PH.D. IN MECHANICAL ENGINEERING

http://www.umcoe.miami.edu/dept-mac/

Overview

The Department of Mechanical and Aerospace Engineering offers courses and provides facilities for a doctoral program of graduate study and research, leading to the degree of Doctor of Philosophy. Within the program, a student is permitted the flexibility to organize much of his/her program of study and research, in close consultation with his/her thesis advisor. Specific programs must, however, reflect the importance of underlying principles of the physical sciences and mathematical analysis to all phases of modern mechanical engineering. Within the department, specializations are available in Fluid Mechanics, Materials Science, Solid Mechanical, Space Systems, Internal Combustion Engines, Robotics, Controls and Design. It is expected that each doctoral student will indicate early in his/her doctoral work the particular area in which he/she intends to concentrate.

Curriculum

1. All candidates for the Ph.D. degree are expected to complete an integrated program of studies in mechanical engineering, mathematics, physics and/or chemistry in preparation for the Qualifying Examination. For students entering with a Master's degree, 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. For students entering with a Bachelor's degree, a maximum of only two courses 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.
2. A qualifying examination, typically offered the last week of September, is to be taken by each doctoral degree student within the first three semesters of study. In the qualifying examination, the student is expected to demonstrate their competence in certain basic courses appropriate to modern mechanical engineering to the satisfaction of the department. A Ph.D. student will be admitted to candidacy after passing the qualifying examination as well as the defense of dissertation proposal.
3. There is no foreign language requirement.
4. One or two years beyond admittance to candidacy will usually be found necessary for the completion of an acceptable dissertation, whereupon the student will be required to pass the Final Oral Defense of the Dissertation.
5. The candidate may, if he/she so desires, pursue for their dissertation an investigation in connection with any of the research projects in progress in the Mechanical and Aerospace Engineering Department or, in the case of interdisciplinary programs, in other Colleges/Schools such as the School of Marine and Atmospheric Science or the Medical School.

Admission Requirements

The program leading to the degree of Doctor of Philosophy in the Department of Mechanical and Aerospace Engineering complies in full with the regulations of the Graduate School concerning admission, residence requirements, qualifying and final examinations and the dissertation.

Curriculum Requirements

Ph.D. in Mechanical Engineering

FOR STUDENTS WITH ONLY A B.S. DEGREE IN ENGINEERING

Expected duration of the program: 4 years

Code	Title	Credit Hours
MAE or Other Approved Electives		**27-33**
At least 12 credits must be 700-level MAE electives		
Seminar Series		**6**
MAE 703	Graduate Research Seminar (New Course: Graduate Research Seminar)	
Teaching Requirement		**3**
MAE 704	Graduate Teaching (New Course: Graduate Teaching)	
Dissertation Credits		**30-36**
MAE 830	Pre-Candidacy Doctoral Dissertation (before passing both parts of the Qualifying Exam)	
MAE 840	Post-Candidacy Doctoral Dissertation (usually after PhD proposal is passed)	
MAE 850	Research in Residence (after completing the required 12 credits of dissertation through MAE 830 and MAE 840)	
Total Credit Hours		**72**

Ph.D. in Mechanical Engineering

For students with a M.S. degree in Engineering*

**Assuming 12 graduate credit hours are approved to count toward the doctoral program*

Expected duration of the program: 3 years

Code	Title	Credit Hours
MAE or Other Approved Electives		**15-21**
At least 6 credits must be 700-level MAE electives		
Seminar Series		**6**
MAE 703	Graduate Research Seminar (New Course: Graduate Research Seminar))	
Teaching Requirement		**3**
MAE 704	Graduate Teaching (New Course: Graduate Teaching)	
Dissertation Credits		**30-36**
MAE 830	Pre-Candidacy Doctoral Dissertation (before passing both parts of the Qualifying Exam)	
MAE 840	Post-Candidacy Doctoral Dissertation (usually after PhD proposal is passed)	
MAE 850	Research in Residence (after completing the required 12 credits of dissertation through MAE 830 and MAE 840)	
Total Credit Hours		**60**

In order to register for courses and/or dissertation in each semester, students are required to select the courses and/or dissertation credits by consulting their respective dissertation (research) advisors. They must also see the Graduate Advisor of the Department (Chair of the Department) for approval and signature.

Please note that the number of credits to be taken in various semesters is stated in each student's Ph.D. assistantship offer letter.

Qualifying Exam

Ph.D. students are required to pass a 2-part Qualifying Exam.

