Doctoral Student Handbook


October, 2015

Note: This document will be updated on a regular basis and information, such as website links, are subject to change.
This document is meant to serve as a supplement to the Graduate Student Handbook.¹

Doctoral Program Objectives
The Institutional Vision: Stevens believes that solutions to many of the critical problems that face humanity can be found in improved use and understanding of technology, and that it is the duty of the Institute to produce engineers, scientists and business leaders prepared for this challenge. Stevens five year vision is to be recognized as a premier technological university noted for its distinctive educational and research programs and its impact on issues of national and global significance.

The School of Systems and Enterprises Vision: SSE’s vision is to provide a foundation for solving critical national and global challenges of the 21st Century through the use of state-of-the-art systems approaches. Our mission is to be the preeminent provider of systems-centered research, knowledge, tools, teaching/training and partnerships to significantly impact the most complex challenges of national and global significance.

As a result, it is the objective of the SSE Doctoral program to educate the thought and technical leaders who will have 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 or industry. To prepare our graduates for these positions of leadership we aspire to ensure that they will have:

- A solid foundation in research methods and methodologies
- Core competencies in system modeling and analysis
- A unique “systems” perspective on how they address engineering and governance challenges
- A track record of publication in peer-reviewed journals by the time they graduate
- Proven written and oral communication skills

School Overview

¹ The Graduate Student Handbook can be found on the Office of Graduate Academics website at:
http://www.stevens.edu/gradacademics/handbook/doctoral.html
Today’s engineered systems are more complex than their predecessors, not only in the sophistication of elements from which they are constructed, but also in the number and nature of the interconnections between the elements. System failures today, whether an automobile malfunction on a busy highway or loss of a spacecraft on a distant planet, are more likely to result from an unanticipated interaction between elements than from the failure of a single element. Software-intensive systems represent a special challenge because of the myriad of possible logic paths that can be woven through their code. And as Moore’s law continues to drive down the size of computers and drive up their speed and power, software that was once deeply embedded within physical components has begun to emerge, enabling connectivity between elements of the system/enterprise that would have been unimaginable only a few years ago.

While the complexity of technical systems continues to grow, equally as exciting is the emergence of a new class of systems, one for which there is no central control. Perhaps as most readily exemplified by the Internet, such systems are characterized by the autonomy enjoyed by their elements, each one acting locally to achieve its individual purpose without benefit of centralized control. And yet, because the elements are richly interconnected, such systems are capable of self-organizing to produce emergent behavior for which they have not been specifically designed. Today, we are only beginning to scratch the surface in exploring the possibilities represented by these decentralized systems, perhaps more properly known as systems of systems. Understanding their behavior, and perhaps even more ambitiously, determining how to create conditions that result in them producing favorable outcomes, will keep researchers and designers occupied for many years to come.

Enterprises represent a special case of systems of systems, one with enormous economic importance. While not traditionally considered within the same domain as technical systems, enterprises are increasingly being seen as representatives of a broader class of human-designed systems, of which technical systems are only one part. A traditional systems engineer would certainly recognize the simplest definition of an enterprise, three or more people engaged in purposeful activity, as a system. Even this simple enterprise comprises elements (people) working together to achieve a common purpose. But today’s global enterprises are far more complex than this simple definition implies. Enabled by a revolution in communications and information technologies, they may be among the most complex systems ever conceived by humans. In a sense, treating them in the same class as technical systems represents a natural evolution, from enterprise systems as enabling technology, to enterprises as systems of cross functional processes, to enterprises as systems in their own right. Certainly, as we look at extended enterprises, whose elements may be independent firms widely dispersed across the globe, each with their own motivations, expertise, cultures and organizations, yet collectively working together to produce a product or service valued by customers; we find that the challenge of designing, managing, evaluating and optimizing these systems is the equal of any other in industry today.

It is in this context that Stevens created the School of Systems and Enterprises (SSE) with the mission to “create knowledge and understanding at the confluence between Systems and Enterprises with the emphasis on the meaning of and”.

Within SSE, we are committed to the educational and research philosophy that we refer
to as the “Open Academic Model” which guides us as follows:

• We will develop meaningful alliances with academic partners to develop and leverage “best of breed” thinking and competencies in our instructional and research initiatives, leading to the greatest benefit to our students and our sponsors.

