ENGINEERING SYSTEMS

Graduate Program Head	Vahid Motevelli
Program Code	ENGSY
Campus(es)	Harrisburg (Ph.D)
Degrees Conferred	Doctor of Philosophy (Ph.D.)
The Graduate Faculty	View (https://secure.gradsch.psu.edu/gpms/?searchType=fac&prog=ENGSY)

The Ph.D. program in Engineering Systems offers an interdisciplinary research opportunity centered in engineering and focused on engineering systems. This program prepares students to meet the challenges, problems, and opportunities of the twenty-first century. An engineering system is defined as a set of engineering processes or devices functioning together as parts of a mechanism or an interconnected network. This program intends to provide a new pathway for interdisciplinary engineering education and research that focuses on the understanding and development of next-generation systems. As its defining characteristic, the program offers an interdisciplinary education that combines course work and doctoral research that cut across disciplines with a focus on engineering systems. More specifically, students may develop expertise in the traditional civil, environmental, electrical, mechanical engineering, and computational systems; however, they are expected to apply their doctoral research to engineering systems. Students in this program can complement their studies with courses and research that provides a broad view of engineering systems. Because of this approach, graduates of the program will be fully prepared to enter "Ph.D. required" positions in fields related to civil, environmental, electrical, mechanical engineering, and computing. The interdisciplinary nature of this program also prepares students to enter other exciting growth areas within academia, the public sector, and the larger economy. These areas include built environments, smart cities, transportation networks, artificial intelligence, medical systems, and many others. This Ph.D. program is the only interdisciplinary doctoral program of its kind in South Central Pennsylvania.

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (https://gradschool.psu.edu/graduate-admissions/how-to-apply/). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (https://gradschool.psu.edu/graduate-education-policies/).

Applicants to the Ph.D. program in Engineering Systems are required to have completed a bachelor's degree in engineering from an institution holding accreditation as outlined in GCAC- 301 Qualifications for Admission, with a minimum 3.0 grade-point average (on a 4.0 scale), and a master's degree in engineering or another STEM field. Students with a master's degree in engineering or other STEM field, but with a bachelor's degree from a non-engineering STEM field, may be admitted on a provisional basis pending successful completion of specific engineering core courses per recommendation of the admissions committee for the Ph.D. in Engineering Systems. Potential applicants may contact the Ph.D. program director to discuss their preparation and credentials to determine if an application to the program is advised.

Applicants are required to submit:

- Scores from the GRE General Test
- Three letters of reference
- A personal statement sharing relevant experience and goals
- A resume
- Official transcripts from all post-secondary institutions attended

Degree Requirements

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (https://gradschool.psu.edu/graduate-education-policies/)

The Ph.D. program in Engineering Systems requires a minimum of 36 credits at the 500, 600, or 800 level post-master's degree. The 36 credits are divided into required course work (minimum of 21 credits) and dissertation research credits (minimum of 15). The 15 dissertation research credits must include a minimum of 12 credits of ENGR 600. Students may take ENGR 600 or ENGR 610 after achieving candidacy to fulfill the requirement for 15 dissertation research credits.

The 21 credits of required course work are divided into the following three categories:

Code	Title	Credits
Required Courses		
Common Core		
ENGR 502	The Smart City	3
ENGR 503	Interdisciplinary Research Methods in Engineering	3
SYSEN 507	Systems Thinking	3
Courses within the Student's Specialty (minimum of 6 credits)		
Students must take a minimum of 6 credits at the 500 or 800 level in the following areas: electrical engineering (EE), mechanical engineering (ME), civil engineering (CE), environmental engineering (ENVE), engineering mechanics (EMCH), engineering design (EDSGN), industrial engineering (IE), material science (MATSE), mathematics (MATH), or computer science (COMP). Additional credits (i.e., courses taken above 6 credits) may be at the 400 level. The courses that will satisfy this requirement can be chosen from a list of approved courses maintained by the graduate program office.		6
Cognate Courses (minimum of 6 credits)		
Students will take a minimum of 6 credits at the 500 or 800 level of interdisciplinary cognate courses. Cognate courses must be complementary to a student's chosen dissertation research area. Interdisciplinary cognate courses play a crucial role in helping this Ph.D. program achieve its objective of offering an interdisciplinary education. Advisers will also be responsible for determining whether a given course contains sufficient complementary content and prepares the students for their chosen dissertation topic to qualify as a cognate course.		6
Dissertation Research		
ENGR 600	Thesis Research	15
Total Credits		**36**

A student must pass the Ph.D. qualifying examination prior to the start of the third regular semester after entering the program. After completion of most of the course work and meeting the English competency requirement, students must pass the Ph.D. comprehensive examination.

A dissertation must be completed under the direction of the Ph.D. committee and the results must be successfully defended in the final oral

examination. To earn the Ph.D. degree, doctoral candidates must write a dissertation that is accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (https://gradschool.psu.edu/graduate-education-policies/) and GCAC-700 Professional Degree Policies (https://gradschool.psu.edu/graduate-education-policies/), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/)
- GCAC-641 Minor - Research Master's (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/)
- GCAC-709 Minor - Professional Doctorate (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/)
- GCAC-741 Minor - Professional Master's (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/)

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (https://gradschool.psu.edu/graduate-funding/) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (https://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants/) set by The Graduate School.

Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Learning Outcomes

1. Students will demonstrate broad knowledge of the several varieties of engineering systems, including their inter-relationships, in their course work, qualifying examination, comprehensive examination, and dissertation.
2. Students will demonstrate specialized knowledge within the engineering fields (civil, environmental, electrical, mechanical, and computer engineering) in their course work, qualifying examination, comprehensive examination, and dissertation.
3. Students will exhibit mastery of the interdisciplinary mindset by applying the knowledge, theories, skills, and methods of two or more disciplines acquired during course work in their independent research.
4. Students will identify areas in their field of study in which they can contribute original research, create new knowledge, and develop solutions to real-world problems.
5. Having studied ethics in a required course, students will choose ethical courses of action in their research projects.
6. Students will develop oral and written communication skills by sharing their research findings in their dissertations, conference presentations, and papers published in academic journals and proceedings.
7. Students will demonstrate the ability to assist faculty in classroom instruction and laboratory exercises.
8. Graduates will exhibit their acquisition of critical thinking skills by independently analyzing and critiquing published scholarship and by assessing its implications in the world.
9. Graduates will become prepared to be leaders in society who are capable of overseeing projects and addressing problems in an effective and ethical way.

Contact

Campus	Harrisburg
Graduate Program Head	Vahid Motevalli
Program Contact	Shelly Sneeringer mms8117@psu.edu (717) 948-6097
Program Website	View (https://harrisburg.psu.edu/science-engineering-technology/engineering-systems-phd/)