

Ph.D. in Electrical and Computer Engineering

Admission Requirements

General requirements for admission are described in the Admissions section of the Graduate Catalog. Specific admission requirements for the Ph.D. in Electrical and Computer Engineering are described below.

1. Graduate degree in Electrical or Computer Engineering or a related field from an ABET* accredited institution in the United States, or proof of equivalent education from an international institution with a GPA of 3.3/4.0 (or its equivalent from an international institution). Undergraduate students with GPAs above 3.5/4.0 may enter the Ph.D. program immediately upon completion of the bachelor's degree.
2. Demonstration of academic achievement and potential as indicated by the results of the Graduate Record Examination (GRE) and upper-level undergraduate and graduate coursework (normally 3.5/4.0 GPA in both). The GRE requirement is waived for applicants with a graduate or undergraduate degree in Electrical or Computer Engineering from UTEP.
3. Three letters of recommendation and any other evidence of background, knowledge, research and scholarship, or work experience in Electrical and Computer Engineering that may be relevant.
4. A written statement of interest, describing his/her career goals and describing his/her vision of the path to those goals (including a summary of previous preparation and of his/her expectations from the graduate program).
5. Applicants whose degrees are from non-English speaking institutions are required to demonstrate English proficiency. Please consult the Graduate School (<https://www.utep.edu/graduate/future-students/applicant-timelines.html>) website for required scores.

Conditional acceptance may be offered to students who do not meet all of the specific criteria for full admission but who show promise of success in graduate studies. Following US government visa policy, conditional admission to the Ph.D. Program in Electrical and Computer Engineering is not offered to international students.

The ECE Committee of Graduate Studies will review applications after they are released by the Graduate School. Application documents are released to the Department once Graduate School verify that the all required application documents have been received. The ECE Committee of Graduate Studies will review the application documents and provide one of the following recommendations to the Graduate School: admission, conditional admission, or rejection of the application.

Degree Requirements

General Track

Each student must complete 72 semester credit hours beyond the bachelor's degree or 42 hours beyond the master's degree. Students entering the doctoral program directly after the bachelor degree must complete 72 semester credit hours, including: 1 credit hour of graduate seminar ECE 6195; 33 credit hours of approved graduate coursework with at least 24 credits in ECE graduate courses; 32 credit hours of ECE6X94 Graduate Research or ECE 6392 or ECE 5392 Research Methods or other courses to strengthen the student research skills with prior approval of the Graduate Program Director; and 6 credit hours of ECE 6398/EE 6399 Dissertation.

Students entering the doctoral program with a master's degree must complete 42 credit hours, including: 1 credit hour of graduate seminar ECE 6195; 18 credit hours of approved graduate coursework with at least 12 credits in ECE graduate courses; 17 credit hours of ECE 6X94 Graduate Research or ECE 6392 or ECE 5392 Research Methods or other courses to strengthen the student research skills with prior approval of the Graduate Program Director; and 6 credit hours of ECE 6398/6399 Dissertation. UTEP students entering the Ph.D. program who previously completed a Master of Science in Electrical or Computer Engineering in the Thesis option can apply 3 credits of ECE 5398, Thesis 1, and 3 credits of ECE 5399, Thesis 2, towards their graduate Research credit hours.

Specific coursework to meet degree coursework requirements will be selected by the student in consultation with the dissertation advisor and the ECE Graduate Advisor to meet and support the student professional and research interests and to meet program requirements.

Industrial and Systems Engineering (ISE) Specialization Track

The Industrial & Systems Engineering (ISE) requires nine (9) credit hours of Industrial, Manufacturing or Systems Engineering graduate courses and allows ECE doctoral students to specialize in ISE-related research. The track is designed to equip students with knowledge and skills of modern industrial and systems engineering, as well as state-of-the-art knowledge and experience in design, implementation, and evaluation of processes. Students will apply their understanding of advanced technologies and integration of knowledge from diverse fields to develop ISE engineering approaches for complex problem-solving in industry, academia and government. Please see the Industrial, Manufacturing and Systems Engineering (IMSE) Department section of the catalog for course descriptions.

