

# AEROSPACE ENGINEERING AND MECHANICS, PH.D.

## Doctor of Philosophy in Aerospace Engineering and Mechanics

The Department of Aerospace Engineering and Mechanics offers a Doctor of Philosophy degree on campus and through an alternative residency (distance learning). In a research-based degree, students are required to propose, complete and defend an approved dissertation on a research topic that contributes to the field of aerospace engineering and/or engineering science and mechanics.

## Admissions

In addition to the minimum Graduate School admission requirements, to be considered for regular admission an application must include:

- Three letters of recommendation
- GRE (optional)

AEM department standards are higher than the graduate school minimums, and all application materials are carefully considered. Meeting minimum graduate school requirements does not guarantee admission into the PhD program.

Students applying to the PhD program without a bachelor's or master's degree in aerospace engineering, mechanical engineering, or engineering mechanics are required to complete the following coursework from an accredited university (if not already completed) prior to applying:

- Calculus (12 semester credit hours)
- Ordinary Differential Equations
- 12 semester credit hours of calculus-based engineering mechanics - Statics, Dynamics, Mechanics of Materials and Fluid Mechanics.

Students have the opportunity to enroll in the mechanics courses through the Office of Teaching Innovation and Digital Education as a non-degree seeking (NDS) applicant.

The PhD distance program is open to US students as well as international students residing in the US with appropriate visas. For students interested in the distance PhD program, it is highly recommended to contact faculty with similar research interests and arrange an on-campus visit or video conference prior to applying to the program. Gaining faculty interest and support is essential in the application review.

See the Admission Criteria section of this catalog for more information.

## Curricular Requirements

The PhD degree can be earned by completing 42 hours of coursework, 18 hours of dissertation research, and a committee approved dissertation that includes an oral defense and written document. Students must complete and earn a grade of B or higher in two core courses from the table below, one from each core designation: Mechanics and Mathematics. Students must also complete an additional Mathematics course from the table or approved by their Research Advisor or the Associate Department Head-Graduate Programs, completing a total of nine hours of core coursework.

Of the 42 coursework hours, at least 21 must have AEM designation. Elective coursework must be approved by the Research Advisor. A 3.0 GPA for coursework is required.

Independent study hours AEM 593/AEM 594/AEM 693/AEM 694 counting for elective coursework is limited to 6 hours for students with a block transfer or 9 hours for students that transfer 15 or less hours.

Curricular Table	Hours
Mechanics Core: AEM 500, AEM 546 or AEM 562	3
Mathematics Core: GES 551, GES 554 or AEM 548	3
Mathematics Core: Approved by Research Advisor or the ADH-Graduate Programs	3
ENGR 501	3
Elective Coursework	30
AEM 699 Dissertation Research (minimum)	18
<b>Total Hours</b>	<b>60</b>

In their careers, PhD engineers are expected to be thought leaders, mentors, trainers of other developing professionals, and communicators with a variety of audiences. Therefore, in addition to technical training in their discipline, all UA College of Engineering PhD students will have a Mentored Instructional Experience (MIE) that will enhance their abilities in these critical areas of communication, giving and receiving formal feedback, mentoring, and training, as well as deepen their own discipline-specific knowledge through educational support experiences (typically office hours, laboratory instruction, conducting recitations, preparing instructional materials, and guiding in-course design teams of undergraduate students).

All PhD students will receive pedagogical training in these instructional support areas through a pedagogy practicum course: ENGR 501 Engineering Instruction Prep. In addition, each student shall complete a set of instructional experiences during designated semesters (2 semesters at 10 hours/week, 4 semesters at 5 hours/week, or the equivalent) under the guidance of a faculty mentor. This additional instructional practice is a graduation requirement and will be tracked through the departmental office.

## Transfer Credit

Transfer credit requests are evaluated by the Graduate School and the AEM department and follow Graduate School policy. The department does support the block transfer option of an appropriate MS degree in aerospace engineering, mechanical engineering, or engineering mechanics that meets Graduate School requirements and is approved by their research advisor and the Associate Department Head - Graduate Programs. An MS block transfer will count for 21 hours of coursework, of which 12 hours will be considered AEM designated. Of the 42 coursework credit hours required by the AEM PhD program, at least 21 must have an AEM or ENGR designation.

