

University of Virginia
Department of Engineering Systems and Environment

GRADUATE STUDENT HANDBOOK

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Acronyms used in this handbook

Accelerated Master's Program (AMP)
Applied Math (APMA)
Bachelor of Science (BS)
Civil and Environmental Engineering (CEE)
Civil Engineering (CE)
Construction Engineering and Management Track (CEM)
Engineering Systems and Environment (ESE)
Engineering Systems and Environment Graduate Student Council (ESE-GSC)
Environmental and Water Resources Engineering Track (EWRE)
Graduate Research Assistantship (GRA)
Graduate Teaching Assistantship (GTA)
Infrastructure Systems Engineering Track (ISE)
Master of Engineering (ME)
Master of Science (MS)
Satisfactory/Unsatisfactory (S/U)
Student Information System (SIS)
Structural Engineering Track (STR)
Systems and Information Engineering (SIE)
Systems Engineering (SE)
Transportation Engineering Track (TRN)
University of Virginia (UVA)
Virginia Engineering Online (VEO)

1. INTRODUCTION

1.1. Department of Engineering Systems and Environment

The Engineering School's Department of Engineering Systems and Environment (ESE) at the University of Virginia (UVA) was founded in 2018. It was created to combine and grow elements of what had previously been two separate departments: Civil and Environmental Engineering (CEE) and Systems and Information Engineering (SIE). The motivation behind the creation of the new department was to draw together expertise and skill sets from civil, systems and environmental engineering to advance education and research in fundamental and applied engineering that improves the quality of life for communities and people.

ESE is now home to more than 40 full-time and joint-appointed faculty members with active teaching and research programs. We offer two accredited undergraduate degrees: the Bachelor of Science (BS) in Civil Engineering (CE) and BS in Systems Engineering (SE). We also offer two master's degrees: the Master of Science (with thesis) and Master of Engineering (non-thesis). Each master's degree is offered in CE and SE. Finally, we also offer Ph.D. degrees, one each in CE and SE.

ESE graduate students play a critical role in our department's research, teaching and service mission, partnering with faculty and staff to deliver excellence in education and discovery. We believe that a better future is possible for all by training the leaders of tomorrow in a collaborative academic environment that encourages excellence in the classroom and laboratory.

1.2. Diversity and Community

ESE is committed to sustaining a vibrant and inclusive environment that fully reflects the core Engineering School's value of diversity, which is defined as "excellence expressing itself through the intersection of every individual's perspectives and lived experiences." Faculty, staff and students will strive for excellence in all we do, treat everyone with respect, and show gratitude and provide outstanding stewardship for the resources that support our mission, which come from tuition, the commonwealth, research sponsors, and our friends and alumni.

2. MASTER OF ENGINEERING PROGRAM

Any student enrolled in the Master of Engineering (ME) program prior to the fall 2019 semester has the option of adhering to either (a) the curriculum presented below or (b) the curriculum that was effective when the student first enrolled in the ME program.

2.1. Overview

The ME is a coursework-based graduate professional degree for those wishing to pursue careers in industry, consulting or government. Our program is designed to provide a blend of fundamental knowledge and professional skills needed by practicing engineers.

It is an intensive, non-thesis program that may be completed on-Grounds as a full-time student; in our weekend Accelerated Master's Program (AMP); online as a student in Virginia Engineering Online (VEO); or in a hybrid combination of VEO and time on Grounds.

2.2. Admissions Criteria and Scholarships

The deadlines for ME applications for U.S. citizens and permanent residents are Aug. 15 for fall semester and Dec. 15 for spring semester. The deadlines for non-U.S. citizens are Jan. 1 for fall semester and Oct. 1 for spring semester. We seek motivated students from [diverse backgrounds](#) who are eager to partner with us in education and discovery. Information about academic eligibility and the admissions process is available on the [UVA Engineering School's Graduate Admissions](#) webpage. All applications are submitted online. Application [fee waivers](#) are available to eligible applicants.

Through the generosity of our friends and alumni, our department is pleased to award scholarships to select exceptionally qualified ME candidates. Recipients receive \$5,000 per academic year.

2.3. Program Requirements

A candidate for the ME degree must fulfill the general requirements of the Engineering School and complete an approved plan of study consisting of at least 30 credit hours. The plan of study must be prepared under the guidance of the faculty advisor by the end of the first semester of study. It then must be approved by the graduate programs director.

The approved plan of study may be revised if necessary but must be submitted for approval.

Transfer Credit

Up to 12 credit hours of graduate courses may be transferred. Only courses with a grade of B or better that have not been applied toward another degree may be transferred. The request for credit transfer must include the following documents: a description of course content and level, an official transcript, and a statement by the student certifying that the course has not been used to satisfy requirements for another degree. If the student is already admitted into a UVA program, then the request for credit transfer must be preapproved before the course is taken. All transfer credits are subject to the approval of the student's advisor and the Engineering School dean's office.

VEO students may transfer up to 15 credits from other schools participating in the VEO program toward their UVA ME degree. The other VEO institutions are George Mason University, Old Dominion University, Virginia Commonwealth University and Virginia Polytechnic Institute and State University (Virginia Tech). Students in the on-Grounds ME program may register for up to 12 credit hours of courses offered through VEO.

Time limit: All requirements for the ME/AMP/VEO degree must be completed within seven years after matriculation to the graduate program.

2.3.1. Civil Engineering

The ME degree in CE program offers five tracks, each corresponding to a subspecialty within CE. Click on the track listed below to view the corresponding *plan of study*. Note that each plan of study contains a footnote summarizing the required prerequisite undergraduate courses for the track. In some instances, certain prerequisites can be taken concurrently with graduate courses. Also, each of the tracks can be modified with approval from the student's graduate advisor and the CE graduate program director.

