

IOWA STATE UNIVERSITY™

Department of Aerospace Engineering

Graduate Handbook of the Department of Aerospace Engineering

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DEPARTMENT OF AEROSPACE ENGINEERING
GRADUATE STUDENT HANDBOOK (REVISED
ON 09/02/2021)

I. OVERVIEW

This handbook contains information regarding the administrative structure of the University and the Department and is a supplement to the Graduate College Handbook. The contents of this handbook include various policies and procedures of the department, and the graduate degree requirements.

II. INTRODUCTION

As you enter graduate study in the Department of Aerospace Engineering, you will undoubtedly have a number of questions about procedures and regulations. Answers to many of your questions can be found in a number of different publications: the Graduate Catalog which is available online at <http://catalog.iastate.edu>; the Graduate College Handbook, published by the Graduate College and available online at <http://www.grad-college.iastate.edu/publications/gchandbook/homepage.html>, and information on electronic thesis/dissertation preparation and submission which is available online at <http://www.grad-college.iastate.edu/current/thesis/>. You will undoubtedly need to refer to these publications at various times during the course of your graduate program. However, there are a number of questions for which the answers are not found in current publications that are particular either to the College of Engineering or the Department of Aerospace Engineering.

III. DEPARTMENT DESCRIPTION

The department offers work leading to the degrees of Master of Engineering (course work only), Master of Science (with creative component or thesis), and Doctor of Philosophy in each of two degree programs: aerospace engineering and engineering mechanics. Areas of specialization fall into five broad categories as follows: Advanced Materials; Aerodynamics, Combustion and Aero-Structural Interaction; Complex Systems and Optimization; Guidance, Control, and Astrodynamics; and Non-destructive Testing and Evaluation. More specific areas of research, falling within these broad categories include: aircraft icing, composites and structural dynamics, complex system analysis and design, computational and theoretical fluid dynamics, computational nano- scale mechanics and boundary elements, elastic wave propagation and scattering, experimental aerodynamics and flow visualization, gas turbine aerodynamics and heat transfer, guidance, controls and navigation, mechanics of smart

materials and structures, micro-/nano-mechanics and manufacturing, multidisciplinary design optimization, nondestructive evaluation, rotorcraft aerodynamics, spacecraft systems, trajectory optimization, ultrasonics and thermography, value driven design of systems, and wind engineering and energy.

Each Master's degree requires a minimum of 30 semester hours of graduate credits in research and/or course work. The Master of Science degree program is research oriented and requires a thesis. The Master of Engineering programs include more course work in exchange for less research experience.

The Doctor of Philosophy degree is strongly research oriented and requires at least 72 semester hours of graduate research and course work plus a dissertation. Doctoral students must also pass a qualifier examination, an oral prelim, and a final oral examination.

As mentioned earlier, there are a wide variety of areas of specialization in which you may pursue your degree. We encourage you to talk to faculty members and your fellow graduate students regarding your choice of a major professor and members for your program of study committee. The graduate faculty members of the Department of Aerospace Engineering and their research areas of interest can be found at the departmental website as follows: <http://www.aere.iastate.edu/department-overview/faculty-by-research-area/>.

IV. POLICIES AND PROCEDURES

A. Admission

The normal prerequisite for major graduate work in aerospace engineering or engineering mechanics is the completion of a curriculum substantially equivalent to that required of the corresponding undergraduate studies at Iowa State University. However, because of the diversity of interests within the graduate programs in aerospace engineering and engineering mechanics, it is possible for a student to qualify for graduate study even though their prior undergraduate or graduate education has been in engineering, physics, mathematics, or related fields. In such cases, it may be necessary for a student to take additional work to provide the requisite background.

B. English Requirement

1. Graduate students whose native language is not English, must take the English Placement Test (EPT) at the beginning of their first semester of enrollment, unless one of the following conditions is met. The student must either have a bachelor's or advanced degree from any US institution (in which the language of instruction is English) or must have a TOEFL PBT score of 600 or above, TOEFL iBT score of 100 and above or with a score of 7.5 or above on the IELTS Academic test.

A student not meeting one of these criteria who does not pass the EPT is assigned to one or more courses in the English 99 to 101 series. This coursework must be completed during the first year of study.

New graduate students who are on a **teaching assistantship (TA)** and whose first language is not English, are also required to take the Oral English Certification Test (formerly the SPEAK/TEACH test) administered by the International TA Program. This is a university-wide English-speaking proficiency test required of all international TAs. The test consists of two section - the Oral Proficiency Interview section and the TEACH teaching simulation section. Four Certification Levels exist, with Level 1 being Fully Certified and Level 4 being Not Certified (<https://cce.grad-college.iastate.edu/speaking/oect-for-itas/results>). A student receiving level 2 through 4 certification will require lab and classes (English 180) with possible retesting before they can be recertified. **Reappointment for a teaching assistantship is contingent upon the student achieving at least a Level 2 rating by the end of their second semester at Iowa State.**

