

# Department of Mechanical and Aerospace Engineering

## Graduate Student Handbook

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The purpose of this handbook is to outline the policies and procedures of the graduate program of the Department of Mechanical and Aerospace Engineering at the University of Virginia. It is a supplement to the University of Virginia Graduate Record, which summarizes the rules and policies of the University and the School of Engineering and Applied Science (SEAS) and is available at <http://records.ureg.virginia.edu/index.php>

Fall 2021

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# Message from the Chair

Welcome to the Department of Mechanical and Aerospace Engineering (MAE) at the University of Virginia, an organization dedicated to cutting edge research and the highest quality engineering education. We are pleased that you have come to MAE to pursue your graduate studies. Here you can have an outstanding, intellectually challenging, and productive educational experience.

The MAE Department is committed to providing you with a superior education and instilling in you a desire to explore the frontiers of science and engineering within the context of lifelong learning. Our goal is to prepare you for a leadership position so that you may function as a valuable, productive, and responsible member of society. Together with dedicated and renowned faculty responsible for your education, you will pursue scientific and technological excellence in a stimulating pedagogical environment underpinned by the power of knowledge uncovered. We believe you should possess both breadth and depth in your education, and we are committed to your intellectual and personal well-being. We seek diversity among our students and value the varied cultural backgrounds and ethnic origins that enrich our department.

In the MAE Department you will find a balance between a tradition of excellence and a pioneering spirit of entrepreneurship in both education and research. Periodic revisions of our curricula keep us at the forefront of what is important to teach, learn, and experience. Major funded research activities maintain us at the cutting edge in various fields including biomechanics, dynamics, solids, fluid- and thermo-mechanics, high speed propulsion, rotating machinery and controls, nanoscale thermal transport, and smart manufacturing. Some of these activities have their homes in laboratories such as the Aerospace Research Lab (ARL), the Center for Applied Biomechanics (CAB), the Nano-Scale Heat Transfer Lab, the Aero/Bio/Energy Lab (ABEL), the Experiments and Simulations in Thermal Engineering (ExSiTE) Lab, and the Rotating Machinery and Controls Lab (ROMAC).

The department offers Master of Science (MS), Master of Engineering (ME) and Doctor of Philosophy degrees (PhD) in Mechanical and Aerospace Engineering (combined, not separate).

I hope you find this information helpful. Please do not hesitate to contact any one of us (fellow student, faculty, or staff member) to help make MAE a happy, interesting, and productive home for you over the next few years.

Eric Loth  
Rolls-Royce Commonwealth Professor and Chair  
Department of Mechanical and Aerospace Engineering

# Department Policies and Organization

## **Advisor, Procedures, and General Information**

A faculty Advisor is a graduate student's mentor, supervisor, research guide, resource on curricular decisions, and representative to the MAE faculty. Ideally, this relationship will be established prior to the start of a student's graduate program. MAE faculty and their areas of interest are listed on the [MAE website](#). Any graduate student who does not have an Advisor should use this information to identify faculty members whose research interests most closely match their student's own and should approach these faculty members to discuss advisement.

A student's Advisor is their primary resource regarding significant matters of curriculum, graduation, and the graduate program. The MAE Graduate Program Coordinator is in MEC 326 and can provide students with guidance concerning the day-to-day operations and logistics of the department. The School of Engineering and Applied Sciences (SEAS) [Office for Research](#) and Graduate Programs is a student's primary resource for broader procedures and regulations related to the SEAS graduate programs. There are also several university resources available to assist students, including the [University of Virginia Ombudsman](#). The University Ombudsman is an independent, confidential resource available to assist faculty, staff, and students in resolving problems, complaints, conflicts, and other issues when normal processes and procedures have not worked satisfactorily. The normal track for academic dispute resolution is the course instructor, then the Advisor, the MAE Graduate Director, the Assoc. Dean for Research and Graduate Studies, and finally the Dean. The office of the Dean of Students can assist with problems not of an academic nature. UVA [Student Health](#) and [Counseling and Psychological Services](#) (CAPS) is also available for consultation and education.

It is expected that graduate students receiving financial support are working full time on their academic and research matters affiliated with their graduate school responsibilities at the University of Virginia. Students may not have any outside employment outside of their contract with the MAE department without permission from the Dean's Office. The student would need to send written notice to the Dean's Office requesting permission for additional work, and the extra work must be explained. We must also have a support letter from the faculty funding the student. All this must be done before the student accepts outside employment.

### **Websites:**

MAE – <http://engineering.virginia.edu/departments/mechanical-and-aerospace-engineering/>

SEAS Office for Research – <https://engineering.virginia.edu/about/offices/office-research/>

University Ombudsman – <http://www.virginia.edu/ombudsman/>

Student Health – <https://www.studenthealth.virginia.edu/>

Counseling and Psychological Services (CAPS) – <https://www.studenthealth.virginia.edu/caps/>

## Department Policies

The following policies have been established concerning the use of departmental equipment, supplies, and materials.

### Keys

Keys to the building and student offices are available from Ms. Lisa Horning, the assistant to the chair in MEC 322.

### Offices

Offices are assigned once a student arrives and should be kept neat and clean as visitors often tour the department.

