School of Systems and Enterprises

Doctoral Student Handbook

Ph.D. Programs in
Systems Engineering, Socio-Technical Systems
and Engineering Management

School of Systems and Enterprises Ph.D. Program Committee
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Hoboken, New Jersey 07030
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1. Doctoral Program Objectives

The Institutional Vision

Stevens will become a premier student-centric technological research university, focusing on six “foundational pillars.” These pillars are areas of societal need where Stevens possesses significant depth and expertise, including artificial intelligence, machine learning, and cybersecurity; data science and information systems; complex systems and networks; financial systems and technologies; biomedical engineering, healthcare, and life sciences; and resilience and sustainability. As education and research capacity grows in these areas, so will external influence.

The School Vision

The mission of the School of Systems and Enterprises (SSE) is to provide students with a research-centered interdisciplinary and transdisciplinary education embedded in systems thinking and design. SSE focuses on applying a “systems approach” that teaches technical leaders to view challenges from all angles, to see the big picture, to understand the nature and complexity of enterprise-wide problems and to conceive creative solutions that achieve breakthrough results across range of domains.

It is the objective of the SSE doctoral program to educate thought and technical leaders who will impact on global challenges in research and development, policy and strategy, and entrepreneurial innovation. This may be achieved in academia, government or non-profit organizations and industries. To prepare graduates for these positions of leadership, we ensure they have:

- A solid foundation in research methods and methodologies
- Core competencies in system modeling and analysis (system science, network science, general system theory), and system design and decision-making (cognitive science, decision science, operations research)
- A unique “systems” perspective on addressing engineering and governance challenges
- A track record of publications in peer-reviewed journals by graduation
- Proven written and oral communication skills

The School Overview

Leveraging the Stevens legacy, the SSE offers undergraduate and graduate degree programs that integrate education and research, extending human intelligence to some of the world’s biggest challenges. Combining the advantages of small programs with the extensive resources of a major research university, students receive an education that combines rigorous academic study and cutting-edge research with innovative opportunities, entrepreneurial thinking, and the support and intellectual stimulation of a diverse campus community.

The SSE experience embodies the spirit of the interdisciplinary approach that Stevens has always embraced. SSE programs equip engineers with leadership skills and technical acumen, enabling them to contribute to effect transformative change in areas such as financial services, healthcare, defense and cybersecurity.

SSE is committed to the educational and research philosophy referred to as the “Open Academic Model”, which prepares students for today's technology-centric enterprises and yields high-impact career results after graduation.
The essence of the open academic model is to develop meaningful relationships with best-in-class partners from academia, industry and government. Partners who, while maintaining an emphasis on technical systems, pay equal attention to the interplay between the systems and human enterprises. These partnerships blur the boundaries between academia, industry and government, and foster intellectual breakthroughs that are both academic and applicable to a wide range of real industry initiatives.

This concept of developing strategic and mutually beneficial alliances and partnerships is critical to the development of the “industry as laboratory” concept, a key tenet of the SSE research strategy. It is also essential to engage in rigorous research endeavors that are grounded in relevance.

The Doctoral Programs Overview

The programs leading to the Doctor of Philosophy (Ph.D.) degree are designed to develop students’ ability to perform research or high-level design in systems engineering, socio-technical systems, and/or engineering management.

- The Ph.D. degree program in systems engineering is designed to develop the ability of the student to perform high-impact research and high-level design that will contribute significantly in the advancement and growth of the field of systems engineering.

- The Ph.D. degree program in engineering management trains students to become successful researchers, practitioners and educators in the management of engineering and technology.

- The Ph.D. degree program in socio-technical systems trains students to understand and develop solutions for problems involving systems and enterprises that are socio-technical in nature (i.e. including the human element in understanding the qualitative and quantitative process of evolving the enterprise/system).

2. Admissions Requirements

Admission to the doctoral program is made through the SSE Ph.D. Program Committee. Admission is based on a review of the candidate’s scholastic record, professional accomplishments and coherence between their research objectives and those of the available SSE faculty. All admitted students must have the potential to advance the state of the art in their field of research. The SSE Ph.D. program committee is chaired by the SSE doctoral program director, with representation from each Ph.D. programs.

