MECHEG:PHD - Doctor of Philosophy in Mechanical Engineering

Overview

Degree Offered
PHD - Doctor of Philosophy

Program Title
Mechanical Engineering

The PhD in Mechanical Engineering will prepare graduates for industrial and/or academic research as well as for higher-level jobs in mechanical-related industry. The design and manufacturing of power plants, automobiles, aircrafts, robots to improved methods of transportation and production by industrial robots are but a few important inventions that would not have been realized without the creativity associated with the mechanical engineering profession. The mechanical engineering academic program provides a well-balanced curriculum in the following areas of specialization: mechanical systems, mechanics, robotics and mechatronics, thermo/fluid systems, heating-ventilation-and-air-conditioning (HVAC), material characterization, manufacturing and automation systems, materials science and engineering, multidisciplinary design optimization and inverse design, computational analysis and distributed parallel computing, biomechanics, laser and plasma materials processing, nanomaterials, nanotechnology, electronic packaging, optical measurement and diagnostics, waste management, and renewable energy. This program provides an opportunity for students to enhance their technical knowledge and to conduct advanced research that can aid in their professional development and pursuit of research-related employment in the mechanical engineering field.

For more information, visit the College of Engineering and Computing website.

To explore more about this program, visit the website below:
Program Website

Academic Group
College of Engineering and Computing

Diploma Title
Doctor of Philosophy in Mechanical Engineering

Total Credits
75

CIP Code
14.1901

Requirements

Simple Requisites

Subplan

No Requirement Level

The requirements for admission to the doctoral program in Mechanical Engineering for applicants having a Bachelor's degree in Mechanical Engineering from an accredited institution are the following:

(1) GPA of at least 3.0/4.0 in the last 60 upper level credit hours

(2) Three letters of recommendation.

(3) International graduate student applicants whose native language is not English are required to submit a score for the Test of English as a Foreign Language (TOEFL) or for the International English Language Testing System (IELTS). A total score of 80 on the iBT TOEFL (equivalent to 550 on the paper-based version, or 213 on the computer-based version of the Test of English as a Foreign Language) or 6.5 overall on the IELTS is required.

(4) Applicants having a Master's degree in Mechanical Engineering from an accredited institution must also satisfy the above requirements for admissions to the doctoral program; however a GPA of at least 3.3/4.0 in the Master's program is also required.

Credentials of all other applicants will be examined by the Graduate Admission Committee on a case by case basis.

In addition to the departmental requirements, all students must satisfy the University's Graduate Policies and Procedures.

Identification of Research Area

Within 4 months upon acceptance into the Ph.D. program, the student having a Master's Degree has to identify an area of research of his or her interest by contacting and being accepted by a professor willing to guide the dissertation research. The student with a Bachelor's degree should identify the area of research by the end of the second semester after acceptance into Ph.D. program. If no professor is obtained, the student will be dismissed from the Ph.D. program. Contact the department for a list of the graduate faculty members and their research interests.

Applicants with a Bachelor's degree in Mechanical Engineering

Applicants having a Bachelor's degree in Mechanical Engineering are required to complete at least 75 credit hours, of which at least 45 hours must be coursework and 15 hours dissertation. The credit hours earned towards the Ph.D. program have the following requirements:

(1) At least 21 credits at the 5000 level or higher, not to include dissertation.

(2) At least 12 credits at the 6000 level or higher, not to include dissertation.

(3) Breadth criteria could be satisfied by taking 3 courses in a field/area outside the student's own field.

(4) Two applied/computational mathematics courses as suggested for M.S. program.

(5) A minimum of 15 credits of dissertation.

(6) A maximum of 6 semester hours of graduate credit earned from another accredited institution that was not used for a previous degree may be transferred as long as the courses were completed within the six years preceding admission to the program and meet university requirements.

(7) EML6908 Ind Studies counts for a maximum of 6 credit hours of coursework.

(8) EML6910 Supervised Research counts for a maximum of 6 credit hours of coursework.

(9) EML6935 Graduate Seminar (zero credits) should be registered every semester until the advancement to candidacy (D-2).

Applicants Entering the PhD program with a Master's degree in Mechanical Engineering

Applicants entering the Ph.D. program with a Masters degree in Mechanical Engineering are required to complete at least 45 credit hours, of which at least 24 hours must be coursework and 15 hours dissertation. The credit hours earned towards the Ph.D. program have the following requirements:

(1) Breadth criteria could be satisfied by taking 3 courses in a field/area outside the student's own field.

(2) A minimum of 12 credits of 6000 higher, not to include dissertation.

(3) A minimum of 15 credits of dissertation.

(4) Additional courses to be determined by candidate's dissertation committee.

(5) EML6908 Ind Studies counts for a maximum of 6 credit hours of coursework.

(6) EML6910 Supervised Research counts for a maximum of 6 credit hours of coursework.

(7) EML6935 Graduate Seminar (zero credits) should be registered every semester until the advancement to candidacy (D-2).

Applicants having a Master's Degree in any other Engineering discipline from an accredited institution may transfer a maximum of 24 semester hours as part of their requirements.

