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. As such, it should be viewed as a supplement to the University of Virginia Graduate Record, which summarizes the rules and regulations of the University and the School of Engineering and Applied Science (SEAS).
Message from the Chairman

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 and will make sure you have an outstanding, intellectually-challenging, and productive educational experience.

The MAE Department is committed to providing you with a superior professional 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 concerned with your intellectual and personal well-being. We seek diversity among our students and value the varied cultural backgrounds and ethnic origins which 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 dynamics and controls, solid-, fluid- and thermo-mechanics, nanomechanics, and bioengineering. Some of these activities have their homes in major laboratories such as the Aerospace Research Lab, the Center for Applied Biomechanics, the Bio-Thermo-Fluids Lab, the Nano-Scale Heat Transfer Lab, and the Rotating Machinery and Controls Lab.

The MAE Department is home to 20 tenured/tenure track faculty, 2 research faculty, 2 general faculty, approximately 300 undergraduate students and 80 full-time graduate students. The department offers Master of Science, Master of Engineering and Ph.D. degrees in Mechanical and Aerospace Engineering. Our primary classrooms, laboratories, and offices are housed in an independent four-story building located on the Grounds of the University. Three of the laboratories mentioned above operate from off-campus sites devoted exclusively to engineering research.

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.

H. Haj-Hariri
Professor and Chair
Department Policies and Organization

Introduction
The Department of Mechanical and Aerospace Engineering has three fields of study:
- Solid Mechanics
- Dynamics/Controls
- Thermofluids

New students should select an advisor from one of these fields of study during or prior to their first semester of study. Affiliating with a specific field does not preclude taking courses in other fields; in fact, all students are required to take courses in fields in addition to their major area. (See requirements under specific degree program)

A list of MAE faculty and their areas of interest is included in Appendix I. New graduate students should use this information to choose an advisor whose research interests most closely match his or her own interests.

The MAE Graduate Office, located in MEC 327, can provide you with forms, keys (MEC 326), and guidance concerning the procedures, deadlines, and regulations applicable to your degree program. Any questions or problems that arise which cannot be satisfactorily resolved with your advisor should be brought to the attention of the graduate office.

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

KEYS
Keys to the building and to the student offices are available from the Administrative Assistant in MEC 326. A replacement fee of $5.00 will be charged for EACH lost key.

OFFICES
Your advisor will normally assign you an office. Offices should be kept neat and clean as we often show visitors through the department. Remember that someone else will occupy your office after you leave, so try to keep it nice. Office space is extremely limited and can normally only be provided to those with research or teaching assistantships.
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 directly charged to the research contract. FAC numbers may be obtained from the faculty investigator of the research project. University policy prohibits personal long distance calls to be made at University expense. Personal long distance calls must be made "collect", by calling card, by credit card, charged to your home telephone number, or on your cell phone. To call a local phone number located off-grounds from any university phone, dial 9, followed by the number you are trying to reach. To reach any phone number within the university directory, simply dial the last five numbers of their number (e.g. 3-4567).

OFFICE SUPPLIES
The department DOES NOT supply paper, pencils, pens, or other office supplies to graduate students. Research laboratories may have their own office supplies for use on research projects.

LAB SUPPLIES
Supplies must be ordered by the fiscal person in MEC 326, or the appropriate research lab secretary. 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 by their research advisor. See the fiscal contact in MEC 326 for more details.

COPY MACHINE
The department photocopy machine, located in the MAE mailroom in MEC 344, requires an access code provided by your advisor. The machine is available to make copies relating to research or teaching activities, from 9am to 5pm Monday through Friday only. There are other machines located throughout the University, but most require either coins or a special copy card.

MAILBOXES and the MAILROOM
Graduate student mailboxes are located in MEC 344 (the mailroom). Each student will be assigned a mailbox for departmental communications and notices, etc. University mail service is NOT to be used for personal mail. Mailboxes should be checked on a regular basis. The mailroom is also where research orders are delivered.
**E MAIL, WORD PROCESSING & COMPUTING FACILITIES**

Information Technology and Communication (ITC) provides general purpose computing resources for the University of Virginia, and their website ([www.itc.virginia.edu](http://www.itc.virginia.edu)) will be helpful to you as you setup your computer for access to the University system. Please obtain an email account ([http://www.itc.virginia.edu/getstarted.html](http://www.itc.virginia.edu/getstarted.html)) promptly. Read your mail daily, as this will be the primary method by which the department will communicate important information to you. Also, a 10$ copy of Microsoft Office is available for purchase for your personal computers from Cavalier Computers in the UVa Bookstore. A work computer may be provided to you by your advisor for research, but you may also be expected to bring a personal computer to work. A specialized computer lab is available in MEC 213 for MAE students. A personal account to access this lab may be obtained by contacting meclab@virginia.edu.

**ADDRESS CHANGES**

Please inform the Graduate Coordinator, as well as the University, of any address changes. It is important that we have an address at which you can be reached during the holidays and summer as well as the academic year. **UPON GRADUATION, PLEASE LEAVE A FORWARDING HOME OR BUSINESS ADDRESS.**

**BUILDING USE AND SECURITY**

We need your help and cooperation in deterring would-be thieves! Please observe the following procedures:

- Keep your office door locked whenever it is unoccupied.

- Teaching assistants must not leave until all students have left the laboratory and they must then secure all doors and windows.

- If you see someone carrying equipment from the building on nights or weekends, 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 by Assistant Dean W. Thurneck.

- Personal belongings are **NOT** covered under the University Insurance Policies. Check your home policy to see if you are covered.
Please be aware that the MEC building will be locked on Football game days.