For domestic students, admission to the doctoral programs in SSE requires that the candidate has graduated from an ABET accredited undergraduate program, preferably in engineering or science. A master’s degree is usually required before a student is admitted to the doctoral program. A student’s master’s level academic performance and/or career must reflect their ability to pursue advanced studies and perform independent research. Typically, a GPA of 3.5 or better at the master’s level and 3.0 or better at the undergraduate level is required for admission to the doctoral program. International students must demonstrate proficiency in the English language prior to admission by taking internationally accepted standard tests like TOEFL.

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1 Options for Ph.D. degrees in Software Engineering may be available in the future.
All doctoral applicants are required to submit Graduate Record Exam (GRE) results. Applicants may submit GMAT scores in lieu of GREs for the doctorate in engineering management and socio-technical systems.

In addition, each applicant must submit a current resume or curriculum vitae, three recommendations and a statement of purpose. The statement of purpose should be limited to three pages and describe the applicant’s academic interests, proposed course work, research interests and rationale, general career objectives and desired full/part-time student status. Applicants are strongly encouraged to review the available doctoral advisors on the SSE website\(^2\), and identify those who they believe most closely align with their desired areas of research in their statement of purpose.

The statement of purpose not only represents the student’s interests, motivations and goals, but also is a reflection of their ability to communicate effectively and reflects the maturity of their research aspirations. Each applicant must also submit an example of their written technical work. This work should be written solely by the applicant. Published work is most desirable. All applications for part-time studies must include a letter of commitment from the applicant’s employer.

The following is a summary of the application submission contents:

- Statement of purpose: which includes academic interests, proposed course work, research interests and rationale, general career objectives and desired full/part-time status
- Current resume or curriculum vitae (CV)
- Official transcripts for all schools of higher learning (university, colleges, etc.) attended; >3.0 undergrad, >3.5 graduate
- A master’s degree in a related area is strongly recommended
- GRE test scores (taken within the last four years)
- Score of English language proficiency test such as TOEFL
- Three recommendations
- Evidence of written work: such as a technical document written solely by the applicant; published work is most desirable
- Letter of endorsement from employer for part-time studies

Applications are accepted on a rolling admissions process throughout the school year. Due to limitations in available faculty advisors, it is strongly encouraged that students complete their application submissions by **March 15 for entry in the fall semester** and by **August 15 for entry in the spring semester**. Applicants who have submitted complete applications by these dates will be notified of their admission decision by April 30 and September 30, respectively. Applications received after these dates will be considered for any remaining open positions and notified within four to six weeks after the complete application has been received.

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\(^2\) SSE Faculty website: [https://www.stevens.edu/school-systems-enterprises/faculty](https://www.stevens.edu/school-systems-enterprises/faculty)
3. Advising

Role of Doctoral Advisor

Upon acceptance into the doctoral program, each student will be assigned a doctoral advisor based on their stated research interest from their statement of purpose. The doctoral advisor serves the dual role of academic and research advisor with the purpose of getting students started with their program of study and doctoral research. The doctoral advisor also serves as the chair or co-chair of the Doctoral Advisory Committee (DAC) and must be a tenured or tenure-track faculty member, a professor emeritus or an approved faculty member within SSE. A student can request a change of advisor by submitting a petition to the Chair of the SSE Ph.D. Program Committee detailing the reasons for the request, along with the endorsement of the new advisor. For such a request to be granted, it has to be approved by the chair of the SSE Ph.D. program committee, the dean of SSE, and the dean of Graduate Academics (or their equivalent).

The Doctoral Advisory Committee (DAC)

A DAC is composed of at least four members, with one member serving as the doctoral advisor and chair. One member of the DAC must be a Stevens faculty member from another department or program outside of SSE. It is permissible and desirable to have a highly qualified person from outside Stevens as a committee member. It is strongly recommended that at least three of the DAC members are Stevens faculty. A minimum of three DAC members must have Ph.D. degrees. All members of the DAC who do not have a Ph.D. degree must be approved by the chair of the SSE Ph.D. program committee and the dean of SSE.

Prior to the qualifying exam, the doctoral advisor and doctoral student will nominate the members of the DAC. (It should be noted that the Stevens professor from another department or program outside of SSE is recommended, but not required for the qualifying exam). A DAC appointment form is completed and submitted to the chair of SSE Ph.D. program committee. Students are encouraged to meet individually with the members of their DAC prior to their proposal and thesis defenses or at the recommendation of their doctoral advisor.

