Electrical Engineering PhD

COLLEGE OF ENGINEERING

Learn more about the Doctor of Philosophy in Electrical Engineering.

About the Program

The PhD in Electrical Engineering is designed to develop electrical engineers who have a clear understanding of the importance of electrical engineering. Doctoral students are prepared to identify a research area in electrical engineering and analyze the literature, develop theory, perform experimentation, and develop their own methodologically rigorous research studies. Students complete their studies with a mastery of the fundamental critical thinking and analytic skills and competencies necessary for electrical and computer engineering. Graduates are well prepared to enter the workforce in a range of engineering companies, universities, research organizations, federal agencies and nonprofit organizations.

Time Limit for Degree Completion: 7 years

Campus Location: Main

Full-Time/Part-Time Status: Students are able to complete the didactic portion of the PhD degree program through classes offered after 4:30 p.m.

Interdisciplinary Study: Engineering research is highly interdisciplinary and draws on collaboration with members of the faculty and students within all departments of the College of Engineering, in the Mathematics Department and departments engaged in the study of the physical sciences, and at the Lewis Katz School of Medicine at Temple University.

Areas of Specialization: The areas of specialization within the Electrical Engineering PhD include:

- Cyber physical systems
- Digital data communication and network
- Digital signal processing and digital image processing
- Microelectronics and computer architectures
- Signal processing and speech processing
- Smart systems and control

In the first term, the student and the Electrical and Computer Engineering (ECE) Graduate Program Director jointly initiate a Plan of Study. This form lists all required courses and the program requirement sequence for the student to follow. The Plan of Study is used to track the student's progress, with an annual annotation and update as the student completes various benchmarks in the PhD program.

Job Prospects: The program is primarily intended for individuals who wish to pursue careers in industry, government and academia in a highly creative environment. The program is dedicated to producing engineers who will contribute to advancements in electrical engineering. In the past, most graduates with the PhD in Electrical Engineering were employed in high-tech industries in research and development positions.

Non-Matriculated Student Policy: Up to 9 credits of graduate Engineering coursework may be taken at Temple University on a non-matriculated basis and subsequently applied to the PhD degree upon admission. If the applicant's undergraduate GPA was less than 3.0, a GPA of 3.25 or better is required on this non-matriculated graduate coursework to receive an admissions exception. Consequently, the ECE Graduate Program Director may encourage those with an undergraduate GPA less than 3.0 to take their first three graduate courses prior to making formal application to the PhD program. (See the relevant Graduate School policies on special admission procedures for non-matriculated students: 02.23.11.03 and 02.24.19.)

Financing Opportunities: Applicants for full-time study in the Electrical Engineering PhD program are automatically considered for financial aid. Three forms of financial aid are awarded to PhD students on a competitive basis:

1. Teaching Assistantship (TA): TA awards are made solely by the Department and require the awardee to work 20 hours per week in support of the Department's undergraduate programs. The TA is compensated with a 9-month stipend, a basic health-insurance plan, and 9 credits per term of tuition remission.
2. Research Assistantship (RA): Individual faculty confer RA awards, using their research funds, upon students who appear well-qualified to carry out the research. Typically, this faculty member becomes the RA's doctoral advisor. The RA normally works up to 20 hours per week and is compensated with a stipend, basic health insurance, and tuition remission.
3. Fellowships: Fellowships are awarded by the University in a competitive process that is open to all PhD applicants. The ECE Graduate Program Director nominates exceptional PhD applicants for a University Fellowship. Fellows receive 9 to 12 months of stipend, depending on the award; basic health insurance; and 12 credits of tuition remission each Fall and Spring term. Fellows of the University have no work obligations with respect to either the Department, the College, or the University.

Because financial aid is awarded on a competitive basis, applicants are urged to complete the application as early as possible.

Admission Requirements and Deadlines

Application Deadline:

Fall:

- December 15 (Fellowship Consideration)
- January 15 (Final Fellowship/Early Assistantship Consideration)
- March 1 (Final Admissions)

Spring: November 1

Applications are processed on a continual basis. Ordinarily, the applicant is informed of an admissions decision within 4 to 6 weeks of receipt of all supporting application documents.

