Doctor of Philosophy in Aerospace Engineering

Aerospace Engineering

The aerospace engineer is concerned with the design, production, operation, and support of aircraft and spacecraft. Aerospace engineers conduct research to advance air flight and space exploration, by solving problems, developing products, and improving processes for the aerospace industry. Aerospace engineers typically work for aircraft and space vehicle industries, national research laboratories, commercial airlines, and federal government agencies. The curriculum includes traditional courses in aerodynamics, flight dynamics and control, propulsion, structures, manufacturing, instrumentation, and spacecraft systems.

Mission

KU Aerospace Engineering is an international leader in aerospace education and is committed to developing a global community of choice for students, educators, and researchers by strategically aligning teaching, research, and service missions. A world-class graduate and undergraduate education focused on designing, simulating, building, testing, and flying aerospace vehicles is provided. The department invests in research infrastructure and chooses outstanding students to work with faculty, and staff to conduct basic and applied research of relevance to aerospace vehicles and systems. The department supports the aerospace profession by educating the public, by maintaining the KU aerospace short-course program, and by advising policy-makers in government, industry, and disciplinary professional organizations.

Educational Objectives

The Aerospace Engineering graduate program objective is that our graduates contribute to the aerospace profession, related fields, and other disciplines through skilled professional practice in industry, government, and/or academia. Within a few years after graduation, we expect that:

- Graduates are meaningfully employed or continuing graduate study in aerospace or other high technology fields, with the majority retained in aerospace or closely related engineering
- Graduates have a positive professional career path including promotions, leadership, and/or continued education
- Graduates recognize the value of their educational preparation for their current and future professional endeavors

Educational Outcomes

The Doctor of Philosophy program in Aerospace Engineering (PhDAE) is a traditional program that requires students to conduct independent, publishable, and impactful research that makes a significant contribution to the field of Aerospace Engineering. Our program is designed to achieve our objectives by establishing measurable learning outcomes which graduates of the program must demonstrate:

1. Demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Demonstrate the ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
3. Demonstrate the ability to develop and conduct either 1) appropriate analytical approaches, 2) simulation, or 3) experimentation; analyze and interpret data; and use engineering judgment to draw conclusions.
4. Demonstrate an ability to communicate effectively with a range of audiences.

Graduate Admission to the Department of Aerospace Engineering

Application Requirements

In order for applications to be considered complete, the following materials must be submitted as part of the application (https://gradapply.ku.edu/apply/) by the posted deadline:

1. Official transcripts from each college attended. For processing purposes, you may attach scanned versions of official transcripts to your application. Documents labeled as unofficial or printouts from a student portal are NOT considered official copies.
   a. *Transcripts that are in a language other than English must be accompanied by English translations.*
   b. *If admitted to the program and accept the admission offer, you will be required to submit an official, final transcript that shows your degree has been conferred.*
2. Three letters of recommendation. Letters must be signed and on letterhead. Recommenders will receive instructions on how to submit their documents at the time the application is submitted.
3. Resume or CV
4. Statement of Objectives
5. Official GRE score report (optional but recommended)
6. Official English proficiency documentation for non-native English speakers as found here (https://gradapply.ku.edu/english-requirements/). English proficiency is required for both in-person and online degree programs. Official reports are those sent directly to KU from the testing agency.

** Please note: All application materials must be received before any kind of decision is made. Do not send paper documents unless requested.*

Admissions Deadlines

Fall Admission:

- Priority Deadline: December 1
- Final Deadline: April 1

Spring Admission:

- Priority Deadline: September 1
- Final Deadline: December 1

Summer Admission:

- Final Deadline: April 1

For full consideration for fellowships, scholarships, and research/teaching assistantships, applications should be received by the priority deadline. Application materials should indicate an interest in financial assistance or research/teaching assistantships.

Application Fees

Domestic: $65

International: $85

Document Specifications

Letters of Recommendation

The letter of recommendation form should be on letterhead and signed. Recommenders will receive instructions on how to submit their documents at the time the application is submitted.

Proof of Finances

Most international students must submit credible evidence of financial support for the first year of study. Further details and requirements for financial documentation can be found at this link (https://iss.ku.edu/proof-finances/).