C. Assistantships

Deserving students from the pool of admitted students are given financial support in the form of **Research Assistantships (RA) or Teaching Assistantships (TA)**. Department sources include all state, contract, and grant funds associated with faculty members of the department. Research Assistantships are offered by the individual faculty member and are based on the suitability of the admitted student for a specific project. A limited number of the admitted students are also offered a Teaching Assistantship based on the departmental needs and availability of funds. In general, RAs are offered for a year (2 academic semesters and a summer) and TAs are given for nine months (2 academic semesters). However, continuation of the assistantships (both RA and TA) from semester to semester is subject to satisfactory performance by the student both in their coursework and their research work. Failing to maintain a cumulative Grade Point Average (GPA) of 3.00 could result in probation and termination of any assistantships. Teaching Assistantships thus terminated will have a minimum waiting period of one semester and will not be considered for assistantship until their GPA is 3.00 or better. Students on probation will not be eligible to receive a tuition scholarship.

In general, students supported on a Teaching Assistantship are expected to take the initiative (work with their major professor) to move their support as soon as possible to a Research Assistantship after one year of support as TA. Nomination of a student to be considered for a TA position (as half-time or less) must be made by the advisor through the standard departmental nomination process.

Each M.S. and Ph.D. student serving as a TA will be evaluated by his/her faculty supervisor at the end of each semester on his/her job performance as a TA for the course assigned. The job performance is rated as good, fair, and poor. If a poor rating is given, then an

explanation must be provided by the assigned faculty supervisor. The TA job-performance rating will be placed in the student's file in the department. **A student receiving a poor rating for the first time will be required to attend teaching seminars through CELT. Two semesters of a poor rating will result in disqualification of that student serving as a TA in the future.**

Under certain circumstances, it may be necessary to terminate a graduate assistantship appointment early for loss of funds or cause. This is discussed later in this handbook under Tenure of Appointment. The Graduate College guidelines regarding **termination of an assistantship** are found in Chapter 9 of the Graduate College Handbook, which is online.

D. Major Professor, Program of Study Committee

As a new graduate student in the department, you are required to select a Major Professor and Program of Study (POS) Committee. The POS Committee will aid you in identifying the coursework and research credit you will need to graduate. The coursework and research credit are considered your Program of Study (POS). It is recommended that you have identified your major professor **by the end of your first semester of graduate study** in the department. **This allows PhD students completing a preliminary oral exam to have their POSC approved 3 months prior to their exam date.** The Program of Study Committee (POSC) form is to be submitted to the Graduate College by the end of your second semester in your graduate program. The requirement to select a Major Professor and POS committee within two semesters also applies to students who are continuing on for their Ph.D. degree after completion of an M.S degree in the department. The POSC form requires both the POS Committee be identified, as well as the projected coursework and research credits for your major – your POS. **If the POSC form is not submitted by the deadline, your assistantship appointment for the next semester will be deferred until it is submitted.** You are strongly encouraged to discuss your plans and interests with a number of faculty members before selecting a Major Professor. This must be a joint decision agreed upon by you and the professor. The role of the major professor is to guide you in the selection of the appropriate courses you should take to achieve your educational objectives and, also, to direct the research work or creative component for your graduate program. For information about faculty members who are actively seeking additional graduate students, please contact the Director of Graduate Education (DOGE) of the department.

The POS committee will include your Major Professor and other faculty members who will reflect your spectrum of interests for your graduate program in both course work and research.

The **Master's (MS with creative component or thesis option) POS Committee** consists of at least three members of the graduate faculty. It must include two members, including the major professor, from inside the major/program. One member of the committee must be from outside the student's field of emphasis to ensure diversity of perspectives. A term member of the graduate faculty may participate in the direction of a student's master's research as a co-major professor if a member of the graduate faculty serves as the other

co-major professor and jointly accepts responsibility for the direction of a program of study. **A POS committee is not required for the course work only MEng degree.** For this degree, the Director of Graduate Education (DOGE) will review and approve your program of study. If situations arise where input is needed from other faculty members, then the graduate committee will serve the function of the POS committee.

The **Ph.D. POS Committee** consists of at least five members of the graduate faculty. It must include at least three members, including the major professor, from within the student's major/program. At least one member of the PhD POS committee must be outside the student's field of emphasis to ensure diversity of perspectives. A term member of the graduate faculty may participate in the direction of a student's dissertation research as a co-major professor if a member of the graduate faculty serves as a co-major professor and jointly accepts responsibility for direction of the dissertation.

E. Program of Study

The Program of Study (POS) must be submitted by all graduate students (new students to study at ISU as well as those who are continuing on for their Ph.D. after completion of a Master's degree in the department) as part of the POSC form. **As a reminder, if the POSC form is not submitted by the deadline, your assistantship appointment for the next semester will be deferred until it is submitted.** The program of study form lists the courses and research credits you intend to take throughout your graduate program. Your POS committee will assist you in filling out a Program of Study, which is then submitted to the Graduate College for approval via electronic submission.