CONFERENCE ROOMS
Conference Rooms are available for oral and written exams, research meetings, and other course or research functions. The department conference room (MEC 305) can be reserved by all staff members. All other rooms must be reserved through Cathy Dean (924-3155).
Academic Policies

Graduate Studies Committee
The Graduate Studies Committee is responsible for all graduate-related matters in the department. The Committee is made up of faculty members from all the various disciplines within the department. The Graduate Committee reviews all degree programs of study. The full committee periodically reviews graduate courses and recommends new course offerings to the faculty.

Course Load
Students receiving financial aid from the School of Engineering and Applied Science must be registered as a full time student, maintain a grade point average of at least 3.0, and maintain satisfactory progress toward a degree. To qualify as full-time during the academic year, the student must be taking at least 12 credit hours of lecture-laboratory courses and/or research per semester. During the summer, graduate research assistants must register for a minimum of 6 credit hours of research. Students receiving financial aid are not permitted to have other employment without prior approval of the Office of the Assistant Dean for Graduate Programs.

Graduate Course Drop Deadline
The last date for dropping a graduate course is nine weeks after the start of the semester. Students may refer to the academic calendar to see when this deadline falls (http://www.virginia.edu/registrar/calendar.html#1108). After this date, students may petition the Dean's Office for a W or WP upon agreement of their instructor and advisor.

Probation and Dismissal Policy
A graduate student will be considered to be on probation if his/her cumulative GPA for graduate work is less than 3.0. He/she will be notified of this situation by the Dean's Office. Graduate students who are on probation are usually ineligible for financial aid. A graduate student will be subject to dismissal if his/her cumulative GPA is not raised to 3.0 within one semester. Undergraduate courses and courses taken on a Pass/No Credit basis may not be used to meet requirements for a graduate degree and will not be used in computing GPA.

Residency
MS and PhD degree programs require a period of residency. A full-time graduate student in residence at the University, whether taking courses or doing research, is expected to be fully engaged in the academic community, to participate in planned and impromptu discussions with faculty, graduate
students and undergraduate students, and to actively contribute to intellectual discourse within the School. During the period of residency, a student should have no major conflicts of commitment. Substantial employment obligations, for example, would generally be in conflict with the residency requirement. The University requires that MS students complete at least one semester in residence at the University of Virginia as a full-time student. The University requires PhD students spent at least one session beyond the master’s degree in full residence. For students who enter a Ph.D. program without a master’s degree, at least 1.5 sessions (3 semesters, not including summer sessions) must be spent in full residence at the University of Virginia in Charlottesville. For the purpose of satisfying these requirements, two regular semesters (not including summer sessions) will be considered as one session.
Financial Support

Financial support may be provided by the department in the form of a fellowship, teaching assistantship (GTA), or research assistantship (GRA). The student 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 investigator feels the student is not performing to the professional standards expected of a graduate engineer.

Graduate Teaching Assistants are assigned to specific courses and complete instructions for GTA's will be given by the faculty member in charge of the course. Some preliminary preparation may be required before the beginning of the semester. At the end of the semester, the GTA should check with the faculty member in charge of the course to make sure that all expected duties have been completed. Generally, first year international students are not eligible for a GTA position.

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 the 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 the Investigator of the project in a professional manner. The Investigator and the student should discuss what is to be expected from the student during the employment period. Masters students receiving financial assistance will normally be required to be enrolled in the M.S. (thesis) program. This is particularly true for students receiving a GRA.

Students are also encouraged to apply for external fellowships. The Office of the Vice President for Research and Graduate Studies maintains a comprehensive list of fellowship opportunities at the following URL: http://www.virginia.edu/vprgs/gradstudies/students.html.

Financial aid is not automatically renewable from one year to the next. It is the student's responsibility to make arrangements with the Investigator of his/her 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 A205.
Students may not have any outside employment 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.
Graduate Curriculum and Degree Requirements

The faculty of the department strive 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 three 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 one of three fields of study.
• To provide sufficient flexibility within our program for interdisciplinary students, acknowledging the great diversity within MAE and its emerging areas.

The Curriculum:

Graduate students in our program choose a field of study from one of the following three disciplines:

• Solid Mechanics
• Dynamical Systems & Control
• Thermofluids

To ensure depth, students in the MS and PhD program are required to take three Core courses within a chosen discipline. Descriptions of the Core courses for each discipline are given below. To ensure breadth, students must take courses from disciplines outside their field of study (one course for MS and two courses for PhD). Students must also take an Engineering Analysis course from an approved list covering a broad array of analytical and computational techniques. These requirements do not apply to Masters of Engineering students (see below for details regarding this program).

Thermofluids – Three Core courses:

1. MAE 6100 – Thermomechanics
2. MAE 6310 – Fluid Mechanics I
3. MAE 6110 – Heat and Mass Transport Phenomena
**Solid Mechanics** – Three Core courses:

1. MAE 6020 – Continuum Mechanics with Applications
2. Any two courses from the following list:
   a. MAE 6070 - Theory of Elasticity
   b. MAE 6080 - Constitutive Modeling of Biosystems
   c. AM 7080 - Inelastic Solid Mechanics
   d. AM 7140 - Nonlinear Elasticity Theory

**Dynamical Systems and Controls** – Three Core courses:

One course from each of the following three categories:

1. Dynamics
   a. MAE 6210 - Analytical Dynamics OR
   b. MAE 6250 - Multibody Mechanical Systems
2. Systems
   a. MAE 6620 - Linear State Space Systems OR
   b. MAE 6230 – Vibrations
3. Control
   a. MAE 6610 - Linear Automatic Control Systems
   b. MAE 7650 - Multivariable Control