- [Environmental and Water Resources Engineering Track \(EWRE\)](#)
- [Structural Engineering Track \(STR\)](#)
- [Transportation Engineering Track \(TRN\)](#)
- [Infrastructure Systems Engineering Track \(ISE\)](#)
- [Construction Engineering and Management Track \(CEM\)](#)

For each track, students complete 30 credits of graded graduate coursework. A thesis is not required; however, all students are encouraged to pursue a research-based project or a paid/unpaid professional internship for course credit as CE 6995. Each of the five tracks can be completed in as little as one year by students who have a BS in CE or a closely related field.

CE ME Special Circumstances

Students pursuing a BS in Engineering at UVA are encouraged to start the CE ME program during their fourth year, with appropriate guidance from their academic advisor and approval from course instructors (as necessary). As 4000-level classes may not be used toward the ME degree, students are encouraged to take 5000- or 6000-level classes with instructor approval.

Students without a BS in Engineering may apply for admission to the CE ME program; however, they must complete certain prerequisite or corequisite courses. Each track has its own prerequisites, which are noted in the links above. If accepted, the student will work with their academic advisor to map out an appropriate sequence of courses toward the degree.

2.3.2. Systems Engineering

The ME degree in SE program is built of two components:

- **Core courses**, supplying the fundamentals of systems engineering
- **Elective courses**, focusing on techniques of analysis and application of fundamentals to a problem area

The plan of study must include at least 30 credit hours of graduate-level work and satisfy the following requirements. In addition, the plan of study should be approved by student’s graduate advisor and SE graduate program director.

- Nine credit hours of *core courses*: SYS 6001, plus six credit hours from SYS 6003, SYS 6005, SYS 6007 and SYS 6021.
- At least 21 credit hours of *elective courses* distributed thusly:
 - At least 12 credit hours of graduate-level systems engineering courses. (These credit hours cannot be earned through Independent Study SYS 6993 and SYS 7993; Supervised Project Research SYS 6995 and SYS 8995; Graduate Teaching Instruction SYS 8997 and SYS 9997; Thesis SYS 8999; and Dissertation SYS 9999.)
 - No more than three credit hours of Independent Study SYS 6993 or SYS 7993.
 - No more than three credit hours of Supervised Project Research SYS 8995.
 - No more than 3 credit hours at the 5000-level from the School of Engineering and Applied Science. (The 5000-level courses in the Graduate School of Arts and Sciences are nominally equivalent to 6000-level courses in the School of Engineering and Applied Science.)

Table 2-1 shows a plan of study for completing an ME degree in two semesters.

Table 2-1: A sample plan of study for the ME program:

Course Number		Credits
Fall Semester		
SYS 6001	Introduction to Systems Engineering	3
SYS 6003/05/07/21	Mathematical Programming/Stochastic Systems/Human Factors/Statistical Modeling	3
SYS 6005/03/07/21	Stochastic Systems/ Mathematical Programming/Human Factors/Statistical Modeling	3
SYS XXXX	Elective	3
YYY XXX1	Elective	3
	<i>SUBTOTAL</i>	<i>15</i>
Spring Semester		

SYS XXXX	Elective	3
SYS XXXX	Elective	3
SYS XXXX	Elective	3
YYY XXX2	Elective	3
YYY XXX3	Elective	3
	<i>SUBTOTAL</i>	<i>15</i>

SE ME Special Circumstances

Prerequisites: The student who does not have the prerequisites (e.g., calculus, linear algebra, probability and statistics, computer programming) should take articulation courses. The SE ME program advisor will work with the student to identify the required articulation courses. These courses cannot be used to satisfy the degree requirements.

Equivalent Courses: The student who, prior to enrolling in the SE ME program, has already taken a course equivalent to a core course may petition the graduate program director for the substitution of the core course by an elective course.

2.3.3. Accelerated Master’s Program

The [Accelerated Master’s Program](#) (AMP) in SE is a one-year program designed to enable working professionals to become systems thinkers and problem solvers through a unique blend of formal education integrated with personal work experience. AMP students attain a solid foundation in systems methodology and apply proven analytical tools and new technologies to “messy” problems in the face of uncertainty, risk and environmental turbulence. Through their coursework and collaboration with classmates from diverse industries, participants find that they look at problems with new eyes and finish the program well-equipped to support effective decision-making involving any large-scale complex system.

The AMP in SE program is built of two components:

- **Core courses**, supplying the fundamentals of systems engineering
- **Elective courses**, focusing on techniques of analysis and application of fundamentals to a problem area

The plan of study must include at least 30 credit hours of graduate-level work and satisfy the following requirements:

- 12 credit hours of *core courses*: SYS 6001, SYS 6002, SYS 6043, SYS 6045
- 18 credit hours of *elective courses* consisting of: APMA 6430, SYS 6018, SYS 6050, SYS 6064, SYS 6582, SYS 7002

An example of a plan of study is shown in Table 2-1.

AMP Special Circumstances

Prerequisites: The student who does not have the prerequisites (e.g., two semesters of calculus, one semester of linear algebra and one semester of computer programming) should take articulation courses. The AMP advisor will work with the student to identify the required articulation courses. These courses cannot be used to satisfy the degree requirements.

2.4. Advising and Professional Development

Upon admission to the program, the student is assigned to the ME program faculty advisor. The student should meet with ME program advisor to plan their course selection and career objectives before the start of each semester.

Seminars: Students are expected to attend and participate actively in scheduled ESE and UVA seminars.

2.5. Administrative Forms

It is important that graduate students submit administrative forms related to degree requirements in a timely manner. These forms can be found on the Engineering School's [webpage](#) for current engineering graduate students.

