

Doctor of Philosophy Degree – Mechanics, Uncertainty, and Simulation in Engineering

The Ph.D. program with an emphasis in Mechanics, Uncertainty, and Simulation in Engineering (MUSE) is highly flexible to accommodate a wide range of student educational objectives and research interests. Overall, however, the Ph.D. program demands high standards of scholarship from students. Students are expected to gain great depth and breadth in their knowledge and to conduct research that represents significant and original contributions. The program seeks to prepare students for careers in teaching and research in academia or advanced engineering in the industry.

In addition to the guidelines and requirements described below, Ph.D. students in MUSE must also follow all the rules and requirements of the Graduate School and the Department of Civil, Architectural and Environmental Engineering.

The Ph.D. degree in MUSE requires the completion of approved significant coursework beyond the M.S. degree, the conduct of independent research leading to the preparation of a dissertation, and the completion of major examinations and other milestones, as described below.

Coursework

There is no prescribed minimum number of courses required for the Ph.D. degree. Nevertheless, Ph.D. students are expected to take a significant number of courses to gain breadth and depth in their knowledge and to prepare them to conduct independent research. The student should select courses in consultation with their Research Supervisor and Dissertation Committee. As a guideline, Ph.D. students in MUSE typically take 7 to 10 courses beyond the M.S. degree.

Courses

Listed below are courses in closely related fields that may interest graduate students in the MUSE program. Course descriptions are provided in the Undergraduate and Graduate Catalogs of The University of Texas at Austin. Course offerings for each semester are listed in the Course Schedule available on the Registrar's website. The list is not intended to be exhaustive; it is provided merely to illustrate the wide variety of courses available.

- **Civil Engineering**
 - CE 380P 4-Boundary Element Methods
 - CE 381P Computer Methods in Structural Analysis
 - CE 381R The Finite Element Method
 - CE 381T Numerical Modeling of Physical Systems
 - CE 381W Introduction to Wave Physics
 - CE 384P Dynamic Response of Structures
 - CE 384R Earthquake Engineering
 - CE 383F Structural Fire Engineering
 - CE 384T Blast-Resistant Structural Design
 - CE 384S Structural Reliability
 - CE 387G Engineering Geology
 - CE 387L-2 Foundation Engineering
 - CE 387R-4 Geotechnical Earthquake Engineering
 - CE 387T Decision, Risk and Reliability
 - CE 393 Advanced Concrete Materials
 - CE 393C Experimental Methods in Cement Chemistry

- CE 393N Novel Structural Materials
- CE 397 Structural Health Monitoring - Nondestructive Evaluation
- CE 397 Sustainable Materials
- CE 397 Introduction to Structural Mechanics
- CE 397 Wind Engineering

- **Engineering Mechanics**
 - EM 380 Theory of Plasticity
 - EM 386R Analytical Methods I
 - EM 386L Analytical Methods II
 - EM 388 Solid Mechanics I
 - EM 388L Solid Mechanics II
 - EM 388F Fracture Mechanics
 - EM 389J Experimental Mechanics

- **Mathematics**
 - M 383C Methods of Applied Mathematics
 - M 383D Methods of Applied Mathematics
 - M 383E Numerical Analysis: Linear Algebra
 - M 384C Mathematical Statistics
 - M 385C Theory of Probability
 - M 385D Theory of Probability

- **Mechanical Engineering**
 - ME 378K Mechanical Behavior of Materials
 - ME 380Q-1 Engineering Analysis: Analytical Methods
 - ME 382T Fire Science
 - ME 383Q.2 Vibrations
 - ME 386P.2 Mechanical Behavior of Materials
 - ME 386Q.10 High-Temperature Materials

Research

The Doctor of Philosophy is a research-focused degree. Conducting high-quality original research represents the most fundamental requirement of the degree. Research for the Ph.D. degree is expected to be significant in scope and must represent an original contribution to the forefront of knowledge in the field. Furthermore, while the research is conducted under the direct guidance of a Research Supervisor and oversight from a Dissertation Committee, Ph.D. students are expected to work independently and demonstrate independence in the conduct of their research.