The approved **Engineering Analysis** courses cover a variety of analytical and computational results useful for investigation across the department’s disciplines. To fulfill requirements, the student must take at least one of the following courses:

MAE 6410: Engineering Mathematics I
MAE 6420: Engineering Mathematics II
MAE 6430: Statistics for Engineers and Scientists
MAE 6710: Finite Element Analysis
MAE 6720: Computational Fluid Dynamics I
The department offers two Master's degrees: a Master of Science (MS), which requires a thesis, and a Master of Engineering (ME), which is a course-based masters degree requiring no research. Only students working on research towards an MS degree (thesis option) are eligible to receive financial support from the department in the form of a GRA, GTA, or a fellowship. Masters students enrolled in the MS program must obtain the agreement of an advisor to supervise an MS thesis. In addition to the MAE Department requirements, there are degree requirements set by the Engineering School, which are given in the SEAS Graduate Record [http://records.ureg.virginia.edu/index.php?catoid=26]. ME students are assigned a faculty member to serve as their advisor to aid in course selection.

Degree Requirements

The MS degree requires completion of at least one semester in residence at UVa as a full-time student. MS degrees require 24 course hours fulfilling the below requirements, plus a thesis of publishable quality reporting their original research. In addition, the MS student will be required to present the thesis in a public oral defense. This examination normally covers the research done for the thesis but may also include questions from related coursework.

The ME degree requires completion of at least 30 course hours. All ME students must have 3 outcome assessments completed before they complete the program. These assessments are intended to be an assessment of the program, not of the student. All ME students should have an assessment of their plan of study completed by their advisor, and they should then choose the two other assessments most appropriate to the work they complete during their degree. In addition to the Plan of Study Assessment, assessments may be in the following areas: Engineering Analysis, Engineering Design, Oral Communication, or Technical Writing. The student is responsible for identifying a faculty member who is capable of assessing the outcome on the basis of their completed course work. They should then invite the faculty member to complete an assessment on their behalf. It is the ME student’s responsibility to ensure that 3 assessment forms are completed prior to their graduation.
**Master of Engineering** – Course Requirements:

- 30 credits of graduate coursework
- 18 credits from Mechanical and Aerospace (MAE) graduate classes
- No more than 9 credits from 500 level classes
- No more than 6 credits from 500 level MAE classes

**Master of Science** – Course Requirements:

- Three Core courses from the Discipline chosen by the student (as detailed for each Discipline)
- One Core course from an MAE Discipline outside the student’s field of study
- One Engineering Analysis class
- Any three graduate classes
- No more than 9 credits from 5000 level classes
- No more than 6 credits from 5000 level MAE classes

**Time Limit for Degree Completion**

Although most students finish within two years, the time limit for completion of the Masters program is five years for the MS and seven years for the ME. The time to degree can be extended beyond its ordinary term for SEAS graduate students for: (1) maternity or family parenting, (2) serious personal or family illness upon notification to and approval of the department and the Associate Dean for Graduate Studies. The “clock-stopping” will be for a period of up to one year. Utilization of this policy should be invoked as soon as the need for additional time becomes known.

**Masters Degree Plan of Study**

All Master students are required to complete an approved course Plan of Study (form G101) with their advisor’s approval. The plan of study should be discussed with the advisor and the advisory committee as early as possible and ideally the plan of study is submitted to the MAE Graduate Office during the first semester of study. When properly completed and approved, the plan of study represents the course curriculum for the degree. For an ME degree, 30 credits of graduate courses are required. For the MS degree 24
credits of coursework, in addition to 6 credits of MAE 8999 (thesis research), are required. A REVISED PLAN OF STUDY MUST BE SUBMITTED should the course curriculum change.

**Transfer Credit**

Master of Science candidates may transfer a maximum of six credits of approved graduate courses into the program. Master of Engineering candidates may transfer twelve hours. Students in the Cooperative Graduate Engineering Program may include up to fifteen hours of credit with grades of C or better from participating institutions. The student must fill out form G112 to request approval of transfer courses, and he/she must include a transcript along with the request. Students not enrolled in the Cooperative Graduate Engineering Program may only transfer courses with a grade of B or better. Requests for transfer credit should be accompanied by a plan of study and are due by the end of the first semester of graduate study.

**Application for Graduation**

All students are required to complete and submit an application for degree form G-113 by the following deadlines:

- October 1 for January graduation
- February 1 for May graduation
- June 1 for August graduation

**Admission into PhD Program after the Masters Program**

Masters students already enrolled at UVa who wish to be considered for admissions into the PhD program after completion of the Masters degree are required to complete form G-123 and submit a recommendation for admission into the PhD program.

**Thesis Preparation and Examination Announcements**

**(MS Students Only)**

Before beginning to write a thesis the student should obtain and read form G-122, Instructions for Thesis Preparation, which outlines the approved school format and requirements for a thesis. Once the thesis has been written and approved by the advisor, a public oral defense of the thesis is required. The examining committee for this oral defense consists of a minimum of three faculty members. The Chair of the committee cannot be
the advisor and must be from the MAE Department. This examining committee is selected by the student and the advisor and approved by the Graduate Committee Chair (Form G-105).

The format of the public oral defense 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 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 should be delivered to each member of the examining committee at least 14 days prior to the date of the final oral exam. After your thesis defense, your committee must complete a Report of Thesis Final Examination on form G-110 (MS) and a Thesis Assessment Form. A completed MAE Course Requirements- Master of Science form should accompany these forms. These forms are due at least 1 week before graduation date.