Admissions Standards

Students who wish to apply for admission to the Aerospace Engineering graduate program must have, as a minimum, a BSAE degree or a BS degree in a closely related field from a university or college with a program equivalent to the KU BSAE program. Students applying with either a BS degree from an engineering program that is not equivalent to the KU BSAE program or a BS degree from a non-aerospace engineering program may have to make up certain undergraduate AE courses at the discretion of the department graduate advisor. Such students will be admitted on probation until a plan of study for make-up courses is completed.

Admission

Master's program admission requires an undergraduate GPA of at least 3.0.

Doctoral program admission requires an undergraduate GPA of at least 3.0 and a GPA of at least 3.5 for courses taken as part of a master's program.

In exceptional cases, applicants with a GPA between 2.75-2.99 may be granted admission. Such students would be admitted as Aerospace Engineering Master of Engineering students. If approved by the student's graduate advisor and the departmental graduate advisor, the student may change to an alternate Aerospace Engineering degree program after successful completion of the first semester and receiving a minimum 3.0 GPA.

GRE Requirements

The GRE is not required, however, is strongly recommended. Preferred scores are a minimum of 50% on the Verbal and Analytical sections of the GRE and 85% on the Quantitative section.

English Proficiency Requirement

Non-native English-speaking students who do not meet full proficiency requirements at the time of application are required to check in at the Applied English Center (https://aec.ku.edu/) (AEC) upon arrival on campus for orientation. This process serves to confirm each student's level of English proficiency and determine whether English courses will be included as a requirement of the student’s academic program.

Refer to the University Policy (http://policy.ku.edu/graduate-studies/english-proficiency-international-students/) on English Proficiency Requirements for Admission to Graduate Study.

Funding

Scholarships/Fellowships - The Aerospace Engineering department nominates applicants for University and School of Engineering scholarships and fellowships based on academic merit and other selection criteria.

Graduate Teaching Assistantships (GTAs) - Teaching Assistantships are available and are awarded competitively based on academic qualifications through the department or school.

Graduate Research Assistantships (GRAs) - Students work with their potential academic advisor/mentor to obtain a funded position on a research project.

**Important note: acceptance into the graduate program DOES NOT guarantee financial aid. To be considered for financial aid, applications must be received by the priority deadline.*

Visit Us

The graduate program staff is happy to work with all prospective students in determining the fit between the student and the program. In order to determine this, we feel that visiting our campus in Lawrence is a very important step. In order to facilitate your visit to KU, there are two main options:

The first, and most preferred, option entails simply applying for admission to the program. All prospective students are welcome to attend the School of Engineering Open House. Eligible admitted students are invited to participate in Campus Visit Days in late February (prior to the fall semester of your intended matriculation). These organized campus visit opportunities will allow you to gather a great deal of first-hand information which we hope will help you in making a final decision about whether to attend KU.

The second option is to make arrangements to visit us on your own, outside of organized events. With early notification, we will do our best to work with you to provide information and schedule appointments with faculty when possible. Please contact us if you feel that this is the best option for you.

Contact Information

Please contact the AE Graduate Program Coordinator at aerohawk@ku.edu or (785) 864-2960, to schedule a visit or with questions about the application process.

The University of Kansas
AE Graduate Program
1530 W. 15th Street
2120 Learned Hall
Lawrence, Kansas, 66045

The Doctor of Philosophy program in Aerospace Engineering (PhDAE) is a traditional program that requires students to successfully demonstrate their abilities in a broad spectrum of aerospace technology, mathematics and original research. To earn the PhD degree students must:

- Complete PhD course requirements in accordance with an approved plan of study
- Pass the Doctoral Qualifying Exam (DQE)
- Complete the Research Skills and Responsible Scholarship (RS^2) requirement

- Satisfy the residency requirements
- Pass a comprehensive oral examination
- Prepare and defend a PhD dissertation which must contain an original contribution to the field by the candidate.

Ph.D. Degree Requirements

The Ph.D. program requires 66 credit hours beyond the B.S. These 66 credit hours consist of at least 24 credit hours of dissertation and at least 36 credit hours of coursework. The 36 hours of coursework can include up to 24 credit hours of relevant coursework from an MS degree completed at a recognized graduate school. Students must complete at least 18 hours of approved coursework as a KUAE graduate student. The minimum coursework requirements are as follows:

- Core courses of at least 9 credit hours of graduate mathematics beyond the B.S. are required. The 9 credit hours must include a minimum of 6 credit hours of graduate-level courses from the Mathematics Department.
  - Graduate mathematics courses are MATH 590 or any other math course 600-level or above.
  - Only AE 712, Techniques of Engineering Evaluation, is considered a mathematics-intensive engineering course that meets the Core requirement.
- Breadth courses consist of 12 credit hours distributed outside the area of specialization in aerodynamics, structures and materials, dynamics and controls, design, propulsion, and astronautics.
- Depth courses consist of 15 credit hours of technical courses (600-level and above) in the area of specialization.