Any changes to your POS, after it is approved, are made online. This electronic form must be approved by your major professor and committee members, the DOGE, and the Graduate College for approval.

A minimum of 30 credits is required for the Master of Science or the Master of Engineering degrees; a minimum of 72 credits is required for the Ph.D. degree. The above credit totals include research and/or creative component credits, and are subject to further restrictions of the Graduate College and those of the specific departmental majors. Departmental policy is that Aerospace Engineering courses **may** be considered to be outside the student's major area for EM graduate students, at the discretion of the POS committee if they are not cross- or co-listed with EM courses. Under similar constraints, EM courses **may** be considered to be outside the major area for Aerospace students.

For all master's programs at ISU: at least 22 graduate credits must be earned at ISU; any transfer of graduate credits from another institution must be recommended on the POSC (with graduate credit earned as a graduate student approved for transfer only if a B grade or better was earned); and, for those pursuing two master's degrees, there must be at least 22 non-overlapping graduate credits.

For all Ph.D. programs at ISU: at least 36 graduate credits, including dissertation research, must be earned at ISU; any transfer of graduate credits from another institution must be recommended on the POSC (with graduate credit earned as a graduate student approved for transfer only if a B grade or better was earned); and, for those pursuing two Ph.D. degrees, there must be at least 36 non-overlapping graduate credits.

With approval of the POSC, graduate students are permitted to use undergraduate courses from outside as well as inside their major for their POS. All 3000 and 4000 level courses at ISU are eligible, up to a maximum of 9 credits (6 of which can be 4000 level and 3 at the 3000 level). Any 3000 level courses must be from outside the student's major.

The department requires students on assistantship to be registered for **a minimum of 9 credits per semester** (any combination of coursework and research credits). Until a Major Professor has been selected, course registrations must be approved by the Director of Graduate Education (DOGE). All changes to course registrations for each semester must be approved by the Major Professor or the DOGE, if a Major Professor has not yet been selected. Violation of this rule may cause the teaching assistantship (TA) or research assistantship (RA) to be terminated during that semester.

F. Master's Student Continuing for Ph.D.

Any M.S. student wishing to continue for a Ph.D., who has not identified a prospective major professor, will be considered for approval by the graduate committee. For these students, the M.S. POS committee members should provide an evaluation form. If approved, the student will complete the "Masters Student on Ph.D. Track in Same Department" form (found in Forms section of the Graduate College website). For students wishing to continue for a Ph.D. who have already identified a major professor, the major professor will be asked to submit a request to the graduate committee for continuation of the M.S. student. The graduate committee will then act on the request. Once accepted, the student will complete the above form. Students originally admitted to the Ph.D. program who wish to complete a master's degree as well, must also complete the above form.

G. Examinations and Evaluations

Final oral examinations are required for all graduate degrees in the department with the exception of the coursework only MEng degree. In addition, a qualifier examination and a preliminary examination are required for the Ph.D. Further information regarding the Ph.D. qualifier examination is located elsewhere in this handbook. Master's students completing their M.S. who wish to continue for a Ph.D. must be evaluated by their POSC,

unless they have an advisor already arranged for the doctoral program, as described in section F above.

To ensure steady progress towards their degree, each M.S. and Ph.D. student will be evaluated by his/her Major Professor at the end of each semester including summer (if supported on an assistantship) on the progress that he/she made towards his/her degree during that semester. The progress towards thesis is rated as good, fair and poor. If a fair or poor rating is given, then an explanation must be provided by the Major Professor on the evaluation form. The progress-toward-thesis rating will be placed in the student's file in the department. **If a student is funded by a TA, then two consecutive semesters of a poor rating will cause the student's TA to be terminated. If a student is funded by an RA, then a poor rating may cause the student's RA to be terminated.** Termination of support is discussed later in this handbook under Tenure of Appointment. The Graduate College guidelines regarding **termination of an assistantship** are found in Chapter 9 of the Graduate College Handbook, which is online.

H. Time Limits

According to the Graduate College Handbook, the time-to-degree limit for all graduate students is seven years. Requests to extend this limit could be considered in the event of unusual circumstances.

I. Facilities and Supplies

Stationery and Office Supplies: **These items will not be provided by the department unless they are required for a student's teaching assistant assignment.**

Photocopying: **Photocopying on departmental copy machines is limited to departmental business only.** Copies for your personal use are not to be made on these machines.

Office Space, Furniture, and Telephone Usage: Office space, furniture and telephone are provided for the **use of AerE/EM graduate students only. Only students on assistantships are guaranteed space.** Since it is necessary for multiple students to be assigned to an office, please be considerate of your office mates and their belongings. Keep phone calls at a reasonable length so the phone is available to everyone. If you are listening to music while studying, wear headphones or earbuds. Visiting with others should take place outside of the offices. Keep food to a minimum; there are other places in the building to eat meals and food kept in desk drawers or on shelves can draw unwanted pests. Any waste from food items should be placed in trashcans that will be emptied nightly (e.g., in hallways, restrooms, or in cans that are placed in the hallway at night). **ISU is a NO SMOKING CAMPUS.** This is a state regulation -- ALL university buildings are non-smoking. Each graduate student office should have a blue recycling

container. **Only white paper** is to be disposed of in this container. Place all other waste (except food waste) in your office trashcan. It is also requested that students take their turn at emptying the blue recycling bin in their office as the custodial staff does not empty this.