### Telephones

Telephones are provided in most graduate student office areas. Necessary research-related long-distance calls are made with a forced authorization code (FAC). The FAC number allows the cost of the call to be charged to the research contract. FAC numbers may be obtained from the faculty Advisor of the research project. University policy prohibits personal long-distance calls to be made at University expense. To call a local phone number located off-grounds from any university phone, dial 9 followed by the number. To reach any phone number within the university directory, dial the last five numbers (e.g. 3-4567).

### Office Supplies

The department does not supply paper, pens, or other office supplies to graduate students. For research supplies see below for LAB SUPPLIES.

### Lab Supplies

Supplies must be ordered by the fiscal administrator in MEC 335B, or by the appropriate research lab personnel. A student can be trained and authorized to make research equipment/materials purchases through the University online ordering system, called the "UVA Marketplace", upon approval the student's research Advisor. See the fiscal administrator in MEC 335B for more details.

### Copy Machine

The department photocopy machine, located in the MAE mailroom in MEC 342, requires an access code provided by a student's Advisor. The machine is available to make copies relating to research or teaching activities, from 8am to 5pm Monday through Friday only. There are other machines located throughout the University.

### Mailroom

University mail service is not to be used for personal mail. Students do not have their own mailboxes but can have their research orders delivered here to the mailroom near MEC 342. See below for the address for deliveries to Mechanical and Aerospace Engineering:

Mechanical & Aerospace Engineering Department  
P.O. Box 400746  
Charlottesville, Va. 22904

An alternative place for deliveries is Thornton Hall. Address below.

Thornton Hall  
P.O. Box 400259  
Charlottesville, VA 22904-4259

## **Information Technology Services and Facilities**

[Information Technology Services](https://virginia.service-now.com/its) (ITS) provides general purpose computing resources for the University of Virginia, and their website (<https://virginia.service-now.com/its>) will be helpful as students setup their computers for access to the University system. Students can contact the MAE department IT at [mae-it@virginia.edu](mailto:mae-it@virginia.edu). New students should obtain an email account from [UVA's Information Technology Services](#) promptly and read their email daily, as this is the primary method by which the department communicates important information. A copy of Microsoft Office is available for purchase for personal computers from Cavalier Computers in the UVA Bookstore. Software downloads available to UVA students can be found at the [UVA Software Gateway](#). A work computer may be provided to a student by their Advisor for research, but a student may also be expected to bring a personal computer to work. A specialized computer lab is available in MEC 216 for MAE students. A personal account to access this lab may be obtained by contacting [meclab@virginia.edu](mailto:meclab@virginia.edu).

## **Address Changes**

Students must inform the Graduate Coordinator, as well as the University, of any address changes. It is important that the department has an address at which a student can be reached during the holidays and summer as well as the academic year. Upon graduation, a student should leave a forwarding address.

## **Building Use and Security**

Theft is rare in the MAE building, but it can happen. The following procedures are required to minimize the risk:

- An office door must remain locked whenever the office is unoccupied.
- Teaching assistants must not leave until all students have left the laboratory and they must then secure all doors and windows.
- If a student sees someone carrying equipment from the building on nights or weekends, he or she should call the University Police (dial 911) and notify the Department Chair or Assistant Chair.
- Only recognized student organizations are permitted to hold private parties or other events in the building or Darden Court. All such functions must be scheduled and approved in advance through SEAS.
- Personal belongings are not covered under the University insurance policies.
- The MEC building will be locked on football game days and on weekends. ID card access is necessary to enter.

## **Conference and Other Rooms**

Rooms are available for departmental functions. Please contact the Graduate Coordinator if you need to reserve a room.

# Academic Policies

## Graduate Studies Committee

The MAE Graduate Studies Committee is composed of MAE faculty and is responsible for all graduate-related matters in the department, including admissions, curricula, qualifying exams, graduation, course scheduling and staffing, and petitions. The committee also periodically reviews graduate courses and recommends new course offerings to the faculty. Students are not expected to participate in this committee. For matters regarding graduate studies, students can contact either the MAE Director of the PhD and MS programs or the Director of MAE ME studies listed on Page 2 of this handbook.

## Financial Support

Financial support may be provided by the department in the form of a fellowship, teaching assistantship (GTA), or research assistantship (GRA). Students should consider such support an honor and make every effort to meet the requirements specified for such support. Financial aid may be terminated at any time if the department or the faculty Advisor feels a student is not performing to the professional standards expected of a graduate student.

## Graduate Teaching Assistants

Graduate Teaching Assistants are assigned to specific courses. The course instructors will provide complete instructions to the GTAs. These instructions vary from course to course. Some preliminary preparation may be required before the beginning of the semester. Please check with the faculty instructor about these preparations. GTAs must pass minimum language requirements and have a minimum level of mastery of the course's subject matter. At the end of the semester, the GTA should check with the faculty member in charge of the course to make sure all expected duties have been completed.

Per SEAS Regulations, GTAs must have a Masters degree or at least 18 credits of graduate work in the discipline for which they will be a GTA and cannot TA a course carrying graduate credit without an exception from the Office of Graduate Programs. The Graduate Coordinator will submit an exception request to the Office of Graduate Programs on behalf of the GTA serving as a TA for a course carrying graduate credit.