APPLY ONLINE to this graduate program.

Review tuition and financial assistant deadlines to ensure financial aid consideration for the intended term of study.

Both admissions and financial aid award decisions originate in the Department of Electrical and Computer Engineering within the College of Engineering. Applicants who plan to matriculate full-time are automatically considered for financial aid awards so no separate application for financial aid is required.

Letters of Reference:
Number Required: 3

From Whom: Letters of recommendation should be obtained from college or research faculty who are familiar with the applicant's competency. If the applicant has an established career in engineering, one of the letters should be provided by the applicant's immediate supervisor. Any applicant who has been out of school long enough that relevant academic reference letters appear impractical should contact the ECE Graduate Program Director to obtain a waiver of this admission requirement.

Coursework Required for Admission Consideration: Students not adequately prepared for advanced courses may be required to take a number of prerequisites. The Department of Electrical and Computer Engineering identifies the needed coursework on a case-by-case basis.

Master's Degree in Discipline/Related Discipline: A master's degree is not required, but preferred.

Bachelor's Degree in Discipline/Related Discipline: A bachelor's degree is required.

University regulations stipulate that the applicant must have earned a 3.0 grade-point average on a 4.0 scale in their undergraduate studies, but admission exceptions are made for a variety of circumstances. (See Graduate School Policy 02.23.11.03.) The ECE Graduate Program Director helps the applicant navigate the admission possibilities and assists in the assessment of their overall educational qualifications with respect to the departmental requirements for the PhD program.

Official transcripts from all institutions of higher education attended, whether or not a degree was awarded, must be submitted. International applicants submit official transcripts or official NACES-accredited evaluation documentation that validates completion and conferral of a degree, diploma and/or certificate. All applicants must ensure transcripts and/or NACES-accredited documentation are sent directly from the institution(s) or NACES-accredited evaluation agency via email to gradengr@temple.edu or to the Temple University College of Engineering, 1947 N. 12th Street, Philadelphia, PA 19122-6077.

Statement of Goals: Describe your relevant technical experiences, career goals, and specific research interests in one to two pages.

Standardized Test Scores:
GRE: Required. Scores that are not more than 5 years in advance of the application date are sent by Educational Testing Service (ETS) to test code 2945. (See Graduate School Policy 02.23.12.) Applicants who require a waiver of the GRE should consult the ECE Graduate Program Director concerning the mechanics and consequences of obtaining an exception.

Applicants who earned their baccalaureate degree from an institution where the language of instruction was other than English, with the exception of those who subsequently earned a master’s degree at a U.S. institution, must ensure official scores are reported directly by the testing agency for a standardized test of English and meet one of these minimums:

- TOEFL iBT: 79
- IELTS Academic: 6.5
- PTE Academic: 53
- Duolingo: 110

Resume: Current resume required.

Advanced Standing: Both transfer credit for courses taken at another institution while matriculated at Temple and/or advanced standing credit for courses taken within the 5-year period prior to matriculating at Temple may be applied toward the PhD-level didactic coursework requirement. Written approval is required from the student's doctoral advisor, the College's Associate Dean for Graduate Study, and the Graduate School. (See Graduate School Policy 02.24.21.) Up to six credits of advanced standing for courses taken within the 5-year period prior to matriculating at Temple may be used to satisfy the master's-level didactic coursework requirement. Approval of the ECE Graduate Program Director is required. The courses must be equivalent to courses offered at Temple in the student's area of study and research, and the grades must be "B" or better.