The DAC appointment form is available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens_edu/files/files/registrar/forms/doctoral_program/Doctoral_Committee_Nomination.pdf

4. Study Plan and Guidelines

Study Plan

The student and their doctoral advisor will create a study plan that outlines the courses and potential dates for the qualifying examination, proposal and thesis defense. This study plan will be completed by the end of the student’s first enrolled semester in the program. The student and their doctoral advisor shall review and update this study plan at the end of each semester. Only courses noted in an approved study plan will be accepted toward the doctoral degree requirements.

The doctoral study plan form is available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens_edu/files/files/registrar/SPAC/SP-AC_Doctoral.pdf
**Special Problems Course 801**

This course is typically conducted as a one-on-one investigation of a topic of particular interest between a faculty member and a student. The course is often used to explore topical areas that can serve as a dissertation. A student may take up to two special problems courses in a doctoral degree program. A department technical report is required as the final product for this course.

The Request for Special Problems Course form is available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens_edu/files/files/registrar/forms/enrollment/Special_Problems.pdf

**Research Credits and Activity Report**

Doctoral students must register for SYS960 through the doctoral research enrollment form. Doctoral students who are enrolled in research credits or Maintenance of Matriculation must submit a Research Activity Report to their DAC. This form is to be signed by the doctoral advisor and is sent to the dean of Graduate Academics for approval. Students who do not submit such a report cannot enroll in additional credits.

The SYS960 registration and Research Activity Report forms are available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens_edu/files/files/registrar/forms/enrollment/Doctoral_Research_Enrollment.pdf

https://www.stevens.edu/sites/stevens_edu/files/files/registrar/forms/doctoral_program/Doctoral_Activity.pdf

**SSE Doctoral Research Symposium**

Each doctoral candidate (a doctoral student who has passed their qualifying exam) is required to attend the SSE Doctoral Research Symposium usually scheduled on Monday and Tuesday of Spring Commencement Week. At this session, the doctoral candidate will be required to present their research in either a presentation or poster session format.

**Academic Standing**

Doctoral students with incompletes must complete the incomplete by the end of the following semester. The student may file for a waiver with the approval of their doctoral advisor, the Chair of the SSE Ph.D. Program Committee, and the dean of Graduate Academics. Valid reasons for a waiver include service in the armed forces or personal/family medical circumstances. Financial issues are not considered to be valid reasons for a waiver. Inability to complete the incomplete within that time period will result in an “F” for the course.

A student who meets at least one of the following criteria will be placed on probation:

- Has received an F in a course that has not been improved by repeating the course. (Please recall that each student must have a current study plan on file with the Office of the Registrar)
- Has less than a B (3.0) average after earning 10 or more credits
- Has received three or more C’s
Once placed on probation, a student must meet with their advisor and complete a Remediation Action Plan (RAP). This plan must be submitted to the Registrar before the student is allowed to take additional courses.

The RAP form is available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens_edu/files/files/registrar/forms/Miscellaneous/Probation_Remediation.pdf

**Time Limit, Enrollment Continuity and Leave of Absence**

A student who has earned a master’s degree or its equivalent is allowed a maximum of six years to complete the requirements for the doctoral degree. Requests for an extension of this limit must be made in writing to the student’s doctoral advisor who will then make their recommendation to the dean of Graduate Academics.

All regular students are expected to maintain continuity of enrollment, except for summer sessions. If this cannot be done, the student must apply in writing for a leave of absence from their doctoral advisor, which is subject to the approval of the dean of Graduate Academics. A leave of absence is granted for a limited period only. The period may be extended at the discretion of the dean of Graduate Academics. Time spent in the Armed Forces of the United States while on leave of absence is not included in the six-year limitation noted above. Time spent on leave of absence for other reasons may or may not be included in the six-year limitation. Each case is decided on the basis of individual circumstances by the dean of Graduate Academics.

The leave of absence form is available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens_edu/files/files/registrar/forms/Miscellaneous/Leave_of_Absence.pdf

A leave of absence does not waive a review of an action on a student’s academic performance. Students who do not maintain continuity of enrollment and who do not obtain a leave of absence may be dropped from the program. Re-enrollment requires permission of the dean of the Graduate Academics and the chair of the SSE Ph.D. program committee with approval by the SSE Ph.D. program committee.

The SSE Ph.D. program committee will meet annually at the end of the academic year to review the progress of all doctoral students. In the event that a student does not make any significant progress during an academic year, the SSE Ph.D. program committee in concert with the doctoral advisor reserves the option to 1) place the student on probation such that they will have to develop a remediation plan to accelerate progress, 2) change that program of study from Ph.D. to a master’s degree or 3) disenroll the student from the program.

