Doctor of Philosophy in Aerospace Engineering

Aerospace Engineering

The aerospace engineering discipline involves the design, production, operation, and support of aircraft and spacecraft. Aerospace engineers solve problems, design aircraft and spacecraft, conduct research, and improve processes for the aerospace industry.

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

Aerospace engineering prepares graduates for professional practice in the aerospace industry and graduate study in aerospace engineering. Achievement is measured through assessment of the performance of graduates three to six years after graduation. Graduates must demonstrate the following measurable learning outcomes:

1. Competence in the analysis, test, and design of aerospace systems and components using contemporary techniques, equipment, and software.
2. An understanding of the professional responsibilities associated with the special public safety and economic aspects of the aerospace industry.
3. The ability to communicate analysis test, and design results to engineers and nonengineers.
4. The ability to work effectively in interdisciplinary teams.
5. An understanding of the need for lifelong learning.

Graduate Admission to the Department of Aerospace Engineering

Application Requirements

In order for applications to be considered complete, the following materials must be submitted online with the application by the posted deadline:

1. Transcripts from all degree granting institutions For processing purposes, you may attach scanned versions of official transcripts to your application, as well as a copy of your degree certificate and/or diploma if the degree has been earned outside the US. A printout from a student portal is NOT considered an official copy.
   a. Transcripts that are in a language other than English must be accompanied with English translations.

   b. NOTE: Documents uploaded with your application are not considered official. KU does not consider transcripts that come from applicants or that have been in the applicant's possession as official.

2. Three letters of recommendation. Letters must be on letterhead. Recommenders will receive instructions on submission at the time the application is submitted.
3. Resume or CV
4. Official GRE score report
5. Statement of Objectives
6. Official TOEFL, IELTS, or PTE score report (International students only)
7. Statement of Financial Resources (International students only)

* Please note: All application materials must be received before any kind of decision is made. Documentation sent in addition to that requested above is not required and may be destroyed. Do not send paper documents unless requested.

Admissions Deadline

Our department priority deadlines for admission are:

Fall Admission: December 1 (all applicants)
Spring & Summer Admission: September 15 (all applicants)

For full consideration for fellowships, scholarships and research/teaching assistantships, applications should be received by December 1 (for fall admissions). Application materials should indicate the 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 completed and sent with a signed document from your chosen references. Recommenders will receive instructions on submission at the time the application is submitted.

Statement of Objectives

To complete the Statement of Objectives Form, the essay should be no longer than the space provided. The Statement of Objectives form is included in the online application.

Statement of Financial Resources

As a part of the application process, all international students must submit credible evidence of financial support for the first year of study (http://iss.ku.edu/cost-sheets/). Financial documents must be less than 6 months old, indicating the type and amount of currency in US dollars. If the bank account is not in the applicant's name, please attach a statement signed by the account holder indicating the relationship to the student for whom the support will be provided. There is no form for the Statement of Financial Resources, please send only the form(s) of documentation listed below.

Acceptable evidence includes:
• Bank statement from checking, savings, stock holdings and/or certificate of deposit.
• Bank letter on letterhead indicating date account opened, average balance and current balance.
• Scholarship or sponsorship letter verifying amount, source and dates of award.

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 provisionally until a plan of study for make-up courses is completed.

Regular Admission
Master’s program regular admission requires an undergraduate GPA of at least 3.0.

Doctoral program regular 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.

Provisional Admission
In exceptional cases, applicants with a GPA between 2.75-2.99 may be granted provisional admission. Students with educational backgrounds other than aerospace engineering may be admitted provisionally.

Provisional students must achieve a 3.0 GPA by the end of their first semester. Failure to achieve the minimum GPA can result in dismissal. In extenuating circumstances, a student may be allowed to continue provisionally for one additional semester.

Students admitted provisionally are not eligible to hold GTA or GRA appointments.

Transfer Credit for Graduate Courses
Up to six hours of approved graduate work may be transferred to KU from other universities. Students with a B.S. degree from KU may transfer up to eight hours of approved graduate work from other universities.

GRE Requirements
Applicants must have a minimum of 50% on the Verbal and Analytical sections of the GRE and 85% on the Quantitative section. Applicants with lower scores, but otherwise exceptional record, will be considered for provisional admission.

English Proficiency Requirement
International students and students who indicated English as a second language, are required to show proof of English proficiency for admission purposes and must check-in at the Applied English Center (http://www.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.

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.

A variety of scholarships, fellowships, and assistantships are available to graduate students through the School of Engineering and KU. Learn more at https://engr.ku.edu/graduate-scholarships (https://engr.ku.edu/graduate-scholarships)

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 our Open House in mid-October and mid-March. 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 making 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
2120 Learned Hall
1530 W. 15th Street
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 (RS³) 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.

**Minimum Course Requirements**

The PhDAE degree typically requires a minimum of 60 credit hours beyond the BSAE degree (or equivalent). These 60 hours must be distributed as follows:

- Core courses of at least 9 credit hours of graduate mathematics beyond the BSAE degree. The 9 hours must include a minimum of 6 hours of graduate-level mathematics courses.
  - Graduate mathematics courses are those taken that are at the 600 level and higher, plus MATH 590, Linear Algebra
  - AE 712, Techniques of Engineering Evaluation, is a mathematics-intensive engineering course that meets the Core requirement
- Breadth courses of at least 12 credit hours of technical courses (above 600 level) must be distributed outside the area of specialization in the areas of:
  - structures and materials
  - aerodynamics
  - design
  - dynamics and controls
  - propulsion
  - astronautics
- Depth courses of at least 15 credit hours of technical courses (above 600 level) in the area of specialization
- At least 24 credit hours of doctoral dissertation

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

**Ph.D. Degree Requirements**

The Ph.D. program requires 60 credit hours beyond the B.S. These 60 credit hours consist of 36 credit hours of course work and at least 24 credit hours of dissertation.

- 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.

Credit hours earned in completing a master's degree can be used to satisfy a portion of these requirements when appropriate. Unique situations can be accommodated with the approval of the graduate advisor and the candidate's major professor.

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 have a minimum KU cumulative GPA of 3.5. If the student fails to meet the 3.5 GPA requirement, 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, 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 course work 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.