Degree Program Credits
Type
Completion Requirement

Elective Courses

Possible elective courses from the Mechanical Engineering department include:

Fulfill ANY of the following requirements:

Thermo/Fluid

Complete ANY of the following Courses:

- EAS6721 - Advanced Aerodynamic Shape Design
- EML5103 - Intermediate Thermodynamics
- EML5104 - Classical Thermodynamics
- EML5152 - Intermediate Heat Transfer
- EML5606C - Advanced Refrigeration and Air Conditioning Systems
- EML5615C - Cad - A/C
- EML5708 - Advanced Design of Thermal and Fluid Systems
- EML5709 - Intermediate Fluid Mechanics
- EML6153 - Advanced Heat Transfer
- EML6154 - Conduction Heat Transfer
- EML6155 - Convection Heat Transfer
- EML6157 - Radiation Heat Transfer
- EML6712 - Advanced Fluid Mechanics I
- EML6714 - Advanced Gas Dynamics
- EML6725 - Comp. Fluid Dynamics

OR

Mechanics/Materials

Complete ANY of the following Courses:

- EAS5221 - Design and Analysis of Aerospace Structures
- EGM5346 - Computational Engineering Analysis
- EGM5354 - Finite Element Method Applications in Mechanical Engineering
- EGM6570 - Fracture Mechanics
- EMA5295 - Principles of Composite Materials
- EMA5106 - Thermodynamics and Kinetics of Materials
- EMA5001 - Physical Properties of Materials
- EMA5507C - Analytical Techniques of Materials Science
- EMA5200 - Nanomechanics and Nanotribology
- EMA5935 - Advanced Topics in Materials Engineering
- EMA6165C - Polymer Physics and Analytical Techniques
- EML5505 - Smart Machine Design and Development
- EML5509 - Optimization Algorithms
- EML5385 - Identification Techniques of Mechanical Systems
- EML5562 - Advanced Electronic Packaging (Inactive)
- EML6223 - Advanced Mechanical Vibration Analysis
- EML6805 - Advanced Design of Robots

OR

Design and Manufacturing

Complete ANY of the following Courses:

- EAS5221 - Design and Analysis of Aerospace Structures
- EGM5615 - Synthesis of Engineering Mechanics
- EGM6570 - Fracture Mechanics
- EML5385 - Identification Techniques of Mechanical Systems
- EML5505 - Smart Machine Design and Development
- EML5082 - Advanced Nondestructive Testing and Mechanical Health Monitoring
- EML5509 - Optimization Algorithms
- EML5530 - Intermediate CAD/CAE
- EML5562 - Advanced Electronic Packaging (Inactive)
- EML5808 - Control Technology for Robotic Systems
- EML5825 - Sensors and Applied Machine Intelligence
- EML6223 - Advanced Mechanical Vibration Analysis
- EML6532 - Advanced Computer-Aided Design/ Computer-Aided Engineering
- EML6805 - Advanced Design of Robots

Additional Comments:

There are no majors associated with this program.

There are no tracks, specializations, concentrations, areas of emphasis, or other curricular offerings associated with this program.

Residency Requirements

The program will provide student access to a wide range of support facilities including research library, cultural events, and other occasions for intellectual growth associated with campus life, significant faculty/student interaction, opportunities for student exposure to and engagement with cognate disciplines and research scholars working in those disciplines, and significant peer interaction among graduate students. Students will be provided with the opportunity for a mentoring apprentice relationship with faculty and students as well as adequate time for in-depth evaluation of the student. To satisfy the residency requirement for the Ph.D. degree, the candidate must complete a minimum of 18 credit hours within a period of 12 months at the University.

PhD Course Breadth Requirements

Breadth criteria could be satisfied by taking 3 courses in a field/area outside student's own field. Examinations and Proposal and Final Defense Student must demonstrate graduate knowledge acquisition in four incremental stages in order to be awarded a Ph.D. in Mechanical Engineering.

Stages of Progression Towards Degree

A student must demonstrate acquisition of graduate knowledge in five incremental stages in order to be awarded a Ph.D. in Mechanical Engineering:

1. **Formation of the Dissertation Committee**
    - Students entering the program with a master's degree must select a dissertation advisor during their first semester of study. These students must also select a dissertation committee and submit the D-1 form during their first semester. Students entering the program with a bachelor's degree must select a dissertation advisor and submit the D-1 form by the end of their second semester.
2. **Comprehensive Exam (CE)**
    - General written exam to test masters level knowledge.
    - A student who is admitted to the Ph.D. program with a bachelors degree must take the CE no later than the beginning of the 4th major semester after admission, and a student who enters the Ph.D. program with a masters degree must take and pass the CE no later than the beginning of the 2nd major semester after admission. Students may petition for exceptions from the departmental graduate committee by one major semester at a time. A student who fails the CE may retake the exam once only.
3. **Admission to Candidacy**

- Candidacy status indicates that a doctoral student is ready to commence working on the dissertation. A student is admitted to candidacy upon successfully completing all required course work and passing the Comprehensive Examination. After completion of coursework credits and the Comprehensive Exam, form D-2 must be turned in.

4. **Proposal Defense (PD)**
    - The dissertation proposal will be presented by the student in the form of a Graduate Seminar in which he/she must submit a proposal for his/her dissertation.
    - Students must declare their proposal subject within 6 months after taking and passing the Comprehensive Exam. After completion of proposal defense, form D-3 must be turned in.
5. **Final Defense (FD)**
    - There will be a public defense at a graduate seminar. The defense can be failed no more than once.
    - The final defense should be presented no later than the 4th year after the master's degree and no later than the 6th year after the bachelor's degree.
    - Following the successful defense of the dissertation, as determined by a majority vote of the student's examining committee, the dissertation must be forwarded to the Dean of the College of Engineering and Computing and the Dean of the University Graduate School for their approval.
    - All dissertations submitted in fulfillment of the requirements for graduate degrees must conform to University guidelines (see "Regulations for Thesis and Dissertation Preparation Manual"). One final and approved copy of the dissertation must be delivered to the Chairperson of the Department of Mechanical Engineering and one to the advisor, in addition to the copies required by the University Graduate School.

Financial Aid

Consult the Department for information on research and teaching assistantships available for doctoral students.