• We will blur the boundary between the academic setting and the industry/government reality in our instructional and research approach. This will be achieved through:
  
  o Bringing a fresh perspective to industry and government in an executable form – a specific method, tool, heuristic or template.
  
  o Bringing the industry and government reality into academia in a researchable or usable form – a problem statement, a specific challenge, guest instructors, heuristics and case studies.

We believe that this concept of developing strategic and mutually beneficial alliances and partnerships is critical to the development of the “industry as laboratory” concept, and this is a key tenet of our research strategy. It is also essential to engage in a rigorous research endeavor that is grounded in relevance.

**Admission to Doctoral Program**

The programs leading to the Doctor of Philosophy (Ph.D.) degree are designed to develop the student’s ability to perform research or high-level design in Systems Engineering, Financial Engineering, Engineering Management and/or Enterprise Systems. Admission to the Doctoral program is made through the school’s Committee on Doctoral Admissions (CDA) and is based on a review of the candidate’s scholastic record, professional accomplishments and fit between his/her 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 CDA is chaired by the SSE Associate Dean for Research with representation from each of the major Doctoral 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 his/her ability to pursue advanced studies and perform independent research. Typically a GPA of 3.5 or better at 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 scoring at least 550 (210 for computer based) on the TOEFL examination.

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 Enterprise Systems.

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2 Options for Ph.D. degrees in Software Engineering may be available in the future.
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 [http://sse.stevens.edu/nc/people/faculty/] and identify those who they believe are most closely aligned 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 his/her ability to communicate effectively and reflects the maturity of his/her research aspirations. Each applicant must also submit an example of his/her written technical work. This work should be written solely by the applicant; published work if available 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
- TOEFL > 550 (scores for non-native speakers of English)
- 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

While applications are accepted in 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 15th for entry in the fall semester and by August 15th for entry in the spring semester. Applicants who have submitted complete applications by these dates will be notified of their admission decision by April 30th and September 30th, 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.

Role of Doctoral Advisor
Upon acceptance into the Doctoral program, each student will be assigned a Doctoral Advisor based on their stated research interest noted in their Statement of Purpose. The Doctoral Advisor serves the dual role of academic and research advisor with the purpose of getting the student started with his/her 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/tenure-track faculty member, professor emeritus or an approved faculty member within SSE. A change can be made of the Doctoral Advisor through the mutual consent of the current and proposed advisor with approval by the SSE Associate Dean of Research.

The Doctoral Advisory Committee (DAC)
A DAC is composed of at least four members; one of whom is the Doctoral Advisor serving as Chair, and the other must be a Stevens professor from another department or program outside of SSE. It is permissible and desirable to have as a committee member a highly qualified person from outside Stevens. It is strongly recommended that at least three of the DAC members are from 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 SSE Associate Dean of Research.

Prior to the Qualifying Exam, the Doctoral Advisor and the Doctoral student 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 SSE Associate Dean of Research (who fills the role of Department Director) and the Dean of Graduate Academics for approval. Once a DAC is formed, it cannot be changed without the approval of the current and new committee members; appeals may be made to the SSE Associate Dean of Research. 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: http://www.stevens.edu/sit/sites/default/files/Doctoral_Committee_Nomination.pdf

Study Plan
The student and his/her Doctoral Advisor will create a study plan which 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 his/her 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.


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 and 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:
Research Credits and Activity Report

Doctoral students must register for SYS960 credits 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:
http://www.stevens.edu/sit/sites/default/files/Doctoral_Activity.pdf

SSE Doctoral Research Symposium

Each Doctoral Candidate (a Doctoral student who has passed his/her Qualifying Exam) is required to attend the SSE Doctoral Research Symposium which are usually scheduled on Monday and Tuesday of Spring Commencement Week. At this session, the Doctoral Candidate will be required to present his/her 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 SSE Associate Dean of Research 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.

By Institute policy, 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 the 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 his/her 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.

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

It is an Institute policy that 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 his/her recommendation to the Dean of Graduate Academics.

It is also an Institute policy that 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 his/her 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: http://www.stevens.edu/sit/sites/default/files/Leave_of_Absence-2_0.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 SSE Associate Dean of Research.

