Erik Jonsson School of Engineering and Computer Science

Department of Mechanical Engineering

Objectives

The program leading to the Master of Science in Mechanical Engineering prepares both recent baccalaureate graduates and experienced mechanical engineers for the design and development of advanced mechanical and thermal systems at nano-, micro-, meso- and macro-scales. Designed to accommodate the needs of working engineers who wish to continue their education, the program offers courses at times convenient for students employed on a full-time basis.

The MS program in Mechanical Engineering (ME) provides advanced studies for both recent baccalaureate graduates and experienced engineers in the following areas: dynamic systems and control, manufacturing and design innovation, mechanics and materials, and thermal and fluid sciences.

The program is designed to provide advanced skills in mechanical engineering. The program also provides the foundation for a PhD degree in mechanical engineering or closely related disciplines.

The PhD program in Mechanical Engineering prepares talented doctoral students for careers in which they will create new technologies and processes for the design, manufacture, control and operation of components and systems in such fields as energy, health care, security, defense, and transportation.

Given the key enabling role of mechanical engineering in all areas of technology, the graduates of this program will have the preparation to become technical leaders in emerging and existing scientific and industrial fields in Texas, the nation, and the rest of the world.

Facilities

The Engineering and Computer Science Building, Bioengineering Science Building, and the Natural Science and Engineering Research Laboratory provide extensive facilities for teaching and research. These include wind tunnels, materials test systems, nanoindenter, high impact facilities, ultra-high speed camera, DMA, XPS, FTIR, NMR, TGA, DSC, XRD, µ-Raman, Fluorescence Spectrometer, con-focal microscopes, AFM, FIB/SEM, and atomic resolution TEM. A Class 10000 microelectronics clean room facility, including e-beam lithography, sputter deposition, PECVD, LPCVD, etch, and evaporation, is available for student projects and research.

Scholarship Opportunities

The Erik Jonsson School of Engineering and Computer Science offers competitive scholarships for highly qualified students. Interested students should request application materials by contacting the Department of Mechanical Engineering (ME).
Master of Science in Mechanical Engineering

33 semester credit hours minimum

Department Faculty

Professors: D. Todd Griffith, Fatemeh Hassanipour, Stefano Leonardi, Yaoyu Li, Hongbing Lu, Dong Qian, Mario A. Rotea, Joshua Summers, Seung M. You

Associate Professors: William Anderson, Giacomo (Valerio) Iungo, Golden Kumar, Arif Malik, Kristin Miller, Majid Minary, Zhenpeng Qin, Tyler Summers, Yonas Tadesse, Jie Zhang

Assistant Professors: Rodrigo Bernal Montoya, Shuang (Cynthia) Cui, Yaqing Jin, Justin Koeln, Juyoung Leem, Wei Li, Xinchen Ni, Hui Ouyang, Ill Ryu, Guoping Xiong, Yanwen Xu, Kianoosh Yousefi, Armin Zare, Yue Zhou

Associate Professors of Instruction: Wooram Park, Oziel Rios, P.L. Stephan Thamban

Professors of Practice: Dani Fadda, jxr230031

Associate Professor of Practice: Robert Hart

UT Dallas Affiliated Faculty: Kyeongjae (KJ) Cho, Babak Fahimi, Matthew J. Goeckner, Jiyoung Kim, Moon J. Kim, S.O. Reza Moheimani, Mehrdad Nourani, Mark W. Spong, Robert M. Wallace, Steve Yurkovich

Admission Requirements

The University's general admission requirements are discussed on the Graduate Admission page.

The student entering the MS ME program should meet the following guidelines:

- A bachelor's degree in engineering or one of the natural sciences from an institution of higher education in the U.S. or from a comparable institution abroad,

- A grade point average (GPA) in upper-division quantitative coursework of 3.0 or better on a 4.0 point scale, and

- GRE scores of 150, 160, and 4 for the verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

- Three letters of recommendation from individuals who are able to judge the candidate's potential for success in the master's degree program.

- An essay outlining the candidate's background, education, and professional goals.

- A detailed resume of all education and work history.

Students from other engineering disciplines or from other areas of science or mathematics may be considered for admission to the program; however, additional coursework may be necessary to complete the master's program.

A student lacking undergraduate prerequisites for graduate courses in mechanical engineering must complete these prerequisites or receive approval from the faculty advisor and the course instructor.
Degree Requirements

The University's general degree requirements are discussed on the Graduate Policies and Procedures page.

The MS degree in Mechanical Engineering requires a minimum of 33 semester credit hours of graduate level coursework, and 24 semester credit hours must be MECH or MECH cross-listed courses. The remaining 9 semester credit hours can be selected from 5000-level courses and above offered by the Erik Jonsson School of Engineering and Computer Science. A student must maintain a grade point average (GPA) of at least 3.0 to remain in good standing and satisfy the degree requirements.

All MS students must take at least one semester of MECH 7000 and receive a passing grade.