After successfully completing any necessary changes to the thesis, take three copies of the final revision of the thesis on acceptable permalife paper signed by author and committee members in manila envelopes with the necessary information (see thesis check list) on the front to Sara Thacker, Graduate Office, Thornton Hall. This must be done at least 10 days before graduation date. She will prepare your paperwork and once complete you will go to Printing Services in Alderman Library and drop your thesis off to be bound. At this time, you must pay to have these three official university copies bound. You will get a receipt. Your binding receipt must be given to Sara Thacker by the 10th day of the month of your graduation.

For more detailed information on preparation of the written thesis please refer to the section of this handbook entitled “Instruction for Thesis (and Dissertation) Preparation.”

Appointment of Committee Requirements:
MS students must select an advisor and, in consultation with that advisor, an examining committee during their first semester of Master study. The advisor is normally a faculty member in the student’s primary area of interest. The examining committee should consist of at least three UVa faculty members (including the advisor), at least 2 of whom must be SEAS faculty. The chair of the committee must be a MAE faculty member and may not be the advisor. Note that the purpose of the examining committee is to provide the student with a broad base of guidance in formulating and executing a plan of study and thesis project. One research professional from
outside UVa or faculty member from outside SEAS may be a fourth voting member, provided that his/her qualifications are commensurate with that of a research faculty or equivalent rank. Should the student’s interest change, the examining committee may be reconstructed as appropriate. Form G-104 should be used for the selection of an advisor and form G-105 should be used for the selection of the examining committee at least 2 weeks prior to the examination date.

Publications
All MS and PhD students are expected to complete publishable quality original research. Regular publication and presentation of scholarly work is an expected part of any graduate level research program.

Masters Degree Forms
The following is a list of required forms that must be filed with the graduate office according to SEAS deadlines. Forms may be obtained from the MAE Graduate Office or the graduate office located in Thornton Hall. A sample of each form is displayed in Appendix II.

First Semester
- Appointment of Advisor G-104
- Master's Degree Plan of Study G-101
- Transfer of Credit (if applicable) G-112 (+ Assessment Forms for ME)

Each Semester -- as Necessary
- Revised Plan of Study G-101

Final Semester
- Degree Application G-113
- Assessment Forms (3 total required for ME students only)

Final Semester -- MS ONLY
- MAE Course Requirements – Master of Science G-105
- Appointment of Examining Committee
- Announce Thesis Defense
- MS Thesis Final Examination Report G-110 (Assessment Form)
DOCTOR OF PHILOSOPHY DEGREE REQUIREMENTS

General Degree Requirements
PhD students must complete at least three years or equivalent of graduate study after the baccalaureate degree or two years or equivalent after the Master's degree. At least two regular semesters beyond (not including summer) the Master's degree must be completed in full residence at the University of Virginia in Charlottesville.

Course Requirements – Doctor of Philosophy
- Three Core courses from the Discipline defined as the student’s field of study (as detailed for each Discipline)
- One Core course from an MAE Discipline outside the student’s field of study
- Either one Core course from the third MAE Discipline or a graduate course in either another SEAS department or a Math or Science graduate course outside the SEAS
- One Engineering Analysis class
- Any six graduate classes
- No more than 9 credits from 5000 level classes
- No more than 6 credits from 5000 level MAE classes

Time Limit
The time limit for completion of the PhD is 7 years. The time to degree can be extended beyond its ordinary term for SEAS graduate students for: (1) maternity or family parenting, (2) serious personal or family illness upon notification to and approval of the department and the Associate Dean for Graduate Studies. The “clock-stopping” will be for a period of up to one year. Utilization of this policy should be invoked as soon as the need for additional time becomes known.
Direct Pursuit of PhD
If a PhD candidate wishes to directly pursue a PhD without a Masters degree, they may do so by completing a request for admission to the PhD program (form G-123).

Selection of Advisor and Advisory Committee
PhD students must select an advisor and, in consultation with their advisor, an advisory committee during their first semester of doctoral study. The advisor is normally a faculty member in the student's primary area of interest. The Advisory Committee recommends a program of formal courses, advises the student on areas in which he or she must take PhD examinations, discusses research objectives and plans with the student, and approves the student’s dissertation proposal. The chair of the Advisory Committee must be a MAE faculty (but may not be the advisor). The PhD Advisory Committee must include a minimum of 3 SEAS faculty, one additional UVa faculty member from outside the student’s home department, and a minimum of 4 total members. Note, all faculty with a primary appointment in Biomedical Engineering are considered SEAS faculty for this purpose. The purpose of the member from outside of the student’s home department is to ensure consistency across the University, to help ensure fairness to the student and to prevent conflict inside the department. The outside member must be UVa faculty. The Advisory Committee should be appointed early in the student’s PhD program and actively participate in advising and directing the student.

Form G-104 should be used for the selection of an advisor and form G-103 should be used for the selection of the Ph.D. Advisory Committee. A current C.V. or biography must be submitted along with the G103 form for members who are not UVa faculty. The C.V. 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. Should the student’s interests change, the advisory committee can be restructured as appropriate.

PhD Plan of Study
All PhD students are required to complete and submit an approved course plan of study (form G-102) by the end of their first semester of doctoral study. The student must meet with his/her advisory committee to determine a plan of study. Before this meeting the student should meet with his/her advisor and prepare a preliminary academic outline consisting of previous degrees, proposed PhD field of study, list of completed graduate courses, a copy of a transcript of graduate and undergraduate courses, and a list of
proposed courses for the PhD degree. The plan of study must include at least 24 hours of MAE 9999 dissertation research, and the student must satisfy the department course requirements, as previously outlined, but these are the minimum course hour requirements. The student's advisory committee may require additional courses.

