

PH.D. IN ENGINEERING (MECHANICAL ENGINEERING)

OVERVIEW

The Ph.D. program in Engineering with a concentration in Mechanical 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 Mechanical Engineering requires the M.S. in Mechanical 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.

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 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 in Mechanical Engineering or Industrial Engineering. The PhD with a concentration in Mechanical Engineering can be completed in one of two

research focus areas: Materials, Design and Manufacturing focus area and Computational & Experimental Thermal Sciences focus area.

Mechanical Engineering concentration - Materials, Design, and Manufacturing

Students pursuing a Ph.D. in the Mechanical Engineering concentration in the Materials, Design and Manufacturing focus area need to take the qualifying examination in three areas:

- Mathematics. General and specific topics are typically covered in MIME 8000: Advanced Engineering Math I and MIME 8100: Advanced Engineering Math II

Two of the following four areas:

- Dynamics and Vibrations. The concepts to be tested in this area are typically presented in courses such as MIME 2300: Engineering Dynamics, MIME 3370 Mechanical Vibrations, and MIME 8200 Advanced Dynamics
- Deformable Body Mechanics. The concepts to be tested in this area are typically presented in courses such as CIVE 1150: Statics, CIVE 1160: Mechanics of Materials, and MIME 5300: Advanced Mechanics of Materials
- Design of Experiments. Topics are typically covered in courses such as MIME 8720: Design of Experiments
- Manufacturing Engineering. Topics tested in this area are typically covered in courses such as MIME 5060: Manufacturing Engineering

MECHANICAL ENGINEERING CONCENTRATION - Computational & Experimental Thermal Sciences

Students pursuing a PhD in the Mechanical Engineering concentration in the Computational & Experimental Thermal Sciences focus area need to take the qualifying exam in three areas:

- Mathematics. General and specific topics are typically covered in MIME 8000: Advanced Engineering Math I and MIME 8100: Advanced Engineering Math II

Two of the following three areas:

- Fluid Mechanics
- Heat Transfer
- Thermodynamics

Doctoral Degree Candidacy

Doctoral candidacy requires satisfactory performance in the doctoral qualifying examination, filing of an approved doctoral program plan, selection of an academic adviser, formation of a doctoral dissertation committee 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 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. The signatures of the committee on the candidate's dissertation indicate approval of the dissertation research and represent the final certification of its adequacy.

- 1) Demonstrate technical proficiency in topics aligned with their focus area.
- 2) Deliver clear and concise written and oral presentations for doctoral level course projects.
- 3) Deliver clear and concise written and oral presentations of their doctoral research.
- 4) Generate high quality engineering research that is original, significant and consequential, and is publishable in high quality journals, book chapters, and conference proceedings.
- 5) Contribute to research proposals in collaboration and / or under the guidance of the faculty advisor.
- 6) Teach undergraduate engineering courses.