KU

DEPARTMENT OF AEROSPACE ENGINEERING

The University of Kansas

School of Engineering

Graduate Handbook

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Introduction

The purpose of this handbook is to present in one document all material needed to plan and monitor your graduate program. The handbook includes requirements for four graduate degree programs as well as any associated rules and procedures.

The Department of Aerospace Engineering offers traditional Master of Science (MSAE) and Doctor of Philosophy (PhDAE) programs which emphasize original analytical and experimental research. In addition, two unique programs are offered: the Master of Engineering (MEAE) and the Doctor of Engineering (DEAE), which emphasize system design and management. All these programs provide an excellent preparation for employment in industry or in private and government laboratories. The doctoral programs also prepare for an academic career in teaching and research.

Graduate course work is available in the following areas of aerospace engineering:

- aerodynamics
- computational fluid dynamics
- propulsion
- structures
- flight testing
- flight dynamics controls
- aircraft design
- spacecraft design
- orbital mechanics

Graduate courses are taught by faculty with a strong background in graduate education and in industry and government laboratory experience. All faculty are currently active in funded or unfunded research in their areas of expertise. Department research programs are typically funded by: NASA, DOD, DOE, NSF, FAA, and the Aerospace industry.

Richard Hale
C.E. and M.J. Spahr Professor and Chair

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1. Department Overview

1.1 Department History

The current department has its origin in the formation of a Department of Aeronautical Engineering on January 2, 1941. The first degree program was the Bachelor of Science in Aeronautical Engineering (BSAE). Until that time the degree program had been an option under the Department of Mechanical Engineering.

In 1961 the name of the department was changed to Aerospace Engineering. Graduate programs leading to the Master of Science in Aerospace Engineering (MSAE) and Doctor of Philosophy in Aerospace Engineering (PhDAE) degree plans were established soon thereafter. During 1962-1967 the departments of Mechanical Engineering and Aerospace Engineering were merged but in 1968 the department, once again, became independent under its current name.

In 1968 the Master of Engineering in Aerospace Engineering (MEAE) degree plan was added followed in 1969 by the Doctor of Engineering in Aerospace Engineering (DEAE) degree plan. Also in 1968 approval was sought to form the Flight Research Laboratory (FRL). Approval was granted in 1969.

In 1970 a short course program was established. The Aerospace Engineering Short Course Program is currently directed by Stacy Cordell and operates as a unit of the KU Continuing Education Division. This program offers more than 50 public and in-house short courses per year in the US and abroad. The program offers a wide range of courses tailored specifically to the needs of industry and government organizations.

In 1980 the department began offering several space science and engineering courses.

1.2 General Description of the Department

The graduate programs build on the nationally and internationally recognized Bachelor of Science in Aerospace Engineering (BSAE) program. Many students from abroad are in the BSAE program. At the undergraduate level students can pursue minor specializations in airplane design, spacecraft design or propulsion system design as well as theoretical, computational and experimental studies in aerodynamics, propulsion, structures, control systems and flight test.

Detailed descriptions of the four graduate programs: MSAE, MEAE, PhDAE and DEAE are available in Sections 4 & 5.

1.3 Aerospace Engineering Faculty

Emily Arnold, Assistant Professor (Ph.D., University of Kansas)
Multifunctional Structures, Airborne Remote Sensing, Unmanned Aircraft Systems
2119A Learned Hall, 785-864-2467, earnold@ku.edu

Ronald Barrett-Gonzalez, Professor (Ph.D., University of Kansas)
Adaptive Aerostructures, Enhancement of Transportation Related Technologies, Missiles and Munitions
2124 Learned Hall, 785-864-2226, barrettr@ku.edu

Haiyang Chao, Assistant Professor (Ph.D., Utah State University)
Estimated and Control of Autonomous Aerospace Vehicles, Cooperative Sensing and Control, Small Unmanned Aircraft Systems
2130 Learned Hall, 785-864-2968, chaohaiyang@ku.edu

Dongkyu Choi, Assistant Professor (Ph.D., Stanford University)
Artificial Intelligence, Intelligent Agent Architectures, Robotics
2117B Learned Hall, 785-864-2924, dongkyuc@ku.edu

Mark Ewing, Associate Professor (Ph.D., Ohio State University)
Structural Vibrations of High Performance Structures, Aircraft Structural Acoustics, Interior Noise Reduction
2118B Learned Hall, 785-864-2964, mewing@ku.edu

Saeed Farokhi, Professor (Ph.D., Massachusetts Institute of Technology)
Propulsion Systems, Flow Control, Renewable Energy: Wind Turbines, Computational Fluid Dynamics
2120D Learned Hall, 785-864-2966, sfarokhi@ku.edu

Richard Hale, Professor, Associate Director of CReSIS, and Department Chair (Ph.D., Iowa State University)
Composite Materials and Structures, Uninhabited Air Vehicles, Experimental Stress Analysis
2120B Learned Hall, 785-864-2949, rhale@ku.edu