Mail: Graduate students are not to have personal mail sent to the departmental mailing address. This causes a problem when the student leaves ISU as the post office will not forward mail to their new address when it has a current address at ISU.

V. GRADUATE DEGREE REQUIREMENTS

A. Major in Aerospace Engineering

Master of Engineering (course work only) – A minimum of 30 credits of acceptable coursework is required, with at least 18 credits of coursework in Aerospace Engineering. The POS for this degree must include at least one course from 4 out of the 5 Aer E core areas. All the credits for the required courses of the core areas must be taken at ISU. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Master of Science (with creative component option) – A minimum of 27 credits of acceptable coursework is required, with at least 18 credits of coursework in Aerospace Engineering, and a minimum of 3 credits of Aer E 5990 (creative component). The POS for this degree must include at least one course from 4 out of the 5 Aer E core areas. All the credits for the required courses of the core areas must be taken at ISU. Effective for students admitted Fall 2023 and beyond, 1 credit of GR ST 5650: Responsible Conduct of Research in Science and Engineering is required. Each student is required to present an open seminar about the creative component work. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Master of Science (with MS thesis option)– A minimum of 21 credits of acceptable coursework, with at least 15 credits of coursework in Aerospace Engineering. In addition, a minimum of 6 credits in Aer E 6990 (thesis research) must be taken. This means that there can be 21-24 credits of coursework with 6-9 credits of thesis research (for a total of 30 credit hours), while satisfying the above minimum requirements.

Further, a thesis is required, which has been found acceptable to the POSC following a thesis defense. The POS for this degree must include at least one course from 3 of the 5 Aer E core areas. All the credits for the required courses of the core areas must be taken at ISU. Effective for students admitted Fall 2023 and beyond, 1 credit of GR ST 5650: Responsible Conduct of Research in Science and Engineering is required. Each student is required to present an open seminar as the first portion of the final thesis defense. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Doctor of Philosophy – The Graduate College requires a minimum of 72 credits for a Ph.D. degree. The department's requirements include a minimum of 36 credits of acceptable coursework, at least 24 credits of which must be coursework in Aerospace Engineering. You must also have a minimum of 9 credits of acceptable coursework from outside the major. Courses related to the history, philosophy, sociology or political aspects of science and technology are strongly encouraged. Some coursework at the 6000 level is expected in all Ph.D. Programs of Study. The minimum of 36 credits of coursework may include appropriate 5900, 6900 and experimental course credits. The POS for this degree must include one course from 3 of the 5 Aer E core areas. All the credits for the required courses of the core areas must be taken at ISU. Effective for students admitted Fall 2023 and beyond, 1 credit of GR ST 5650: Responsible Conduct of Research in Science and Engineering is required. The remainder of the POS is to be determined by the student and the POS committee. Requirements for qualifying and preliminary exams are provided in sections C and D below. Each student is required to present an open seminar as the first portion of the final thesis defense. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Aerospace Engineering Core Areas *Aerospace*

Systems and Design

1. Aer E 5630 – Introduction to Multidisciplinary Design Optimization (MDO)
2. Aer E 5650 – System Engineering
3. Aer E 5680 – Large-Scale Complex Engineered Systems (LSCES)
4. Aer E 5110X – Wind Energy System Design

Aircraft Structures

1. Aer E 5210 - Airframe Analysis
2. Aer E 5690 - Mechanics of Composite and Combined Materials
3. EM 5140 - Advanced Mechanics of Materials
4. EM 5250 - Finite Element Analysis
5. E M 5500 – Nondestructive Evaluation

Astrodynamics and Flight Dynamics

1. Aer E 5510 - Orbital Mechanics
2. Aer E 5770 - Linear Systems
3. Aer E 5780 - Nonlinear Systems
4. EM 5480 - Advanced Engineering Dynamics

Incompressible/Compressible Aerodynamics

1. Aer E 5320 - Compressible Fluid Flow
2. Aer E 5410 - Incompressible Flow Aerodynamics

3. Aer E 5450 – Advanced Experimental Techniques for Thermal-Fluid Studies
4. Aer E 5460 – Computational Fluid Mechanics and Heat Transfer I

Guidance, Navigation, and Control

1. Aer E 5310 - Automatic Control of Flight Vehicles
2. Aer E 5560 - Guidance and Navigation of Aerospace Vehicles
3. Aer E 5730 - Random Signals and Kalman Filtering
4. Aer E 5740 - Optimal Control

