1. PROGRAM DESCRIPTION

1.1 Doctor of Philosophy is an advanced graduate degree for those wishing to contribute to knowledge through independent, original research at the cutting edge of systems engineering. The program provides a springboard for careers as academicians, researchers, consultants, and higher-level engineering managers in universities, institutes, industry, and government.

1.2 Doctoral students should possess initiative, inquisitiveness, ingenuity, and perseverance. Our program affords each student the flexibility to design a plan of study that fulfills the individual's career objectives and intellectual aspirations. The primary concern of the faculty is to give each student guidance to and opportunity for a complete educational experience and superior professional preparation. Towards that end, the program includes four components.

- **Courses** through which the student acquires fundamental and advanced knowledge.
- **Colloquium**, a regular meeting of graduate students and faculty for presenting and discussing contemporary systems problems and research.
- **Research** conducted individually, under the guidance of a faculty advisor, and leading to a doctoral dissertation and scholarly papers.
- **Participation** in the intellectual life of the University.
2. DEGREE REQUIREMENTS

2.1 A candidate for the Ph.D. degree must fulfill the general requirements of the School of Engineering and Applied Science and the following specific requirements.

- **Complete an approved plan of study** consisting of at least 24 credit hours of courses, 2 credit hours of colloquium, and 24 credit hours of research – all credit hours beyond the master's degree.
- **Pass a comprehensive examination.**
- **Present satisfactorily a dissertation proposal.**
- **Present at least one colloquium.**
- **Publish, or have under review**, at least one scholarly paper in an archival journal, and publish at least one paper in conference proceedings.
- **Defend satisfactorily a dissertation.**

2.2 The nominal sequencing and timing of the doctoral program requirements is as follows:

**Year 1**
1. Identify a RESEARCH AREA.
2. Establish a WORKING RELATIONSHIP with the faculty advisor.
3. Form an ADVISORY COMMITTEE.
4. Develop and submit a PLAN OF STUDY.

**Year 2**
1. Finish taking COURSES.
2. Take COMPREHENSIVE EXAMINATION.
3. Develop a PLAN OF RESEARCH.
4. Present DISSERTATION PROPOSAL.
5. Petition for ADMISSION TO CANDIDACY.

**Year 3**
1. Present COLLOQUIUM.
2. Submit a paper for PUBLICATION.
3. Defend DISSERTATION.

2.3 The student must complete all the requirements for the Ph.D. degree within seven years after admission to the doctoral program. Expired credits may be revalidated upon approval of the faculty advisor, the department chair, the SEAS graduate studies committee, and the Office of the Dean.
3. ADVISORY COMMITTEE

3.1 Upon admission to the program, the student is assigned a faculty advisor by the Graduate Programs Director (Form G104). The student should meet with the advisor to initiate a planning effort.

3.2 As soon as the student identifies the research area, an advisory committee should be proposed (Form G103) to the Graduate Programs Director, who approves it and recommends it for appointment to the Office of the Dean. The advisory committee consists of at least 4 members: 2 members representing the major area of study, and 2 members each representing one minor area of study. At least three members must have their primary appointments (not joint appointments) on the Systems and Information Engineering faculty; they must be tenured, or tenure-track, or research faculty. At least one member should be from outside the department.

3.3 The advisory committee meets with the student as soon as possible to assist in planning study and research. The committee recommends formal courses to be taken, discusses with the student research objectives and the plan of research, and advises the student on the areas which must be covered by the comprehensive examination.

3.4 The advisory committee meets with the student as needed to review progress and, if necessary, to assist the student in revising the plan of study or the plan of research.

4. PLAN OF STUDY

4.1 Immediately upon entering the program, the student should engage in a thorough and intensive planning effort in order to

   (i) crystallize academic and career objectives,
   (ii) identify a research area, and
   (iii) establish a working relationship with the faculty advisor who agrees to direct the research, and with other faculty members in the area of the student's interests.

This planning effort culminates in a plan of study.

4.2 The plan of study (Form G102) must be submitted to the advisory committee for approval no later than the end of the second semester of doctoral study. Then it must be approved by the Graduate Programs Director and the Office of the Dean.

4.3 The approved plan of study may be revised if necessary; the new plan must be submitted on Form G102 for approval.

4.4 A student completing a master's degree in systems engineering at the University of Virginia and wishing to enter the doctoral program must request admission using Form G123 before submitting the plan of study.
4.5 When preparing the plan of study, the student should seek a balance between the breadth of fundamental knowledge and the depth of advanced knowledge. The following conditions apply.