Shawn Keshmiri, John E. and Winifred Sharp Professor and Associate Professor (Ph.D., University of Kansas)
Nonlinear Parameter and System Identification, Flight Testing Unmanned Aerial System, Nonlinear Dynamic Planning and Optimization
2117A Learned Hall, 785-864-2974, keshmiri@ku.edu

Craig McLaughlin, Associate Professor (Ph.D., University of Colorado at Boulder)
Satellite Drag and Aeronomy, Orbit Determination and Astrodynamics, Space Surveillance
2119D Learned Hall, 785-864-2967, craigm@ku.edu

Ray Taghavi, John E. and Winifred Sharp Professor and Associate Chairperson (Ph.D., University of Kansas)
Fluid Mechanics, Aerodynamics, Rocket Propulsion
2118D Learned Hall, 785-864-2973, rtaghavi@ku.edu

ZJ Wang, Spahr Professor (Ph.D., University of Glasgow)
Computational Fluid Dynamics, Adaptive High-Order Methods
2119B Learned Hall, 785-864-2440, zjw@ku.edu

Huixuan Wu, Assistant Professor (Ph.D., Johns Hopkins University)
Experimental Fluid Mechanics, Turbulence and Stochastic Process, Applied Optics
2119C Learned Hall, 785-864-2970, hwu@ku.edu

Zhongquan Charlie Zheng, Professor (Ph.D. Old Dominion University)
Aerodynamics, Vortex Dynamics, Computational Fluid Dynamics & Heat Transfer
2118C Learned Hall, 785-864-2904, zzheng@ku.edu

2. Application Requirements

2.1 Application Materials Needed

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

- 1 official transcript from each post-secondary school
- Three letters of recommendation
- Resume or CV
- Official GRE score report
- Official TOEFL, IELTS, or PTE score report (international students only)
- Statement of Financial Resources (international students only)

DO NOT send:

- Paper documents, unless requested
- Certificates or transcripts not related to post-secondary schooling
- Conference papers, journal articles, or other reports

* 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.

2.2 Admissions Deadlines

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 the priority deadlines. Application materials should indicate the interest in financial assistance or research/teaching assistantships.

2.3 Application Document Specifications

Application Fees
Domestic: $65
International: $85

Transcript
If admitted, official transcripts must be sent for all applicants - including KU undergraduate students. In order for transcripts to be considered official, they must be sent directly from the institution either by mail or e-mailed directly to the university. KU does not consider transcripts that come from applicants or that have been in the applicant's possession as official. Your official transcript must be received- sent directly from your institution – before any admissions decisions will be made. Degree conferral transcripts must be received by the end of your first semester of graduate enrollment to be eligible to continue enrollment. The official transcript must show that your undergraduate degree has been conferred.

Letters of Recommendation
Recommenders will receive instructions on submission at the time the application is submitted, this includes the recommendation form and instructions for uploading documents. Please use full first and last name of all recommenders. Recommendations must be submitted through this process. Letters uploaded by the applicant are not valid.

Statement of Purpose
Only complete the Statement of Purpose Form included in the application. The essay should be no longer than the space provided on the form. It is important to indicate the preferred area of interest so you can be properly matched with an advisor.

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, are considered for provisional admission. GRE scores must be received by the University directly from ETS. Student copies or copies provided by the student are not official.

Non-English Speaking Students
An official copy of an applicant's English proficiency standardized test scores (e.g. TOEFL, IELTS, or PTE) must be received before the application will be considered for admission. Scores must not be more than two years old prior to the semester of first enrollment. Test scores must be sent directly from the testing agency to the University in order to be considered original. Student copies, or copies submitted by students are not official.

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. Financial documents must be less than 6 months old, indicating the type and amount of currency in US dollars. Details about acceptable financial support is at https://iss.ku.edu/submit-proof-financial-support. Information regarding cost of attendance for the first year is at http://iss.ku.edu/cost-sheets.

2.4 Contact Information

KU Office of Graduate Studies
213 Strong Hall
1450 Jayhawk Blvd
Lawrence, Kansas 66045
785-864-8040
graduate@ku.edu
Website: http://graduate.ku.edu/

KU Aerospace Engineering Graduate Program
2120 Learned Hall
1530 W. 15th Street
Lawrence, Kansas, 66045
785-864-2960
aerohawk@ku.edu
Website: http://www.ae.engr.ku.edu

2.5 Admission Standards

Students who wish to apply for admission to 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 aerospace 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.

2.5.1 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 3.5 for courses taken as part of a master's program.

2.5.2 Provisional Admission

International students are not eligible for provisional admission due to Department of Homeland Security requirements.

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 continual provisionally for one additional semester.

Students admitted provisionally are not eligible to hold Graduate Teaching Assistant (GTA) or Graduate

Research Assistant (GRA) appointments.

2.5.3 English Proficiency Requirement

All students who are not native speakers of English and/or international students and who are admitted to campus-based programs are required to check in at the Applied English Center (AEC) upon arrival on campus. At that time, the AEC will confirm the student's level of English proficiency and determine if English courses are required. Any courses required as a result of the AEC Proficiency Test must be completed within 3 semesters of initial enrollment. Failure to complete the English proficiency requirement within this time limit may result in dismissal from the Aerospace Engineering graduate program.