Students must also take at least .5 hours of AE 690, Professional Development for Graduate Students.

No more than three courses below the 700 level may be used to satisfy degree requirements, in addition to the required AE 690 course. All AE courses other than AE 690 must be 700 level and above.

It is required that the doctoral qualifying exam (DQE) be taken within the first year for students with a master's degree, and within the second year for students without a master's degree. In order to be eligible for the DQE, students must be in good academic standing and have a KU GPA of 3.0. If the student fails to meet these requirements, they will work with their major advisor to develop an alternate plan of study.

The DQE tests the breadth of knowledge and determines the student’s ability to formulate mathematical representations of real physical situations. The examination covers mathematics and 2 of these 5 areas:

- Aerodynamics
- Astronautics
- Dynamics and controls
- Propulsion
- Structures and materials

A student is allowed only 2 attempts to pass this examination. If a student has completed AE 712 with a grade of B or higher, the mathematics section of the qualifying exam is waived.

The aspirant forms a dissertation committee and completes a Plan of Study after the first semester and before the end of the second semester. The dissertation committee must have 5 members, including 3 tenured or tenure-track faculty from aerospace engineering and at least 1 member from a department other than aerospace engineering. The committee approves the aspirant’s program and administers the comprehensive examination and the formal oral defense and dissertation.

When the aspirant has completed most of the course work and satisfied the research skills, responsible scholarship and residency requirements, they must take the comprehensive examination. The comprehensive exam cannot be taken until research skills, responsible scholarship, and residency requirements have been met.

- The research skill requirement provides the aspirant with a research skill distinct from, but strongly supportive of, the dissertation research. One research skill is required. Possible research skills include computer science, mathematics, statistics, specific laboratory skills, and specific skills in the physical or biological sciences. The selected research skill must be listed on the Plan of Study form.
- The responsible scholarship requirement serves to ensure that students are trained in responsible research practices. Aspirants can satisfy the responsible scholarship requirement by enrolling in 2 semesters of AE 690 (https://catalog.ku.edu/search/?P=AE%20690), Professional Development for Graduate Students. This course covers ethical behavior for graduate students, intellectual property, and technical writing.
- The residency requirement is met by completing 2 semesters, which may include 1 summer session, in resident study and enrollment in 6 credit hours or more. During the period of residence, the student must be involved full-time in academic pursuits, which may include up to half-time teaching or research.

The comprehensive examination is made up of two parts. The first part must consist of a written research proposal outlining in some detail the work to be done for the dissertation. The second part is an oral examination in which they must defend the research plans and demonstrate competence in their particular and related areas. Upon passing the comprehensive oral examination the aspirant becomes a candidate for the AE Ph.D. degree. The dissertation committee directs the preparation of the approved dissertation topic and research. The candidate now completes the dissertation work or research and writes the dissertation. The dissertation must contain an original contribution made by the candidate to the field. In addition, a comprehensive review of the pertinent literature must be included. This dissertation must be approved by the candidate's dissertation committee. A formal oral and public defense of the dissertation is required before the candidate’s committee, any other interested members of the graduate faculty, and the general public. Candidates for the Ph.D. must also satisfy the university’s general requirements for the degree.

To be awarded the Ph.D. degree a student must:

1. Complete all coursework with a 3.0. Grades of C-, D, and F are not allowed.
2. Satisfy residency requirements.
3. Pass the Doctoral Qualifying Examination.
4. Satisfy the Research Skills and Responsible Scholarship requirements.

5. Pass the Comprehensive Exam.
6. Prepare and defend a Ph.D. dissertation that must contain an original contribution to the field by the candidate.

Note well:

a. The dissertation must be publicly defended in the presence of the candidate's dissertation committee. Public notice of this defense must be given at least two weeks before the defense. The dissertation defense

must be public and reasonable questions from the public must be addressed by the candidate.

b. At least one month must elapse between passing the comprehensive oral examination and conducting the final dissertation defense.

Maximum Tenure

The dissertation must be completed within eight years after being admitted to the Ph.D. program in AE. In cases that require more than eight years, the dissertation committee may grant an appeal for an extension of this period.