Each student must complete 72 semester credit hours beyond the bachelor's degree, or 42 hours beyond the master's degree. Students entering the doctoral program directly after the bachelor degree must complete 72 semester credit hours approved by the Graduate Advisor, which include 1 credit hour of graduate seminar EE 6195; 18 credit hours of approved ECE graduate concentration coursework; ECE ; 9 credit hours of approved ISE graduate concentration coursework; 6 credit hours of approved ECE graduate coursework not in the concentration area; 32 credit hours of ECE 6X94 Graduate Research or ECE 6392 or ECE 5392 Research Methods or other courses to strengthen the student research skills with prior approval of the Graduate Programs Director; and 6 credit hours of ECE 6398/ECE 6399 Dissertation. Students entering the doctoral program with a master's

degree must complete 42 credits including: 1 credit hour of graduate seminar ECE 6195; 12 credit hours of approved ECE graduate concentration coursework; 6 credit hours of approved ISE graduate concentration coursework 17 credit hours of ECE 6X94 Graduate Research or ECE 6392 or ECE 5392 Research Methods or other courses to strengthen the student research skills with prior approval of the Graduate Programs Director; and 6 credit hours of ECE 6398/6399 Dissertation. UTEP students entering the Ph.D. program who previously completed a Master of Science in Electrical or Computer Engineering in the Thesis option can apply 3 credits of ECE 5398, Thesis 1, and 3 credits of ECE 5399, Thesis 2, towards their Graduate Research credit hours.

Specific coursework to meet degree coursework requirements for the ISE Track will be selected by the student in consultation with the dissertation advisor and the-ECE Graduate Advisor to meet and support the student professional and research interests and to meet program requirements.

Committees

Admission into the program is awarded by the Graduate School upon recommendation from the ECE Committee of Graduate Studies. The committee is composed of the ECE Chair, the ECE Graduate Advisor, and three faculty members elected from the ECE Graduate Faculty.

For each Ph.D. student, a Dissertation Committee will be formed consisting of a Dissertation Advisor and at least three additional faculty members with expertise in areas related to the student's program of study and research. At least one committee member must be from a department other than Electrical and Computer Engineering. At least one member of the committee must be an ECE Graduate Faculty Member with appointment in ECE.

The dissertation advisor must be a member of the ECE Graduate Faculty. The Dissertation Committee will be appointed in consultation with the student after two semesters of enrollment. The appointment must be approved by the Graduate Programs Director. The Dissertation Committee will provide mentorship to the student during dissertation research, Dissertation Proposal defense and the final Dissertation Defense. In addition to guiding the student in research efforts, the committee may recommend or require (1) coursework in addition to the degree requirements specific in the catalog, and (2) submission of the articles to peer-reviewed journals or conference proceedings prior to completing the dissertation or dissertation proposal. Requirements beyond those in the catalog need to be approved by the ECE Committee of Graduate Studies.

Examinations

Upon entering the Ph.D. program each student will be required to take a Qualifying Examination. To pass this examination, a student must demonstrate both competency in the fundamentals of Electrical and Computer Engineering, and the ability to conduct research in the selected discipline of study.

The Qualifying Examination will consist of two sections: (1) Electrical and Computer Engineering Fundamentals, and (2) Research Competency. A passing grade in the Qualifying Examination indicates that the student is allowed to continue with his/her studies in the Ph.D. program, while a failing grade will result in dismissal from the program. Failure to take a given examination at the scheduled time without prior authorization from the Graduate Programs Director, will result in forfeiting the attempt.

The objective of **Section 1** of the Qualifying Examination, ECE Fundamentals, is to have the student demonstrate mastery of the fundamental areas in Electrical and Computer Engineering. To successfully complete this section of the examination, a student must be able to pass tests related to at least five of the areas representing "ECE Fundamental Knowledge." Ordinarily, each student will be required to take this examination at the beginning of the second semester of enrollment. If the student does not pass the initial examination, he/she will be allowed to retake it a second time. Failure to pass the exam after the second attempt may result in dismissal from the program. A third and final attempt may be permitted for students who demonstrate significant progress in their research work. A third and final attempt request needs to be endorsed by the student's doctoral committee and approved by the Department Committee of Graduate Studies.