2.5.4 Permit to Re-Enroll

The Permit to Re-enroll form is for individuals who have enrolled in their graduate program in the past year. The permit to re-enroll form is NOT available to a student who:

- Was dismissed from a program at KU;
- Was voluntarily discontinued (formally withdrew) from a graduate program;
- Completed the graduate degree program; or
- Most recently enrolled as a non-degree-seeking graduate student

Before completing the permit to re-enroll form, students should contact the AE graduate program manager directly to confirm availability of the permit to re-enroll.

Students returning from an approved Leave of Absence will be returned from leave by their department; such students are not required to use the Permit to Re-enroll. http://policy.ku.edu/graduate-studies/permit-to-reenroll

2.5.5 Transfer Credit for Graduate Courses

At the discretion of the major department and the Graduate Division, up to nine hours of graduate credit taken at a regionally-accredited graduate school may be transferred and applied to a KU master's degree plan if the credits were taken prior to the final semester of enrollment at KU. Only coursework graded 3.0 or higher (on a 4.0 scale) can be transferred.

Students with a BSAE from KU and an undergraduate cumulative GPA of 3.5 or higher may petition for a 6 hour reduction of the degree requirements for their MSAE, MEAE, PhDAE, or DEAE. These 6 hours come in the form of technical electives taken to satisfy the KU BSAE degree requirements. This can be done by submitting an Application for Reduction of Hours to the AE graduate program manager.

3. Departmental Guidelines

3.1 Definition of a Full-time Graduate Student

The minimum enrollment required for a full-time graduate student is 9 hours. If a student is employed as a GTA or GRA full-time enrollment is 6 hours.

International students may not work more than 50% FTE (20 hours weekly) during the academic year due to Visa restrictions.

3.2 Course Numbering System

The course numbering system used by the Department of Aerospace Engineering is:

100 – 299 Courses for freshmen and sophomores
300 – 499 Courses for sophomores, juniors and seniors
500 – 699 Courses primarily for juniors and seniors. These courses may be taken by graduate students with fewer than 30 hours of graduate credit.
700 – 799 Courses for graduate students with fewer than 30 hours of graduate credit. These courses may also be taken by undergraduates.
800 – 900 Courses for graduate students with more than 30 hours of graduate credit

3.3 Course Guidelines

- Courses numbered below 500 will not be counted towards the graduate student's GPA or required hours for degree, even if required to make-up any deficiency
- Courses numbered 500-599 will count towards the graduate student's GPA, but will not count towards required hours for the degree, even if required to make-up any deficiency with the exception of MATH 590, Linear Algebra
- Graduate mathematics courses are considered those taken at the 600 level and higher, with the exception of MATH 590, Linear Algebra
- AE 712, Techniques of Engineering Evaluation, is the only mathematics-intensive engineering course that will help fulfill the graduate mathematics requirement

3.4 Responsible Scholarship

All graduate students are required to take AE 690, Professional Development for Graduate Studies. Masters students must take 1 semester of AE 690. Doctoral students are required to take 2 semesters of AE 690. AE 690 is not offered every semester, so it is advised that students enroll in the first sections available. Students that do not meet the responsible scholarship requirement prior to their last semester may be required to take an alternate course of at least 3 hours to fulfill the requirement.

3.5 Financial Aid

Where possible the department offers financial support to graduate students. Financial support may be offered in the following forms:

- Graduate Teaching Assistant (GTA): GTA positions include a stipend, tuition waiver, and other benefits
- Graduate Research Assistant (GRA): GRA positions include a stipend, possible tuition waiver, and other benefits
- Fellowship: The department strives to provide approximately equal total compensation for GTA and GRA positions

*Important note: acceptance into the graduate program does not guarantee financial aid.

To be considered eligible for a GTA or GRA position or a Fellowship, applications must be received before the priority application deadline. Applicants will be contacted if they have been selected for such support.

GTA and Fellowship appointments are made by the department chair following a review and recommendation by the faculty.

GRA appointments are made by individual faculty members who have funded research projects. Students interested in applying for a GRA appointment are advised to contact the faculty member(s) directly who work in the area of interest.

In order for GTA's or GRA's to be eligible for in-state tuition, their semester appointments must be equal to 40% or more.

3.5.1 GTA and GRA Eligibility

GTA and GRA eligibility requirements are different than those required for admission. Additional information about eligibility are found at http://policy.ku.edu/graduate-studies/GRA-GTA-GA-guidelines-eligibility.

The Board of Regents policy on spoken English competency for graduate teaching assistants requires that non-native speakers of English demonstrate English proficiency by obtaining a minimum score of 50 on the SPEAK or TSE, a 22 on the speaking portion of the TOEFL iBT, an 8 on the IELTS, and that the student must be interviewed by three institutional representatives to determine sufficient English proficiency. More information may be found in the Kansas Board of Regents Policy on Spoken English Language Competency of Faculty and Graduate Teaching Assistants http://policy.ku.edu/KBOR/spoken-english-competency-BOR-policy.