All MS students taking the thesis option must have the thesis advisor's approval for a plan of study within the first two consecutive long semesters in the program.

All MS students must complete one of the following experiential learning components to satisfy MS ME program requirements:

- Master's Thesis (9 semester credit hours)
- Graduate Capstone Project Design (6 semester credit hours)
- Research guided by ME faculty (3 semester credit hours)
- Graduate Internship (MECH 7099, 0 semester credit hours)

The MS ME program offers both a thesis and a non-thesis option. All students will be assigned initially to the non-thesis option. Those wishing to elect the thesis option may do so by obtaining the approval of a faculty thesis supervisor.

All full-time, supported students are required to participate in the thesis option.

Non-Thesis Degree Requirements

Required Major Courses: 12 semester credit hours

A MS student in ME must take a total of four courses, selected from the following MECH major courses. Students must receive a grade of B- or better and maintain a GPA of 3.0 or better in all MECH major courses.

MECH 6300 (EECS 6331 or SYSM 6307) Linear Systems

MECH 6303 Computer Aided Design

MECH 6306 Continuum Mechanics

MECH 6309 Intermediate Dynamics

MECH 6318 Engineering Optimization

MECH 6325 Optimal Estimation and Kalman Filter
Thesis Degree Requirements

Required Major Courses: 9 semester credit hours

A MS-Thesis student in ME must take a total of three core courses, selected the following MECH major courses. Students must receive a grade of B- or better and must maintain a GPA of 3.0 or better in all MECH major courses.

- **MECH 6300** (EECS 6331 or **SYSM 6307**) Linear Systems
- **MECH 6303** Computer Aided Design
- **MECH 6306** Continuum Mechanics
- **MECH 6309** Intermediate Dynamics
- **MECH 6318** Engineering Optimization
- **MECH 6325** Optimal Estimation and Kalman Filter
- **MECH 6326** Optimal Control and Dynamic Programming
- **MECH 6333** Materials Design and Manufacturing
- **MECH 6350** Advanced Solid Mechanics
- **MECH 6370** Incompressible Fluid Mechanics
- **MECH 6373** Convective Heat Transfer
- **MECH 6374** Conductive and Radiative Heat Transfer

Students participating in the thesis option must take the following courses to fulfill the research and thesis requirements of the MS ME degree program:

- **MECH 6V97** Research in Mechanical Engineering (6 semester credit hours minimum)
- **MECH 6V98** Thesis (3 semester credit hours minimum)

The thesis is required to be submitted to the graduate school and presented in a formal public defense. The supervising committee administers this defense and is chosen in consultation with the student's thesis advisor prior to enrolling for thesis credit. Thesis semester credit hours cannot be counted in a MS...
ME degree plan unless a thesis is written and successfully defended.

All electives must be approved by the faculty advisor

Doctor of Philosophy in Mechanical Engineering

78 semester credit hours minimum beyond the baccalaureate degree

Department Faculty

Professors: D. Todd Griffith, Fatemeh Hassani Pour, Stefano Leonardi, Yaoyu Li, Hongbing Lu, Dong Qian, Mario A. Rotea, Joshua Summers, Seung M. You

Associate Professors: William Anderson, Giacomo (Valerio) Iungo, Golden Kumar, Arif Malik, Kristin Miller, Majid Minary, Zhenpeng Qin, Tyler Summers, Yonas Tadesse, Jie Zhang

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Admission Requirements

The University's general admission requirements are discussed on the Graduate Admission page.

The PhD in Mechanical Engineering is awarded primarily to acknowledge the student's success in an original research project, the description of which is a significant contribution to the scholarly literature. Applicants for the doctoral program are therefore selected by the Mechanical Engineering Graduate Committee on the basis of research aptitude as well as academic record.

The following are guidelines for admission to the PhD program in Mechanical Engineering:

- A master's or bachelor's degree in engineering or one of the natural sciences from an institution of higher education in the U.S. or from a comparable institution abroad.
- A grade point average (GPA) of 3.3 or better on a 4.0 point scale.
- GRE scores of 150, 160, and 4 for the verbal, quantitative and analytical components, respectively, are advisable based on our experience with student success. (See also UT Dallas requirements for English proficiency).
- Three letters of recommendation from individuals who are familiar with the student's record, and are able to judge the candidate's preparation and ability to succeed in doctoral study in Mechanical Engineering.
• An essay describing motivation for doctoral study and how it relates to the student's professional goals.
• A detailed resume of all education and work history.

Students from other engineering disciplines or from other areas of science or mathematics may be considered for admission to the program; however, additional coursework may be necessary to complete the PhD program.

For students who are interested in pursuing a PhD but are unable to attend school full-time, there is a part-time option. The guidelines for admission to the program and the degree requirements are the same as for full-time PhD students.

**Degree Requirements**

The University's general degree requirements are discussed on the [Graduate Policies and Procedures](https://catalog.utdallas.edu/2023/graduate/programs/ecs/mechanical-engineering) page.