3. MASTER OF SCIENCE PROGRAM

3.1. Overview

Master of Science (MS) is a graduate degree for those who desire not only to acquire fundamental knowledge but also to contribute to the advancement of knowledge through independent, original research. ESE offers two MS programs: in CE and SE. The unifying elements underscore the interrelationships among modern civil, environmental and systems engineering. Both programs provide a springboard for careers as an academician, as a researcher, as a consultant or in management/leadership within a university, institute, industry or government setting. ESE master's programs include three components:

- **Coursework** to gain fundamental and advanced knowledge
- **Research** conducted in a collaborative environment leading to a thesis and scholarly papers
- **Engagement** in UVA's intellectual life

3.2. Admissions Criteria

The deadlines for MS applications with financial aid requests are Jan. 1 for fall semester and Oct. 1 for spring semester. Applicants may apply to both the CE and the SE programs concurrently. All ESE faculty are eligible to advise students enrolled in the CE and/or SE MS programs. We accept applications from candidates with degrees from all engineering and some affiliated backgrounds. In some cases, candidates who do not have engineering or similar credentials will be offered conditional admission, which will require them to take selected undergraduate coursework in addition to the coursework required for their MS.

Most accepted MS students receive financial aid. Funding offers take the form of graduate research assistantships (GRAs), graduate teaching assistantships (GTAs) and/or various fellowships. The department's default stipend for master's students is \$25,000= per year. Note that this is the minimum rate, and some individual advisors may pay more. Funded offers also include tuition and health insurance. Some MS students are funded by third-party entities (e.g., their employer or government or military agencies), and a small number of students are self-funded.

3.3. Engineering School Requirements

Engineering School requirements for MS degrees are described on the [UVA Graduate School of Engineering's information webpage](#). This page also addresses admission requirements, rules and regulations pertaining to financial assistance and outside employment, and other matters. The portion of the Engineering School's website devoted to [current graduate students](#) contains many helpful resources, including required forms.

Time limit: All requirements for the MS degree must be completed within five years after matriculation to the graduate program.

3.4. Program Requirements

3.4.1. Civil Engineering

A candidate for the MS in CE must fulfill the general requirements of the Engineering School along with the following specific requirements.

Coursework: The MS in CE requires 30 credits of coursework and research beyond the BS program, of which at least 12 credits must be taken within CE. In addition, students must take required core courses specified in their subspecialty area. For example, an Environmental and Water Resources Engineering student should take at least four core courses from [EWRE track plan of study](#).

Plan of Study: Students should prepare corresponding *plan of study* shown below including prerequisite courses and approved by their advisor and the CE graduate program director.

- [Environmental and Water Resources Engineering Track \(EWRE\)](#)
- [Structural Engineering Track \(STR\)](#)
- [Transportation Engineering Track \(TRN\)](#)
- [Infrastructure Systems Engineering Track \(ISE\)](#)
- [Construction Engineering and Management Track \(CEM\)](#)

Scholarship: A student must be the author or coauthor of at least one technical manuscript under review or accepted into a conference or journal before scheduling their final thesis defense.

Thesis and Committee: MS students will work with their advisor to identify a suitable master's research topic. Up to six of the 30 credits toward the MS will typically comprise thesis research via the CE 8999 listing. The MS candidate and their advisor will also select an MS thesis committee comprising at least three UVA faculty members. One of these three members may be from outside ESE. At least two of the three members must be faculty members with non-zero percentage appointments in ESE. The thesis committee must review and approve the student's academic requirements report, written thesis and oral thesis defense. MS students should check the accuracy and completeness of their academic requirements report in the Student Information System (SIS) frequently, at least at the start and end of each semester and in consultation with their faculty advisor. The request to appoint the MS thesis committee must be submitted at least 14 days before the proposed final defense date. The request must be approved by the graduate programs director. Degree candidates must apply for graduation in SIS at the beginning of the semester in which they're expected to graduate. In addition, after successful completion of their final defense, the candidate must submit the thesis via Libra (see [Graduation Procedure](#)).

Seminar Series: As members of our community of scholars, MS students are expected to attend and participate in the coordination of the ESE Seminar Series. Together with their advisor and research group, students will have the opportunity to invite and host speakers of interest.

Training and Engagement: MS students are expected to be good citizens of the department by engaging in required training activities and participating in departmental activities (e.g., symposiums, workshops, social events).

3.4.2. Systems Engineering

A candidate for the MS in SE must fulfill the general requirements of the Engineering School along with the following specific requirements.

Coursework: The MS in SE requires 30 credits of coursework and research beyond the BS program. The following requirements should be met:

- Nine credit hours of *core courses*: SYS 6001, plus six credit hours from SYS 6003, SYS 6005, SYS 6007 and SYS 6021.
- At least 15 credit hours of *elective courses* distributed thusly:
 - At least three credit hours of systems engineering courses at the 6000 or 7000 level. (These credit hours cannot be earned through Independent Study SYS 6993 and SYS 7993; Supervised Project Research SYS 6995 and SYS 8995; Graduate Teaching Instruction SYS 8997 and SYS 9997; Thesis SYS 8999; and Dissertation SYS 9999.)
 - No more than three credit hours of Independent Study SYS 6993 or SYS 7993.
 - No more than three credit hours of Supervised Project Research SYS 8995.
 - At least six credit hours of Thesis SYS 8999 (of which six count toward the 30-credit requirement).
- Special Circumstances
 - *Prerequisites*: The student who does not have the prerequisites (i.e., calculus, linear algebra, probability and statistics, computer programming) should take articulation courses. These courses cannot be used to satisfy the degree requirements.
 - *Equivalent Courses*: The student who, prior to enrolling in our graduate program, has already taken a course equivalent to a core course may petition the graduate programs director for the substitution of the core course by an elective course.
 - *Transfer Credit*: Up to six credit hours of graduate courses may be transferred. Only courses with a grade of B or better that have not been applied toward another degree may be transferred. The request for credit transfer must include the following documents: a description of course content and level, an official transcript, and a statement by the student certifying that the course has not been used to satisfy requirements for another degree. If the student is already admitted into a UVA program, then the request for credit transfer must be preapproved before the course is taken.