B. Major in Engineering Mechanics

Master of Engineering (course work only option) – A minimum of 30 credits of acceptable course work is required, with at least 18 credits of coursework in Engineering Mechanics, or a closely related specialty, and a minimum of 3 credits of mathematics. The POS for this degree must include at least one course from 4 out of the 5 EM core areas. All the credits for the required courses of the core areas must be taken at ISU. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Master of Science (with creative component option) – A minimum of 27 credits of acceptable coursework is required, with at least 18 credits of coursework in Engineering Mechanics (or a closely related specialty). Additionally, a minimum of 3 credits of mathematics and 3 credits of E M 5990 (creative component) are required. The POS for this degree must include at least one course from 4 out of the 5 EM core areas. All the credits for the required courses of the core areas must be taken at ISU. Effective for students admitted Fall 2023 and beyond, 1 credit of GR ST 5650: Responsible Conduct of Research in Science and Engineering is required. Each student is required to present an open seminar about the creative component work. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Master of Science (with MS thesis option)– A minimum of 21 credits of acceptable coursework, with at least 12 credits of coursework in Engineering Mechanics (or a closely related specialty) and a minimum of 3 credits of acceptable mathematics. In addition, a minimum of 6 credits in E M 6990 (thesis research) must be taken. This means that there can be 21-24 credits of coursework with 6-9 credits of thesis research (for a total of 30 credit hours), while satisfying the above minimum requirements. Further, a thesis is required, which has been found acceptable to the POSC following a thesis defense. The POS for this degree must include at least one course from 3 of the 5 EM core areas. All the credits for the required courses of the core areas must be taken at ISU. Effective for students admitted Fall 2023 and beyond, 1 credit of GR ST 5650: Responsible Conduct of Research in Science and Engineering is required. Each student

is required to present an open seminar as the first portion of the final thesis defense. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Doctor of Philosophy – The Graduate College requires a minimum of 72 credits for a Ph.D. degree. The department’s requirements include a minimum of 36 credits of acceptable course work, at least 24 credits of which must be graduate work in Engineering Mechanics (or a closely related specialty). The Ph.D. candidate must complete 12 credits total of acceptable coursework from outside E M, with at least 6 of these credits acceptable mathematics courses. Courses related to the history, philosophy, sociology or political aspects of science and technology are strongly encouraged. The coursework may also include appropriate 5900 or experimental course credits. In addition, a minimum of 36 credits in E M 6990 (thesis research) must be taken. The POS for this degree must include one course from 3 of the 5 EM core areas. All the credits for the required courses of the core areas must be taken at ISU. Effective for students admitted Fall 2023 and beyond, 1 credit of GR ST 5650: Responsible Conduct of Research in Science and Engineering is required. The remainder of the POS is to be determined by the student and the POS committee. Requirements for qualifying and preliminary exams are provided in sections C and D below. Each student is required to present an open seminar as the first portion of the final thesis defense. The student is also required to attend departmental seminars/thesis defenses at a minimum of 4 times per semester, and the attendance will be recorded.

Engineering Mechanics Core Areas

Solid Mechanics/Mechanics of Materials

1. E M 5100 – Continuum Mechanics
2. E M 5140 – Advanced Mechanics of Materials
3. E M 5160 – Mechanics of Deformable Solids
4. E M 5640 – Fracture and Fatigue

Fluid Mechanics/Aerodynamics

1. Aer E 5320 – Compressible Fluid Flow
2. Aer E 5410 – Incompressible Flow Aerodynamics
3. Aer E 5450 – Advanced Experimental Techniques for Thermal-Fluid Studies
4. Aer E 5460 – Computational Fluid Mechanics and Heat Transfer I

Dynamics/Vibrations/ Wave Mechanics

1. E M 5180 – Waves in Elastic Solids with Applications to Ultrasonic NDE
2. E M 5430 – Introduction to Random Vibrations and Nonlinear Dynamics
3. E M 5480 – Advanced Engineering Dynamics
4. EM 5520 – Advanced Acoustics

Computational Mechanics

1. E M 5250 – Finite Elements Analysis
2. Aer E 5460 – Computational Fluid Mechanics and Heat Transfer I
3. Math 5610/5620 – Numerical Analysis I &II
4. E M 5500 – Nondestructive Evaluation

Nondestructive Evaluation

1. EM 5500 - Nondestructive Evaluation/Modeling
2. EM 5180 – Ultrasonics
3. CE 5490 – Structural Health Monitoring

C. Ph.D. Qualifier Exam – Aerospace Engineering & Engineering Mechanics

The qualifier exam (QE) is meant to assess the student's potential to conduct independent research and provide guidance to remedy potential weakness. The QE is expected to provide an early warning for students who selected a wrong career plan and provide the possibility of a career change at an early stage of the program. The student and the advisor (who acts as the chair of the POSC) select the POS committee members.

The student and the advisor will decide on the most appropriate exam format. The exam date will be selected in consultation with the POS. The Request of QE form must be filed and approved prior to the QE.