3.6 Plan of Study

A Plan of Study must be completed and approved no later than the end of the student's first semester in residence. The Plan of Study serves as a record of the student's intentions, an indicator of the likely time-to-degree, and as an official acknowledgement of the advisor's and committee member's approval of the student's study plans. The form can be accessed and changed by the student subsequent to initial approval, but any changes must be approved by the advisor.

Information included as part of the plan of study is:

- Committee - master's students are required to enter at least 3 committee members, and doctoral students are required to enter at least 5 committee members
- Proposed area of research
- Proposed semester of graduation
- Proposed sequence of courses through the semester of graduation
- Proposed qualifying exam date (doctoral students only)
- Proposed date of residency completion (doctoral students only)
- Proposed date of research skills completion (doctoral students only)
- Proposed date of comprehensive exam (doctoral students only)
- Proposed date of responsible scholarship completion (doctoral students only)

The online plan of study must be updated each semester in order to enroll. The online plan of study is located at https://gradplan.engr.ku.edu/. Detailed course descriptions are in the catalog at http://catalog.ku.edu/engineering/aerospace-engineering/#courseinventory.

The department of Aerospace Engineering requires that all students update their plan and have it approved each semester before the enrollment hold is lifted. The first time the plan is submitted, it must be approved by the full committee, subsequent times only need to be approved by the committee chair and departmental graduate advisor. The final semester of enrollment, the plan must also be approved by the full committee.

New AE students should have their plan completed and approved by the end of their first semester in order for their hold to be removed and enroll in the second semester. In outstanding circumstances, the first semester requirement may be waived by the AE graduate program manager.

The plan should include all courses through time of graduation. This includes any pre-requisite courses that may be required, as well as any hours taken in addition to the minimum required hours. Permission for enrollment in special projects courses (AE 790 & AE 892) or thesis and dissertation hours (AE 895 & AE 996) will not be automatically granted unless they are included in your approved plan of study.

It is wise that students complete their plan of study in a timely manner. If the plan is not submitted and approved before the beginning of the semester, students could incur late enrollment fees.

3.7 Leave of Absence

A Leave of Absence may be granted upon request to the graduate program in advance of leave. A leave of absence may be granted in extraordinary circumstances (e.g. cases of illness, emergency, financial hardship, military leave), to pursue family responsibilities, or to pursue full-time activities related to long-range professional goals.

Appropriate documentation related to these extraordinary circumstances may be requested from the student directly. Evidence of progress towards degree will also be a determining factor in the decision to grant an exception. Students must receive approval from their advisor before submitting a leave of absence request to the AE graduate program manager.

The time taken for a leave of absence does not count against the student's time to degree. However, if the total time for the leave extends more than five years, the student will lose the student's place in the program and must reapply for admission.

3.8 Thesis, Dissertation and Project Report Publication Guidelines

The University of Kansas has adopted the electronic submission method for theses and dissertations, effective December 2005. To learn more about the theses and dissertation preparation and electronic submission, visit the Electronic Theses and Dissertations website at www.graduate.ku.edu/04-02_etd.shtml. In addition, the Aerospace Engineering Department requires a CD of the thesis or dissertation to be submitted to the AE graduate program manager.

3.9 Academic Misconduct

The AE Department regards academic misconduct as a very serious matter. Students who violate conduct policies will be subject to severe penalties, up through and including dismissal from the School of Engineering. Please refer to the University Senate Rules and Regulations policy at http://policy.ku.edu/governance/USRR#art2sect6 and the Rules and Regulations of the School of Engineering at http://policy.ku.edu/sites/policy.ku.edu/files/SchoolOfEngineeringRulesRegs.pdf for specific guidelines about actions considered to be academic misconduct and the repercussions of such action.

These actions include, but are not limited to disruption of classes, threatening an instructor or fellow student in an academic setting; giving or receiving of unauthorized aid on examinations or in the preparation of notebooks, themes, reports or other assignments; knowingly misrepresenting the source of any academic work; unauthorized changing of grades; unauthorized use of University approvals or forging of signatures; falsification of research results; plagiarizing of another's work; violation of regulations or ethical codes for the treatment of human and animal subjects; or otherwise acting dishonestly in research.