**Minimum Load**

Students must enroll for a minimum of one credit each semester to maintain matriculation until they have completed or enrolled for all credits required. Students who have completed or already enrolled for all needed credits and who need to maintain matriculation while completing a thesis, special problem, dissertation, project or other degree requirements must enroll for D999, Maintenance of Matriculation, and pay the required fees.
The Maintenance of Matriculation Enrollment form is available from the Office of the Registrar website at:

Course and Major
Program change and change of enrollment forms must be requested from the dean of Graduate Academics or the Chair of SSE Ph.D. Program Committee.

5. Doctoral Requirements Summary
The following is a summary of doctoral degree requirements in the School of Systems and Enterprises:

- **Course & Research Work:** 84 credits of graduate work in an approved program of study beyond the Bachelor’s degree consisting of:
  - A maximum of 30 credit hours obtained in a master’s program
  - A minimum of 15 credits of additional graduate course work
  - A minimum of 15 credit hours of dissertation work
  - Completion of SSE core course requirements
  - Completion of Stevens Doctoral Signature Course – PRV 961

- **Examinations:**
  - Written and Oral Qualifying Examination
  - Dissertation Proposal Defense (also called Preliminary Examination)
  - Dissertation Defense (also called Final Examination)

- **Dissertation**

Effective fall 2012, the minimum requirements for a Ph.D. degree are 84 graduate credits beyond the Bachelor’s degree including Institute requirements and a minimum of 15 credit hours of dissertation research. All doctoral students must successfully complete the Stevens Institute three credit signature course, PRV 961. Non-resident, part-time doctoral candidates may receive a waiver for PRV 961 with the approval of the SSE Doctoral Committee and the dean of graduate academics. The waiver process includes a presentation by the candidate to affirm their capabilities in the PRV961 course area. Note that no credits are awarded with the waiver of PRV 961.

A prior master’s degree earned at another institution may be transferred for up to 30 credits without specific course descriptions with approval of the department and the dean of graduate academics. Up to one-third of additional course credits may be transferred with the approval of the advisory committee and the dean of graduate academics. The additional credits required for the Ph.D. beyond the master’s degree may not have been already used towards any other degree. A grade of “B” or better (3.0) is required for such courses. (A grade of B- is not acceptable.) No credits may be transferred towards dissertation research.
Core Course Requirements

To ensure that every student has the skills to be successful in their chosen field, to ensure consistency in skill set standards and provide a common experience between students, there are a number of core courses requirements as follows:

- Course Specific - Core Courses required for all SSE Doctorate degrees
  - ES684 Systems Thinking
  - SYS710 Research Methods

- Area Specific - Selection of one (1) course from each of the following two areas (other courses may be accepted based on the approval of the advisor and the doctoral program director):
  - Quantitative Methods
    - EM605 Elements of Operations Research
    - SYS611 Modeling and Simulation
    - SYS645 Design for Reliability, Maintainability, and Supportability
    - SYS660 Decision and Risk Analysis
    - SYS670 Forecasting and Demand Modeling Systems
    - SYS681 Dynamic Modeling of Systems and Enterprise
  - Economics, Financial Systems & Policy
    - EM600 Engineering Economics and Cost Analysis
    - EM620 Engineering Cost Management

- Domain Specific - Selection of three (3) courses from degree domain

- Domain Non-Specific - Selection of one (1) course from any domain

Note that each Ph.D. program might have additional core course requirements. Students should contact their advisor to ensure that they have complied with their specific program requirements. In general, these are courses that are required for the master's degree in the area. It is recommended that the core course requirements are completed before the student enrolls in any elective courses.

6. Qualifying Exam

The purpose of the qualifying examination is to assess the candidate’s ability to conduct independent, research quality, communicate effectively, develop original ideas in their chosen area of research interest, and to examine the student’s knowledge of relevant fundamental topics in the areas of systems engineering and engineering management. The candidate should develop an original research paper worthy of submission to a top-tier academic conference or journal. Students are expected to start working on the paper under their doctoral advisor’s guidance as soon as they enter the program.

Timeline of Qualifying Exam

Students may not schedule the qualifying examination until they have completed their two (2) Core, two (2) Area and one (1) Domain specific core courses (a total of five courses). At the
time of scheduling their qualification exam, the student should have a minimum 3.5 cumulative GPA in their course of study as part of the doctoral program. If they do not, they will have to defer the exam until they raise their GPA up to a minimum of 3.5. If they cannot achieve this within the allotted number of course credits for a PhD, they will be dismissed from the doctoral program.