The Committee on Doctoral Admissions (CDA) 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 CDA in concert with the Doctoral Advisor reserves the option to 1) place the student on probation such that he/she 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 him/her 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 for the degree. Students who have completed or have 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: http://www.stevens.edu/sit/sites/default/files/D999_0.pdf
Course and Major
Program change and change of enrollment forms can be found at:
http://www.stevens.edu/sit/sites/default/files/Program_Change.pdf
http://www.stevens.edu/sit/sites/default/files/Change_of_Enrollment-modified-july-2010_0.pdf

Institute Doctoral Task Force
An Institute Doctoral Task Force was established to “develop requirements, structures and standards at the Institute level to enhance Ph.D. education at Stevens. The objective is to better prepare Stevens graduates to function in both the professional and academic environments. Enhancements are to include broad-based knowledge of an interdisciplinary nature and involving management skills, inculcation of the innovative mind set and a great emphasis on communication skills.” This task force reviewed a number of areas in which this may be accomplished, including standards in innovation processes, teaching and communication and curriculum.

While a number of the task force’s recommendations have already been incorporated in the SSE Doctoral Program, there are two additional changes of note. To allow full time students the possibility of completing their credit requirements in three academic years, the minimum number of required credits beyond the master’s degree was reduced from 60 to 54 credits. To ensure that the doctoral educational experience includes an appreciation for multidisciplinary research, there is a new requirement for the completion of three credits from Stevens Doctoral Signature course(s) which are focused in the topic areas of systems thinking, entrepreneurship, and communication skills.

Doctoral Requirements Summary
The following is a summary of the requirements for a Doctoral degree 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

- **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 the 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. To be eligible for this credit reduction, all doctoral students must successfully complete a Stevens Institute three credit signature course, PRV 961 which will be available starting Fall 2012. This signature course will be an Institute requirement for all doctoral students entering the program beginning in the Fall of 2012 and is to be taken during the semester in which the student is expecting to undergo his/her Proposal Defense. Students enrolled in the SSE Doctoral program prior to Fall 2012 who elect not to take the signature course will be required to have a minimum of 90 graduate credits and a minimum of 30 dissertation research credits.

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 his/her chosen field, ensure consistency in skill set standards and provide a common experience between students, there are a number of core courses requirements which are effective for students entering the program in Fall 2011. The course requirements are as follows:

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

• **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 Associate Dean of Research):
  - Quantitative Methods
    - EM605  Elements of Operations Research
    - FE610  Stochastic Calculus for Financial Engineers
    - FE621  Computational Methods in Finance
    - 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
- FE620  Pricing and Hedging
- FE630  Portfolio Theory and Applications
- FE635  Financial Enterprise Risk Engineering
- FE655  Systemic Risk and Financial Regulation
- FE680  Advanced Derivatives

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

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

Note that each Doctoral 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.

**Qualifying Exam**

The purpose of the Qualifying Examination is to assess the candidate’s ability to conduct independent, Doctoral-quality research, communicate effectively and develop original ideas in his/her chosen area of research interest. The candidate should develop a “Research Interest Statement” (see appendix A for guidance) that articulates his/her research interests. Students are encouraged to take one or two SYS/EM/ES 8010 courses, to collaborate with their Doctoral Advisor and to develop the details of their research statement that will provide a context for their dissertation research. It is suggested that the students should typically take this course as their 5th or 6th course.

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, with the actual timing to 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 Associate Dean of Research. All students enrolled in the SSE Doctoral Program on or before Fall 2010 must take their qualifying exam by August 31, 2013 or be removed from the program. Students enrolled in the Doctoral Program after Fall 2010 and prior to Fall 2012 may have a maximum one year extension with approval by their Doctoral Advisor (e.g., a
student enrolled on September 1, 2011 may petition to take their qualifying exam as late as August 31, 2014).

Students are permitted to enroll in a maximum of 9 dissertation credits (SYS960) prior to taking the Qualifying Examination, with permission from his/her 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.