4. Master's Program

4.1 Outline of Typical Master's Program

An outline of a typical Master's program in Aerospace Engineering is as follows:

1. Upon arrival, the student selects or is assigned a major advisor based upon the student's area of interest. The major advisor assists the student in selecting courses for the first semester.
    a. If the student hasn't decided on a specific area of interest, the department graduate advisor will assist in choosing courses for the first semester
2. During the first semester, the major advisor assists in:
    a. The preparation of a plan of study (section 3.6)
    b. The formation of an initial thesis or project committee
    c. Defining an area of thesis or project research for MS students
3. Each semester the student updates the plan of study
4. During the 3rd semester MS thesis student begins research and writing of final thesis
5. During the 4th semester Students
    a. Submit their final plan of study for full committee approval
    b. MS project students complete their project & project report and MS thesis students conclude their research and complete their thesis
    c. The MS thesis or project report is approved by the committee
    d. After approval, the student schedules their defense
    e. Apply to graduate in Enroll & Pay
6. After scheduling their defense, the student
    a. Completes the Exam Defense Notice form and submits it to the AE graduate program manager at least **2 weeks prior to the defense**
    b. Begins the master's degree checklist found on the School of Engineering website at http://engr.ku.edu/masters-degree-checklist
    c. Updates the plan of study and submit it for final committee approval
    d. Defends the thesis or project before the student's master's committee, other faculty, students, and invited guests
7. After the defense, the student
    a. Turns in completed documents to the AE graduate program manager
        i. Master's degree checklist completed through the 4th check box for Requirements for Graduation
        ii. Engineering Career Center Graduation Report form
        iii. Signed Tile Page and Acceptance Page
    b. MS thesis students complete the final 3 items on the degree checklist
    c. Sends a pdf copy of the final thesis or project to the AE graduate program manager

If a student enters the Aerospace Engineering master's program without an equivalent BSAE background the department graduate advisor may require the student to enroll in selected undergraduate courses in AE and achieve a grade of C or higher in each, to achieve BSAE degree equivalency. Such "make-up" courses do not count toward the MSAE degree. All coursework, including undergraduate "make- up" courses, will appear on the transcript, but only graduate courses will be included in the GPA.

4.2 Master of Science in Aerospace Engineering (MSAE)

4.2.1 MSAE General Description

The Master of Science program in Aerospace Engineering (MSAE) has two options:

- Thesis Option: Typically requires a minimum of **30** semester hours of graduate work, including 3 hours of Math (section 3.3) and 6 hours in the satisfactory completion of a thesis
- Project Option: Typically requires a minimum of **33** semester hours of graduate work, including 3 hours of Math (section 3.3). This option does not require a thesis but does include a project with at least 3 hours of project (AE 895, M.S. Thesis or Project) to be satisfactorily completed.

Students must also take at least one semester of AE 690, Professional Development for Graduate Students.

Graduate mathematics courses are considered those taken at the 600 level and higher. Master's students may choose any one mathematics course (up to 3 hours) at the level 500 and higher. AE 712, Techniques of Engineering Evaluation, is the only mathematics-intensive engineering course that will help fulfill the graduate mathematics requirement.

Both the thesis and the project must be orally defended before the student's master's committee, other department faculty, students, and invited guests.

To earn the MSAE degree the student must:

- Complete the MSAE course requirements according to an approved plan of study
- Prepare and defend a thesis or project report approved by the student's master's committee
- The student is expected to demonstrate a working knowledge of aerospace engineering as part of the thesis or project defense.

4.2.2 Thesis or Project Committee

As part of the plan of study a student is required to form a thesis or project committee.
Master's committees are composed of at least three AE voting members. The chairman of the thesis or project committee must be an active AE faculty member.

The majority of committee members serving on a master's student oral examination committee must be tenured/tenure-track faculty holding regular or dissertation graduate faculty status in the candidate's department/program of study. Tenured/tenure-track faculty who are appointed as courtesy faculty within the program/department are considered (for the purposes of committee composition) to be faculty of that program/department.

Beyond the majority requirement, additional members may hold any graduate faculty status, including regular, dissertation, or special status. This third member can be, but need not be, a member of the candidate's department/program.

For approved professional master's degree programs, the committee may be composed as described above, or any number of the committee members may be professors of the practice, clinical faculty, or research faculty in the department/program. For the approved professional master's degree programs, the committee chair can hold any graduate faculty status. As long as the conditions above are met, the

committee may include more than three members.

The master's committee chair must hold regular or dissertation status. While master's committees are not required to have a co-chair, the student or the committee members may decide to select a co-chair. The co-chair can hold any graduate faculty status.

Substitutions of the committee chair (and/or co-chair) are prohibited after the committee has been approved by the Graduate Division of the school/college. If a committee chair (and/or co-chair) needs to be replaced, the revised committee must be approved by the Graduate Division of the school/college in advance of the exam.

Substitutions of the committee members are permitted as long as the new members hold regular or dissertation graduate faculty status. Special members can be added after the committee has been approved by the Graduate Division of the school/college, but these additions must be approved by the Graduate Division of the school/college in advance of the exam.
http://policy.ku.edu/graduate-studies/masters-oral-exam-committee-composition

4.3 Master of Engineering in Aerospace Engineering (MEAE)

The Master of Engineering (ME) program in Aerospace Engineering (MEAE) is a program which emphasizes systems design and management skills and procedures rather than the more analytical emphasis of the MSAE program. The MEAE program requires a total of 30 semester hours of graduate course work.

4.3.1 MEAE General Description

The minimum course requirements for the ME degree are:

- At least 21 semester credit hours of graduate-level technical electives (Breadth)
- At least 9 semester hours of design, technology, and management courses (Depth)

4.3.2 Completion of MEAE

The MEAE degree does not require a full committee, only a graduate advisor. All plan of study changes are approved by the student's graduate advisor and the department graduate advisor.