While most PhD students will complete a Master's Degree before entering the PhD program, students may be admitted directly to the PhD program from a Baccalaureate program with the approval of the Graduate Studies Committee.

**Transfer of Credit**

PhD students do not typically transfer credits but “credit” is given for courses taken previously (credit towards both the plan of study and the qualifying exam exemption requirements as described in the next section). All PhD students must satisfy the course curriculum requirements, but this may be done through coursework taken at other universities toward an MS or from other PhD work. Students should discuss their prior coursework with their advisor and advisory committee as the plan of study is developed and then petition the Graduate Studies Committee to allow prior course work to fulfill the appropriate curriculum requirements. The following should be included in the request to the Graduate Studies Committee: an endorsement from their faculty advisor, a course description of the course taken elsewhere along with the syllabus (including the text book used), and a complete plan of study showing how the course fits into the overall course plan.

**PhD Qualifying Exam**

**Purpose:**

The purpose of the comprehensive examinations shall be to evaluate the ability of the student to think and to critically evaluate research in his/her field.

**General Guidelines:**

- The exam will be administered once a year, typically in September or October.
- The scheduling of any required reexaminations will be done by the examination committee but must occur by the end of that same semester.
• The exam must be taken no later than the first offering occurring one year after the student begins the PhD program. An Examination Committee appointed by the Graduate Studies Committee (and excluding the student’s research advisor) will conduct the exam.

• The Examination Committee will consist of four or five members. The committee will contain at least one expert in the student's field of research interest. The Graduate Studies Committee must approve experts from outside the University.

• The oral exam will consist of a formal seminar during which the student will discuss an existing paper in the literature, chosen in the student's area of research by the Examination Committee. The seminar will be followed by a period of formal questioning conducted by the Examination Committee.

• Two written exams must be taken, unless exempted via the paragraphs in the section on Written Examinations below. One must come from the following list of three exams:
  • Dynamical Systems and Control
  • Solid Mechanics
  • Thermofluids

The second exam must come from the following list:
  • one of the other three exams listed above
  • APMA (applied mathematics)
  • an exam in an outside area

Requests to take an exam in an outside area should be approved by the Graduate Studies Committee well in advance of the examination. Exams in outside areas will be written and graded by faculty in those areas.

**Written Examinations:**

Written examinations will be taken in two areas, one of which must be Dynamical Systems & Control, Solid Mechanics, or Thermofluids; however, the student may be considered exempt from either or both of these examinations if the prescribed courses and minimum levels of performance listed below are satisfied.

• **Dynamical Systems & Control**
  
  *A grade of A- or better in one course from each of two chosen categories:*

<table>
<thead>
<tr>
<th>Category</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamics</td>
<td>MAE 6210 - Analytical Dynamics</td>
</tr>
<tr>
<td></td>
<td>MAE 6250 - Multibody Mechanical Systems</td>
</tr>
</tbody>
</table>
Systems | MAE 6520 - Linear State Space Systems  
| MAE 6230 – Vibrations  
Control | MAE 6510 - Linear Automatic Control Systems  
| MAE 7550 – Multivariable Control

- **Solid Mechanics**

  A grade of A- or better in two of the following five courses:  
  MAE 6020 – Continuum Mechanics with Applications  
  MAE 6070 - Theory of Elasticity  
  MAE 6080 - Constitutive Modeling of Biosystems  
  AM 7080 - Inelastic Solid Mechanics  
  AM 7140 - Nonlinear Elasticity Theory

- **Thermofluids**

  A grade of A- or better in two of the three following courses:  
  MAE 6100 – Thermomechanics  
  MAE 6310 – Fluid Mechanics I  
  MAE 6110 – Heat and Mass Transport Phenomena

- **Applied Mathematics**

  A grade of A- or better in the following two courses:  
  APMA 6410 - Engineering Mathematics I  
  APMA 6420 - Engineering Mathematics II

- **Written Examinations in Outside Areas:** An outside area examination, including a list of courses and levels of minimum performance for exemption from that examination, must be approved by the Graduate Studies Committee. It is recommended that this be done at least 6 months in advance of the examination.

Petitions for substitution of the above courses by courses taken outside the university will be considered by the Graduate Studies Committee (see Transfer of Credit section for the PhD program above).

The chairman for each written examination area will provide the student with the format of the written exam at the student's request.
Oral Examinations:

- To determine the area for the research paper, the student should provide the Graduate Studies Committee with a written statement of his/her research area, including keywords, when requested a few months in advance of the scheduled exam. The advisor may make suggestions for research papers to be considered for presentation at this time.

- The Graduate Studies Committee will appoint the Examination Committee and the Committee Chair (who should have significant expertise in the area of research).

- The Examination Committee will select the paper for oral presentation by the student. The chosen paper should be often cited or referenced. The student's faculty advisor will be consulted for the suitability of the selected paper. The student will be informed of the paper selected for presentation at least 3 weeks before the scheduled oral presentation.

Format of oral presentation:

- The oral presentation shall be a formal, public presentation of the selected research paper. The presentation will be approximately one hour in length and will be addressed primarily to the Examination Committee, some of whom will not be experts in the field.

- The presentation shall include the following:
  
a. Discussion of the work done in the field prior to the publication (i.e., put the paper into historical perspective).

  b. Presentation of the paper in a standard format (i.e., introduction, approach, results, conclusions, etc).

  c. Critique of the paper. This should include a discussion of any errors, incorrect or unjustified assumptions, alternative approaches, etc.

  d. Discussion of the impact/significance of the paper to the field.

  e. Review of the progress in the field since the publication of this paper.
Evaluation of oral presentation:

1. The public presentation will be followed by a closed question/answer session conducted by the Examination Committee. The faculty advisor may be present at the closed session, but may not participate in the questioning or answering.