The Qualifying Exam must take place by the end of the second year of enrollment for all full-time and part-time students. Timing will be determined by the advisor. Failure to take the qualifying exam within this timeframe will result in the student’s dismissal from the program. A petition to waive these requirements may be filed by the student and needs to be approved by their doctoral advisor and the SSE doctoral program director with approval by the SSE Doctoral Committee.

Students are permitted to enroll in a maximum of nine dissertation credits (SYS960) prior to taking the qualifying examination, with permission from their advisor. However, there is an associated risk in taking the maximum allowed dissertation credits prior to passing the qualification exam. SYS960 credits are pass/fail credits. If the student does not pass the qualification exam, the credits cannot be counted toward another degree. Careful consideration and discussion with the doctoral advisor must be undertaken before taking the allowed number of dissertation credits and before taking the qualifying examination. Students must be registered during the semester that the qualifying examination is taken.

**Structure of Qualifying Exam**

The qualifying exam consists of written and oral portions.

1) **Qualifying Exam – Written**

For the written part of the qualifying exam, students must prepare an original research paper demonstrating their ability to conduct research on a problem relevant to systems engineering and/or engineering management. The paper must be less than 5,000 words in length. The paper can, but does not have to be, an extension of a term paper from one of the SSE core classes. Students are expected to seek the supervision of their advisor in preparation of their research paper. The research paper must consist of all elements of a coherent scientific research paper including motivation, literature review, methods, results, discussion, and conclusion. The paper must be on research conducted at Stevens during the first two years of doctoral program.

2) **Qualifying Exam – Oral**

Upon submission of the written component, the advisor will schedule the oral part of the qualifying exam. The DAC will read and evaluate the written component prior to the oral component. The oral part of the qualifying exam will be scheduled by the advisor and evaluated by the DAC upon the submission and the review of the paper. The oral exam is scheduled to be 90 minutes, during which the student makes a 20-minute oral presentation of the research work. Students will receive questions and feedback on the paper itself as well as questions on the fundamental topics in the areas of systems engineering and engineering management. Students are encouraged to take the following courses during their two years at Stevens, which covers fundamental conceptual topics relevant to systems engineering and engineering management:
The student’s DAC administers the qualifying examination. To pass the Qualifying Exams, a doctoral candidate must have a favorable vote from a majority of the examining/advisory committee, with at most a single negative vote. If performance on the examination is unsatisfactory, the student has the following two choices: 1) complete the requirements for a master’s degree and exit the doctoral program or 2) retake the exam within one full semester (15 weeks) after the initial failure. Students failing the examination twice will be dismissed from the doctoral program. Students who pass the qualifying examination are then considered to be doctoral candidates.

The Qualifying Exam Report form filled out by the DAC can be found at the Office of the Registrar website at: https://my.stevens.edu/system/files/doctoral_qualifying_exam_report.pdf

7. Dissertation Process

Proposal Defense

A student pursuing a doctoral degree should demonstrate through the Qualifying Exam, proposal and dissertation, the ability to conduct high-quality, original and creative research. The writing style, grammar and spelling of the proposal and dissertation should reflect a high level of written communication skills. The purpose of the Proposal Defense is to ensure that the dissertation is appropriately scoped and all members of the DAC are in agreement with the methodology, products, validation approach, results, etc., for the dissertation. This proposal should show that the research results could be publishable in a refereed journal.

Every doctoral candidate is required to prepare a research proposal that addresses the following seven areas:

1) describes the research content and why it is important
2) presents a literature review to demonstrate what others have done in the area
3) discusses the research outcome(s) anticipated including its relationship to related published research
4) proposes a research validation approach
5) articulates the specific contributions to the field of endeavor
6) articulates the creative content and uniqueness of the research effort
7) describes anticipated obstacles

The candidate must clearly articulate to their DAC why and how they propose to accomplish this research. This proposal must be in a written form and formally presented to the candidate’s DAC. As a minimum, the candidate should have Chapter 1 (Problem Statement) or equivalent, Chapter 2 (Literature Review) or equivalent, Chapter 3 (Approach), emerging results, validation and verification plan, schedule for completing the dissertation, content and target journals to publish the results of the research along with a schedule for their publication. In addition, the candidate should have one paper accepted for publication in a peer reviewed journal that is derived from the research related to the proposal. The Proposal Defense should take place after
the student has completed 15-18 research credits (See Figure 1). Typically, for a full-time student the Proposal Defense should take place 6-9 months after initiation of research on their chosen a thesis topic. For a part-time student, this should take place approximately one year after the initiation of this research (See Figure 2).