GTAs must also enroll in the Graduate Teaching Instruction course (MAE 8897) under the appropriate section for their faculty instructor. Enrolling in an MAE Graduate Teaching Instructions Course is a School requirement according to the Graduate Record under Financial Assistance. GTAs should determine the number of teaching credits to enroll in by their appointment hours in accordance with Provost Policy 022: Determination and Assignment of Academic Credit. Full GTA assignments (equivalent to 20 hours per week) cannot enroll in more than 6 teaching units per semester. Half GTA assignments (equivalent to 10 hours per week) cannot enroll in more than 3 units per semester. The GTA should also enroll in the same course as the one they are supporting under their faculty instructor. If the GTA cannot find the correct course, please contact the Graduate Coordinator.

## Graduate Research Assistantship

Graduate Research Assistantship (GRA) support is provided for assistance on sponsored research contracts or grants. This work not only aids the research project but also may provide a topic for a student's thesis or dissertation. This financial aid is not a gift to the student: the student is expected to complete the work specified by their Advisor of the project in a professional manner. The Advisor and the student should discuss what is expected during the employment period.

Students are also encouraged to apply for external fellowships. The Office of the Vice President for Graduate Studies and Postdoctoral Programs maintains a list of selected fellowship opportunities at the following URL:  
<https://gradstudies.virginia.edu/funding-and-opportunities>.

Financial aid is not automatically renewable from one year to the next. It is the student's responsibility to plan with the Advisor of their research regarding the possibility of continued employment for the next academic year.

All students receiving financial assistance are responsible for providing withholding tax information, a social security card, and completing the Federal Employment Eligibility Form I9. Please report to the Budget Office for the School of Engineering and Applied Science in Thornton Room A206.

Students receiving financial aid from SEAS must be registered as full-time students, defined as at least 12 credits of lecture-laboratory courses and/or research during the academic year, must maintain a grade point average of 3.0, and must maintain satisfactory progress toward a degree. Graduate research assistants must register for a minimum of 6 credits of research during the summer term. Students receiving financial aid are not permitted to have other employment without approval of their Advisor and of the Office of the Assoc. Dean for Research and Graduate Programs. Students are awarded financial assistance to enable them to devote maximum effort to graduate studies.

## Graduate Curriculum and Degree Requirements

The department offers a Doctorate degree (PhD) and two Masters degrees: a Master of Science (MS), which requires a thesis, and a Master of Engineering (ME), which is a course-based masters Masters degree requiring no research. PhD and MS students must obtain the agreement of an Advisor to supervise their PhD dissertation or MS thesis. ME students are assigned an Advisor to aid in course selection.

The faculty of the department strives to offer graduate courses that will challenge the students' capabilities, inform them of cutting-edge innovations, and develop in them an appreciation of the beauty and history of our discipline. Toward these ends, our curriculum has four goals:

- To ensure that all graduates possess a broad knowledge of the fundamentals underlying Mechanical and Aerospace Engineering.
- To ensure that all graduates have a depth of knowledge within their fields.
- To ensure that all graduates have a strong understanding of basic analytical and numerical principles that form the foundation of their fields of study.
- To provide sufficient flexibility within our program for interdisciplinary students, acknowledging the great diversity within MAE and its emerging areas.

The courses in the MAE department are categorized into the following three areas: analytical math, numerical, and topical. With the approval of their Advisor and the Department, graduate students must take a minimum number of classes from each area that form the graduate student's "Core Courses".

- **PhD students** must complete 36 credit hours of coursework, as approved by their Advisor. 15 of these aforementioned credit hours must come from the approved list of MAE core courses. Within these 15 credit hours of MAE core courses, the student must complete:
  - at least 1 course from the "analytical math" category
  - at least 1 course from the "numerical" category
  - at least 3 courses from the "topical" category
- **Masters of Science** students must complete 24 credit hours of coursework, as approved by their Advisor. 12 of these aforementioned credit hours must come from the approved list of MAE core courses. Within these 12 credit hours of MAE core courses, the student must complete:
  - at least 1 course from the "analytical math" category
  - at least 1 course from the "numerical" category
  - at least 2 courses from the "topical" category

- **Masters of Engineering** students must complete 30 credit hours of coursework, as approved by their Advisor. At least 18 of these aforementioned credits must come from MAE classes. There is no common core course requirement among students pursuing a ME degree.

**The Core Courses are:**

- **Analytical Math**
  - Engineering Math I (6410)
  - Engineering Math II (6420)
  - Statistics for Engineers and Scientists (6430)
- **Numerical**
  - Multibody Mechanical Systems (6250)
  - Finite Element Analysis (6710)
  - Computational Fluid Dynamics I (6720)
- **Topical**
  - Any 6000-level MAE course, including Special Topics courses such as MAE 6592 Special Topics in MAE. This does not include Independent Study courses such as MAE 6993 Independent Study in MAE. All topical courses that fulfill the core requirements must be approved by both the Advisor and the Advisory committee (Committees outlined below).