To develop a suitable topic and scope for their research, Ph.D. students are encouraged to discuss their ideas and interests with the MUSE faculty. Ph.D. students are also encouraged to identify a faculty member to serve as their Research Supervisor and to identify a topic for their Ph.D. research as early as possible.

While the student will work closely with their Research Supervisor, the student will also form a Dissertation Committee to help guide and review the research. The Dissertation Committee usually consists of a minimum of five faculty members, with at least one member from outside the CAEE Department.

Milestones Toward the Ph.D. Degree

This section outlines major steps and milestones toward achieving the Ph.D. degree.

Milestone A: Meeting criteria. All MUSE Ph.D. students must meet one or more of the criteria described below, subject to the recommendation of a committee of MUSE faculty. The committee will examine a student's preparation and meeting of the criteria set below as a first milestone toward the Ph.D. degree. The criteria that will be considered by the committee include, but are not limited to, the following:

- Evidence of prior advanced research product or experience
- Having passed a qualifying exam at an equivalent level at a peer institution
- Performance on a written and/or oral exam administered by the MUSE committee that is deemed satisfactory
- Satisfactory GPA (>3.5) as a full-time student at UT Austin in the first year, in graduate courses from the MUSE faculty-approved course list

For each PhD student, the MUSE faculty committee will meet after the end of the first year of the student's entry to the PhD program, and no later than the end of the second year, to make a recommendation. The committee may, for example, recommend that the PhD student would meet Milestone A only upon the successful passing of a written or oral qualifying exam, or may assess that prior research experience or related scholarly products are sufficient to satisfy Milestone A.

Milestone B: Demonstration of English Proficiency. Before a student can apply for Ph.D. Candidacy, they must satisfy the CAEE Department's English proficiency requirements for Ph.D. students. This generally requires a minimum score of 4.0 on the GRE Analytical Writing Exam or passing an approved technical writing course. Students should consult with the CAEE Graduate Coordinator for requirements.

Milestone C: Admission to Ph.D. Candidacy. After passing Milestones A-B, Ph.D. students should apply to the Graduate School for admission to Ph.D. Candidacy. The application for admission to Ph.D. Candidacy may be completed online at the Graduate School website. Specific requirements of the application for admission to Ph.D. Candidacy are available from the Graduate School and also from the CAEE Graduate Coordinator. In general, however, an application must include a list of members of the Dissertation Committee, a preliminary title of the Dissertation, and a brief description of the proposed dissertation research.

Milestone D: Comprehensive Exam. The Comprehensive Exam, also known as the Mastery of the Major Exam, must be taken and passed by all MUSE Ph.D. students. The Comprehensive Exam is administered by the Dissertation Committee and is usually taken after the student has completed a majority of their coursework and has started on their dissertation research; it must be taken at least one year before the next milestone: Final Oral Examination (Defense of Dissertation). Students should discuss the appropriate timing of the Comprehensive Exam with their Research Supervisor. The content and format of the Comprehensive Exam are at the discretion of the Dissertation Committee. In general, however, the Comprehensive Exam includes a presentation by the student on the proposed dissertation topic, including the proposed research objectives, scope, and methods. Successful completion (passing) of the exam is determined by the Dissertation Committee, which must assess if the proposed research is suitable for a Ph.D. dissertation and whether the student is adequately prepared to undertake the research. The Dissertation Committee may suggest or require changes to the research plan and may also suggest or require the student to take additional coursework.

Milestone E: Defense of Dissertation (Final Oral Examination). The Defense of Dissertation is the final exam toward the award of the Ph.D. degree. In this exam, the student presents the results of their dissertation research to the Dissertation Committee. At least four weeks before the exam, the student must deliver a final draft of their dissertation, reviewed for technical and grammatical correctness by the Research Supervisor, to members of the Dissertation Committee. The student must also submit a written request for the Final Oral Examination to the Graduate School at least two weeks before the examination. Note that the Dissertation Committee may request changes to the dissertation as part of the exam. Consequently, students are encouraged to schedule the exam well ahead of the filing deadline for the desired semester of graduation.