Upon completion of all coursework, the student's plan of study must meet final approval and the student must complete the ME Completion Form and submit it to the AE graduate program manager.

5. Doctorate Program

5.1 Outline of Typical Doctorate Program

A seven-step outline of a typical Doctorate program is as follows:

1. After earning the MSAE or MEAE degree (or equivalent) the student applies for admission to the doctorate program.
    a. A student judged to be capable of earning the degree is admitted to the program as a doctoral aspirant
    b. Exceptionally qualified students with a BSAE (or equivalent) degree and a GPA of at least 3.75 may be admitted as a doctoral aspirant
2. The aspirant selects or (upon request) is assigned a major advisor based upon the aspirant's area of interest
    a. The major advisor assists the aspirant in selecting courses for the first year of study and the preparation of an initial plan of study including the formation of an initial dissertation committee
3. After completing the first year of study with a GPA of at least 3.5 (grades of D or F do not count toward the doctorate degree) the aspirant requests the preparation of a doctoral qualifying examination (DQE) (section 5.2)
4. After passing the DQE the aspirant finalizes their dissertation or project Committee and updates the plan of study (section 3.6)
5. The aspirant satisfies the Research Skills and Responsible Scholarship (RS2) requirement
6. The aspirant prepares for the comprehensive oral examination
    a. An important component of this is a documented, original research plan which becomes the focus. This original plan must be approved by the aspirant's committee
    b. After committee approval the aspirant defends the original research or project plan Sections 5.5.3 & 5.6.3 describe the requirements for the comprehensive oral examination
    c. After passing the comprehensive oral examination the aspirant becomes a doctoral candidate
7. The candidate completes the doctoral research in accordance with the original research or project plan of Step 6 and writes a dissertation or project report.
    a. The dissertation or project must be approved by the candidate's committee. After approval by the candidate's committee the candidate defends the dissertation or project report. (sections 5.5.4 & 5.6.4)

The residency requirement described in Section 5.4 can be satisfied during any of Steps 1-7. The doctoral requirements must be completed within eight years after being admitted to the doctorate program. In cases which require more than eight years the candidate's committee may grant an appeal for an extension of this period.

The sequence of steps described here is typical. In special situations this sequence may be altered. However, any changes in the sequence must be approved by the candidate's committee and by the department graduate advisor.

5.2 Doctoral Qualifying Exam (DQE)

The purpose of the Doctoral Qualifying Exam is to assess the aspirant's preparation for doctoral-level research. Specifically, the DQE is intended to assess the aspirant's breadth of knowledge and to demonstrate the aspirant's ability to formulate mathematical representations of real physical situations in the broad field of aerospace engineering.

It is required that the qualifying exam 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 of 3.5 cumulative KU GPA. If the student fails to meet the 3.5 GPA requirement they will work with their major advisor to develop and alternate plan of study.

The qualifying exam is a written exam which covers mathematics and two of the following five areas at the option of the aspirant:

- aerodynamics
- astronautics
- dynamics and controls
- propulsion
- structures and materials

The qualifying exam is normally conducted over a two-day period, the Thursday and Friday before the first day of the semester. The math exam is given on day one, when applicable. Day two has both a morning and afternoon session, and each session is devoted to one of the non-math exam areas selected by the aspirant. Aspirants have a maximum of three hours to complete each exam.
The mathematics exam may be waived if the student passes AE 712, Techniques of Engineering Evaluation, with a B or higher.

The outcome of each exam may be: "pass", "conditional pass" or "fail". A "conditional pass" outcome usually requires the aspirant to take additional coursework in that area with a B grade as a minimum. Failing to meet this condition equates to a failed exam attempt. Any conditional course requirements or retake exams must be taken at the next course or exam offering time, unless approved by the AE graduate advisor.

An aspirant must retake any failed exam. An aspirant who fails both area exams must retake the entire DQE, including math when applicable.

Conditional pass is not an option when retaking an exam.

Aspirants that fail to pass any of the exams after two attempts will be dismissed from the AE doctoral program.

5.3 Research Skills and Responsible Scholarship (RS2) Requirement

Every doctoral student is required to obtain research skills pertinent to their field of study and to have training in responsible scholarship. Both requirements must be met prior to scheduling the comprehensive oral exam.

5.3.1 Research Skills

Aspirants can satisfy the research skills requirement by selecting one of two options as long as their committee chairman approves of that choice:

- Option 1: Aspirants must demonstrate proficiency in computation and complete three hours of graduate course work in instrumentation or experimentation if their area of interest is primarily theoretical.
- Option 2: Aspirants must demonstrate proficiency in computation and complete three hours of graduate course work in computational methodology if their area of interest is primarily experimental.