The graduation requirements also include completion (satisfactory grade) in the Research Seminar class, which requires attendance at MAE seminars and lectures. The specific requirements are:

- At least one semester of MAE 7510 for a ME degree.
- At least two semesters of MAE 7510 for a MS degree.
- At least six semesters of MAE 8591 for a PhD degree or MAE 7510 for an MS degree.

These seminar courses can be taken for 0 credits each semester and a satisfactory grade requires attendance at six or more seminars. The student should contact the seminar course instructor to discuss any potential conflicts before the beginning of the semester or immediately when knowledge of any conflicts arises.

PhD and MS students should enroll in Dissertation Research (MAE 9999) or Masters Thesis Research (MAE 8999), respectively, under the appropriate course section for their Advisor, to meet the minimum enrollment requirements of 12 credit hours for the fall and spring, and 6 credit hours for the summer (if those requirements are not fulfilled with other course hours). This enrollment counts towards the 24 and 6 credit hours of research required for PhD and MS degrees, respectively.

Students may have the opportunity to enroll in Independent Study courses during their graduate program. These courses may count towards their graduate degree requirements provided approval by the student's Advisor, Advisory committee, and the graduate director. The department recommends that no more than 6 credits of Independent Study coursework be applied to the PhD course requirements, no more than 3 credits of Independent Study coursework be applied to the MS course requirements, and no more than 6 credits of Independent Study coursework be applied to the ME course requirements.

While classes outside of the department and school can count towards the student's academic requirement, these courses must be approved by the student's Advisor and the MAE program.

In addition to the MAE departmental requirements, there are degree requirements set by the University and by the Engineering School, which are in the [University Graduate Record](#) and on the SEAS Graduate Studies website (<https://engineering.virginia.edu/current-students/current-graduate-students>). Students should refer regularly to the [Student Information System \(SIS\)](#) to monitor their progress toward the fulfillment of all academic requirements (university level, SEAS level, and MAE level). They should also regularly check their Academic Requirements report in SIS to ensure they are meeting important milestones and that they are being recorded properly by the school.

The MAE department continually strives to deliver an excellent academic curriculum to the graduate students. As such, the graduate curriculum and course requirements can change over time. If this occurs during a student's pursuit of their graduate degree, then the student can choose to adopt the new curriculum for their degree or choose to be grandfathered into the curriculum with which they were pursuing when they started the program.

### **Transfer of Credit**

All graduate students must satisfy all MAE requirements, but graduate courses taken at other universities as part of an MS or PhD program may be used to satisfy certain departmental requirements. Students should discuss their graduate coursework at other universities with their Advisor and Advisory Committee and, if appropriate, petition the MAE Graduate Program Director to allow that coursework to fulfill the appropriate curriculum requirements.

The following should be included in the petition to the Graduate Studies Committee: an endorsement from the student's faculty Advisor, a detailed description of the course(s) taken elsewhere along with the syllabus (including the textbook used), and the student's complete planned coursework showing how the course fits into their overall PhD academic path. The MAE Graduate Program Director will then assess the petition, which could include consultation of the petition with the Professors on record that are instructing the courses in which the students are petitioning. Transferring credits will be handled on a student-by-student basis. An example petition and format for listing the pertinent course information is given in the Appendix.

No other UVA courses will be considered as replacements for the core courses, but a student may petition the MAE Graduate Studies Committee to have courses taken at another university satisfy analogous courses in the core curriculum. Any replacement course must be substantially similar to the core offering at UVA and, while the course grade does not impact the official UVA GPA calculation, it will be considered in the calculation of the composite core GPA for PhD candidacy (see below). The burden will be on the student to prove that any replacement course is substantially similar and to translate any course grade to the grading scale used at UVA. Any grade translation will require convincing documentation.

To transfer credits towards graduation, students must complete various forms for approval from both the MAE Graduate Program Director and the SEAS Graduate Studies Committee. These forms can be found here: <https://engineering.virginia.edu/current-students/current-graduate-students#accordion153168>.

The most common form that will be used in these cases is the "Request Approval of Transfer Credits" form. Note, as stated on this form, no more than 6 credits can be transferred toward an MS or PhD degree, and no more than 12 credits can be transferred toward a ME degree. These courses must have been completed with a B or better. A course cannot have been used to satisfy requirements toward another degree.

Under certain and special situations, the number of credits that can be transferred towards the student's UVA degree can be higher than those mentioned above. For example, if the student has earned a Masters degree in a relevant field at another institution and has fully or partially satisfied the UVA SEAS requirement for 24 credits of graded coursework after the baccalaureate, then up to 24 credits may be transferred (pending approval).