Scholarship: A student must be the author or coauthor of at least one technical manuscript under review or accepted into a conference or journal before scheduling their final thesis defense.

Thesis and Committee: MS students will work with their advisor to identify a suitable master's research topic. Up to six of the 30 credits toward the MS will typically comprise thesis research via the SYS 8999 listing. The MS candidate and their advisor will also select an MS thesis committee comprising at least three UVA faculty members. One of these three members may be from outside ESE. At least two of the three members must be faculty members with non-zero percentage appointments in ESE. The thesis committee must review and approve the student's academic requirements report, written thesis and oral thesis defense. MS students should check the accuracy and completeness of their academic requirement report in SIS

frequently, at least at the start end of each semester and in consultation with their faculty advisor. The request to appoint the MS thesis committee must be submitted at least 14 days before the proposed final defense date. The request must be approved by the graduate programs director. Degree candidates must apply for graduation in SIS at the beginning of the semester in which they're expected to graduate. In addition, after successful completion of their final defense, the candidate must submit the dissertation via Libra (see [Graduation Procedure](#)).

Seminar Series: As members of our community of scholars, MS students are expected to attend and participate in the coordination of the ESE Seminar Series. Together with their adviser and research group, students will have the opportunity to invite and host speakers of interest.

Training and Engagement: MS students are expected to be good citizens of the department by engaging in required training activities and participating in departmental activities (e.g., symposiums, workshops, social events).

3.5. Administrative Forms

It is important that graduate students submit administrative forms related to degree requirements in a timely manner. These forms can be found on the Engineering School's [webpage](#) for current engineering graduate students.

4. DOCTOR OF PHILOSOPHY

4.1. Overview

The Ph.D. is an advanced graduate degree for students wishing to contribute to knowledge creation through independent, original, cutting-edge research.

ESE offers two parallel doctoral programs: the Ph.D. in CE and the Ph.D. in SE. These degree programs are distinct from each other in their emphasis on specific knowledge domains, but they are unified by several crosscutting components. The unifying elements underscore the interrelationships among modern civil, environmental and systems engineering. Both programs provide a springboard for careers as an academician, as a researcher, as a consultant or in management/leadership within a university, institute, industry or government setting. ESE doctoral programs include three components:

- **Coursework and Teaching** to gain fundamental and advanced knowledge, as both student and GTA
- **Research** conducted in a collaborative environment leading to a doctoral dissertation and scholarly papers
- **Engagement** in UVA's intellectual life

4.2. Admissions Criteria

The deadlines for Ph.D. applications with financial aid requests are Jan. 1 for fall semester and Oct. 1 for spring semester. Applicants may apply to both the CE and SE programs concurrently. All ESE faculty are eligible to advise students enrolled in the CE and/or SE Ph.D. programs. We accept applications from candidates with degrees from all engineering and some affiliated backgrounds. In some cases, candidates who do not have engineering or similar credentials will be offered conditional admission, which will require them to take selected undergraduate coursework in addition to the coursework required for their Ph.D.

All candidates are evaluated by one or more of the ESE research subgroups. Some students are admitted directly into a specific research group with a specific advisor. Other candidates are admitted into a subgroup and are then connected with an advisor during the first year.

Most accepted Ph.D. students receive financial aid. Funding offers take the form of GRAs, GTAs and/or various fellowships. ESE is committed to acquiring the resources to fund Ph.D. students for five years, contingent upon satisfactory progress toward the degree. The department's default stipends are:

- \$25,000 for students without an MS, or up until the qualifying exam is passed (after having entered the Ph.D. program without completing an MS)
- \$27,000 for Ph.D. students who enter with an MS, or after passing the qualifying exam (for those who entered the Ph.D. program directly without completing an MS)
- \$29,000 for Ph.D. students who have completed their dissertation proposal milestone

Note that these are the minimum rates, and some individual advisors may pay more. Funded offers also include tuition and health insurance. Some Ph.D. students are funded by third-party entities (e.g., their employer or government or military agencies), and a small number of students are self-funded.

4.3. Engineering School Requirements

Engineering School requirements for the Ph.D. degree are described on the [UVA Graduate School of Engineering's information webpage](#). The page also addresses admission requirements, rules and regulations pertaining to financial assistance and outside employment, and other matters. The portion of the Engineering School's website devoted to [current graduate students](#) contains many helpful resources, including required forms.

Time limit: All requirements for the Ph.D. degree must be completed within seven years after matriculation to the program.

4.4. Engineering Systems and Environment Requirements and Milestones

4.4.1. Coursework, Professional Development and Engagement

ESE has three general classes of Ph.D. requirements: coursework, professional development and academic engagement. These are described below.

Coursework

The CE and SE programs require relevant coursework to help students access foundational knowledge in their discipline while striking a balance between depth and breadth. All ESE Ph.D. students must take at least six credits of graduate coursework at UVA beyond the master's degree. All ESE Ph.D. students, including those entering with an MS from another institution, must complete at least six credits of ESE coursework. Students who earn an ME or MS degree at UVA en route to a Ph.D. in ESE may use ESE credits from their master's degree to meet this requirement. A minimum of 30 credits beyond the BS program is required for all Engineering School Ph.D.s. Each degree program has its own coursework requirements, as summarized in Table 4-1.

Table 4-1: ESE coursework requirements by degree program

Program	Coursework Requirements
CE	<ul style="list-style-type: none"> ● Two core courses from any CE ME framework* (EWRE, STR, TRN, ISE, CEM) ● Two additional courses selected from the core, SSRR and/or technical electives of any CE ME framework*
SE	<ul style="list-style-type: none"> ● Four foundation courses including SYS 6001** ● Four methodological courses from at least two areas** ● Three electives

*See the CE ME frameworks in **Section 2.3.1.** or this portion of the [ESE website](#).

