

PH.D. IN ENGINEERING (ELECTRICAL ENGINEERING)

OVERVIEW

The Ph.D. degree in Engineering (with concentration in electrical engineering) is conferred on the basis of extended study and high scholarly attainment in the field of electrical engineering. Students are expected to apply advanced and specialized knowledge and skills, gained through the program, to solve novel and complex problems in the domain of electrical engineering, and develop appropriate professional skills. In the course of the program, the students will demonstrate effective communication skills and competency commensurate with the doctoral education by making an original and substantial contribution to the body of knowledge in electrical engineering.

Graduate courses and research include topics in communications; controls, signal processing; machine vision and imaging; power systems; power electronics; electronic materials and devices; photovoltaic devices; device modeling, laser-based advanced processing; renewable energy and smart grid; electro-optics and photonics; microelectronics; fault tolerance and reliability; electromagnetics; computer aided design and simulation; microwave electronics, antennas, and plasma physics; and hardware-oriented security and trust.

The program prepares students with advanced and up-to-date knowledge and skills to pursue careers as scientists/researchers/educators in the various fields of electrical engineering. The doctoral program provides the foundation needed to become leaders as well as productive scholars or developers of innovative solutions to technological problems in these fields.

ADMISSION REQUIREMENTS

Admission to the Ph.D. in Engineering (concentration in electrical engineering) program requires a B.S. or M.S. degree in electrical engineering or a closely related field.

Application requirements:

- **Degree:** Applicants must hold a four-year bachelor's degree from a regionally accredited college or university
- **GPA:** Applicants must have at least a 3.0/4.0 grade point average from previous undergraduate and graduate coursework
- **Application:** UToledo application required
- **GRE:** Required for applicants whose degree is from a non-US institution.
- **Transcripts:** Required
- **Statement of Purpose:** Required
- **Letters of Recommendation:** minimum of 2 required

- **Proof of English language proficiency:** Required for students from non-English speaking countries. See University graduate admissions for minimum test score requirements and exceptions.

Application priority deadlines for admissions and funding decisions:

- **Fall:** March 1
- **Spring:** October 1
- **Summer:** Contact department

PROGRAM REQUIREMENTS

Ph.D. students must complete a total of at least 90 hours of graduate credit (including 45 credit hours of dissertation) beyond the bachelor's degree, or 60 credit hours beyond the M.S. degree. Doctoral candidacy requires selection of an academic advisor, formation of a dissertation committee, and satisfactory performance on the doctoral qualifying examination. Candidates are awarded the Ph.D. degree following:

1. Satisfactory completion of the requisite credit hours beyond the M.S. / B.S. degree (the M.S. or B.S. degree must be in a closely related field); and
2. Successful defense of a dissertation that constitutes a fundamental advancement of knowledge in the field.

The Ph.D. typically takes a minimum of three full years of graduate work beyond the M.S. degree.

The general requirements for the Ph.D. degree are:

- A minimum of 60 credit hours beyond the M.S. degree or a minimum of 90 credit hours beyond the B.S. degree. Out of these credit hours, a minimum of 45 credit hours should be devoted to research toward the student's dissertation.
- No more than three credit hours of independent study for students with an M.S. degree and no more than 9 credit hours of independent study for students with a B.S. degree may be counted toward the Ph.D. course requirement.
- The student must pursue, complete and publish a research manuscript that is demonstrated to be an original contribution to the field of study.
- The dissertation must be written and successfully defended publicly before the Ph.D. degree is conferred.
- Students must submit a minimum of two journal papers based on the dissertation research. Copies of the accepted/published papers, or official letters of acknowledgments for the submitted papers must be given to the graduate director at least one week prior to dissertation defense date.
- The student is required to take the 1cr.h. EECS seminar course and pass with an S grade.

Ph.D. Qualifying Examination

The intent of the Ph.D. Qualifying Examination is to assess the student's potential for successfully completing doctoral level studies and research in the department. The students are tested in four areas: two based on the required core courses of the specialization area; and two based on

the recommended courses list in the student's specialization areas, chosen in consultation with the student's advisor. The examination is given in two written parts.

Further details pertaining to the qualifying examination, as well as course registration requirements, Plan of Study requirements, and PhD proposal defense requirements can be found in the EECS Graduate Handbook.

It is the responsibility of the student and the faculty advisor to formulate a program of study that satisfies the requirements for the Ph.D. degree. The student's program of study should promote depth of knowledge by covering one of the specialization areas associated with Electrical Engineering. The program of study must be approved by the faculty advisor, the Advisory Committee, the Graduate Program Director, the Associate Dean of Graduate Studies of the College of Engineering, and the College of Graduate Studies.

PhD/EE (the student has a BS degree in EE or a related field - 90cr hr required)

Code	Title	Hours
Core Courses		9
Recommended Courses		30
EECS 8990	Independent Study	5
EECS 5930	Electrical Engineering & Computer Science Seminar	1
EECS 8960	Dissertation	45
Total Hours		90

PhD/EE (the student has an MS degree in EE or a related field - a minimum of 60 cr hr required)

Code	Title	Hours
Core Courses		9
Recommended Courses		6
EECS 5930	Electrical Engineering & Computer Science Seminar	1
EECS 8960	Dissertation	45
Total Hours		61

- PLO 1. Apply advanced and specialized knowledge and skills gained through the program to solve novel and complex problems in the domain of electrical engineering.
- PLO 2. Demonstrate competency commensurate with the doctoral education by making an original and substantial contribution to the body of knowledge in electrical engineering.
- PLO 3. Demonstrate effective communication skills.
- PLO 4. Demonstrate professional skills appropriate to the discipline.