### **PhD Students Entering with a Masters Degree**

PhD students who have earned a Masters degree in a STEM field will receive an automatic bulk transfer of 24 graduate course credits toward their program of study. PhD students who have earned a Masters degree in a non-STEM field will receive an automatic bulk transfer of 12 graduate course credits toward their program of study. These bulk transfers do not automatically satisfy the core course requirements or seminar requirements. For these special situations, the following form must be completed, "Request, Requirement Change, Exception or Waiver":

[https://engineering.virginia.edu/sites/default/files/common/offices/graduate-programs-office/Files/form\\_request\\_requirement\\_change\\_waiver.pdf](https://engineering.virginia.edu/sites/default/files/common/offices/graduate-programs-office/Files/form_request_requirement_change_waiver.pdf)

## **Dissemination and Transfer of Knowledge**

All MS and PhD students are expected to complete publishable original research. Regular publication and presentation of scholarly work is an expected part of any graduate level research program. To this end, graduate students are encouraged to publish their work in indexed journals and present their work at external conferences. It is highly recommended that PhD students have presented their work at national or international conferences and submitted their work to indexed journals before the final dissertation defense. Furthermore, MS and PhD students may assist in various courses as Teaching Assistants. These TA assignments are important aspects of the graduate program and serve as training of the graduate students in teaching and transferring knowledge in the classroom environment.

## **Masters of Engineering Degree Requirements & Procedures**

### **Degree Requirements**

- 30 hours of graduate coursework, which must include 18 credits from MAE classes.
- No more than 9 credits from 5000 level classes
- No more than 6 credits from 5000 level MAE classes
- No courses below 5000 may be counted
- 1 semester of MAE 7510
- ME Assessment Requirements: All ME students (both onsite and online) also need to complete and submit three assessment forms: plan of study, engineering analysis, and technical writing. Completion and submission of these forms is mandatory for graduation. These forms are typically completed and submitted 6-8 weeks before graduating. These forms are completed by the student's Advisor. The student must submit a two-page report based on a research seminar to the Advisor so he/she can review and complete these forms. To complete the research seminar report, the student must take one semester of MAE 7510 (MAE Research Seminar for Masters students, a zero credit hour course) and write the report based on one of the seminars presented. Online students may watch the seminar videos online, but on grounds students must attend seminars in person. The report must address all the aspects mentioned in the technical writing assessment form.

## **Masters of Science Degree Requirements & Procedures**

### **Degree Requirements**

- 24 hours of graduate coursework (12 hours of graduate course work coursework beyond the core, where these 12 additional hours must be approved by the student's Advisor; note, other additional core courses listed above beyond the student's designated core courses can be used to satisfy these 12 hours).
- At least 6 hours of MAE 8999 Masters Thesis Research
- Completion of 12 hours of core courses described above
- No more than 9 credits from 5000 level classes
- No more than 6 credits from 5000 level MAE classes
- No courses below 5000 may be counted

### **Thesis Preparation of Examination**

A student's thesis Examining Committee is selected by the student and the Advisor. The purpose of this committee is to provide the student with a broad base of guidance in formulating and executing a formal course program and thesis project. This committee attends the final Master of Science thesis examination (oral defense) and makes the ultimate decision regarding the student's completion of the thesis requirement. The Examining Committee consists of a minimum of three SEAS faculty members, at least two of whom must be MAE faculty, the chair, and the Advisor. The Chair of the committee cannot be the student's Advisor and must be from the MAE Department. One research professional from outside UVA or a faculty member from outside SEAS may be a fourth voting member of the committee, provided that their qualifications are commensurate with those of a university professor, which should be discussed with your Advisor and chair. The Examining Committee may be reconstructed as appropriate.

The format of the final thesis examination is a presentation by the student, which is followed by a question and answer period. The student presentation portion of the defense should not exceed 30 minutes.

The student is responsible for reserving a suitable conference room and should send the thesis title and abstract to the graduate coordinator at least 7 days prior to the date of the exam so that the coordinator can announce the exam. The completed thesis must be delivered to each member of the Examining Committee at least 14 days prior to the date of the final thesis examination. The student should acquire the Thesis Assessment Form from the graduate program coordinator before the final examination for the Examining Committee to complete after the exam.

The Examining Committee may suggest or require changes to the thesis. These changes must be completed to the satisfaction of the committee. Once the changes have been made, the Thesis Assessment Form should be completed and submitted.

## **Doctor of Philosophy Degree Requirements & Procedures**

### **Selection of Advisor and Advisory Committee**

A PhD student must select an Advisor and, in consultation with the Advisor, an Advisory Committee, a Qualifying Exam Committee, and a PhD Final Dissertation Examination Committee. Timelines for these milestones are outlined in the Table below. The Advisor is normally a faculty member in the student's primary area of interest. The Advisory Committee recommends a program of formal courses, discusses research objectives, and plans with the student, and approves the student's dissertation proposal. The chair of the Advisory Committee must be on the MAE faculty and cannot be the Advisor. The PhD Advisory Committee must include a minimum of 4 members, 3 SEAS faculty and one additional UVA faculty member from outside MAE. This includes the Advisor and the chair of the Advisory committee.

Individuals from outside UVA may serve on a student's Advisory Committee, provided that their qualifications are commensurate with those of a university professor. For non-professors, a current CV or professional bio-sketch must be submitted to the Advisor and Graduate Program Chair for review and approval to serve on the Advisory committee. The CV or biography should include the highest degree attained, the year and institution, and any relevant experience or research which would provide expertise needed for sitting on the committee. The Advisory Committee can be restructured as appropriate at any time during a student's period of enrollment.

Upon selecting members of the Advisory Committee, the graduate student must complete the Doctoral Advisory Committee Form found on the [Engineering website](#). If the Advisory Committee changes, then the graduate student must complete a new Doctoral Advisory Committee Form. Upon completing this form, the graduate student must submit the completed form to the Graduate Program Coordinator for processing. The form will then be submitted to the Registrar's Office and then recorded in the student's record.

