

PH.D IN ENGINEERING (INDUSTRIAL ENGINEERING)

OVERVIEW

The Ph.D. program in Engineering with a concentration in Industrial Engineering is interdisciplinary and provides its students with an opportunity to study in a broad range of areas within mechanical engineering, industrial engineering, and other engineering areas within the College of Engineering and College of Medicine and Life Sciences. Ph.D. students could work at the intersection of materials engineering, medicine, and advanced manufacturing on a wide range of projects from innovative biomedical devices and technologies to advanced bearing, ice detection and prevention, human movements, robotics, recycling, fatigue, and innovative coatings. These projects include experimental characterization as well as multi-scale modeling and data analysis.

ADMISSIONS REQUIREMENTS

Admission for the Ph.D. program in Engineering with a concentration in Industrial Engineering requires the M.S. in Industrial Engineering or another engineering field provided the student shows evidence of an appropriate engineering background at the undergraduate level, including a minimum of two years of calculus through differential equations and one year of physics. Highly qualified B.S. engineering graduates can be admitted directly into the Ph.D. program.

Application requirements:

- **Degree:** Applicants must hold a four-year bachelor's degree from a regionally accredited college or university
- **GPA:** Applicants must have at least a 3.0/4.0 grade point average from previous undergraduate coursework or a 3.3/4.0 for previous graduate coursework
- **Application:** UToledo application required
- **GRE:** Not required
- **Transcripts:** Required
- **Statement of Purpose:** Required
- **Letters of Recommendation:** 2 minimum; 3 preferred
- **Proof of English language proficiency:** Required for students from non-English speaking countries. See University graduate admissions for minimum test score requirements and exceptions.

Application priority deadlines for admissions and funding decisions:

- **Fall:** March 15
- **Spring:** October 1
- **Summer:** Contact department

PROGRAM REQUIREMENTS

A satisfactory doctoral degree plan is developed jointly by the student and the dissertation adviser, subject to the approval of the department chair or graduate program director.

A minimum of 15 credit hours of regular 8000-level graduate courses taken for a letter grade beyond the M.S. degree is required for the doctoral degree program. Twelve of these 15 credit hours must be departmental graduate courses. Students entering the direct doctoral program with a bachelor's degree must complete 45 credit hours of graduate course work, of which 36 are regular departmental graduate courses beyond their bachelor's degree, and at least 27 credit hours must be at the 6000/8000 level. Other courses taken may include courses not listed as departmental courses, independent study courses, and courses taken S/U.

In addition to the above course requirements, all supported students are required to enroll and participate in a graduate seminar (MIME 8930 (<https://catalog.utoledo.edu/search/?P=MIME%208930>) or equivalent) each semester. The department may specify additional credit or non-credit requirements, for satisfactory completion as well as enhancement of degree objectives.

For transfer credit, students should refer to the general policies of the College of Graduate Studies.

Doctoral Qualifying Examination

Students can complete the PhD degree with a concentration Industrial Engineering. The MIME PhD qualifying includes earning a grade of (A-) in **three classes**. These three classes must be taken by all students (with or w/o a prior MS degree) who are seeking a PhD degree in MIME at the University of Toledo. Below are the three classes that students must take and obtain a satisfactory grade (A-). **These classes are currently offered at least once a year.**

Students must complete the mathematics course (Advanced Engineering Mathematics I – MIME 6000/8000) and the following two courses (a total of 3 classes):

- Design of Experiments (**Design of Experiment - MIME 6720/8720**)
- Manufacturing Engineering (**Manufacturing Engineering - MIME 5060**)

1. Students must follow the following steps:

A. Students must select their **PhD advisor by the end of their first academic semester.**

B. Students must **form their PhD committee by the end of their second semester.** Proper forms must be filled out and signatures of the committee members must be obtained. The doctoral dissertation committee must consist of at least five members. The chair of the committee will be the candidate's principal adviser. The other members usually will be the co-adviser (if any), faculty members or experts in a related field, with at least one committee member outside the department.

C. The **committee members** will check and verify whether the student has fulfilled grade requirements (A-) in the selected courses after students finish **their second semester**. Proper signatures to be obtained.

D. The **student's committee** can decide (before beginning of the 3rd semester) what **courses students must take** if the grade requirement is not fulfilled in each area/course.

E. Students must present to their committee by the end of their 3rd or 4th semester at MIME UToledo about their research topic (i.e. research questions, literature review, and preliminary data if available). The committee can probe fundamental understanding of the students related to their research. This is different than research progress and can focus on fundamentals in a student's area of study. Committee members will decide whether 1) the student is on the right track in research. 2) Whether the student has fundamental understanding related to the research area. If the committee members deem appropriate, they can suggest to students to take classes related to their research area and to improve fundamental understanding of the students. This can include an independent study with a research advisor.

If a student does not satisfy grade requirements in core classes or other classes suggested by the PhD committee, the committee must assess student's research performance, fundamental understanding, and grades to decide whether the student can continue in the PhD program. The PhD committee members will vote to make the final decision.

A student will be considered a Ph.D. candidate after this step.

F. Research Proposal Presentation: Students should present their research progress to their committee during a **formal proposal defense**.

G. Students can schedule their dissertation defense a semester following their successful proposal defense. Summer can count as a semester.

Note: If students change their PhD advisor **after** their qualifying exam requirements fulfilled, the student must select a new advisor and form a new committee and then can resume from **step E**. The new advisor and the student will decide about taking new classes and the committee might suggest that the student should take some other classes as well. If students change their advisor any time **before** fulfilling the qualifying exam, the student must find a new advisor and work with him/her to start from **step B**.

Doctoral Degree Candidacy

Doctoral candidacy requires satisfactory performance in the doctoral qualifying examination (steps A through E above), filing of an approved doctoral program plan, selection of an academic adviser (step A above), formation of a doctoral dissertation committee (step B above) and maintaining good academic performance as specified in the MIME Department Graduate Student Handbook.

When the above requirements have been met, the student may file his/her application for doctoral candidacy. The department requires that the application be filed within one year of the time the doctoral qualifying examination is passed. Doctoral students must have established candidacy for the doctoral degree before presenting and defending dissertation research.

Doctoral Dissertation

After the student and the adviser have agreed on a dissertation topic, the student must write a dissertation proposal. The student will present the proposal to the doctoral dissertation committee and successfully defend his/her dissertation proposal.

The signatures of the committee on the candidate's dissertation indicate approval of the dissertation research and represent the final certification of its adequacy.

- PLO 1) Demonstrate technical proficiency in their focus area topics.
- PLO 2) Explain doctoral level course projects clearly and concisely in written and oral formats.
- PLO 3) Explain their doctoral research clearly and concisely in written and oral formats.
- PLO 4) Generate high quality engineering research that is original, significant and consequential, and is publishable in high quality journals, book chapters, and conference proceedings.
- PLO 5) Participate in research proposal writing to fund their research.
- PLO 6) Teach undergraduate engineering courses.