In the ECE Fundamentals section, the student chooses to be examined in at least five of the following areas :

1. Digital Design (ECE 2303 Digital Systems Design I)
2. Electric Circuits (ECE 2301 Electric Circuits I)
3. Electronics (ECE 3341 Electronics I)
4. Electronic Devices (ECE 3344 Fund. of Semiconductor Dev)
5. Electromagnetics (ECE 3320 Electromagnetic Field Theory)
6. Microprocessor Systems (ECE 2304 Microprocessor Systems I)
7. Probability Theory (ECE 3332 Prob with App Elect/Comp Eng)
8. Signals and Systems (ECE 2331 Cont. Time Signals & Systems)
9. Software Design (ECE 2300 Software Design I)
10. Systems Engineering* (ECE 5381 Systems Engineering Fundamentals/SE 5341 Systems Engr Fundamentals). Available only for the ISE/ECE Ph.D. Track students.

The exam will take place during the beginning of the semester. The student will receive a letter grade (A, B, C, D, F) for each area exam. A minimum grade of C is required to pass one area and an overall GPA of at least 3.0 is required to pass the fundamental section of the Qualifier after combining the grades of the five area exams. A student may attempt more than five topics. Only the best five grades will be counted for the overall passing grade.

The objective of **Section 2**, of the Qualifying Examination Research Competency is to have the student demonstrate skills required in research. . Each student will be required to successfully complete the Research Competency Section by the fourth semester of enrollment. In consultation with

the Student's Dissertation- Committee and the Graduate Programs Director the research competency that can be satisfied with one of the following options:

1. Submission of a paper to a peer-reviewed journal. The paper should be reviewed and approved by the dissertation committee. Dissertation committee review and approval is waived if the peer-reviewed journal paper is published. The paper has to be in the area related to Electrical and Computer Engineering.
2. Completion of a master's thesis at UTEP in Electrical and Computer Engineering, along with submission of a paper to be peer-reviewed journal or conference based on the thesis work.
3. Pass ECE 5392 or ECE 6392 Research Methods with A.

Dissertation Proposal Defense

All doctoral students are required to complete a dissertation proposal. The dissertation proposal must demonstrate both the ability to conduct independent research and the competence in scholarly exposition. It should present original investigations at an advanced level of a significant problem in Electrical and Computer Engineering and should provide the basis for publishable contributions to peer-reviewed journals in the field.

The dissertation topic is developed by the student and the research advisor in collaboration with the dissertation committee. A Dissertation Proposal must be prepared and defended. The Dissertation Proposal Examination consists of (1) an evaluation of a dissertation document prepared by the student, and (2) an oral examination including and oral presentation of the dissertation proposal by the student. The student must submit draft of the dissertation proposal with the approval of the dissertation advisor, to the Dissertation Committee, and to the ECE Graduate Advisor at least two weeks before the Dissertation. A student can only prepare and defend a dissertation proposal after passing the qualifier examination. The student can apply to the graduate school for Ph.D. candidacy after successfully defending the dissertation proposal. A dissertation proposal defense must be announced to the ECE faculty and graduate students at least one week before it takes place. Dissertation proposal defenses are open to the academic community.

Dissertation Defense

The Doctoral student can enroll in ECE 6398 Dissertation for the first time during the semester that the proposal examination will take place. The student will be allowed to enroll in ECE 6399 if the proposal defense is successfully completed and will need to continuously enroll in ECE 6399 until completion and successful defense of the dissertation.

After completion of the proposed dissertation research, the student will be examined with regard to the dissertation research outcome in the Dissertation Defense. The Dissertation Defense consists of evaluation of a dissertation document prepared by the candidate, and an oral examination including an oral presentation of the dissertation by the student.