The Qualifying Examination has two components – written and oral. For the written component, the candidate sends to his/her Doctoral Advisor an electronic copy of his/her Research Interest Statement, which the Doctoral Advisor distributes to the rest of the DAC. Upon receiving the Research Statement, each member of the DAC will develop two or three questions intended to examine the candidate’s ability to conduct research and synthesize objective and cogent responses to these questions. These questions may or may not be based on the student’s research statement. However, they will require critical review of relevant papers and comprehensive assessment of the significance of anticipated research within the related literature, both academic and practitioner. The Doctoral Advisor will collect these questions from the DAC, synthesize them into a single exam and transmit them to the student. The student is expected to respond to all questions within two weeks, responding with an electronic copy of responses to all questions the day the exam is due (it is highly recommended that part-time Doctoral students take time off from work as this exam is extremely taxing, and it is extremely difficult to pass while also working full-time).

While the structure and duration of the Oral Examination is determined by the DAC, the following is a brief description of a typical process. The student presents the answers that he/she has proposed to each of the questions in the written exam. This presentation may take approximately 1-2 hours. The student generally has access to any materials needed to present the justification for his/her responses. The DAC may ask additional questions, which are likely to be based on the student’s responses and may extend into areas beyond the Research Interest Statement. These questions may be asked during or after the presentation, depending on the DAC’s preference. The duration of the question and answer period will be determined by the DAC and should be sufficient to allow a determination of pass or fail.

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: http://www.stevens.edu/sit/sites/default/files/Doctoral_Qualifying_Exam_Report.pdf

Proposal Defense

A student pursuing a Doctoral degree should demonstrate, through the Qualifying Exam, this proposal and ultimately the dissertation, the ability to conduct high-quality, original and creative research. The writing style, grammar and spelling of the proposal and the 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 his/her DAC why and how he/she proposes 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 his/her 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 his/her Doctoral Advisor within seven days of its completion. To pass the Proposal Defense, a degree 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, he/she has the option to complete the requirements for a Master’s degree and exit the Doctoral program or schedule a second defense within one semester whileremedying 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:

The 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 B. A proposed rubric for the assessment of Doctoral Research is shown in Appendix C.)

(See http://www.stevens.edu/library/services/phd.html for specific formatting and submission information.)

All research that involves human subjects requires Institutional Review Board (IRB) approval. See http://www.stevens.edu/osr/humans/ for more information on this matter.

Application for Candidacy
Within two weeks after the start of the last semester in which 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.


Public Defense
At the completion of the research, the candidate must defend his/her 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, he/she 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:


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. Our goal is to have full-time students complete the program in about three 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).
Appendix A – Qualifying Exam Research Interest Statement Sample Form

The Research Interest Statement (RIS) should contain two major headings: Research Interest Summary; Research Interest Statement. Below is guidance on what should be contained in each of these sections.

Research Interest Summary
The Research Interest Statement (RIS) must contain a Summary of the proposed interest suitable for public release, not more than one page in length. It should not be an abstract.

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3 This is an adaptation of the National Science Foundation’s proposal guidance.
of the RIS, but rather a self-contained description of the RIS that in and of itself could “sell” the research interest. The summary should be written in the third person and include a statement of objectives and methods to be employed. It must clearly address in separate statements (within the one-page summary):

- the intellectual merit of the proposed activity
- the broader impacts resulting from the proposed activity

It should be informative to other persons working in the same or related fields and, insofar as possible, understandable to a scientifically or technically literate lay reader. An RIS that does not separately address both merit review criteria within the one-page summary will be considered unacceptable.

**Research Interest Statement**

**i. Content**

The student’s RIS will be reviewed utilizing the two merit review criteria previously mentioned and described in greater length under Review Criteria. The RIS should provide a clear statement of the work to be undertaken and must include: objectives for the period of the dissertation work and expected significance; relation to longer-term goals of the Doctoral student's interest; and relation to the present state of knowledge in the field, to work in progress by the Doctoral student under other support and to work in progress elsewhere.

The RIS should outline the general plan of work, including the broad design of activities to be undertaken, and, where appropriate, provide a clear description of experimental methods and procedures and plans for preservation, documentation and sharing of data, samples, physical collections, curriculum materials and other related research and education products. It must describe, as an integral part of the narrative, the broader impacts resulting from the proposed activities, addressing one or more of the following as appropriate for the project: how the project will advance discovery and understanding of the topic, how the results of the work will be disseminated broadly to enhance scientific and technological understanding and potential benefits of the proposed activity to society at large.