The Proposal Defense document must be made available to the Doctoral Advisory Committee at least two weeks before the scheduled event. Feedback on the Proposal Defense will be given to the student by their doctoral advisor within seven days of its completion. To pass the Proposal Defense, a candidate must have a favorable vote from a majority of the DAC, with at most a single negative vote. If the student does not pass the Proposal Defense, they have the option to complete the requirements for a master’s degree and exit the doctoral program or schedule a second defense within one semester while remedying deficiencies noted in the defense. Students failing the defense twice will be dismissed from the doctoral program.

The Proposal Exam Report form filled out by the DAC can be found at the Office of the Registrar website at: https://my.stevens.edu/system/files/docieroquealifying_exam_report.pdf

**Dissertation**

The dissertation is the capstone of the doctoral program and should result in research that advances the state of the art in the chosen field. Dissertations may be written in a traditional format or composed of a portfolio where the main body of the dissertation integrates a set of refereed journals and peer reviewed conference papers which are included as appendices for the details. Regardless of the format, the results of the research must be deemed publishable in major scholarly journals.

The following are the guidelines for publication prior to dissertation defense, but should be considered the norm:

- one (1) accepted peer reviewed journal article
- one (1) submitted peer reviewed journal article
- two (2) presented refereed conference papers

The intent of this requirement is the belief that peer reviewed research produces a superior dissertation, providing a broad review of quality and dissemination of the results to a wider community. (Example table of contents for traditional and portfolio based dissertations is shown in Appendix A. A proposed rubric for the assessment of doctoral research is shown in Appendix B.)

(See https://library.stevens.edu/submitDissert/Thesis for specific formatting and submission information.)

All research that involves human subjects requires Institutional Review Board (IRB) approval. See https://my.stevens.edu/osp/compliance/humansubject_rib/overview for more information on this matter.
Application for Candidacy
Within two weeks after the start of the last semester when the student expects to complete the requirements for the doctorate, the student needs to submit an Application for Candidacy to the Office of the Registrar.

The Doctoral Application for Candidacy form is available from the Office of the Registrar website at: https://www.stevens.edu/sites/stevens.edu/files/files/registrar/SPAC/SP-AC_Doctoral.pdf

Public Defense
At the completion of the research, the candidate must defend their dissertation in a public presentation. A private defense, which is limited to the DAC, is required prior to scheduling the public defense. The scheduling of the public defense requires passing the private defense by the majority of the DAC, with at most a single negative vote. The private defense can be waived with approval by the majority of the DAC, with at most a single negative vote. All students are strongly encouraged to meet individually with the DAC before the public defense to ensure that the dissertation has met their expectations.

After the dissertation has been accepted and approved by the DAC, the student, in conjunction with the School of Systems and Enterprises, shall schedule the final public oral examination. The dissertation abstract shall be submitted to the Office of the Registrar to publicize the public defense of doctoral dissertation at least ten working days before the examination. The Defense must take place at least three weeks before Commencement. The final dissertation document must be made available to the DAC for distribution to the public at the time of scheduling. It is strongly encouraged that all SSE research faculty members attend the public defense. To pass the final examination, a degree candidate must have a favorable vote from a majority of the DAC, with at most a single negative vote.

If a student fails the public defense, there must be a lapse of one full semester (15 weeks) before rescheduling the defense. A student is allowed no more than two opportunities to successfully defend the dissertation. If a student fails, they must either disenroll from the program or exit the program with a master’s degree.

The Dissertation Defense Report form filled out by the DAC can be found at the Office of the Registrar website at: https://my.stevens.edu/system/files/doctoral_defense_report.pdf

Post Graduation
After graduation, it is strongly encouraged that the student remains in contact with Stevens and provides SSE with changes in contact information. In addition, SSE may send out surveys and questionnaires periodically that the student should fill in and return.