The student must submit the draft dissertation document, with the approval of the dissertation advisor, to the Dissertation Committee, to the department and to the Graduate School at least two weeks before the Dissertation Defense. A dissertation defense must be announced to the ECE faculty and graduate students at least one week before it takes place. Dissertation defenses are open to the academic community.

Doctoral candidates are expected to have published multiple peer-reviewed publications by the time they defend their dissertation. Successful publication of peer-reviewed publication is a form of validation of the work by the scientific community. Although it is not a program requirement, individual dissertation committees may require peer-reviewed publications as part of the instruments used to assess the contribution of the candidate's research work.

Degree Plan

Ph.D. in Electrical & Computer Engineering

Required Credits: 72

Code	Title	Hours
PhD in Electrical/Computer Engineering (All courses require a grade of C or better)		
Research:		
Select thirty three credit hours of the following:		33
ECE 6194	Graduate Research	
ECE 6195	Doctoral Seminar	
ECE 6294	Graduate Research	
ECE 6340	Semiconductor Device Physics	
ECE 6342	Modern Semiconductor Devices	
ECE 6390	Special Topics	
ECE 6391	Individual Studies	
ECE 6392	Research Methods	
ECE 6394	Graduate Research	
ECE 6494	Graduate Research	

ECE 6594	Graduate Research	
ECE 6694	Graduate Research	
ECE 5398	Thesis	
ECE 5399	Thesis	
Dissertation:		
ECE 6398	Dissertation	3
ECE 6399	Dissertation	3
Course Work:		
Select 33 credit hours of approved ELCE graduate coursework. The specific coursework required of each student will be determined by his/her Doctoral Advisory Committee		33
ECE 6141	Laboratory for ECE 6341	
ECE 6191	Individual Studies	
ECE 6194	Graduate Research	
ECE 6195	Doctoral Seminar	
ECE 6291	Individual Studies	
ECE 6294	Graduate Research	
ECE 6300	Probability & Random Processes	
ECE 6301	Computational Methods for EE	
ECE 6310	Power System Operations	
ECE 6311	Smart Grid Fundamentals	
ECE 6312	Energy Sustainability	
ECE 6313	Advanced Trans Power Flow Cont	
ECE 6321	Antenna Theory	
ECE 6322	Adv Fiber Optic Communications	
ECE 6323	Radar Signal Processing	
ECE 6330	Digital Signal Processing	
ECE 6331	Image Processing	
ECE 6332	Biomed Signal & Image Process	
ECE 6335	Adv Digital Communications	
ECE 6336	Stat Infer for Signal Analysis	
ECE 6340	Semiconductor Device Physics	
ECE 6341	Electronic Material Processing	
ECE 6342	Modern Semiconductor Devices	
ECE 6343	Nanoelectronics	
ECE 6344	Advanced Optoelectronic Device	
ECE 6350	Operating Systems	
ECE 6352	Computer Architecture I	
ECE 6353	Advanced Digital Syst Design I	
ECE 6355	Advanced VLSI Design	
ECE 6361	Fuzzy Logic & Engineering	
ECE 6362	Computer Vision	
ECE 6371	Data Communications	
ECE 6372	Network Protocols	
ECE 6380	Linear Systems Analysis	
ECE 6381	Systems Engineering Fundamtlis	
ECE 6390	Special Topics	
ECE 6391	Individual Studies	
ECE 6392	Research Methods	
ECE 6394	Graduate Research	
ECE 6395	Practicum in Elect & Comp Eng	
ECE 6494	Graduate Research	
ECE 6594	Graduate Research	

ECE 6694	Graduate Research
EE 6333	Data Compression
EE 6342	Systems Engineering Mgmt
EE 6343	Requirements Engineering
EE 6344	Integratn, Verifictn, Validatn
EE 6369	CMOS Digital Circuit Design
EE 6386	High Frequency Power Converter