5.3.2 Responsible Scholarship

Aspirants can satisfy the responsible scholarship requirement by enrolling in two semesters (a total of .5 hours) of AE 690, Professional Development for Graduate Students.
This seminar- style course will cover topics such as:

- Ethical behavior in research to include plagiarism, peer reviews, conflicts of interest, copyrighting, authorship, and confidentiality
- Intellectual property management
- Technical writing topics to include theses, journals, and proposals Students will also make technical presentations on their own research.
- AE 690 is not offered every semester, so it is advised that students enroll in the first sections available.

5.4 Residency and Internship Requirements

Doctoral students are required to spend at least two semesters (this may include a summer semester) in residence study at The University of Kansas. During this period of residence the student must be a full time graduate student as defined in Section 3.1. An appointment for teaching or research is acceptable as long as that activity is directed toward the aspirant's or candidate's degree objectives.

In addition, the DEAE student must complete a 12 month industrial internship requirement. (Section 5.6.1) To obtain credit for this, the DEAE student must also enroll for a minimum of 12 credit hours of industrial internship, AE 990, DE Internship.

5.5 Doctor of Philosophy in Aerospace Engineering (PhDAE)

The Doctor of Philosophy program in Aerospace Engineering 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 DQE
- Complete the Research Skills and Responsible Scholarship (RS2) 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.

5.5.1 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.

A maximum of 30 credit hours earned while completing the MSAE or MEAE (or equivalent) degree can be used to satisfy a portion of the core and breadth requirements, provided those credits are appropriate to the overall PhDAE program of the aspirant. Unique situations can be accommodated with the combined approval of the AE department graduate advisor and the aspirant's major advisor.

5.5.2 Dissertation Committee

By the end of the first semester, the PhDAE aspirant forms their dissertation committee. This committee consists of at least five members, including at least three AE faculty members, plus at least one faculty member from outside the AE department. The outside member represents the Graduate School. The dissertation committee chairman is normally the aspirant's major advisor.

The majority of committee members serving on a doctoral student oral examination committee must be tenured/tenure-track faculty holding regular or dissertation graduate faculty status in the candidate's department/program of study. Tenured/tenure-track faculty who are appointed as courtesy faculty within the program/department are considered (for the purposes of committee composition) to be faculty of that program/department.

One member must meet the requirements for serving as the Graduate Studies representative. The Graduate Studies representative must be a member of the Graduate Faculty with regular or dissertation status from a department other than the aspirant's major department. A faculty member from a different department with a courtesy appointment in the student's department may serve as the Graduate Studies representative or in fulfillment of the committee majority pursuant of the Doctoral Student Oral Exam Committee Composition policy, but cannot serve in both roles at the same time.

The Graduate Studies representative is a voting member of the committee and has full rights to participate in the examination. In the case of any unsatisfactory or irregular aspects of the exam or violation of Graduate Studies policy, the outside member shall provide a written report to the Dean of Graduate Studies for consideration of further action.

Before the examination, the Graduate Division should provide a list of responsibilities to the Graduate Studies representative. A list of these responsibilities is provided below:

- The defense was conducted in compliance with the policies and by-laws of Graduate Studies and the program's Graduate Division
- The defense was held in a manner that was free and open to the public
- They were accorded full participatory rights in the examination
- They were accorded full voting rights as a member of the committee
- The defense was free from irregularities or unfairness to the student
- The defense was free from irregularities or unfairness among faculty members
- The defense, if repeated, occurred at least 90 days after last unsuccessful attempt

Beyond the majority requirement, the additional member may hold any graduate faculty status, including regular, dissertation, or special status. This fifth member can be, but need not be, a member of the candidate's department/program. For more information, see the policy on Graduate Faculty appointments. As long as the conditions above are met, the committee may include more than five members. http://policy.ku.edu/graduate-studies/graduate-faculty-appointments

The doctoral committee chair must hold dissertation status. While committees are not required to have a co-chair, the student or the committee members may decide to select a co-chair. The co-chair can hold any graduate faculty status.

Substitutions of the committee chair (and/or co-chair) are prohibited after the committee has been approved by the Graduate Division of the school/college. If a committee chair (and/or co-chair) needs to be replaced, the revised committee must be approved by the Graduate Division in advance of the exam.

Substitutions of the committee members are permitted as long as the new members hold regular or dissertation graduate faculty status. Special members can be added after the committee has been approved by the Graduate Division of the school/college, but these additions must be approved by the Graduate Division in advance of the exam.

5.5.3 Comprehensive Oral Examination

The purpose of the comprehensive oral examination (a.k.a. comp) is to determine whether or not the aspirant has an acceptable proposal for research leading to a dissertation. This research and the ensuing dissertation must contain an original contribution of the aspirant to the field.
The comprehensive oral examination consists of two parts:

- A written proposal outlining in reasonable detail the work or research plan to be done for the dissertation. This written proposal must contain a historical outline (with references) of similar work done in the field.
- An oral examination during which the aspirant defends the proposed work or research plan. In addition the aspirant is expected to demonstrate proficiency in his/her area of specialization.

The aspirant must submit copies of their work to their committee members no less than 3 weeks prior to the comp. An Exam Defense Notice must also be submitted to the AE department graduate program manager at least 3 weeks prior to the defense.