**See the SE curriculum or this portion of the [ESE website](#); many of these requirements are already met with MS course requirements.

Professional Development and Academic Engagement

The ultimate goal of an ESE Ph.D. is to give students the best possible preparation for their careers in research, government or industry. The following professional training requirements help students prepare for the full spectrum of career choices:

GTAs: Students will serve as GTA for at least **one semesters**. GTAs will enroll for three credits (Satisfactory/Unsatisfactory, or S/U, basis) of CE 8001 or SYS 6097 in a section corresponding to their supervising instructor. ESE students assigned as GTA for Applied Math (APMA) courses will register for APMA 8897, again in the section corresponding to their supervising instructor. A GTA assignment will not count toward the teaching requirement if the student does not receive an S grade. Receipt of one or more U grades for graduate instruction may endanger a student’s eligibility to serve as GTA in future semesters. More information about the Engineering School’s language-skills requirements for international students serving as GTAs can be found [here](#). In special circumstances, a student may petition their committee to substitute a substantive alternative professional development and/or specialized training experience (e.g., externship) for one of the two required GTA experiences. This determination is at the discretion of the committee and approval of the graduate programs director.

Research Dissemination: Students will disseminate their research via papers and conferences. Before scheduling the final defense, students must have at least one “first-authored” paper with their advisor published or accepted by a journal or peer-reviewed conference paper approved by their advisory committee. In addition, students must have presented at least one paper at a conference. To support students’ travel, all ESE Ph.D. students are eligible to receive a travel grant. See the Doctoral Student Travel Grant section below.

Seminars and Defenses: Students are expected to attend and participate actively in scheduled ESE and UVA seminars and student thesis/dissertation defenses.

Academic Engagement: Doctoral students are valued members of ESE's community of scholars. They are expected to be good citizens of ESE by engaging in departmental and schoolwide events (e.g., milestone defenses, symposiums, workshops, social events). Section 5 provides more information about the role of the ESE Graduate Student Council and opportunities for students to be involved in departmental leadership.

Doctoral Student Travel Grant

Each ESE Ph.D. student is eligible for a travel grant of up to \$1,500 to present their research at a peer-reviewed conference. This is for one time during their academic career, and approval from academic advisors is required.

Milestones

The three main milestones toward completion of an ESE Ph.D. are the qualifying exam, the dissertation proposal and the dissertation defense. Sections 4.3 and 4.4 provide additional information on the goals, format, timing and administration of these milestones, including policies governing committee composition.

Table 4-2 depicts a typical timeline for completion of the Ph.D. in ESE. This timeline assumes that students enter the Ph.D. after first completing a master's degree; however, ESE also routinely accepts students directly into the Ph.D. program without first requiring them to complete an MS. For these students, it may be valuable to extend the initial timeline by one year, in which case students can delay the qualifying exam until the end of their second year. The rest of the timeline then proceeds as shown in Table 4-2.

Engineering School policy allows a leave of absence (an action students can take after the completion of a semester, indicating that the student plans to be away from the university for at least one semester) for parental leave or serious personal or family illness; this requires notification to and approval from the appropriate department or program and the Office of Graduate Programs. When considering these options, students are urged to talk with their advisor, their program's graduate director and the Engineering School's graduate registrar. These individuals are committed to helping students find and navigate their best possible paths. Students must first obtain the approval of their advisor and the graduate director of the student's program.

Table 4-2: Typical timeline for ESE doctoral students entering with a master’s degree. Students entering without an MS may need one extra year before taking the qualifying exam. Different research groups offer qualifying exams at different times of year.

Year 1	<ul style="list-style-type: none"> • Establish a working relationship with the faculty advisor(s) • Begin coursework • Identify a research area • Prepare a draft plan of study* • Pass the qualifying exam (August)
Year 2	<ul style="list-style-type: none"> • Finish coursework • Establish research and identify doctoral committee (December) • Present and defend dissertation proposal (March–June) • Finalize a plan of study*
Year 3	<ul style="list-style-type: none"> • Continue research • Continue or complete teaching requirement (as a GTA) • Submit a paper for publication • Attend and present at a research conference
Years 4-5 (as needed)	<ul style="list-style-type: none"> • Complete research • Continue or complete teaching requirement (as a GTA) • Publish additional papers or proceedings • Defend dissertation

*The plan of study form can be accessed from the ESE website. This form is for departmental use only. Students should file the form with a graduate student services coordinator and access it whenever they convene their committee and/or complete a requirement. Official tracking for Engineering School and ESE requirements is done using the academic requirements report in SIS.

4.4.2. Qualifying Exam

The principal objective of the qualifying exam (also referred to as the comprehensive exam and Ph.D. exam) is to assess a student’s research aptitude and confirm that they have the skills necessary to make a substantive contribution in their field. The exam also provides an opportunity for students to receive early, individualized feedback regarding their strengths and weaknesses in research and foundational knowledge.

The goal of the qualifying exam is not to directly assess any content in required courses but to provide a comprehensive use of the foundational principles and methods in research. Thus, students must have already specified the required coursework they will take for their program before taking the qualifying exam. Required coursework varies by program and concentration (see Section 4.4.1).

Successful students will demonstrate that they can:

- a) Understand, interpret and critically evaluate relevant literature.

- b) Analyze data (via experiments, observations, surveys, simulation, etc.) and draw meaningful conclusions.
- c) Apply technical/engineering tools, concepts, coursework and/or approaches to gain insight on real-world problems.
- d) Effectively communicate results in both oral and written formats.
- e) Answer questions and respond to critical feedback when sharing, defending and revising their ideas.