Program Requirements

General Program Requirements:

Number of Credits Required Beyond the Bachelor's: 60, including 45 credits of graduate-level didactic coursework and 15 research credits, including preliminary PhD examination and dissertation research

Number of Credits Required Beyond the Master's: 30, including 15 credits of graduate-level didactic coursework and 15 research credits, including preliminary PhD examination and dissertation research

Required Courses:

Post-Baccalaureate (for students WITHOUT a master's degree in Electrical Engineering)

Code	Title	Credit Hours
Required Seminar		
ECE 5600	Graduate Seminar	0
Core Courses [1]		**45**
Research Courses [2]		**15**
ECE 9991	Directed Research (1-9 credits)	
ECE 9994	Preliminary Examination Preparation (1-2 credits)	
ECE 9998	Pre-Dissertation Research (1 credit minimum)	
ECE 9999	Dissertation Research (2 credits minimum)	
Total Credit Hours		**60**

1 Coursework is typically selected by the student's Doctoral Advisory Committee. It may include up to 6 credits of CEE 9182 Independent Study I and/or CEE 9282 Independent Study II. Two Independent Study courses are permitted for students requiring 60 credits for a PhD.

2 Sample distribution of the 15 credits associated with PhD examinations and dissertation research is shown, although the actual distribution of credits can vary across courses depending on the student's particular needs. Completion of the required 15 credits includes a minimum of 1 credit but no more than 2 credits of ECE 9994, a minimum of 1 credit of ECE 9998, and a minimum of 2 credits of ECE 9999, with the further stipulation that the minimum number of credits taken in ECE 9994, ECE 9998 and ECE 9999 combined is 6.

Post-Master's (for students WITH a master's degree in Electrical Engineering)

Code	Title	Credit Hours
Required Seminar		
ECE 5600	Graduate Seminar	0
Core Courses [1]		**15**
Research Courses [2]		**15**
ECE 9991	Directed Research (1-9 credits)	
ECE 9994	Preliminary Examination Preparation (1-2 credits)	
ECE 9998	Pre-Dissertation Research (1 credit minimum)	
ECE 9999	Dissertation Research (2 credits minimum)	
Total Credit Hours		**30**

1 Coursework is typically selected by the student's Doctoral Advisory Committee. It may include up to 3 credits of CEE 9182 Independent Study I. Only one Independent Study course is permitted for students requiring 30 credits for a PhD.

2 Sample distribution of the 15 credits associated with PhD examinations and dissertation research is shown, although the actual distribution of credits can vary across courses depending on the student's particular needs. Completion of the required 15 credits includes a minimum of 1 credit

but no more than 2 credits of ECE 9994, a minimum of 1 credit of ECE 9998, and a minimum of 2 credits of ECE 9999, with the further stipulation that the minimum number of credits taken in ECE 9994, ECE 9998 and ECE 9999 combined is 6.

Culminating Events:

Formation of the Doctoral Advisory Committee:

Selection of a research advisor and formation of a Doctoral Advisory Committee constitute the first steps toward achieving a PhD. Selection of a doctoral advisor depends on the student's level of preparation upon entering the PhD program. The Doctoral Advisory Committee selects the required coursework and guides the progress of the student's dissertation research:

- Students entering the PhD program with a master's degree, i.e., those who must complete 30 credits to earn the degree, form their Doctoral Advisory Committee before the end of their second regular term of study.
- Students entering the program with a bachelor's degree, i.e., those who must complete 60 credits to earn the PhD degree, generally complete most of their coursework before forming their Doctoral Advisory Committee by the end of their fourth regular term in the program.

See Graduate School Policy 02.28.11 for clarification on the composition of the Doctoral Advisory Committee.

Preliminary Examination:

All students generally complete their didactic coursework prior to taking the preliminary examination. (See Graduate School Policy 02.27.11.) Students in the 30-credit cohort ordinarily take the exam in their third or fourth term. Students in the 60-credit cohort typically take the exam no later than the eighth regular term. Students should register for one credit of ECE 9994 Preliminary Examination Preparation in the term when the exam will be taken.

The preliminary exam tests both the student's core knowledge in Electrical Engineering and their capacity to synthesize and interpret research communications. The student coordinates the scheduling of the preliminary exam with the ECE Graduate Program Director. The ECE Graduate Program Director supervises the specific form, content and frequency of the Electrical Engineering preliminary exam. A maximum of two opportunities to pass the preliminary exam are available to the student. In each term when the exam is attempted, the student registers for one credit of ECE 9994. Students are dismissed upon the second failure.