### **Course Requirements**

- 36 hours of graduate coursework (21 hours of graduate coursework beyond the core, where these 21 additional hours must be approved by the student's Advisor; note, other additional core courses listed above beyond the student's designated core courses can be used to satisfy these 21 hours)
- At least 24 hours of MAE 9999 Dissertation Research
- Completion of 15 hours of core courses described above
- No more than 9 credits from 5000 level classes
- No more than 6 credits from 5000 level MAE classes
- No courses below 5000 may be counted

## Admission to PhD Candidacy

A PhD student must satisfy all the requirements for PhD candidacy at least one semester before graduating. To become a PhD candidate, a student must

- Have completed all their core courses, and
- Have a composite GPA of at least 3.50 in their required core of 5 courses, and
- Have no grade lower than a B- in their core courses, and
- Have passed the PhD Qualifying Exam, and
- Have successfully completed a PhD Dissertation Proposal

## Qualifying Exam

The goal of the qualification exam is to assess the student's capability to perform independent research for their dissertation. The qualifying exam is a milestone in a PhD student's career that must be passed before a student can be admitted to candidacy. The MAE qualification exam is designed to be student-centered to address the specific research topic and technical skill of each individual student.

The student will be evaluated by the student's Qualifying Exam Committee, which consists of the PhD Advisor and 3 additional SEAS faculty members whose expertise are aligned with the student's research area, a total of 4 Committee members. At least two Committee members must be from MAE, and one committee member (not the Advisor) will be designated as Committee Chair. The student must work with their PhD Advisor to form the Examination Committee. Note, the Qualifying Examination Committee can be, and is often comprised of the student's Advisory Committee.

The exam format will be determined by the Committee, and approved by the department, and will be tailored to match the background and research plan for each student. Example formats include, but are not limited to, taking a written exam, critiquing a research paper, developing a research plan, or researching a specific topic or question. The Committee Chair will notify the Director of MAE PhD Studies of the designated date and format of the qualifying exam at least 6 weeks before the exam. Upon approval by the Director of MAE PhD Studies, the Committee Chair will give the exam requirements to the student 4 weeks prior to the exam date. The PhD Qualifying Exam must be conducted during normal business hours and on a day on which faculty members are expected to be on grounds. The Program-specific Qualifying Exam form for MAE ("Mechanical and Aerospace Engineering Qualifying Exam Assessment" form) uses the following criteria to assist the Committee in determining if the student passes the exam:

- Understanding of the problem,
- Understanding the approach,
- Understanding the context,
- Summarizing key points,
- Considering limitations,
- Knowledge of the field,
- Impact of work,
- Presentation quality, and
- Ability to answer questions.

Based on the exam results, the Committee will determine if the student is qualified to continue with the PhD degree program. If the Committee determines the student did not pass the Qualifying Exam, the Committee will determine the format and schedule for the student to retake the exam, should the student elect to retake the exam. **\*Note that the student is given one opportunity to retake the exam.**

A student should take the exam as soon as he/she has completed all core coursework (with a core-course GPA of at least 3.5 averaged among the completed core courses) and other preparations, as determined jointly by the Advisor and the student. This will typically be between the student's first year and second year (12 and 24 months) after the student begins the PhD program and must occur before the end of their third year, (36th month) of enrollment. Under no circumstances shall a student be admitted to PhD candidacy before successfully completing the qualifying exam.

Upon completing the PhD Qualifying Exam, the graduate student must complete the PhD Examination Report form and the Program-specific Qualifying Exam form for MAE, both of which can be found on the School of Engineering website. Upon completing these forms, the graduate student must submit the completed forms to the Graduate Program Coordinator for processing. These forms will then be submitted to the Registrar's Office and then recorded in the student's record.

## **Dissertation Proposal**

A PhD student must work with their Advisor to define a dissertation topic. Prior to admission to PhD candidacy, a written dissertation proposal based on this topic must be developed in close collaboration with the student's Advisor, submitted to the student's Advisory Committee as defined above, and defended in a public presentation to the satisfaction of the Advisory Committee.

The dissertation proposal should be presented before extensive research is undertaken, to receive feedback, guidance, and faculty approval of the proposed research. However, the student should also have enough research experience towards their PhD to properly defend and assess the breadth and depth of their research topic and goals. As such, prior to the dissertation proposal defense, the student must submit their CV, which must include a detailed list of any publications, abstracts, and presentations, along with electronic copies of each paper and abstract. This will allow the Advisory Committee to evaluate the level of research progress by the student at the time of the proposal defense.

The written proposal document should have a length of around 20 single-spaced pages, including figures and references. It should be prepared according to the following guidelines:

The document should succinctly describe:

1. The research questions or hypotheses
2. The motivation for the research
3. The research plan including specific research activities, research objectives, milestones, outcomes, and a detailed plan for completion of the proposed work
4. Preliminary results
5. Expected contributions and means of dissemination, including past publications; publications in preparation, review, or press; future publications planned and their anticipated submission dates

The proposal should not include a comprehensive literature review.