## Doctoral Plan of Study Requirement

Graduate School Information on the Doctoral Plan of Study can be found here.

## Qualifying Exam

Students must pass a qualifying exam prior to Candidacy and enrolling in AEM 699 dissertation research. The qualifying exam is to help determine the student's preparedness for the advance knowledge and critical thinking required for independent research, two areas of assessment for the PhD program.

The exam is created and evaluated by a qualifying exam committee. The qualifying exam committee will consist of the student's research advisor and two faculty members selected by the advisor with consideration of input by the student, the student's expected research area, and the student's core curriculum.

Except for study week and finals week, the qualifying exam may be scheduled when the university is in session for fall, spring, or summer and the committee is available. The exam is a take-home assignment based on the student's coursework and research area. The student then presents their results to the committee, followed by a question-and-answer session.

The qualifying exam committee will assess the student's pass or fail performance in context to their preparedness for the advance knowledge and critical thinking required for independent research in their area. Students have two opportunities to pass the qualifying exam; exam attempts must be in different semesters.

Further information about the qualifying exam such as timelines is available by contacting the Associate Department Head - Graduate Programs.

## Admission to Candidacy Requirements

Admission to Candidacy is determined by either:

- passing the AEM Department Qualification Exam and completing 75% of their coursework hours

OR

- passing the AEM Department Qualification Exam and passing the Dissertation Proposal

Candidacy should be attained by the third year for on-campus students and at least a year before the dissertation defense. An up-to-date Plan of Study detailing courses completed and transferred is required. Students may start enrolling in AEM 699 once they have attained candidacy.

## Continuous Enrollment Policy

Graduate School Policy.

## Dissertation Requirements

On-campus students should form their dissertation committee (minimum of five graduate faculty, the majority from AEM and at least one outside the department) and propose their dissertation topic after passing their qualifying exam and nearing the completion of their coursework. The proposal must be submitted eight months prior to the oral dissertation defense.

Dissertation submission deadlines, document formatting, and graduate semester enrollment requirements follow the Graduate School calendar and policy including submitting the Public Notice of a Dissertation Defense form at least two-weeks prior to the scheduled dissertation date. Department requirements include:

- The defense to occur on campus unless a departmental waiver is approved.
- The publication of at least one research paper related to the subject of the dissertation prior to signing the Committee Acceptance Form of the Electronic Dissertation

## Time Limits For Degree Completion Requirements

Graduate School Policy

## Student Progress Requirement

Students are expected to progress through their degree program in a timely manner and with consultation with their advisor.

## Academic Misconduct Information

Graduate School Policy

## Withdrawals and Leave of Absence Information

Graduate School Policy

## Academic Grievances Information

Graduate School Information

## Grades and Academic Standing

Graduate School Policy

## Graduate School Deadlines Information

Graduate School Information

## Application for Graduation Information

Graduate School Policy

Assistantships (teaching and research) are offered by the department and faculty to highly-qualified applicants with preference towards those pursuing a PhD. Most assistantships start in the fall and last one academic year with consideration for renewal. A full assistantship provides a competitive stipend, tuition and health benefits. Assistantships usually do not cover fees related to personal items.

Assistantship offers are contingent upon receipt of acceptable results of a pre-employment background report. To maintain assistantship funding, recipients must register for at least the minimum number of graduate hours, remain in good academic standing, competently and timely perform departmental assigned activities, successfully complete our International Teaching Assistant Program (ITAP) within the first academic year if an international student, and continually progress through the degree program. These criteria are evaluated by your assigned research advisor and the Department Head. Failing to meet or complete any of these criteria can result in the termination of the assistantship but not necessarily dismissal from the program if in good academic standing.

No additional application is necessary to be considered for a departmental assistantship; however, **if seeking an assistantship then it is recommended to submit your application by January 31 or earlier for the ensuing fall semester.** Contacting faculty with similar research interests is encouraged.

Several national, state and university fellowship programs exist, including the University's Graduate Council Fellowship. Students are encouraged to seek these opportunities as well.

For additional information about financial assistance in the AEM graduate programs, contact the Graduate Program Coordinator.