 30 |

Sample Plan of Study

M.S. in Mechanical Engineering (Non-Thesis Option)

| | | |
|---------------------------|---------------------------------|---------------------|
| Year One | | |
| Fall | | Credit Hours |
| MAE 601 | Methods of Engineering Analysis | 3 |
| MAE Fall Elective 1 | | 3 |
| MAE Fall Elective 2 | | 3 |
| Credit Hours | | 9 |
| Spring | | |
| MAE Spring Elective 3 | | 3 |
| MAE Spring Elective 4 | | 3 |
| MAE Spring Elective 5 | | 3 |
| Credit Hours | | 9 |
| Year Two | | |
| Fall | | |
| MAE Fall elective 6 | | 3 |
| MAE Fall elective 7 | | 3 |
| Credit Hours | | 6 |
| Spring | | |
| MAE Spring Elective 8 | | 3 |
| MAE 751 | Master's Project | 3 |
| Credit Hours | | 6 |
| Total Credit Hours | | 30 |

Sample Plan of Study

M.S. in Mechanical Engineering (Management Option)

| | | |
|-----------------------|---------------------------------|---------------------|
| Year One | | |
| Fall | | Credit Hours |
| MAE 601 | Methods of Engineering Analysis | 3 |
| MAE Fall elective 1 | | 3 |
| IEN Fall Elective 1 | | 3 |
| Credit Hours | | 9 |
| Spring | | |
| MAE Spring Elective 2 | | 3 |
| IEN Spring Elective 2 | | 3 |
| IEN Spring Elective 3 | | 3 |
| Credit Hours | | 9 |

| Year Two | | |
|-----------------------|---------------------------|-----------|
| Fall | | |
| MAE Fall elective 3 | | 3 |
| IEN Fall Elective 4 | | 3 |
| | Credit Hours | 6 |
| Spring | | |
| IEN Spring Elective 5 | | 3 |
| MAE 751 | Master's Project | 3 |
| | Credit Hours | 6 |
| | Total Credit Hours | 30 |

Sample Plan of Study

M.S. in Mechanical Engineering: Additive Manufacturing Concentration (Thesis Option)

| Year One | | | Credit Hours |
|---------------------|--|--|---------------------|
| Fall | | | |
| MAE 601 | Methods of Engineering Analysis | | 3 |
| MAE 631 | Scientific and Engineering Foundations of Additive Manufacturing | | 3 |
| MAE 730 | Mechanical Systems Optimization | | 3 |
| | Credit Hours | | 9 |
| Spring | | | |
| MAE 632 | Additive Manufacturing of Engineering Materials | | 3 |
| MAE 733 | Additive Manufacturing Lab | | 3 |
| MAE 762 | CAD and FEM for Stress Analysis of 3D Printed Structures | | 3 |
| | Credit Hours | | 9 |
| Year Two | | | |
| Fall | | | |
| MAE Fall Elective 1 | | | 3 |
| MAE Fall Elective 2 | | | 3 |
| | Credit Hours | | 6 |
| Spring | | | |
| MAE 810 | Master's Thesis | | 6 |
| | Credit Hours | | 6 |
| | Total Credit Hours | | 30 |

Sample Plan of Study

M.S. in Mechanical Engineering: Additive Manufacturing Concentration (Non-Thesis Option)

| Year One | | | Credit Hours |
|---------------------|--|--|---------------------|
| Fall | | | |
| MAE 601 | Methods of Engineering Analysis | | 3 |
| MAE 631 | Scientific and Engineering Foundations of Additive Manufacturing | | 3 |
| MAE 730 | Mechanical Systems Optimization | | 3 |
| | Credit Hours | | 9 |
| Spring | | | |
| MAE 632 | Additive Manufacturing of Engineering Materials | | 3 |
| MAE 733 | Additive Manufacturing Lab | | 1-4 |
| MAE 762 | CAD and FEM for Stress Analysis of 3D Printed Structures | | 3 |
| | Credit Hours | | 7-10 |
| Year Two | | | |
| Fall | | | |
| MAE Fall Elective 1 | | | 3 |

| | | |
|-----------------------|---------------------------|--------------|
| MAE Fall Elective 2 | | 3 |
| | Credit Hours | 6 |
| Spring | | |
| MAE Spring Elective 3 | | 3 |
| MAE 751 | Master's Project | 3 |
| | Credit Hours | 6 |
| | Total Credit Hours | 28-31 |

Mission

The mission of the graduate program is to prepare students to become knowledgeable and skilled engineers and researchers with an understanding of the ethical and other professional aspects of mechanical engineering.

Goals

The goal of the MS program in Mechanical Engineering is to prepare students for successful careers in the industry, academia, or government, or for further study in doctoral or other engineering-related programs. The educational objective of the program is to graduate engineers with advanced skills and knowledge in mechanical engineering and to train, motivate and inspire our graduates to become leaders in their fields.

Student Learning Outcomes

- Students will demonstrate competence in the theoretical and practical knowledge of mechanical engineering.
- Students will demonstrate the ability to effectively communicate the results of their scientific research in writing and in oral presentations.
- Students will demonstrate the ability to think critically in learning and/or research.