Exam Format: The QE may have any of the following formats, or any combination:

- (a) An oral exam with a research proposal by the student. Exam discussion is focused on both the proposed dissertation topic and selected subject areas, determined by the POS committee.
- (b) A combined written and oral exam with a research proposal by the student. Exam discussion is focused on both the proposed dissertation topic and selected subject areas, determined by the POS committee.
- (c) An oral exam on selected subject areas, determined by the POS committee.
- (d) A written exam on selected subject areas, determined by the POS committee.

Option (c) and (d), or their combinations, are reserved for students without significant research progress to be reported.

The exam materials and discussion is expected to be at the undergraduate level with an advanced level of understanding, as well as the first year level of introductory graduate coursework. All incoming students with a BS or MS should take the exam no later than the 4th week of their third semester in residence. Any required retake should be done by the 4th week of the following semester. A single retake may be granted. Early

administration of the exam is encouraged. Both the student and the major advisor are responsible for following this timeline. Any deviation should be submitted in writing by the major advisor to the graduate committee.

The exam timing will allow failed students to finish an MS or MEng terminal degree and provide a structured means for leaving the Ph.D. program. The exam is meant to be at the undergraduate level and is meant to explore and verify one's ability to conduct research.

The QE will be graded on the following scale: Pass; Conditional Pass; Fail and retake; or Fail and dismiss. The POS will submit the Report of Qualifier Exam form following the QE. The approval process of the exam outcome is as follows:

- (i) Pass: The graduate committee approves the results.
- (ii) Conditional Pass: The student may be advised to take additional course work. The conditions required to pass the exam must be stated on the Report of Qualifier Exam. The conditions must be limited to a maximum of two academic semesters to be satisfied. The graduate committee approves both the exam results and ensures the satisfaction of the conditions imposed by the POS on the student.
- (iii) Fail and Retake: The student may be advised to retake the entire exam, in addition to any other required remedies. The weaknesses of the student's performance and required remedies, including any additional conditions required to pass the exam, must be stated on the Report of Qualifier Exam. The graduate committee will review the report and might grant or deny the retake.
- (iv) Fail and Dismiss: The weaknesses of the student's performance must be clearly identified on the Report of Qualifier Exam. The graduate committee will review the POS recommendation and will forward its recommendation to the entire graduate faculty for approval of the student dismissal. The student has the right to petition the graduate committee to retake the QE. The graduate committee will re-examine the student's case and make a final determination.

D. Preliminary Exam

For the Ph.D. degree in both Aerospace Engineering and in Engineering Mechanics, you must take a Preliminary Examination which is administered by your POS committee. This is an oral examination over your PhD research and related technical topics open to the public. A set of written materials which document your PhD research must be provided to your POS committee members at least one week prior to the oral examination. While the exact nature of the written materials given to your POS committee members is decided in consultation with your major professor, the written materials must consist of some combination of: i) an early draft dissertation or written overview of your

research; ii) copies of technical publications; iii) a literature review; iv) a plan for completion of your PhD dissertation, as well as any other supporting materials. During the oral examination, the POS committee members may also ask you questions about technical topics and coursework related to your field of study. The individual POS committee members are given broad latitude in their selection of questions to be asked during the examination. The purpose of the preliminary examination is to assess your progress towards completion of your dissertation, evaluate your research and establish your depth of understanding of your field of study. The examination must be passed **no later than six months prior to your final exam** (dissertation defense). If you fail all or part of the preliminary oral examination, then you may retake the exam. Six months must elapse between the first attempt and the next.

E. Co-Majors and Minors

There are no minors required for either Master's degrees or the Ph.D. As previously indicated courses outside the major are encouraged for the Master's degree and required for the Ph.D. However, outside courses need not be necessarily all from one area. If you wish to declare a minor, one member of your Program of Study committee must be from that minor department – he/she would be listed as a minor representative.

The minor requirements, in terms of specific courses, are determined by your POS committee and/or your minor representative. It is unusual to declare a minor at the Master's level. If you do, you would probably take 7-10 credits designated as minor credits. For a Ph.D. declared minor, usually 10-20 credits are designated as minor credits. Some departments may have requirements that must be satisfied for declared minors outside their department. You should consult with your minor representative for specific course requirements.

A co-major is more common than a minor. According to the Graduate College Handbook, "A co-major is a program of study for a single degree in which the requirements for two separate majors are met. A joint major is similar to a co-major but is only available in specific participating programs. In both programs, the single degree is granted when the student fulfills the requirements of both majors. The program of study (POS) committee will include co-chairs, each of whom represents one of the co- majors. Both co-chairs must be members of the graduate faculty. The same person, if a faculty member in both majors, will be allowed to serve as major professor for both majors. A preliminary oral examination and research work for the Ph.D. degree should be related to both majors. Students declaring co-majors or joint majors must satisfy requirements established by each major as monitored by the representatives on the program of study (POS) committee and the DOGEs of the two majors. A co-major or joint major cannot be added after the preliminary oral examination has been taken."