The comprehensive oral examination will be conducted by the aspirant's dissertation committee. The examination must be public and reasonable questions from the public must be addressed by the aspirant. After the comprehensive oral examination, the candidate must continuously enroll in 6 hours of dissertation in fall and spring semester until 18 hours of dissertation have been taken or all requirements for graduation have been met. If a candidate accumulates 18 hours of post comp dissertation, the minimum hourly enrollment per semester is reduced to only 1 hour. Candidates may defend their final dissertation no earlier than 1 month after the comprehensive oral examination, thus completing all graduation requirements. https://policy.ku.edu/graduate-studies/doctoral-candidacy

5.5.4 Dissertation and Public Defense

Upon passing the comprehensive oral examination the aspirant becomes a candidate for the PhDAE degree. 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.

The dissertation must be publicly defended in the presence of the candidate's dissertation committee. An Exam Defense Notice form should be submitted to the AE graduate program manager no less than 3 weeks prior to the defense date. The dissertation defense must be public and reasonable questions from the public must be addressed by the candidate.

At least 1 month must elapse between passing the comprehensive oral examination and conducting the dissertation defense.

5.6 Doctor of Engineering in Aerospace Engineering (DEAE) Program

The Doctor of Engineering program in Aerospace Engineering (DEAE) is a unique program that emphasizes system design and management skills. The program also requires students to successfully demonstrate their abilities in a broad spectrum of aerospace technology, mathematics and original research. To earn the DE degree students must:

- Complete DE course requirements in accordance with an approved plan of study
- Pass the DQE
- Complete the Research Skills and Responsible Scholarship (RS2) requirement
- Satisfy the residency requirements
- Pass a comprehensive oral examination
- Complete a 12 month industrial internship requirement
- Prepare and defend a DE project report which must contain an original contribution to the field by the candidate

An important requirement of the DEAE program is a minimum of twelve months of industrial internship in an industry or government organization. Because this internship is a degree requirement, and because neither the University nor the Department of Aerospace Engineering can guarantee internship employment, students must indicate in writing before they have completed their first semester how the internship requirement will be satisfied.

5.6.1 Minimum Course Requirements

The DEAE degree typically requires a minimum of 66 credit hours beyond the BSAE degree. These 66 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 and the only non-MATH course that meets the Core requirement
- Breadth courses of at least 12 credit hours of technical courses (beyond 600 level) must be distributed in the areas of:
    - structures and materials
    - aerodynamics
    - design
    - dynamics and controls
    - propulsion
    - astronautics
- Depth courses of at least 15 credit hours (beyond 600 level) must be taken in engineering management courses
- 18 credit hours of DE project
- 12 credit hours of industrial internship. To obtain these credit hours, the student must complete a 12-month industrial internship.

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

A maximum of 30 credit hours earned while completing the MSAE or MEAE (or equivalent) degree can

be used to satisfy a portion of the of the core and breadth requirements, provided those credits are appropriate to the overall DEAE program of the aspirant. Unique situations can be accommodated with the combined approval of the AE department graduate advisor and the aspirant's major advisor.

5.6.2 Project Committee

After successfully completing the qualifying examination the aspirant finalizes the project committee. This committee consists of four AE faculty members, one faculty member from the area of engineering management plus at least one faculty member from outside the AE department. The project committee chairman is normally the aspirant's major advisor. The project committee assists the aspirant during the remainder of the DEAE program, particularly with the project work and associated research. If any outside members of the project committee is not a member of the graduate faculty an ad hoc appointment to the graduate faculty must be secured before being allowed to serve as a member of the project committee.

5.6.3 Project Research and Project Examination

The purpose of the project research and comprehensive oral examination is to determine whether or not the aspirant has an acceptable proposal for research/work leading to a successful project. This research/work and the ensuing project report must contain an original contribution of the aspirant to the field.

The project research and comprehensive oral examination consists of two parts:

- A written proposal outlining in reasonable detail the work or research plan to be done for the project. This written proposal must contain a historical outline (with references) of similar work done in the field.
- An oral examination during which the aspirant defends the proposed work or research plan. The aspirant is also expected to demonstrate proficiency in his/her area of specialization.

The aspirant must submit copies or their work to their committee members no less than 3 weeks prior to the comp. An Exam Defense Notice must also be submitted to the AE department graduate program manager at least 3 weeks prior to the defense.

5.6.4 Project Report and Public Defense

Upon passing the comprehensive oral examination, the aspirant becomes a candidate for the DEAE degree. The candidate now completes the project work/research and writes the project report. In addition, a comprehensive review of the pertinent literature must be included. This project report must be approved by the candidate's project committee.

The project report must be publicly defended in the presence of the candidate's project committee. An Exam Defense Notice form should be submitted to the AE graduate program manager no less than 3 weeks prior to the defense date. The dissertation defense must be public and reasonable questions from the public must be addressed by the candidate.

At least 1 month must elapse between passing the comprehensive oral examination and conducting the dissertation defense.