- **Prerequisites.** SYS 6001, SYS 6003, and SYS 6005, or equivalent. Equivalent courses must be approved by the departmental graduate programs committee.

- **Courses.** At least 24 credit hours of courses beyond the master's degree, including at least 6 credit hours of graduate mathematics. All courses beyond the bachelor's degree must be included in the plan of study.

- **Transfer Credit.** Courses transferred from other institutions of recognized standing must be included in the plan of study. The credit transfer must be requested separately on Form G112 to which the following documents must be attached: a description of course content and level, a transcript, and a letter certifying that the course has not been used to satisfy requirements for another degree.

- **Colloquium.** At least 2 credit hours of systems engineering colloquium, SYS 7096, beyond the master's degree. The colloquium is a regular meeting of graduate students and faculty for presenting and discussing contemporary systems problems and research. Each doctoral student must present at least one colloquium prior to defending the dissertation.

- **Research.** At least 24 credit hours of research towards dissertation, SYS 9999. The research is performed under the direction of the faculty advisor and the advisory committee, and is documented in a written dissertation.

4.6 Besides working to complete the plan of study, the student should exploit the vast opportunities for intellectual enrichment that the University offers. In particular, the student is expected to actively participate in various colloquia, defenses of master's theses, presentations of doctoral dissertation proposals, and defenses of doctoral dissertations. Being an active member of the academic community and a contributor to its intellectual life is viewed by the faculty as an essential prerequisite for admission to candidacy for the doctor's degree.
5. COMPREHENSIVE EXAMINATION

5.1 The student should take the comprehensive examination within 18 months of starting the doctoral program.

5.2 The comprehensive examination requires the student to demonstrate
   (i) mastery of materials from the courses prerequisite for the Ph.D. degree:
       SYS 6001, SYS 6003, and SYS 6005,
   (ii) a deep understanding of a body of advanced knowledge,
   (iii) a degree of sophistication in analyzing and synthesizing this knowledge, and
   (iv) superior communication skills.

The examination covers a broad spectrum of subjects within the student’s major and minor areas of study. These areas are proposed by the student in harmony with the plan of study and must be approved by the advisory committee. The major areas should constitute a subset of systems engineering (systems analysis, design, and integration; decision theory and risk analysis; optimization and control; probability, simulation, and forecasting; human factors) and should include the fundamentals of systems engineering covered in one of the methodological courses. The minor areas may fall outside systems engineering (e.g., within civil engineering, computer engineering, environmental sciences, mathematics, statistics, economics, cognitive psychology).

5.3 The examination consists of two parts, written and oral, and must be passed as a whole. The following guidelines apply.

- The examining committee must include the student’s advisory committee, and may also include additional members. The request to appoint the examining committee (Form G105) must be submitted at least 14 days before the proposed start of the examination. The request must be approved by the Graduate Programs Director and by the Office of the Dean.
- The student proposes a list of readings organized by topics and subtopics in the major and minor areas. The list must be approved by the advisory committee.
- The student proposes the examination schedule. Each member of the examining committee prepares written questions related to the list of readings. The student has 10 days to answer in writing the questions. The oral examination takes place within one week of returning the answers.
- The test of satisfactory performance is whether in the professional judgment of the examining committee the student has demonstrated advanced knowledge and expert qualifications to such a degree that the faculty members are, or soon will be, willing to accept the student as a junior professional colleague. Feedback is given to the student at the end of the oral examination. A student who does not give a satisfactory performance may be allowed, upon the recommendation of the examining committee, to retake the examination within 6 months. The examination cannot be retaken more than once.
- Form G107 is used to report the outcome of the examination.
6. DISSERTATION PROPOSAL

6.1 A written dissertation proposal must be submitted to the advisory committee, and then presented orally in a public examination. This examination should take place no later than 12 months following the qualifying examination.

6.2 The proposal should state the research objectives, assess the state of the art, outline the proposed method of investigation, and discuss the anticipated results and their significance. The document should not exceed 20 pages, double-spaced.

6.3 The examination of the dissertation proposal should be planned and conducted in accordance with the following guidelines.

