DOCTOR OF PHILOSOPHY IN THE FIELD OF SYSTEMS ENGINEERING

The systems engineering program provides broad knowledge of the “systems approach” for designing and managing large-scale engineering systems throughout the life cycle, with faculty and students exploring case studies and methodologies from NASA, the U.S. Department of Defense and U.S. corporations.

Graduate students can pursue their degrees in one of two focus areas: operations research and management science or systems engineering and integration.

The doctoral program is individually tailored for each student. It is designed to provide students with the ability to perform substantive research in their areas of choice. Students benefit from working closely with faculty members whose applications research has been successfully used by major organizations.

GW’s graduate-level systems engineering programs are offered at the University’s campus in Arlington, Va. They are also offered on site at U.S. corporate offices and facilities.

For additional on-campus program information, visit the on-campus program website (https://www.emse.seas.gwu.edu/doctor-philosophy/).

For additional online program information, visit the online program website (https://seasonline.gwu.edu/doctoral-degrees/doctor-of-philosophy/).

ADMISSIONS

The admission requirements below are for the on-campus program. Admission requirements for the online program are available at the online programs website (https://seasonline.gwu.edu/apply-today/phd-program/).

Admission deadlines:
- Fall: January 15
- Spring: September 1
- Summer*: March 1

Standardized test scores:
- The Graduate Record Examination (GRE) is required of all applicants. (Institution code 5246.)
- The Test of English as a Foreign Language (TOEFL), the academic International English Language Testing System (IELTS), or the PTE Academic is required of all applicants except those who hold a bachelor’s, master’s, or doctoral degree from a college or university in the United States or from an institution located in a country in which English is the official language, provided English was the language of instruction.
  - Minimum scores:
    - Academic IELTS: an overall band score of 7.0 with no individual score below 6.5; or
    - TOEFL: 600 on paper-based or 100 on Internet-based; or
    - PTE Academic: 68.

Recommendations required:
- Three (3) recommendations required. If possible, one recommendation should be from your advisor at the institution from which you earned your highest degree.
Prior academic records: Transcripts are required from all colleges and universities attended, whether or not credit was earned, the program was completed, or the credit appears as transfer credit on another transcript. Unofficial transcripts from all colleges and universities attended must be uploaded to your online application. Official transcripts are required only of applicants who are offered admission.

If academic records are in a language other than English, a copy in the original language and an English language translation must be uploaded. Transcript evaluations should not be uploaded. Applicants with degrees from Indian universities should upload transcripts and/or detailed marksheets.

Statement of purpose: Please write a comprehensive essay of 400 to 600 words, indicating your primary and supporting fields of study, your specialized interests, and the general subject area of your planned dissertation or professional project.

Additional requirements: Applicants whose highest earned degree is a master’s degree should have a grade-point average of at least 3.5. Applicants without a master’s degree must have a bachelor’s degree with a GPA of at least 3.3 on a 4.0 scale. All applicants should choose an area of focus that most closely matches their interests and note this on the online application. All applicants must submit a resumé or CV. Applicants to the doctoral program should identify one to three faculty members whose research interests most closely match their own and note this on the online application.

International applicants only: Please review International Applicant Information (https://graduate.admissions.gwu.edu/international-student-application-requirements/) carefully for details on required documents, earlier deadlines for applicants requiring an I-20 or DS-2019 from GW. International applicants requiring a visa from GW are not eligible to apply for admission to the graduate certificate program, but may apply for the M.S., Ph.D., or professional degrees (App. Sc. or Engr.) in systems engineering.

* A limited number of doctoral applicants are accepted for the summer. Please contact the admissions office for details. International applicants who require a visa from GW are eligible to apply for admission in fall and spring only (not summer).

For more information on the admission process, please visit the SEAS Frequently Asked Questions page. (http://graduate.seas.gwu.edu/apply/faq/)

Contact for questions: engineering@gwu.edu - 202-994-1802 (phone) - 202-994-1651 (fax)
9:00 - 5:00 pm, Monday through Friday

REQUIREMENTS

The following requirements must be fulfilled:

The general requirements stated under School of Engineering, Doctoral Program Regulations (http://bulletin.gwu.edu/engineering-applied-science/#seasregulationstext)

Students with an MS degree must take a minimum of 54 credits, of which at least 30 must be credits from courses available for graduate credit, and at least 24 must be dissertation research credits. The courses to be taken by the student must be approved by the student’s advisor. Students with a BS degree must take a minimum of 78 credits, including 54 credits of graduate coursework and at least 24 credits of dissertation research. The courses to be taken by the student must be approved by the student’s advisor. In some cases, particularly when the student undertakes a doctoral program in a field other than that in which the earlier degree was earned, the program of study exceeds the minimum number of credits. Students in the online PhD in systems engineering program must have an MS degree. Online PhD students must take a minimum of 54 credits, of which at least 24 must be from courses available for graduate credit, and at least 30 must be
Curriculum
No specific courses are required beyond the preparatory courses. The student and advisor design the curriculum to meet the student’s needs and goals.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 1231</td>
<td>Single-Variable Calculus I</td>
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<tr>
<td>MATH 1232</td>
<td>Single-Variable Calculus II</td>
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<tr>
<td>APSC 3115</td>
<td>Engineering Analysis III</td>
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Preliminary/qualifying examinations
The qualifying examination is the principal means of determining whether a student qualifies as a candidate for the doctoral degree and progress to the second stage of the program. Its purpose is to ascertain that the student’s background and intellectual development are adequate to support doctoral research in the central field. The DQE will be offered in January (both parts) and September (only data analysis). Before taking the examination, students must have completed the core courses and 27 credits (nine courses) of their required coursework and have the DegreeMap finalized. Students must also submit a doctoral qualifying examination checklist to the doctoral coordinator.