**ii. Format**

Brevity will assist reviewers in dealing effectively with the RIS. Therefore, RIS should target approximately 25 pages in length. Visual materials, including charts, graphs, maps, photographs and other pictorial presentations are included in the page count. Doctoral students are cautioned that the RIS must be self-contained and that URLs that provide information related to the RIS should not be used because 1) the information could circumvent page limitations, 2) the reviewers are under no obligation to view the sites, and 3) the sites could be altered or abolished between the time of submission and the time of review. The text should be left margin justified single column with top, bottom, left and right margins of at least 1 inch. All text should be in the same font (10-12pt) and single-spaced except for the RIS title (no greater than 14 pt) and text in tables, figures and comments (no less than 10pt). Citations and referencing should follow
either APA or Chicago style. References are NOT considered part of the 25-page limitation.

iii. RIS Review Criteria
All RIS are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, we may employ additional criteria as required to highlight the specific objectives of certain research activities.

The two merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions, and not all will apply to any given RIS. While Doctoral students must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the RIS being considered and for which the reviewer is qualified to make judgments.

(1) What is the intellectual merit of the proposed activity?

How important is the research interest to advancing knowledge and understanding within its own field or across different fields? How well qualified is the Doctoral student to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the research interest suggest and explore creative, original or potentially-transformative concepts? How well-conceived and organized is the RIS? Is there sufficient access to resources?

(2) What are the broader impacts of the proposed activity?

How well does the proposed research advance discovery and understanding? To what extent will it enhance the body of knowledge for research in the area? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?
Appendix B - 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 C – Ph.D. Research Assessment

PROPOSED Ph.D. ASSESSMENT FOR SCIENCE AND ENGINEERING – Stevens Institute
David Vaccari, Dept. Head for Ocean and Environmental Engineering
Siva Thangan, 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% 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 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 his/her feet” and respond to verbal inquiries clearly, succinctly and accurately.
### Engineering Ph.D. Thesis and Defense Assessment RUBRIC

**Stevens Institute of Technology**

#### CRITERIA

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<td>High production quality and articulate presentation</td>
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<td>Responsiveness to questioning</td>
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<td>Makes satisfactory responses on his/her 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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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

## Candidate Name:

__________

## Committee Member:

________________________

## Date of Defense:

________

## Instructions:

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<td>Work incrementally improves on previous approaches</td>
<td>Work is cleverly designed and/or represents a significantly new direction or approach</td>
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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

Rating before defense (based on thesis)  

Rating after defense:

## Comment on candidate performance:

## Comment on criteria or rubric:
Revision History

V1.0 October 1, 2010 – Initial version.

V1.1 September 1, 2011

• Added specific courses for the Core Courses in the area of Quantitative Methods and Economics, Financial Systems & Policy.
• Added clarification on the Dissertation Defense process.
• Added information on SSE Doctoral Research Symposium that will occur only once per year on the Monday and Tuesday of Spring Commencement Week.
• Added information on SYS960 registration.
• Added information on SYS801 registration.
• Changed maximum number of research credits prior to Qualifying Exam from ten (10) to nine (9) to conform to Institute requirements.
• Updated Institute Doctoral Task Force & Core Courses section with new minimum credits and signature course information.
• Corrected typographical errors.

V1.2 September 1, 2012

• Added policy on completion of incompletes.
• Updated Qualifying Exam policy to include a 3.5 GPA requirement for taking the exam, a two year time limit for its completion for all students and the need to retake the exam within one semester of an initial failure.
• Updated Doctoral Credit requirements to reflect new Institute policy of reduction in credits from 90 to 84 and reduced the SSE minimum research credits from 30 to 15 for consistency.
• Relaxed page count limitation in RIS.
• Added program change and change of enrollment form location information
• Updated links to doctoral administrative forms
• Corrected typographical errors

V1.3 January 28, 2013

• Removed references to tuition reimbursement for the Stevens Doctoral signature course.

V1.35 February 11, 2013

• Added back Qualifying Exam section inadvertently deleted in V1.3.

V1.4 October 22, 15

• Deleted GRE Waiver Information