The student must submit a detailed presentation of the proposed research to their Advisory Committee, after which the Advisory Committee may ask for additional information, make recommendations, and require changes before deciding on the suitability of the proposed research. This presentation and all discussions with the Advisory Committee are open to the public and any member of the public may ask questions or provide suggestions. It is recommended that the proposal be presented within 12 - 24 months after successfully completing the PhD Qualifying Examination. The student must provide the Advisory Committee with the written proposal document at least 14 days prior to the oral defense; any delay in this must be actively communicated with the Advisory Committee. A copy of the student's transcript, curriculum vitae, and any publications should also be given to the committee at this time, as previously mentioned. The student is responsible for reserving a suitable conference room and should send the dissertation title and abstract to the Graduate Program Coordinator and Graduate Program Chair at least 7 days prior to the defense for public announcement.

Upon completion of the PhD Proposal, the Dissertation Proposal Form and the Dissertation Proposal Assessment Form found on the [Engineering website](#), must be completed and submitted to the Graduate Program Coordinator for processing. The forms will then be submitted to the Registrar's Office and then recorded in the student's record.

Successful defense of the dissertation proposal will be determined by the Advisory Committee and is a requirement for admission to PhD candidacy. The student must complete at least one full semester as a candidate before the degree is awarded. If a suitable proposal is not presented, the Advisory Committee will decide if another public proposal defense will be allowed, if another document must be prepared, or both. The Advisory Committee will determine the timeline for a

second public proposal defense and resubmission of a written proposal, but typically this would occur within 6 months of the original proposal presentation.

Once the Advisory Committee has approved the proposed research, the student must prepare their PhD dissertation, which will be evaluated by the student's PhD Final Dissertation Examination Committee.

### **Dissertation Examination Committee**

The PhD Final Dissertation Examination Committee must include a minimum of 5 Committee members. Out of these 5, a minimum of 4 Committee members must be UVA faculty and a minimum of 3 Committee members must be SEAS faculty. One of the UVA faculty members must be from outside the student's home department. The chair of the Final Examination Committee must be an MAE faculty but may not be the student's Advisor. The committee is typically composed of the student's PhD Advisory Committee along with one additional member.

Upon selecting members for the Dissertation Examination Committee, the graduate student must complete the Final Examination Committee form found on the Engineering website. Upon completing this form, the graduate student must submit the completed form to the Graduate Program Coordinator for processing. The form will then be submitted to the Registrar's Office and then recorded in the student's record.

### **Dissertation and Final Defense**

Before beginning to write a dissertation, a PhD student should review the SEAS instructions for dissertation preparation.

The student must publicly defend their dissertation to their Final Dissertation Examination Committee. A complete dissertation draft must be delivered to each member of the Final Dissertation Examining Committee **14 days prior** to the oral defense; any delay in this must be actively communicated with the Final Dissertation Examining Committee. At this time, the student should also provide to the committee a copy of their plan of their transcript, curriculum vitae, and copies of all publications. The student is responsible for reserving a suitable conference room and should send the dissertation title and abstract to the Graduate Program Coordinator and Graduate Program Chair at least 7 days prior to the defense for public announcement. All documents must also be provided to the MAE Graduate Program Director and MAE Graduate Coordinator after the dissertation defense, regardless of the outcome.

The dissertation defense will include an oral presentation of the dissertation, which should be no more than 45 minutes in length. A period of questioning follows the oral presentation with no time limits. Any member of the public may ask questions of the student and each member of the Final Dissertation Examination Committee will be invited by the chair to ask questions and provide comments regarding the dissertation. Following the questioning and comments, the Final Dissertation Examination Committee will meet privately to discuss the dissertation defense and to determine whether the student has satisfactorily completed a dissertation worthy of a doctoral scholar. After this deliberation, the Final Dissertation Examination Committee may ask for additional information, make recommendations, require changes, or determine that the student has not satisfactorily defended the dissertation. If changes are required, the Final Dissertation Examination Committee will determine the method for evaluating these changes. This may include a second review of the written document by the entire committee, by a subset of the committee, or by the Advisor. A second public defense may also be required. Once the Final Dissertation Examination Committee is satisfied with the dissertation, the student must submit the document for publication and can use it toward the satisfaction of the PhD graduation requirements.

Students should refer to the University Graduate Record and the SEAS Graduate Studies website for information on the submission procedures and scheduling requirements for dissertations once they have been successfully defended.