Total Hours**72**

Ph.D. in Electrical & Computer Engineering - Industrial & Systems Engineering

Required Credits: 84

Code	Title	Hours
PhD in ECE (Industrial & Systems Track) (All courses require a grade of C or better)		
Required Courses:		
ECE 6195	Doctoral Seminar	1
ECE Courses:		
Select six courses of the following:		18
ECE 6300	Probability & Random Processes	
ECE 6380	Linear Systems Analysis	
EE 6333	Data Compression	
ECE 6322	Adv Fiber Optic Communications	
ECE 6330	Digital Signal Processing	
ECE 6331	Image Processing	
ECE 6394	Graduate Research	
ISE Track Courses:		
Select three courses of the following:		9
ECE 6381	Systems Engineering Fundamtl	
EE 6342	Systems Engineering Mgmt	
EE 6343	Requirements Engineering	
EE 6344	Integratn, Verifictn, Validatn	
IE 5351	Linear and Combin Optimiz Meth	
IE 5352	Design/Analysis Indust Exprmnt	
IE 5357	Computer Simulation Appli	
IE 5385	Advanced Quality Control	
IE 5390	Special Topics Industrial Engr	
MFG 5311	Design for Manufacturability	
MFG 5312	Strategic Design-Mfg Processes	
MFG 5321	Modeling/Analysis-Mfg Process	
MFG 5350	Reliability & Maintainability	
MFG 5359	Computer-Aided Manufacturing	
SE 5341	Systems Engr Fundamentals	
SE 5342	Systems Engr Management	
SE 5343	Systems Requirements Analysis	
SE 5344	Sys Intgrtn, Verfctn, & Valdtn	
SE 5345	Sys Engr Project Practicum	
SE 5346	Systems Architecture & Design	
SE 5347	Systems Engr Processes	
SE 5348	Systems Modeling & Simulation	
SE 5390	Systems Engr Special Topics	
ECE Electives:		
Select fifteen hours of the following:		15
ECE 6141	Laboratory for ECE 6341	

ECE 6191	Individual Studies
ECE 6194	Graduate Research
ECE 6291	Individual Studies
ECE 6294	Graduate Research
ECE 6300	Probability & Random Processes
ECE 6301	Computational Methods for EE
ECE 6380	Linear Systems Analysis
ECE 6321	Antenna Theory
ECE 6340	Semiconductor Device Physics
ECE 6344	Advanced Optoelectronic Device
ECE 6342	Modern Semiconductor Devices
ECE 6341	Electronic Material Processing
ECE 6343	Nanoelectronics
ECE 6335	Adv Digital Communications
ECE 6336	Stat Infer for Signal Analysis
ECE 6371	Data Communications
EE 6333	Data Compression
ECE 6322	Adv Fiber Optic Communications
ECE 6381	Systems Engineering Fundamtlis
EE 6342	Systems Engineering Mgmt
EE 6343	Requirements Engineering
EE 6344	Integratn, Verifictn, Validatn
ECE 6395	Practicum in Elect & Comp Eng
ECE 6332	Biomed Signal & Image Process
ECE 6362	Computer Vision
ECE 6361	Fuzzy Logic & Engineering
EE 6369	CMOS Digital Circuit Design
ECE 6350	Operating Systems
ECE 6330	Digital Signal Processing
ECE 6331	Image Processing
ECE 6353	Advanced Digital Syst Design I
ECE 6352	Computer Architecture I
ECE 6355	Advanced VLSI Design
ECE 6372	Network Protocols
ECE 6312	Energy Sustainability
ECE 6311	Smart Grid Fundamentals
ECE 6313	Advanced Trans Power Flow Cont
EE 6386	High Frequency Power Converter
ECE 6310	Power System Operations
ECE 6323	Radar Signal Processing
ECE 6390	Special Topics
ECE 6391	Individual Studies
ECE 6392	Research Methods
ECE 6394	Graduate Research
EE 6396	Graduate Projects
EE 6397	Graduate Projects
ECE 6594	Graduate Research
ECE 6694	Graduate Research
ECE 6594	Graduate Research

Dissertation Research:

ECE 6394 Graduate Research (Complete 11 semesters)

Thesis:

ECE 6398	Dissertation	3
ECE 6399	Dissertation	3
Total Hours		82