Requirements for obtaining a graduate minor in Aerospace Engineering (AerE) or Engineering Mechanics (EM):

Students pursuing a graduate degree in another discipline may pursue a minor in either Aerospace Engineering (AerE) or Engineering Mechanics (EM). On completion of the following requirements, their degree certificate will state the minor in “Aerospace Engineering” or “Engineering Mechanics”.

General requirements: To obtain a graduate minor in AerE/EM, student must:

- Have an AerE or EM faculty member as the minor representative on the POS committee.
- Student pursuing a Master's degree with AerE or EM minor should complete at least 3 AerE or EM graduate-level courses.
- Student pursuing a PhD degree with AerE or EM minor should complete at least 4 AerE or EM graduate-level courses.
- Undergraduate courses, as well as 490, 590, 690 courses, cannot be used to satisfy the graduate minor.

VI. ADDITIONAL INFORMATION

A. Letter of Intent

All graduate assistants must sign a letter of intent for the department offering the assistantship. The letter of intent establishes the amount of the monthly stipend, length of appointment, and the number of hours of service per week during the appointment. **It should be understood that the letter of intent is an agreement between the department and the student. The student is an employee of the university and is expected to fulfill his/her responsibilities from the first day of the letter of intent through the end date of the letter of intent.**

B. Leave

The department policy on graduate student leave has been developed to be consistent with ISU policy. The university determines the benefits policy for graduate assistants, and that policy states that C-Based employees do not accrue vacation. It is not allowable to charge graduate assistant vacation time to external awards (in the case of an RA) or to general funds (in the case of a TA).

Per the Graduate College Handbook: “Arrangements for a leave of absence are made between the graduate assistant and that assistant’s supervisor. When a graduate student employee needs to be absent either for personal reasons or illness, the supervisor should be understanding and accommodating to that need. At the same time, the graduate assistants should attempt to plan personal leave so that it does not interfere with or cause neglect of the duties associated with his or her appointment.

Supervisors of graduate assistants are responsible for ensuring that their assistants do not exceed reasonable limits for leave.” When such a leave of absence occurs, the student cannot be paid a stipend for their time away from the university.

Regular vacation and leave for graduate students should be allocated to all regular “university holidays” (days when the university offices are closed for business). Please note that Spring Break is not a university holiday and time between Fall and Spring semesters is likewise not a university holiday. RAs and TAs are expected to continue work on their research even if classes are not in session.

Students who are absent during their regularly assigned time are liable for reimbursement of pay and tuition on a pro-rated basis, and in extreme cases may lose their funding entirely. Ultimately, arrangements for leaves of absence are made between the graduate assistant and that assistant’s supervisor.

C. Prescription Drug Benefit Program

Graduate Students receive single coverage free of charge in a program that reduces the cost of prescription medication available at the Thielen Student Health Center Pharmacy. Spouse and children can receive the prescription benefit if they are enrolled in the ISU Student and Scholar Health Insurance Plan and the payroll deduction option is chosen for payment of premium. For further information, browse the Web site at <http://www.hrs.iastate.edu/sship/homepage.html> or contact the Thielen Student Health Center Pharmacy at 515-294-7983.

D. Health Insurance

Per the Graduate College Handbook, “Graduate assistants with an appointment of one quarter time or more for at least 3 months of the fall or spring terms receive self only health insurance coverage as a benefit for the term at no cost”.

Graduate assistants may enroll their spouse and children for an additional premium. An enrollment form must be completed before the Semester Enrollment Deadline or within the first 30 days of the date of appointment, whichever is later.

The health insurance plan is Wellmark. A copy of plan information is available on-line at <https://sship.hr.iastate.edu/>. For further information, the Student & Scholar Health Insurance Program in 3810 Beardshear, or call 515-294-4820. Graduate assistants do not participate in the ISU staff medical plans.

E. Graduate Students on Assistantship

Per the Graduate College Handbook, graduate students should be hired as graduate assistants when they are teaching or performing research that is part of their educational program. They should not be hired as hourly employees unless their employment does not involve ISU facilities or faculty supervision. This applies to summer support as well. Graduate assistants must register and pay tuition and fees for each term in which they hold an appointment. Students on full or provisional admission with graduate assistantships of $\frac{1}{4}$ -time or more (for three months or more during the academic term) are assessed C-base (same as resident) tuition and fees. Non-resident students on full or provisional admission with graduate assistantships of $\frac{1}{4}$ -time or more (for three months or more during the term) retain their non-residency classification, but are assessed C-base tuition and fees as long as the graduate assistantship is continued. Students on appointment ($\frac{1}{4}$ -time or more) for more than five class days but less than three months of the term are assessed fees by the credit hour according to residency and are not eligible for scholarship credit. Students on appointment for less than five class days are not required to register. The Graduate College's minimum registration requirement for a graduate assistant is at least 1 credit.