# Important Milestones, Notes & Timeline for Defense

All forms noted below can be found here:

<https://engineering.virginia.edu/current-students/current-graduate-students#accordion153168>

Milestone	Suggested Timeline and Notes	Forms
<b>Completion of Core Courses</b>	-12 – 24 months after start of graduate school program	
<b>Selection of PhD Advisory Committee</b>	<ul style="list-style-type: none"> <li>-12 – 24 months after the start of graduate school</li> <li>-Minimum of 4 members, including the student's Advisor</li> <li>-Minimum of 3 SEAS faculty</li> <li>-Minimum of 1 UVA faculty member outside MAE</li> <li>-Chair cannot be the student's Advisor and must be in the MAE department</li> <li>-More members of Advisory committee are permissible as long as minimum requirements are satisfied</li> <li>-PhD Advisory committee must be established before selection of qualifying exam committee (see next row). Note, these committees can be the same depending on composition.</li> </ul>	Doctoral Advisory Committee ("Recommendation and Certification of Doctoral Advisory Committee")
<b>Qualifying Exam</b>	<ul style="list-style-type: none"> <li>-Recommended that students complete qualifying exam between 12 – 24 months after start of PhD program, after core course completion</li> <li>-Qualifying exam <b>MUST</b> be completed before 36 months after start of PhD program</li> <li>-Exam format determined by examination committee</li> <li>-Exam Committee consists of the PhD Advisor and 3 additional SEAS faculty members. At least two Committee members must be from MAE, and one committee member (not the Advisor) will be designated as Committee Chair</li> </ul>	PhD Examination Report ("Report on PhD Exam") & Program specific qualifying exam form ("SEAS Form G 107 – MAE")
<b>Dissertation Proposal</b>	<ul style="list-style-type: none"> <li>-Recommended that the dissertation proposal presentation to Advisory committee be completed 36 -48 months after start of PhD program</li> <li>-Must complete proposal at least one semester before dissertation defense, but MAE department strongly urges the proposal to be completed much earlier in the PhD process, and ASAP after qualifying exam completion</li> <li>-Upon successful completion of the proposal, the student becomes officially a "PhD Candidate"</li> <li>-The written proposal document, and the student's CV, and all publications and abstracts must be provided to the Advisory committee, MAE Graduate Program Director and MAE Graduate Program Coordinator</li> </ul>	Dissertation Proposal ("Dissertation Proposal and Admission to Candidacy") & Engineering Dissertation Proposal Assessment ("SEAS Form G 108A")
<b>Dissertation and Dissertation Defense/Final Examination</b>	<ul style="list-style-type: none"> <li>-Timeline dependent on guidance and input from Advisor and Advisory Committee, but cannot be completed in the same academic semester as the proposal</li> <li>-Final Dissertation Examining committee must include a minimum of 3 SEAS faculty, 4 UVA faculty, and 5 total members. One UVA faculty member must be outside of the student's home department</li> <li>-More members of defense committee are permissible as long as minimum requirements are satisfied.</li> <li>-The PhD Advisory Committee can serve on the dissertation defense/final exam committee (and our department recommends that this be the case)</li> <li>-The written dissertation document, and the student's CV, and all publications and abstracts must be provided to the Advisory committee, MAE Graduate Program Director and MAE Graduate Program Coordinator</li> </ul>	Final Examination Committee ("Appointment of Final Examination Committee") & Thesis/Dissertation Cover and Approval Pages & Report on Final Examination ("Report on Dissertation or Thesis Final Examination") & Thesis and Dissertation Assessment & Complete online Survey of Earned Doctorates

# Application for Graduation

Students should refer to the University Graduate Record and the [SEAS Graduate Studies website](#) for information on the paperwork requirements and deadlines for graduation following the satisfactory completion of all requirements. Students should refer to SIS frequently to track their progress and to confirm that all requirements are completed on schedule.

# Appendix: Example Petition for Transferring Credits

[Date]

Dear [MAE Graduate Program Director] and [MAE Graduate Program Coordinator]:

We request your consideration of the following [insert number of courses you proposed to transfer] courses taken at [inset previous institution name here] to replace [insert number of courses you propose to replace] core courses in [Student's name]'s graduate plan of study formal course program. We have both reviewed each previous course and compared them to UVA MAE's current core courses, and believe the proposed core course transfer replacements contain significant overlap to warrant transfer and satisfaction of these core requirements. A summary of the proposed core course transfers are on the following pages, and the course syllabi from the transfer courses from [inset previous institution name here] are appended to the end of this document. I look forward to your and the current UVA course instructor's assessments of this transfer request.

Please let us know if you have any questions.

Sincerely,

[Advisor Signature]

[Student Signature]

[Advisor Signature Block]

[Student Signature Block]

Institution and Course number		Course Name	Course Description
Core Transfer #1	U. State MAE 6000	Advanced Math 1000	Insert description of course from previous institution. <b>Include letter grade received in the course.</b>
	UVA MAE 6410	Engineering Mathematics I	Review of ordinary differential equations. Initial value problems, boundary value problems, and various physical applications. Linear algebra, including systems of linear equations, matrices, eigenvalues, eigenvectors, diagonalization, and various applications. Scalar and vector field theory, including the divergence theorem, Green's theorem, and Stokes theorem, and various applications. Partial differential equations that govern physical phenomena in science and engineering. Solution of partial differential equations by separation by variables, superposition, Fourier series, variation of parameter, d'Alembert's solution. Eigenfunction expansion techniques for non-homogeneous initial-value, boundary-value problems. Particular focus on various physical applications of the heat equation, the potential (Laplace) equation, and the wave equations in rectangular, cylindrical, and spherical coordinates.
Core Transfer #2	Transfer course		
	UVA course		
Core Transfer #3	Transfer course		
	UVA course		
Core Transfer #4	Transfer course		
	UVA course		
Core Transfer #5	Transfer course		
	UVA course		