Part 1 of the Qualifying Exam:

It consists of a written examination (no oral exam). Each student is required to select three areas, including Methods of Analysis, out of the following six areas:

- Methods of Analysis (Level of MAE 601) – compulsory for all students
- Mechanics of Solids (Undergraduate level)
- Fluid Mechanics (Undergraduate level)
- Heat Transfer (Undergraduate level)
- Materials (Undergraduate level)
- Control and dynamics (Undergraduate level)

A list of topics in each course will be given to the student at least one month before the Exam. All three areas will be covered in one exam of 6-hour duration (2 hours for each of the three areas) with a 30-minute break. It is expected that each student passes Part 1 of Qualifying Exam within the first year. If a student fails in one or more areas, a second chance may be given (within 6 months of the first exam).

Part 2 of the Qualifying Exam:

It consists of an oral exam before the student's Dissertation Committee.

- The student presents a research proposal (in the form of a written report) to the Dissertation Committee after completing some preliminary research work including the Literature Review.

- Part 2 of the Qualifying Exam is to be taken within 2 years if the student has a Master's degree in Engineering and 2.5 years if the student has only a B.S. degree in Engineering.

Sample Plan of Study

Ph.D. in Mechanical Engineering

FOR STUDENTS WITH ONLY A B.S. DEGREE IN ENGINEERING:

Year One		
Fall		**Credit Hours**
MAE Fall Elective 1		3
MAE Fall elective 2		3
MAE Fall elective 3		3
CoE Fall Elective 4		3
MAE 703	Graduate Research Seminar	1
	Credit Hours	**13**
Spring		
MAE Spring Elective 5		3
MAE Spring Elective 6		3
MAE Spring Elective 7		3
CoE Spring Elective 8		3
MAE 703	Graduate Research Seminar	1
	Credit Hours	**13**
Year Two		
Fall		
MAE Fall Elective 9		3
MAE 703	Graduate Research Seminar	1
MAE 704	Graduate Teaching	1
MAE 830	Pre-Candidacy Doctoral Dissertation	1
	Credit Hours	**6**
Spring		
MAE 703	Graduate Research Seminar	1
MAE 704	Graduate Teaching	2
MAE 830	Pre-Candidacy Doctoral Dissertation	1
	Credit Hours	**4**
Year Three		
Fall		
MAE 703	Graduate Research Seminar	1
MAE 830	Pre-Candidacy Doctoral Dissertation	8
	Credit Hours	**9**
Spring		
MAE 703	Graduate Research Seminar	1
MAE 830	Pre-Candidacy Doctoral Dissertation	8
	Credit Hours	**9**
Year Four		
Fall		
MAE 840	Post-Candidacy Doctoral Dissertation	9
	Credit Hours	**9**
Spring		
MAE 840	Post-Candidacy Doctoral Dissertation	9
	Credit Hours	**9**
	Total Credit Hours	**72**

Sample Plan of Study

Ph.D. in Mechanical Engineering

FOR STUDENTS WITH A M.S. DEGREE IN ENGINEERING

Year One		
Fall		**Credit Hours**
MAE Fall Elective 1		3
MAE Fall Elective 2		3
MAE Fall elective 3		3
MAE 703	Graduate Research Seminar	1
MAE 704	Graduate Teaching	1
MAE 830	Pre-Candidacy Doctoral Dissertation	1
	Credit Hours	**12**
Spring		
MAE Spring Elective 4		3
MAE Spring Elective 5		3
MAE 703	Graduate Research Seminar	1
MAE 704	Graduate Teaching	2
MAE 830	Pre-Candidacy Doctoral Dissertation	1
	Credit Hours	**10**
Year Two		
Fall		
MAE 703	Graduate Research Seminar	1
MAE 830	Pre-Candidacy Doctoral Dissertation	8
	Credit Hours	**9**
Spring		
MAE 703	Graduate Research Seminar	1
MAE 830	Pre-Candidacy Doctoral Dissertation	8
	Credit Hours	**9**
Year Three		
Fall		
MAE 703	Graduate Research Seminar	1
MAE 840	Post-Candidacy Doctoral Dissertation	9
	Credit Hours	**10**
Spring		
MAE 703	Graduate Research Seminar	1
MAE 840	Post-Candidacy Doctoral Dissertation	9
	Credit Hours	**10**
	Total Credit Hours	**60**

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 PhD program in Mechanical Engineering is to train students for advanced independent research and technical innovation in mechanical engineering. The program is designed to prepare graduates for careers in academia, industrial research and development, or government. 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 field and scholarship.

Student Learning Outcomes

- Students will demonstrate competence in the theoretical and practical knowledge of mechanical engineering.
- Students will demonstrate the ability to communicate effectively the scientific and technical research in writing and oral presentations.
- Graduates will demonstrate the ability to conduct independent research and contribute to existing knowledge.