The qualifying examination consists of two parts: a two-part written examination and a focus area exam.

Written examination (Part I)
This examination consists of a two-hour, in-class examination covering EMSE 6765 and an eight-hour, take-home exam covering EMSE 8000 and EMSE 8001. Both examinations are offered during the last week in January. The EMSE 6765-based exam is also offered during the last week in January. Students should apply to take this examination before the end of the preceding semester.

Focus area exam (Part II)
The focus area examination is both written and oral. Students must take this examination by the end of the semester following the successful completion of DQE Part I (i.e., student nominally completes Part I in January, and must take Part II in the third week of May). Students should register for EMSE 8999 for the semester in which they are taking the exam.

Students have three options for the basis for their oral defense:

- A conference or journal paper, on which they are the lead author. If it is a conference paper, the full paper must have been peer-reviewed.
- A seminal journal paper in their focus area. Their advisor and examining committee must approve the paper.
- A ten-page literature review on a topic in their focus area. They have two weeks to complete the review.

In all cases, students are required to defend the work in front of a committee. The committee must consist of three faculty members, at least two of which are full-time in EMSE. Oral exams are approximately one hour long.

At the discretion of the committee a student who fails any part of the qualifying examination may be given a second opportunity to attempt qualification for candidacy. Usually, only the failed portion of the examination must be retaken. Students who fail to qualify for candidacy in a doctoral program of the School are considered to have failed on a school-wide basis and will not be admitted to further doctoral study within the School.

After successful completion of the DQE, the candidate’s advisor presents the academic record of the candidate and request the formation of a research committee. The Department votes on (provisional) admission to candidacy and the research committee. The research committee must be formed before the proposal defense (described below) and must consist of the student’s advisor and two other faculty members, at least one of whom must be full-time. Once the student is admitted to candidacy for the degree, they begin specialized study and research under the supervision of their research committee. At this point the research committee remains fixed unless a change is formally requested and approved by the department chair and advisor.

Publication Requirements
Students are given 18 months from completion of DQE Part II to be accepted into a pre-approved conference for presentation on a topic relevant to their research. This presentation must be co-authored by their advisor. Failure to do so will result in termination of their candidacy in the doctoral program.

Dissertation
Proposal defense—After acceptance to a conference, students are required to present a written dissertation proposal to their research committee and to successfully defend the proposal in an oral defense. This proposal should consist of, at a minimum, an introductory chapter, a review of the literature chapter, a methodology chapter, and a chapter on potential results. The Request for Proposal Defense form must be filed and approved two weeks prior to the defense. The Form 5 Doctor of Science Dissertation form is present at the proposal defense and, after a successful defense, is signed by all committee members. After the defense, the advisor in collaboration with the student submits, in writing, a copy (signed by student and adviser) of all suggestions, clarifications, and corrections to the proposal along with the signed Form 5 to the doctoral coordinator within four weeks of the defense. Failure to do so will void the defense. The doctoral coordinator forwards the Form 5 to the
Students are given a maximum of two attempts and a maximum time limit of two years past the semester in which they pass their DQEs to successfully defend their proposal. Failure to do so will result in termination of their candidacy in the doctoral program.

**Final examination/doctoral defense**—Once the dissertation has been completed and accepted by the faculty advisor and research committee, students may file a Request for final examination form with the doctoral coordinator. This form must be filed and approved by the department chair at least two weeks prior to the final examination date. Approval is granted only when all required materials have been presented to the doctoral coordinator. The required materials include a completely filed Request for Final Examination Form, a copy of the journal article with reviews, resumes of outside evaluators and electronic and written copies of the dissertation. The final examination is oral and open to the public. The candidate must demonstrate mastery of the special field of study and of the materials and techniques used in the research. The committee of examiners may include qualified experts brought to the University specially to participate in the examination. The director of research usually serves as advocate for the candidate. Students should consult department regulations concerning the formation of the committee. The committee votes on the quality and originality of the candidate’s contribution to knowledge as well as their mastery of the scholarship and research techniques of the field. Upon a majority vote for pass, the committee recommends the candidate for the degree of doctor of philosophy. The vote to pass may be provisional based on committee recommendations for changes to the dissertation in terms of additional analysis, writing or clarifications.

**Seminar and colloquia requirements**
As described in the “Publication Requirements” section above, students are required to present in a pre-approved conference on a topic relevant to their research. In addition, students are also encouraged to present and participate in departmental research seminars.

**Graduation and scholarship requirements**
Students are responsible for knowing the university’s minimum GPA requirement for graduation and scholarships. Visit the Graduation and Scholarship Requirements (http://bulletin.gwu.edu/engineering-applied-science/#graduation_requirements_phd) section in this Bulletin to read the requirements. Students should contact the department for additional information and requirements.