Dissertation Proposal:

After passing the preliminary exam, the student must develop a written research proposal and present it in an open College seminar. The student must schedule the proposal ten business days prior to the presentation seminar and post an announcement. Immediately following the seminar, the Doctoral Advisory Committee will question the student about the details and strategy of their proposed research.

Approval is granted for the proposed dissertation research when the "Dissertation Proposal Transmittal for Elevation to Candidacy" form (found in TUportal under the Tools tab within "University Forms") has been signed off by the entire Doctoral Advisory Committee. After the dissertation proposal has been accepted by the Doctoral Advisory Committee and the Graduate School has received the form, the student is considered to be a doctoral candidate. (See Graduate School Policy 02.28.12 for more information.)

Research Credits:

Students carry out research throughout their studies and register for the corresponding research credits while in the PhD program. However, the type of research credits that a student registers for depends on the student's progress in the program:

- Prior to passing the preliminary exam, credit hours associated with the student's research should be registered under ECE 9991 Directed Research.
- After the preliminary exam is passed, but before elevation to candidacy, credit hours associated with the student's research should be registered under ECE 9998 Pre-Dissertation Research.
- After elevation to candidacy, the student's research credits should be registered under ECE 9999 Dissertation Research. Students are required to register for at least three credits of ECE 9999 following their elevation to candidacy. (See Graduate School Policy 02.28.15.)

Publications:

Paper writing and presentation at a conference are considered integral to the student's training. Also, peer review, in part, offers an indication of the quality and novelty of the student's research. All doctoral students must publish at least two technical papers in refereed journals or refereed conferences. The papers must be based on the student's dissertation research with the student as the first author.

Dissertation:

The dissertation defense is an open University seminar in which the student presents the concepts and results of their research.

The student must coordinate the formation of the Dissertation Examining Committee in the term that they intend to defend their dissertation. This committee consists of the original Doctoral Advisory Committee plus one additional "external" member who is not faculty in the College of Engineering. If the external examiner is not a member of Temple University's Graduate Faculty, the person must be approved by the Graduate School at least four weeks prior to the dissertation defense.

The dissertation defense is to take place during a regular academic term (i.e., not scheduled during study days, final exams, or the breaks between terms). If the student is to graduate in the same term as the dissertation defense is held, then the defense should take place at least 30 days prior to the end of the term to allow for document revisions.

Three weeks prior to the defense, the members of the committee elect a Chair of the Dissertation Examining Committee. The Chair cannot be the student's doctoral advisor. The Associate Dean of Research and Graduate Studies must approve the selection. The Chair is identified to the Graduate School in the student's official request for permission to schedule the defense. (See Graduate School Policy 02.28.15.) The Chair's role includes coordination of the proceedings of the defense and completion of all relevant College and Graduate School forms concerning the defense.

The dissertation document should be prepared in a format compliant with University standards. (See Graduate School Policy 02.28.18.) A copy of the completed dissertation must be provided to the committee at least three weeks before the date of the dissertation defense. Note that any Graduate Faculty may request a copy of the dissertation in advance of the defense and may participate in the defense.

A minimum of two weeks prior to the defense, a public announcement of the defense must be posted. Prior to posting, this announcement must be approved in writing by the Graduate School. (See Graduate School Policy 02.28.16.)

Immediately following the presentation, the Dissertation Examining Committee closely examines the student's performance and their research. External attendees may participate in this closed portion of the defense with the permission of the Dissertation Examining Committee Chair. However, only members of the Dissertation Examining Committee may actually vote on the decision to accept the dissertation as prepared, accept the dissertation with revisions, or not accept the dissertation. If the dissertation is accepted with revisions, a revised copy of the dissertation must be submitted and approved by the Committee within 30 days of the original defense date.

Contacts

Program Web Address:

https://www.temple.edu/academics/degree-programs/electrical-engineering-phd-en-ece-phd

Department Information:

College of Engineering
ATTN: ECE Programs
1947 N. 12th Street
Philadelphia, PA 19122-6077
gradengr@temple.edu
215-204-7800

Submission Address for Application Materials:

https://apply.temple.edu/ENGINEERING/Account/Login

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