- The examining committee must include the student’s advisory committee, and may also include additional members. The request to appoint the examining committee (Form G105) must be submitted at least 14 days before the proposed examination date. The request must be approved by the Graduate Programs Director and by the Office of the Dean.
- The examination should be scheduled when the university is in regular session, i.e., between the first and last day of classes. This is usually December 1 in Fall semester, April 15 in Spring semester, and August 1 in Summer session.
- At least 2 hours must be allotted for the examination.
- The announcement of the examination must be distributed at least 14 days prior to the examination to all SEAS faculty and SIE graduate students.
- A copy of the dissertation proposal must be available for reading in the department’s office at least 14 days prior to the examination.
- The student should prepare a formal presentation of the proposed research lasting about 30 minutes.
- A student who does not give a satisfactory performance on the examination may, upon the recommendation of the examining committee, be granted a further examination.
- Form G108 is used to report the outcome of the examination.

7. ADMISSION TO CANDIDACY

7.1 An application for admission to candidacy for the degree may be submitted after the student has met the following requirements.

- Completed courses listed on the approved plan of study and met the minimum grade requirements of the School of Engineering and Applied Science.
- Passed the comprehensive examination.
- Received approval for the dissertation proposal.

7.2 Admission to candidacy must be completed at least one semester before the defense of the dissertation. Form G108 is used to certify that the student has met all the requirements for admission to candidacy.
8. DISSERTATION

8.1 The doctoral dissertation should document an independent, original research that makes a significant contribution to a field of research within systems engineering.

8.2 The dissertation should be prepared in accordance with the instructions from the Office of the Dean (Form G122). A copy of the dissertation should be brought to the Graduate Records Office for a format check. All revisions required by the Graduate Records Office should be implemented prior to submitting the dissertation to the examining committee.

8.3 The dissertation must be submitted to the examining committee at least 21 days prior to the defense.

9. DISSERTATION DEFENSE

9.1 The final examination consists of an oral presentation and defense of the dissertation in a public forum. It is designed to assess the student’s contribution to a field of research and to test the student’s knowledge of that field.

9.2 The final examination can be offered only after the student has submitted the dissertation to the examining committee with sufficient lead time and has met all other degree requirements. It should be planned and conducted in accordance with the following guidelines.

- The examining committee must be composed of at least 5 members and must include the student’s advisory committee. The request to appoint the examining committee (Form G105) must be submitted at least 14 days before the proposed examination date. The request must be approved by the Graduate Programs Director and by the Office of the Dean.
- The examination should be scheduled when the university is in regular session, i.e., between the first and last day of classes. This is usually December 1 in Fall semester, April 15 in Spring semester, and August 1 in Summer session.
- At least 2 hours must be allotted for the examination.
- The announcement of the examination must be distributed at least 14 days prior to the examination to all SEAS faculty and SIE graduate students.
- A copy of the dissertation must be available for reading in the department’s office at least 14 days prior to the examination.
- The student should prepare a formal presentation of the research lasting about 40 minutes.
- A student who does not give a satisfactory performance on the examination may, upon the recommendation of the examining committee, be granted a further examination.
- Form G111 is used to report the outcome of the examination.
10. DISSERTATION SUBMISSION

10.1 After the defense, the student must revise the dissertation in accordance with the report of the examining committee.

10.2 After the final version of the dissertation is approved by the examining committee, four signed copies (three for the University and one for the advisor) must be submitted to the Office of the Dean by the date specified in the academic calendar.

10.3 After they are signed by the dean, the four copies must be delivered for binding to Printing Services, Alderman Library, in accordance with the instructions (Form G122).

11. APPLICATION FOR THE DEGREE

11.1 An application for the degree must be submitted on Form G113 by the date specified in the academic calendar. This is usually October 1 for January graduation, February 1 for May graduation, and June 1 for August graduation.

11.2 In the event of not completing all degree requirements in time for graduation, reapplication is necessary in time for the new intended graduation date.

11.3 The student must be registered to apply for the degree.

12. ADMINISTRATIVE FORMS

All administrative forms that must be completed in the course of study may be found at http://www.sys.virginia.edu/students/forms.html or may be obtained in Olsson Hall 114.

- G102 - Plan of Study
- G103 - Appointment of Advisory Committee
- G104 - Appointment of Advisor
- G105 - Appointment of Examining Committee
- G107 - Comprehensive Examination
- G108 - Dissertation Proposal (Outline) and Admission to Candidacy
- G111 - Dissertation Defense (Final Examination)
- G112 - Transfer of Graduate Courses
- G113 - Application for Graduate Degree
- G122 - Instructions for Dissertation Preparation
- G123 - Request for Admission to the Ph.D. Program