Doctoral students must have a faculty advisor and an approved plan of study within the first two consecutive long semesters in the program. Each doctoral student must conduct original research in Mechanical Engineering, under the direction of the faculty advisor and approved supervisory committee. A student must maintain a grade point average (GPA) of at least 3.0 to remain in good standing and satisfy the degree requirements.

The PhD program in Mechanical Engineering requires a minimum of 78 semester credit hours beyond the baccalaureate degree.

Students entering the PhD program with a master's degree must satisfy the MECH core course requirement and complete a minimum of 6 semester credit hours of graduate-level mathematics electives outlined below.

Students entering the PhD program without a master's degree must complete a minimum of 33 semester credit hours, and 24 semester credit hours must be MECH or MECH cross-listed courses.

All PhD students must take at least two semesters of MECH 7000 and receive a passing grade.

**Required Major Courses: 12 semester credit hours**

A PhD student in ME must take a total of four courses, selected from the following MECH major courses. Students must receive a grade of B- or better and maintain a GPA of 3.0 or better in all MECH major courses.

- **MECH 6300** *(EECS 6331 or SYSM 6307)* Linear Systems
- **MECH 6303** Computer Aided Design
- **MECH 6306** Continuum Mechanics
- **MECH 6309** Intermediate Dynamics
- **MECH 6318** Engineering Optimization
- **MECH 6325** Optimal Estimation and Kalman Filter
MECH 6326  Optimal Control and Dynamic Programming
MECH 6333  Materials Design and Manufacturing
MECH 6350  Advanced Solid Mechanics
MECH 6370  Incompressible Fluid Mechanics
MECH 6373  Convective Heat Transfer
MECH 6374  Conductive and Radiative Heat Transfer

Mathematics Electives: 6 semester credit hours

The following is a list of suggested elective courses in mathematics.

Two courses are required for mathematics electives.

MATH 6303  Theory of Complex Functions I
MATH 6313  Numerical Analysis
MATH 6315  Ordinary Differential Equations
MATH 6318  Numerical Analysis of Differential Equations
MATH 6319  Principles and Techniques in Applied Mathematics I
MATH 6320  Principles and Techniques in Applied Mathematics II
MATH 6308  Inverse Problems and Applications
MATH 6321  Optimization
MATH 6340  Numerical Linear Algebra
MECH 6391 (EEGR 6381)  Computational Methods in Engineering
MECH 7392  Advanced Mathematics for Mechanical Engineers I
MECH 7393  Advanced Mathematics for Mechanical Engineers II
STAT 6331  Statistical Inference I
STAT 6337  Advanced Statistical Methods I
    and STAT 6338  Advanced Statistical Methods II
STAT 6339  Linear Statistical Models
STAT 6341  Numerical Linear Algebra and Statistical Computing
MATH 7313  Partial Differential Equations I

Upon the approval of a student's faculty advisor, a qualified student can request to take other graduate courses in mathematics not listed above.

In addition to course requirements, the PhD students need to complete the following:
• Qualifying Exam (QE): It tests fundamental knowledge in mathematics and an area of mechanical engineering. A student entering the PhD program with an MS ME must take this exam within three long semesters. A student entering the PhD program without an MS ME must take this exam within five long semesters. A student has at most two attempts made within two consecutive semesters at this qualifying exam. The exam is given during the fall and spring semesters.

• A student will be advanced to PhD candidacy after passing the QE and forming an approved supervisory committee.

• Comprehensive Exam (CE): Written dissertation proposal and an exam are given by the candidate's supervisory committee.

• Final Exam: Completion of a major research project culminating in a dissertation demonstrating an original contribution to the body of knowledge. The dissertation is defended publicly. The rules for this defense are specified by the Office of the Dean of Graduate Education.

The following courses are required to fulfill the research and dissertation requirements of the PhD degree program:

**MECH 8V70** Advanced Research in Mechanical Engineering (30 semester credit hours minimum)

**MECH 8V99** Dissertation (6 semester credit hours minimum)

Neither a foreign language nor a minor is required for the PhD. However, the student's supervisory committee may impose these or other requirements that it feels are necessary and appropriate to the student's degree program.

## Non-Degree Seeking Students in Mechanical Engineering

"Non-Degree Seeking" is a term which applies to students who are taking selected courses and who have not applied to, or been accepted into, a degree program. A student may be taking classes for various reasons; i.e., personal or professional enhancement, to transfer courses to another university, to correct a grade deficiency. Students who have not taken the GRE or GMAT, or who are awaiting results, may also be classified non-degree seeking.

A non-degree seeking student must meet the same academic eligibility requirements and English proficiency requirements as ME graduate degree seeking students. Non-degree seeking students who are ultimately admitted to a MS graduate degree program may transfer no more than 15 non-degree semester credit hours to the ME graduate degree program. A new application must be submitted when transferring from non-degree to degree seeking status.

Updated: 2023-05-31 10:21:27 v17.44770a