The examination consists of two parts, written and oral. The following guidelines apply.

Committee Composition

The examining committee will include three to five members. At least two of the committee members must be from the candidate's main research area. At least three of the members must be faculty members with non-zero percentage appointments in ESE. External (non-ESE) or courtesy faculty may be a part of the committee but do not count toward the program requirement. In most instances, the qualifying committee contains many of the same members as the student's dissertation advisory committee. However, this is not mandatory.

The chair of the qualifying exam committee should be from the student's home program but cannot be the student's advisor. The chair will be responsible for collecting and delivering feedback to the student, as explained below.

Committee Creation and Preliminary Scheduling

Students should work with their advisor to identify a qualifying exam committee and schedule their exam to take place no later than the end of their second year in the ESE department. Some students may be ready earlier, and if the committee is amenable, they may take the exam after completion of the required coursework for their program. The student must file a completed [qualifying exam committee composition form](#) with the graduate coordinator by the end of the semester preceding the examination.

The faculty recognizes that preparing for and taking the qualifying exam can be one of the more stressful periods of the Ph.D. program. However, framing the exam as a research aptitude assessment is intended to make it such that "preparing for the exam" and "doing research" can be one and the same. Students should meet with each of their committee members prior to beginning their exam preparations so they can discuss how the candidate can best make use of their time.

Structure and Format of Exam

Students will work with their individual examination committees to identify dates for the written and oral components of the exam. They should then work backward from those dates to complete the activities summarized below. Table 4-3 provides a hypothetical sample timeline for completing the exam. It should be noted that some groups of faculty give their qualifying exams once a year at a particular time (e.g., TRN in August after the first year, EWRE in January of the second year). The ESE-wide exam structure is intended to be compatible with and accommodating to those practices.

Once the written exam date has been selected, students should prepare a two-page document that (i) outlines their research area and explains how it will advance knowledge, including in their PhD discipline (civil or systems engineering), (ii) describes how their past, current, and future coursework aligns with their research and career goals, and (iii) provides a preliminary reading list (e.g., research papers, book chapters, policy briefs) organized by topic to be used in their qualifying exam. They should circulate these materials to their committee members no later than one month before their scheduled exam date. Committee members will have one week to respond to the student with suggested modifications to their proposed reading list. The student will then circulate the final reading list to the whole committee no later than two weeks before the scheduled exam date. It is recommended that students start this process early so they can have a thoughtful, engaged dialogue with the committee and prepare a comprehensive reading list.

The student's examination committee will then prepare their questions based upon the research overview and finalized reading list. They will forward the questions to the advisor and other committee members before the exam with adequate time for everyone to evaluate the exam as a whole before it begins.

The student will work on the exam for up to seven days; however, individual faculty may specify time limits for their own individual questions. Students will submit their solutions to the examination committee at the end of the exam period. Each committee member will score their own question using the a-e criteria of the ESE Qualifying Exam Assessment Form (see Table 4-4). Each committee member should complete their scoring prior to the oral exam.

The oral exam will consist of two parts: 1) a brief prepared presentation summarizing the questions and the student's responses to the questions and 2) follow-up questions from the committee. There is no stipulated duration for the oral exam. Once the oral exam has concluded, each committee member will rescore their question, again using the a-e criteria and the ESE Qualifying Exam Assessment Form (see Table 4-4). The chair is responsible for collecting and organizing feedback from the committee and then communicating it to the student after the exam. A key objective for the exam is to give students individualized feedback on their unique strengths and weaknesses.

Exam Outcomes

The outcome of the exam is determined collectively by the examination committee choosing from four options: pass with distinction, pass, pass with remediation or fail. The committee weighs both parts of the exam (written and oral) at its discretion when determining the outcome. The chair is responsible for communicating the outcome of the exam and delivering feedback from the committee to the student after the exam.

Students who do not pass, or pass with remediation, can retake the examination within six months. After two unsuccessful attempts, the student is dismissed from the Ph.D. program.

Forms

- Engineering School ***Qualifying Exam Committee Composition Form*** ([Doctoral Advisory Committee](#)): This form is due to an ESE student services coordinator at least one semester before the scheduled examination.
- Engineering School ***Ph.D. Examination Report***: The student brings one copy to the oral exam and the committee chair files one completed version with an ESE student services coordinator after the exam has been completed.
- ***Academic Requirements Report from SIS***: The student brings one copy for each committee member to the oral exam.
- ***ESE Qualifying Exam Assessment Form*** (see Table 4-4): Each committee member brings one copy to the oral exam; the committee chair collates committee feedback into a final version for sharing with the candidate and filing with the ESE student services coordinator.

Note: A student must have approval from the academic advisor for forming their committee.

Table 4-3: Hypothetical timeline for an ESE qualifying exam for an Aug. 1 exam date

Date	Task(s)
Jan. 1	Student forms examination committee and files committee composition form
February	Candidate circulates research overview and preliminary reading list to examination committee
May, June	Candidate and committee finalize reading list; committee members formulate and review questions
Aug. 1	Questions delivered to candidate
Aug. 8	Candidate submits written responses to examination committee and graduate coordinator
Aug. 9	Committee members score written responses to their questions
Aug. 16	Oral examination takes place; committee rescores candidate responses and chair collects feedback and reports outcome (pass with distinction, pass, pass with remediation, fail) to candidate
Aug. 17	Follow-up email/interaction with chair if necessary

Table 4-4: ESE Qualifying Exam Assessment Form. Committees may comprise three to five members, but at least two members must be from the student’s main research area. (Rating scale: 5 = superior/outstanding, 4 = very good, 3 = acceptable, 2 = marginal/needs attention, 1 = unacceptable for Ph.D. student.) Note that this form is an ESE internal form.