2. Performance on the oral exam will be evaluated primarily on the technical content of the presentation and how well each of the points, 2a-2e above, were addressed; however, the quality of the presentation will also be considered in the overall evaluation.

The examining committee should be appointed and approved on Form G105 at least one week in advance of the exam, and the report on the examination (form G107) should be filed within one week after the conclusion of the exam, along with the assessment form.
Dissertation Proposal

After the student has been admitted to PhD study, the student should work with his/her advisor and define a dissertation topic. A dissertation proposal based on this topic must be submitted to the proposal examining committee. The proposal examining committee, which must include at least four members of the Advisory Committee, is appointed via form G-105. The student should prepare an acceptable dissertation proposal completed under the guidance of the student's advisor. This proposal should be presented before any extensive research is undertaken, in order to receive early faculty approval of the suitability of the proposed research. It is recommended that the written proposal document, typically around 20 single-spaced pages, including figures, be prepared according to the following guidelines:

The document should succinctly describe:
1. the problem
2. relationship to other work in the field
3. the research plan including specific research activities;
4. expected contributions and the anticipated means of dissemination (publication plans)
   * A comprehensive literature review may be included as an appendix

An example of an organization that may be appropriate is:
- What is the problem?
- Why is it important?
- What is novel about the proposed research?
- What is the research agenda? The proposed approach?
- What are the contingency plans?
- What is the anticipated schedule? (Which journals? When?)

The student should prepare a public oral presentation of the proposal. It is recommended that the proposal be made within two semesters after successfully completing the Ph.D. qualifying examination. The student should provide the proposal examining committee (which is identical to the Advisory Committee, and is appointed via form G-105) with the written proposal document at least two weeks prior to the oral presentation. A copy of the student’s plan of study (complete with grades), CV, and any publications should also be given to the committee at this time.
The oral presentation should be limited to 30 minutes and will be followed by questions from the audience and the proposal examining committee. Successful completion of the dissertation proposal examination will result in admission to candidacy for the degree (using form G-108). **The student must complete at least one full semester as a candidate before the degree is awarded.** In the event that a suitable proposal is not presented, but the faculty believes the student has sufficient research potential, another research presentation should be scheduled within 6 months.

**Dissertation**

Before beginning to write a dissertation, the student should obtain and read form G-122, entitled “Instructions for Thesis Preparation”, which outlines the approved school format and requirements. Prior to completion of the final dissertation, a typed copy should be submitted to the SEAS Graduate Office (complete except for minor typographical errors) to be checked for format and returned to the candidate.

The completed dissertation must be delivered to each member of the examining committee **at least 14 days** prior to the defense. At this time, the student should also provide a copy of a plan of study, CV, and copies of all publications to his/her committee. The student is responsible for reserving a suitable conference room and should send the abstract to the graduate coordinator **at least 7 days** prior to the defense for public announcement.

After your dissertation defense, your committee must complete a Dissertation Final Exam (oral defense) Report (form G-111) and a Dissertation Assessment form. These forms should be accompanied by a completed MAE Course Requirements – Doctor of Philosophy form. **These forms are due at least 1 week before graduation date.**

After successfully completing any changes that need to be made to the dissertation, take three copies of the final revision of the dissertation on acceptable permalife paper, signed by author and committee members, in manila envelopes with the necessary information (see thesis check list) clearly visible on the envelope to Sara Thacker, Graduate Office, Thornton Hall. This must be done **at least 10 days** before graduation date. She will prepare your paperwork and, once all paperwork is complete, you will go to Printing Services in Alderman Library and drop your thesis off to be bound. At this time you must pay to have these three official university copies bound. You will get a receipt, and that receipt must be given to Sara Thacker by the 10\(^{th}\) day of the month of your graduation.
Application for Graduation
All students are required to complete and submit an application for degree (form G-113) by the following deadlines:
- October 1 for January graduation
- February 1 for May graduation
- June 1 for August graduation
It is important to double-check all deadlines and dates the semester you intend to graduate.

Publications
All MS and PhD students are expected to complete publishable quality original research. Regular publication and presentation of scholarly work is an expected part of any graduate level research program.

PhD Forms and Announcement Requirements
The following is a list of requirements and forms that must be submitted to the graduate office according to SEAS deadlines. All forms are available on the departmental website.

First Semester (Revise as necessary)
Appointment of Advisor G-104
Appointment of Doctoral Advisory Committee G-103
Doctoral Degree Plan of Study G-102

Comprehensive Exam (one year after being admitted to PhD program)
Appointment of Examining Committee G-105
Report of Comprehensive Exam G-107

Dissertation Proposal (minimum of one semester before graduation)
Appointment of Examining Committee G-105
Announcement of Proposal to Faculty
Report on Dissertation Outline/Admission to Candidacy G-108
+ Assessment Form

Final Semester
MAE Course Requirements – Doctor of Philosophy
Degree Application G-113
Appointment of Examining Committee G-105
Announcement of Defense to Faculty
Dissertation Final Exam (Oral Defense) Report G-111
+ Assessment Form
Dissertation Submission and Binding Receipt

Please note: all forms should be submitted to the MAE Graduate Office.
INSTRUCTIONS FOR THESIS (AND DISSERTATION) PREPARATION

These instructions apply to candidates for both the Master's and Doctoral degrees. The term thesis as used here refers to both the Master's thesis and the Doctoral dissertation. The term advisor refers to both the Master's faculty advisor and the Doctoral advisory committee.

I. Writing and Submission:
Three major steps should be observed in reporting the research completed for a graduate degree: 1. submission of the research proposal and thesis outline (for Ph.D. students only), 2. defense of the thesis, and 3. copies of the final thesis submitted for binding.