Student Academic Loads
A student who has been accepted into the doctoral program is allowed a maximum of six years to complete the requirements for the doctoral degree. The goal of SSE is to have full-time students complete the program in about three to four years, provided that they have already completed the courses required for a master’s thesis and they start their research in their first year (Figure 1). The goal for part-time students is to complete the program in about five years (Figure 2).
Figure 1 - Recommended Full Time Student Progression

Figure 2 - Recommended Part Time Student Progression
Appendix A - Draft Structure of a Doctoral Dissertation

The major difference between the traditional and portfolio approaches is that in the traditional approach all of the text is contained within the body of the thesis, while in the portfolio approach information is referenced from the body to papers included in the appendices. In both cases, the same information is presented albeit in a different format. In the following example, the portfolio modifications are noted in “[..]”.

i. Abstract
ii. Acknowledgement
iii. Table of Contents
iv. List of Tables
v. List of Figures
vi. List of Symbols

Chapter 1: Introduction and Problem Setting [Strong reference to first paper]

1.1 Introduction [extended concept paper]
1.2 Overview of the Problem Domain
1.3 Problem Statement
1.4 Research Objectives
1.5 Uniqueness of this Research
1.6 Dissertation Organization and Structure

Chapter 2: Literature Review and Taxonomy (illustrative) [Strong reference to second paper]

2.1 Approach One
2.2 Approach Two
2.3 Taxonomy Development
2.4 Restatement of the Research Thesis and Hypothesis

Chapters 3, 4, and 5 can address the Model – Development, Analysis and Experiment, Validation and Results [Strong reference to third and fourth papers]

Chapter 6 can address Final Conclusions, Restatement of the Uniqueness of this Research, and a Statement and Description of Future Research

[All of the above can be summarized in 50-75 pages]
[First Technical Paper (Addressing the “What”)]
[Second Technical Paper (Addressing the “Why”)]
[Third and Fourth Technical Papers (Addressing the “How”)]

Any Appendices and References (All synthesis, analysis, modeling, experimental, testing, validation details can be contained in the appendices)

Vitae
Appendix B – Ph.D. Research Assessment

PROPOSED Ph.D. ASSESSMENT FOR SCIENCE AND ENGINEERING – Stevens Institute
David Vaccari, Dept. Head for Ocean and Environmental Engineering
Siva Thangam, Professor & Dean of Academic Administration

Two metrics are proposed for assessing the doctoral work at Stevens Institute of Technology:

1. The percentage of graduates with doctoral degrees who have at least a peer-reviewed journal article of their thesis published within two years of graduation. Impact factors of the journals should be reported.

2. Criteria for evaluation of the thesis and defense by the Thesis Committee, with a rubric.

The first of these amounts to an external evaluation or benchmarking of the thesis. The goal is for 100 percent of theses to be published in peer-reviewed journal articles. The degree to which it is met will be an index of the quality of the program.

The proposed metric is summative, that is, it is an after-the-fact measurement of performance, and thus is used to improve the program, not the individual thesis.

For the second metric, we have identified a more detailed set of criteria than those described above. The criteria we propose for the thesis and for the oral defense include:

- The work is original and novel; that is, it uses methods or produces results which are not generally anticipated, or which may not be obvious to others in the field.

  *Originality should be judged relative to existing work in the same field.*

- The work advances the state of the art in the relevant field.

  *The work should push the boundaries of the field either in a new direction or further along the lines of previous work.*

- The state of the art is well-described in the literature survey.

  *The candidate should show through the literature survey that he/she has mastered the literature on the subject, understands the theory and methodology and is able to critically evaluate the work that has gone before and its relationship to the current work.*

- The work has academic or practical utility.

  *In other words, the results of the thesis could be used by others to do useful things that are difficult or impossible without the results, including the production of further advances in the state of the art.*

  *Academic utility is defined to mean that the work is likely to be used for further advances in the development of the field, such as experimental results that suggest the need for new theory, or
theoretical results that suggest the need for new data. In other words, the result of this work could be to stimulate further research by others.

Practical utility means that the work has the potential to be used for the sake of the results themselves, such as the ability to make useful predictions or to design a new process or product. Other characteristics of Ph.D. work which may be unique to science and engineering (as opposed to, say, humanities theses) are:

- The work uses advanced techniques, or techniques which are new to the field.

  Utilization of new techniques can provide new insights not previously accessible.

- The work has elements of both theory and experiment.

  Theoretical results may be used to suggest experimental design, or the theory itself may be a major outcome of the work. Experiment may be used to validate new or existing theory, or to probe natural behaviors to suggest the need for new theory or understanding.

In addition, the mission of Stevens Institute of Technology has led us to define several additional criteria, which are:

- The work has considered the potential to result in marketable new technology.