Criterion	Member 1 Initials: _____	Member 2 Initials: _____	Member 3 Initials: _____	Member 4 Initials: _____	Member 5 Initials: _____	
a. Understand, interpret, and critically evaluate relevant literature.	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	
b. Analyze data and draw meaningful conclusions.	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	
c. Apply technical/engineering tools, concepts, and/or approaches to gain insight on real-world problems.	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	
d. Effectively communicate results in both oral and written formats.	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	
e. Answer questions and respond to critical feedback when defending his/her ideas.	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	WRITTEN 1 2 3 4 5 NA ORAL 1 2 3 4 5 NA	
Overall assessment (circle):	1 2 3 4 5					
Recommended outcome (circle):	Pass with Distinction		Pass	Pass with Remediation		Fail

Comments:

Specific Strengths and Weaknesses:

4.4.3. Dissertation Proposal

Formulation of a dissertation proposal is a key step toward completion of the Ph.D. This milestone allows a student’s committee to make three important determinations:

1. To assess whether the student’s knowledge of their chosen area and their understanding of relevant literature is adequate to complete a Ph.D.
2. To recommend coursework, approaches/techniques and other resources that would facilitate or enhance the proposed work.
3. To evaluate whether or not the proposed work, if completed, would constitute an acceptable basis for a doctoral dissertation.

Selection of a Ph.D. committee is an important component of the dissertation proposal process, insofar as the committee is responsible for helping the candidate navigate their path to the Ph.D. The Ph.D. committee approves a candidate’s plan of study, including coursework, teaching, dissertation proposal and the final dissertation. ESE faculty place high value on interdisciplinarity

and crosscutting collaborative research. Accordingly, we are firmly committed to letting each student pick a committee that best supports their scholarly and professional development. Ph.D. candidates are not subject to any committee composition rules beyond the Engineering School requirements. The Engineering School rules are as follows: The final dissertation committee must include a minimum of three Engineering School faculty, a minimum of four UVA faculty and a minimum of five total members; one of the UVA members (the “external member”) must be from outside ESE; and at least three of the members must be faculty members with non-zero percentage appointments in ESE. It is ESE policy that graduate students may use a courtesy-appointed faculty member as either an internal or external member. It is strongly recommended that the dissertation proposal committee consist of all five faculty members that would be on the final defense; however, it is acceptable for a dissertation proposal committee to have four instead of five members, in which case the fifth person is added before the final defense.

All members of the committee evaluate the proposal and generate a preliminary assessment of the candidate’s achievement of the following research skills: a) identifying relevant problems of interest, b) interpreting existing literature, c) generating hypotheses, d) collecting data (via experiment, observation, modeling and/or simulation), e) interpreting results and drawing conclusions, f) communicating results (in oral and written formats), g) answering questions and defending their work, and h) commenting/critiquing on the work of others.

The oral defense of a dissertation proposal is advertised within the ESE and Engineering School. All interested parties are welcome to attend. The candidate gives a brief overview (20 to 25 minutes) of their proposed dissertation research, then takes questions from the audience and their committee. The committee then deliberates and decides whether the candidate has passed. The committee also reviews the student’s transcript and plan of study to recommend additional coursework or other relevant training if necessary. In this way, the emphasis of the dissertation proposal will be on supporting student growth, rather than just deciding who passes/fails. Candidates who fail the exam must take it again within six months. The chair of the candidate’s committee takes the lead in identifying an appropriate format and timeline for the second-chance defense. Students who do not pass on their second attempt are dismissed from the Ph.D. program.

It is the candidate’s responsibility to print out and bring the relevant forms ([Dissertation Proposal](#) and [Dissertation Proposal Assessment](#)) to the proposal defense, in addition to their transcripts and plan of study. Each committee member is responsible for completing a research skills assessment and submitting it to the committee chair. The chair collates the feedback, submits an aggregated assessment form to the department’s graduate coordinator (who sends it to the Engineering School register) and circulates the feedback to the candidate and their advisor within two weeks of the defense.

Finally, reiterating from Section 4.4 and Table 4-2, ESE students typically complete their proposal milestone at the end of Year 2, or the end of Year 3 if they enter the Ph.D. without an MS. The [committee composition form](#) should be submitted to the graduate coordinator no later than Dec. 1. Proposal defenses are scheduled from March through June.

4.4.4. Final Defense

The final dissertation defense is the culminating step of the Ph.D. process. The main objective of this milestone is to confirm that the completed research constitutes a meaningful contribution to the body of knowledge in our field. A secondary objective is to ensure that the written quality of the final document is adequate to highlight the value of the work and make it accessible for an educated audience. Often, there are intermediate meetings with the committee between the proposal and the defense to discuss various topics from data to preliminary results.

Students are eligible to defend their dissertation once they have completed all other requirements, including the publication requirement. The final defense committee must have five members (see Section 4.4.3). There is no required format for the dissertation; rather, the candidate should work with their committee to prepare a satisfactory document. The candidate should circulate the final dissertation to their committee no later than two weeks before the oral defense date. Final defenses are advertised within the ESE and Engineering School. All interested parties are welcome to attend. The candidate gives a brief overview (30 to 35 minutes) of their dissertation research, then takes questions from the audience and their committee. The committee then deliberates and makes a determination about whether the candidate has passed.

Ph.D. candidates must apply for graduation in SIS at the beginning of the semester in which they're expected to graduate. In addition, after successful completion of the final defense, the candidate must submit the dissertation via Libra (see [Graduation Procedure](#)).

4.5. Administrative Forms

It is important that graduate students submit administrative forms related to degree requirements in a timely manner. These forms can be found on the Engineering School's [website for current graduate students](#).

5. ESE GRADUATE STUDENT COUNCIL

The ESE Graduate Student Council, a nonprofit, student-run organization, will hereafter be referred to as ESE-GSC.

5.1. Mission/Charge

ESE-GSC exists to ensure that graduate students in the department are represented in decisions regarding departmental activities, changes and day-to-day operations. ESE-GSC is an independent graduate student organization that advocates on behalf of ESE graduate students, including by consulting with departmental faculty and staff in order to ensure the continuation of equitable treatment.

5.2. Organizational Structure

5.2.1. Membership

While anyone who is affiliated with UVA in an official capacity (e.g., students, faculty and staff) is welcome to attend open general body meetings of ESE-GSC, active membership is exclusively and automatically conferred to those who are enrolled (currently or in the previous academic year) in an ESE graduate program in good standing. Closed, general body meetings are open only to the active members.

ESE-GSC does not restrict its membership, programs or activities on the basis of age, color, disability, gender identity, marital status, national or ethnic origin, race, religion, sex, pregnancy, sexual orientation, veteran status, and family and genetic information.

Note: There are no dues/fees associated with being a member of ESE-GSC.

5.2.2. Officers of the ESE-GSC Executive Committee

The ESE-GSC is governed by the following means:

1. An elected president is primarily responsible for interactions with university faculty. The president presides over general and executive committee meetings. The president presents all motions to the body present and is required to be present at no fewer than 80% of ESE-GSC meetings. The president has the authority to request funds from departmental resources with the consent of the treasurer.
2. Two elected vice presidents, one from each program, are primarily responsible for receiving student concerns and complaints and bringing them to the executive committee for discussion. In the absence of the president, the vice presidents assume the president's responsibilities. The vice presidents are primarily responsible for counting the votes on any amendments, motions and elections.
3. An elected executive officer takes attendance and notes at each meeting and reports the minutes via email and/or in person at the beginning of the next meeting. The executive officer also drafts solicitation and thank-you notes to distribute after major events. The executive officer maintains a list of all graduate students in the department and is

responsible for validating the vote count recorded by the vice presidents.

4. An elected treasurer keeps a written account of all financial transactions and is responsible for submitting a budget proposal at the beginning of each semester. The treasurer should work with other members of the executive committee when preparing the budget proposal. The treasurer coordinates with faculty and staff to arrange logistics, including payment, for ESE-GSC-sponsored events.

5.2.3. Chair and Committee Positions of the ESE-GSC

The ESE-GSC Executive Committee appoints active members to the following positions. Members who are interested in a position should submit a brief email expressing their interest and qualifications (if applicable) for the position. No previous involvement in ESE-GSC is required to hold a chair position. Chairs are filled as necessary each year within one month of the executive committee being elected.

1. **Speaker Series Chair (one or two positions):** Solicits nominations for speakers from students; facilitates the process of choosing speakers; communicates with invited speakers; organizes and plans speaker series sessions; and works with faculty and staff to ensure success of speaker series events
2. **Publicity/Marketing Chair:** Creates advertising materials for ESE-GSC events and ensures that events and resources are adequately publicized
3. **Representative Chair:** Communicates with ESE-GSC representatives from each research group; this includes recruiting new representatives when necessary, collecting feedback from representatives and disseminating important information from ESE-GSC to representative chairs
4. **Recruitment Committee:** Works with students, faculty and staff throughout the year to improve graduate student recruitment efforts in ESE; organizes a go-to plan for students who visit outside the normal recruiting window; works with other groups (e.g., GRIT, engineering professional societies) to coordinate recruiting events and solicit current students to participate; and in the spring semester forms a team of students to plan the annual recruitment weekend events
5. **Retreat Committee:** Plans and leads an annual retreat for ESE-GSC, a portion of which is open to ESE faculty and staff; the goal of the retreat is to have an open forum that is less formal than general body meetings and is not run by the executive committee, and it gives members and the executive committee an opportunity to assess how effective the group was throughout the year and propose adjustments for the following year and amendments to the charter
6. **Website Liaison:** Works with department staff to ensure that the ESE website contains information that is useful, relevant and necessary for incoming and current graduate students

A. REVISION HISTORY

<u>Date</u>	<u>Affected Section(s)/Pages</u>	<u>Description of Change</u>
01/06/2021	Sections 3.4.1., 3.4.2., 4.4.2., 4.4.3., 4.4.4	Updated MS/PhD committee composition requirements
01/06/2021	Section 4.4.2.	Updated the specificity in goals/plan
01/06/2021	Page 27	Added revision history appendix
01/06/2021	Page 28	Added faculty eligibility for advisor and committee appendix
01/13/2021	Section 4.1.1.	Changed GTA requirement to one semester

B. FACULTY ELIGIBILITY FOR MS/PHD ADVISOR AND COMMITTEES

Faculty eligible to be on MS/PhD committees:

- General Faculty (AGF: research, teaching, practice; all ranks [with a PhD])
- Tenure Track Faculty (all ranks)
- Research Scientists (all levels with a PhD)
- Special cases not listed above must be approved by the appropriate Program Chair.

Faculty eligible to be a MS/PhD Advisor:

- Any faculty with a joint appointment in ESE (at any % > 0).
- Special cases not listed above must be approved by the appropriate Program Chair.

NOTES:

1. The advisor must be UVA faculty, so for example not a member of the Professional Research Staff (research scientists, senior scientists, principle scientists, etc.), not a Lecturer, and not a visiting faculty.
2. “Faculty” for all committees includes any faculty status and includes faculty-qualified ESE research and teaching members (e.g., research scientists and lecturers that hold a Ph.D.).
3. All committees must follow UVA and SEAS guidelines, see:
<http://records.ureg.virginia.edu/content.php?catoid=50&navoid=3783>
4. AGF must follow AGF policy guidelines, see:
<https://engineering.virginia.edu/sites/default/files/common/offices/deans-office/policies-bylaws/2017.7%20SEAS%20Policy%20on%20Academic%20General%20Faculty%203.5.2019.pdf>