1. A typed copy of the detailed proposal and outline must be submitted to the Office of the Dean by the specified date. An individual copy of the proposal must also be given to each advisory committee member. Note that this requirement is for Ph.D. students ONLY.

2. Prior to your final defense, bring a copy of your thesis/dissertation to A-108, Thornton Hall (Graduate Records) for a format check.

3. Three copies of the final revision of thesis, signed by the author and the thesis advisor or advisory committee chairman, in manila envelopes, must be submitted to the Graduate Records Office, A-108, Thornton Hall by the specified date. This date will be different for each graduating session.

II. Form:
The specifications stated therein are acceptable to the School of Engineering and Applied Science unless stated otherwise below. Samples of engineering theses are available in the University of Virginia Libraries or departmental offices. In addition to these general requirements, there are certain special requirements of the School of Engineering and Applied Science.

1. A standard type with 10 or 12 characters per inch must be used throughout the thesis. If there are any questions, a sample of type may be submitted to the Graduate Records Office for approval before typing of the thesis is started. All theses must be typed, double space, on a good grade of white bond paper, 8 1/2" x 11" sheets. Copies that are not clear and readable will be
rejected. It is preferable that all photos are original prints unless reproductions with a resolution equal to the original print can be supplied.

2. All copies must be on thesis quality paper. A listing of acceptable papers can be obtained from the Graduate Office, A-108, Thornton Hall.

3. A margin of 1 1/2" inches must be maintained on the left side. A margin of 1" inch must be maintained on the top, right side, and bottom of each page. The text and footnotes should be kept within these margins. The page numbers are to be placed in the top right hand corner of the page.

4. The thesis should start with a title page, immediately followed by an approval page. Samples of both special pages are attached.

5. A complete list of Symbols should be given following the list of figures. These symbols should be listed in alphabetical order, and if both Arabic and Greek letters are used, all the Arabic Symbols should be listed first and these followed by the Greek (and others in order, if used).

6. References should be numbered consecutively throughout the text of the thesis. These numbers will refer to a numbered bibliography, which should immediately follow the thesis text. Reference by name of author and date of publication is also acceptable. However, footnotes (as distinguished from references) should be placed at the bottom of the page of which they occur.

7. Figures should be inserted in the text of the thesis so each figure follows its text reference as closely as possible. They should not be collected in a separate section at the end of the thesis. Figures and graphs should be centered within the margins specified above. In any authorized deviation the binding margin must be wide enough to permit binding without obscuring any part of the figures, graph or text.

8. Both Master's and Doctoral students must prepare a thesis abstract of not more than 600 words and submit this abstract with their thesis. The abstract should follow the signature page.
9. Doctoral students must also fill out a Survey of Earned Doctorate Form and a Microfilm Agreement. These forms may be obtained from the Graduate Records Office.

III. Deposit of Official Copies:
Three bound copies of the final thesis are necessary: one for preservation in the archives of the University of Virginia, one for the MAE department, and one for the technical reference use in the Library of the School of Engineering and Applied Science. Current information on procedures and costs for binding and microfilming may be obtained from the Graduate Records Office.

A fourth copy of the final thesis, either bound or unbound, may be required by the thesis advisor for personal use. If the author wishes one or more bound copies for personal use, these arrangements can be made with Printing Services in Alderman Library. Titles of all accepted theses will be listed in the appropriate volume of the University's Publications and Research record. Thesis material that is published as a report or in scientific journals should have proper credit given to the University of Virginia.

IV. Joint Efforts:
When thesis research involves the joint efforts of two or more persons, it becomes the responsibility of the degree candidate to show responsible charge of the work covered by the thesis. For such material to be acceptable, the candidate must have performed work demonstrating ability to carry out an investigation, and the analysis of the results must be done by the candidate. For such joint work the tentative thesis should include an inserted sheet (not a part of the final thesis and hence not carrying a page number) clearly explaining to what extent others participated in the work and how the candidate's experimental work and analysis meet the requirements for an acceptable demonstration of ability.

THESIS / DISSERTATION APPROVAL CHECK-LIST
1. The Engineering School requires three (3) copies of dissertations and theses. An original is not required.

2. IT IS EXTREMELY IMPORTANT THAT ALL COPIES BE ON ACCEPTABLE BOND PAPER. (Any bond paper that is 25% cotton is acceptable).

3. Each copy must be submitted in a labeled manila envelope with the following information on the front of each:
   a. Your name
b. Shortened theses/dissertation title of no more than 36 characters including spaces. This shortened title appears on the spine of the binding.
c. Degree date i.e., January 2000, May 2000, August 2000
d. Your degree and school

4. DISSERTATIONS
   a. A microfilm agreement must accompany your dissertation when it is taken to Alderman Library. Please be sure to sign this form where it asks for “Author’s Signature”. An extra copy of the title page and abstract must accompany the microfilm agreement. The microfilm agreement is obtained from the Graduate Office.
   b. A survey of earned doctorate form is required and placement form is required of all persons receiving their Ph.D. degree. These forms are obtained from the Graduate Office.
   c. Copyright is optional; if desired, a copyright sheet must be included in each copy of the dissertation, with the following information: (Must use c symbol ©, NOT @).
      © Copyright by
      Your Name
      All rights reserved
      Date (Month and Year of Graduation)

5. Your abstract must be 600 words or less. This is approximately equivalent to 2 ½ pages, double-spaced.

6. MARGINS: The left hand margin must be 1-½ inches – all others 1 inch. This is proper for both the theses and dissertations.

7. PAGE NUMBERS; the correct pagination is to place page numbers in the upper right corner, within the one inch margin.

8. SUGGESTED PAGE ORDER:
   a). Dissertations:
      1) Title Page
      2) Copyright Page (if applicable)
      3) Signature page
      4) Abstract
      5) Acknowledgements (optional)
      6) Body of text
   b). Theses:
      1) Title page
      2) Signature page
      3) Abstract
      4) Acknowledgements (optional)
      5) Body of text
### Appendix I

**Faculty Areas of Interest**

<table>
<thead>
<tr>
<th>Name</th>
<th>Areas of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOSSSEIN HAJ-HARIRI, Professor and Chair</td>
<td>Stability, fluid dynamics, mechanics, applied mathematics.</td>
</tr>
<tr>
<td>PAUL E. ALLAIRE, Professor</td>
<td>Magnetic bearings, rotor dynamics, fluid bearings, controls.</td>
</tr>
<tr>
<td>Hilary Bart-Smith, Associate Professor</td>
<td>Mechanics of ultralight materials, Morphing Structures, and nano structured polymer composites.</td>
</tr>
<tr>
<td>EDWARD J. BERGER, Associate Professor</td>
<td>Transient interface mechanics, friction and friction damping atomic force microscopy, mechanics of soft materials.</td>
</tr>
<tr>
<td>SILVIA S. BLEMKER, Assistant Professor</td>
<td>Neuromuscular biomechanics, movement disorders, musculoskeletal modeling &amp; simulation, medical imaging, and constitutive modeling.</td>
</tr>
<tr>
<td>HARSHA K. CHELLIAH, Professor</td>
<td>Combustion.</td>
</tr>
<tr>
<td>JEFF A. CRANDALL, Professor</td>
<td>Auto safety and biomechanics.</td>
</tr>
<tr>
<td>Gavin Garner, Assistant Professor</td>
<td>Mecatronics, robotics, automation, and mechanisms.</td>
</tr>
<tr>
<td>GEORGE T. GILLIES, Research Professor</td>
<td>Precision measurements, medical physics, gravitation.</td>
</tr>
<tr>
<td>CHRIS GOYNE, Research Assistant Professor</td>
<td>Hypersonic propulsion, hypersonic vehicles, rotating machinery flows and seals</td>
</tr>
<tr>
<td>Patrick Hopkins, Assistant Professor</td>
<td>Thermal, electrical, and optical interactions in nanomaterials</td>
</tr>
<tr>
<td>Name</td>
<td>Title</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>RICHARD W. KENT</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>CARL R. KNOSPE</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>GABRIEL LAUFER</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Eric Loth</td>
<td>Professor &amp; Associate Chair</td>
</tr>
<tr>
<td>JAMES C. MCDANIEL</td>
<td>Professor</td>
</tr>
<tr>
<td>PAMELA M. NORRIS</td>
<td>Professor</td>
</tr>
<tr>
<td>ROBERT J. RIBANDO</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>LARRY G. RICHARDS</td>
<td>Professor</td>
</tr>
<tr>
<td>JOHN G. THACKER</td>
<td>Professor</td>
</tr>
<tr>
<td>Marcel Utz</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>HOUSTON G. WOOD, III</td>
<td>Professor</td>
</tr>
</tbody>
</table>
## Appendix II  Forms

<table>
<thead>
<tr>
<th>Action</th>
<th>Form/Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph.D.: Request appointment of your advisory committee. (replaces form G-103)</td>
<td>Doctoral Advisory Committee (may be re-submitted if changed)</td>
</tr>
<tr>
<td>Ph.D.: Submit a report of your PhD (qualifying, preliminary, comprehensive) examination (replaces form G107). You MUST also submit the program-specific qualifying exam assessment form (below)</td>
<td>PhD Examination Report and Program Specific Qualifying Exam Report</td>
</tr>
<tr>
<td>MS and Ph.D.: Request appointment of your final examination (defense) committee (replaces form G105)</td>
<td>Final Examination Committee</td>
</tr>
<tr>
<td>MS and Ph.D.: Submit a report of Final Examination, to be completed at exam (replaces forms G110 and G111). You MUST also submit a Thesis and Dissertation Assessment form and (Ph.D. only) a certificate of completion of the online Survey of Earned Doctorates</td>
<td>Report on Final Examination and Thesis and Dissertation Assessment</td>
</tr>
<tr>
<td>M.S. and Ph.D.: Obtain an official Approval Sheet and Signature page from your department, to be completed at the exam or after required corrections are complete.</td>
<td>SAMPLE Approval Sheet</td>
</tr>
<tr>
<td>MS/ME: Request approval of transfer credits/courses—will appear on U.Va. transcript (limit 6 in MS/12 in ME/ 15 in CGEP). (replaces form G112)</td>
<td>Request Approval of Transfer Credits</td>
</tr>
<tr>
<td>ALL Degrees.: Apply for graduate degree (submit by 10/1, 2/1 or 6/1) for graduation at semester’s end. (replaces form G113)</td>
<td>Application for Graduate Degree</td>
</tr>
<tr>
<td>ALL Degrees: Request change of program/department or degree (replaces and supplements form G123)</td>
<td>Request Program Plan Change</td>
</tr>
</tbody>
</table>

### Outcome Assessment Forms
- Engineering Analysis Assessment
- Engineering Design Assessment
- Engineering Dissertation Proposal Assessment
- Engineering Oral Communication Assessment
• Engineering Plan of Study Assessment
• Engineering Technical Writing Assessment
• Engineering Thesis & Dissertation Assessment

Program Specific Qualifying Exam Forms
• Mechanical and Aerospace Engineering