F. Graduate Tuition Scholarship Awards

Graduate students on full or provisional admission and who are appointed to graduate assistantships of $\frac{1}{4}$ -time or more, except those also holding traineeships or fellowships that provide funds for payment of tuition and/or fees, are assessed tuition at the C-base (same as resident) rate and fees. In addition, these students are eligible for a Graduate Tuition Scholarship award covering a portion of the C-base tuition. (Note: Students on restricted admission or on academic probation who may be on assistantship are not eligible for the scholarship tuition funds...any exceptions must be approved by the Dean of the College.) The scholarship awards are:

- For Master's students
 - $\frac{1}{2}$ -time or greater appointment – 50% of resident tuition costs
 - $\frac{1}{4}$ - to $\frac{1}{2}$ -time appointment – 25% of resident tuition costs
- For Ph.D. students
 - $\frac{1}{2}$ -time or greater appointment – 100% of resident tuition costs
 - $\frac{1}{4}$ - to $\frac{1}{2}$ -time appointment – 50% of resident tuition costs

For fall and spring semesters, a student must be on appointment for at least three months of the semester to qualify for a scholarship award. For summer session, a student must be on appointment for at least four weeks of the term to qualify for a Graduate Tuition Scholarship award. For all terms, appointment papers must have been

processed by the Graduate College before the end of the first full month of classes (i.e., usually around the fifth week of the fall or spring semesters). Graduate tuition scholarships not used by the due date of the second fee payment installment will be forfeited.

G. Tenure of Appointment

Assistantship appointments are made fiscal year by fiscal year. Because of this, each appointment is made for one year or less, and quite often semester by semester. Appointments may be terminated only for cause or loss of funding. Termination for cause is discussed in Chapter 9 of the Graduate College Handbook, which is online. The satisfactory completion of one appointment, plus satisfactory academic performance, will ordinarily make a student eligible for reappointment. However, departments have the discretion not to reappoint. Failure to reappoint is not termination and is not subject to formal appeal. Departments have an obligation to provide reasonable notice if reappointment is not to be made.

During the period of appointment, the university provides services and equipment essential to the performance of the assistant's duties, considering practical limitations of the resources of the university.

H. General Guidelines on AerE Graduate Assistant Leave and Vacation:

- In general, all graduate students on ISU payroll system with teaching assistantship (TA) or Research Assistantship (RA) are expected to work even if regular class is recessed (i.e., during spring break, thanksgiving break and winter break). In principle, all TAs/RAs can only take vacation on University holidays. Further information about ISU University holidays is available at <http://www.registrar.iastate.edu/calendar/>.
- TAs are paid for the full month of December. TAs may be asked to help assigned course instructors to monitor and/or grade final exams at the end of the semesters. TA duty does not end until the final grades of the assigned courses are successfully submitted.
- TAs are paid for the full month of January. TAs may also be asked to help the assigned course instructors prepare classes and/or perform TA training even before the start of the Spring semester. Unexcused absence from their assigned TA duties in the first week of the class may lead to the revocation of TA support.
- All TAs are expected to work with their major professor on their thesis research, in addition to finishing their TA teaching duties.
- If any graduate students with RA/TA support needs to be absent either for personal reasons or illness, they should inform their supervisors (course instructors, major professors and DOGE for TAs and major professor for RAs) as soon as possible. At the

same time, the RAs/TAs should attempt to plan personal leave so that it does not interfere with their assigned duties.

- Supervisors are responsible for ensuring that TAs/RAs do not exceed reasonable limits for leave.
- Any unexcused absence from TA/RA duties may require graduate students to pay a portion of their stipends and tuition costs back to AerE department (TA fund account for TAs and research accounts for RAs).

VII. GRADUATION SCHEDULE

The following is a summary of the examinations and preparations you need to follow for graduation. The items marked with an * must be submitted to the Graduate College and, except for those that are paper forms (indicated with a +), are available for completion at the following website: <http://www.grad-college.iastate.edu/forms/forms.html>

<i>ITEM</i>	<i>COMPLETION DATE</i>
Major Professor	It is recommended that your major professor be selected by the end of 1st semester of graduate program.
Program of Study Committee (POSC)*	Submitted by the end of 2nd semester of graduate program (recommendation of the Graduate College as well as the department).
Qualifier Exam (PhD only)+	See schedule in section D.
Request for Preliminary Exam (PhD only; oral exam)*+	Submitted three weeks prior to proposed date for prelim exam; must be passed at least six months prior to final oral exam.
Application for Graduation	See Graduate College Deadlines page for exact deadlines.
Request for Final Oral Exam*	Submitted at least three weeks prior to the proposed date of oral exam.
Final Oral Examination*	See Graduate College Deadlines page for exact deadlines.
Final submission of thesis or dissertation*	See Graduate College Deadlines page for exact deadlines.
Graduate Student Approval Form*	See Graduate College Deadlines page for exact deadlines.

Available at Graduate College office, 1137 Pearson Hall or online at <https://www.grad-college.iastate.edu/calendar/>