  When relevant, intellectual property (IP) issues should be addressed in the thesis, and the potential identified.

  This criterion arises from Stevens long tradition of enterprise and innovation that started with the Stevens founding family, which has been incorporated into its mission. Stevens has pioneered the concept of Technogenesis as the educational frontier, where faculty, students and industry jointly nurture research concepts to commercialization and back to the classroom. It is more than technology transfer, it is part of the Stevens educational experience and creates a climate of innovation and enterprise across the campus.

- The Ph.D. candidate demonstrates the ability to communicate at a high level, both written and orally.

  The written thesis should present technical information with adequate detail and clarity, and the Ph.D. candidate should present the information orally with clarity demonstrate the ability to “think on their feet” and respond to verbal inquiries clearly, succinctly and accurately.
# Engineering Ph.D. Thesis and Defense Assessment RUBRIC

*Stevens Institute of Technology*

## CRITERIA

<table>
<thead>
<tr>
<th>CRITERIA</th>
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<td><strong>Originality and novelty</strong></td>
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<td>Work incrementally improves on previous approaches</td>
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<td>Results are obvious or easily anticipated</td>
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<td>Incrementally advanced the knowledge in the field</td>
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<td>Complete and concise, but not adequately critical</td>
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<td>Comprehensive and critical</td>
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<td><strong>Possesses Practical and/or Academic Utility (Potential Impact)</strong></td>
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<td>Work is unlikely to be useful to others</td>
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<td>Work has a low likelihood to be used by others</td>
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<td>Work is reasonably likely to be used by others</td>
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<td>Work has strong potential for use by others either in applications or in further research</td>
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<td><strong>Uses new or advanced techniques</strong></td>
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<td>Uses only primitive methods</td>
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<td>Uses only simple and long-established methods and techniques</td>
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<td>Uses standard methods commonly known in the field</td>
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<td>Uses the most advanced established methods</td>
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<td>Uses leading-edge methods not applied before in this field or newly developed methods</td>
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<td>Does not involve any theoretical development or predictions</td>
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<td>Incorporates standard theory in the field</td>
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<td>Incrementally advances theory currently used in the field</td>
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<td>Significantly extends existing theory in the field</td>
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<td>Involves theory that represents a break with the state-of-the-art</td>
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<td><strong>Has elements of experiment</strong></td>
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<td>There is no data collection or usage</td>
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<td>Few data are collected or relies on data from others</td>
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<td>Data collection is a minor part of this work</td>
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<td>Data collection is a major part of this work</td>
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<td>Employs sophisticated and novel experimental methods</td>
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## CRITERIA

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<td>No IP issues recognized or addressed</td>
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<td>Some recognition of IP issues</td>
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<td>IP issues considered but there is limited IP potential</td>
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<td>Significant consideration of IP issues and demonstrated IP potential</td>
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<td>Well defined IP context and strong IP potential</td>
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<td>Missing significant details or very difficult to read</td>
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<td>Disorganized or lacking in some details</td>
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<td>All details are present, but requires some effort by reader</td>
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<td>All details are present, organization is adequate</td>
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<td>Comprehensive, elegantly and clearly written</td>
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<td>Poor quality visuals or inarticulate presentation</td>
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<td>Some visuals need improvement or presentation is not confident</td>
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<td>All visuals adequate and presentation is confident</td>
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<td>Significant effort evident in visuals, and presentation is confident</td>
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<td>High production quality and articulate presentation</td>
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<td><strong>Responsiveness to questioning</strong></td>
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<td>“Freezes up” or generally unable to adequately handle questioning</td>
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<td>Often isn’t able to respond to questions, or requires prompting</td>
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<td>Makes satisfactory responses on their own to most questions</td>
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<td>Clearly understands the issues raised and always makes satisfactory responses</td>
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<td>Articulate and thorough, demonstrates complete mastery of the topic</td>
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Committee members should provide written comments on the issues noted above that most need improvement (use back or separate sheet).
# Engineering Ph.D. Thesis and Defense Assessment Form

(DRAFT, INCOMPLETE)

Stevens Institute of Technology

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The work is original and novel; that is, it uses methods or produces results which are not generally anticipated, or which may not be obvious to others in the field

<table>
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<tr>
<th>Rating before defense (based on thesis)</th>
<th>Rating after defense:</th>
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Comment on candidate performance:

Comment on criteria or rubric: