ELECTRICAL ENGINEERING (PHD)

The Electrical and Computer Engineering (ECE) department offers Doctor of Philosophy (Ph.D.) degrees in Electrical Engineering with two possible areas of concentration: Electronics, Photonics and Biophotonics or Information, Communication, Decision, and Energy Systems. In addition, Ph.D. students can take a track in Computer Engineering, either along with one of the areas of concentration or separately. The graduate program is predicated on students having developed a strong technical background in basic Electrical and Computer Engineering through work in undergraduate courses. The objective of the graduate program is to enhance this background by providing more advanced course work, along with insight into state-of-the-art problems and new research areas.

Location

- Storrs Campus

Modality

- In Person

Requirements

All students in the Ph.D. program must maintain a cumulative GPA of 3.0 or above; pass a two-part general examination near the end of the formal course work; and complete a dissertation which represents a significant contribution to the field.

In addition, students must meet the following minimum research publications requirements:

1. Two conference proceedings, full length papers accepted with first authorship (Journal Papers may be substituted for conference proceedings) by the time of the proposal presentation.
2. Three journal papers with first authorship by the time of the dissertation defense, two accepted and one submitted. With the approval of the advisory committee, up to two journal papers may be replaced by full proceedings papers with first authorship presented at leading international conferences with a documented acceptance rate of under 30% based on data from the previous year. In either scenario, at least one journal paper should have been accepted by the time of the defense.

Students must also meet a related area requirement, which can be satisfied by six credits of additional graduate work in any single technical area (such as Computer Science, Statistics, Physics, Mathematics, or another Engineering field).

The student's Plan of Study should be completed according to the following requirements and approved before the Ph.D. General Examination. The student's Advisory Committee has the final word on all Plan of Study matters. After the Plan of Study is approved, a Ph.D. Dissertation Prospectus should be submitted at least six months before the defense.

In addition to these general requirements, students who choose to do an area of concentration and/or the Computer Engineering track must satisfy the requirements specific to those specialties outlined below.

Ph.D. in Electrical Engineering: Electronics, Photonics, and Biophotonics Concentration

Requirements: Minimum of 30 credits of content coursework beyond the baccalaureate (or its equivalent) or at least 15 credits of content related coursework beyond the master's degree or other advanced degree in the same or a closely-related field of study; two credits of ECE 6094 Seminar.

A student will select six (Ph.D.) courses for the written exams in consultation with their advisory committee. At least one course should be chosen from each area:

- Area 1 - Electromagnetics/Photonics
- Area 2 - Semiconductor/Optoelectronic Devices
- Area 3 - Applications

Ph.D. in Electrical Engineering: Information, Communication, Decision, and Energy Systems Concentration

For Student Holders of M.S. Degree

Students must take at least 12 credits of appropriate graduate course work and six credits of related area graduate course work. Of these a maximum of three credits may be ECE 6099 Independent Study in Electrical Engineering. The related area can be satisfied by six credits of graduate work in any single technical area (such as Computer Science, Statistics, Physics, Mathematics, or another Engineering field).

ECE 5101 Introduction to System Theory, ECE 6111 Applied Probability and Stochastic Processes, and ECE 6122 Digital Signal Processing are introductory basic graduate courses and should not normally count toward the 12 required credits for the Ph.D. In special circumstances, a Systems subgroup Ph.D. student's M.S. background may be considered to have little in common with the Systems subgroup M.S., but nonetheless to be a significant contribution to the students Ph.D. research. In such cases the student's Advisory Committee may decide that some or all of these courses may be counted toward Ph.D. totals. Such cases are assumed to be unusual.

Requirements: ECE 6094 Seminar must be taken for credit at least twice. Attendance at this seminar is required every semester for full-time students. A minimum of 15 credits of GRAD 6950 Doctoral Dissertation Research.

The Ph.D. General Examination for Information, Communication, Decision, and Energy Systems students who are not in the Energy Systems subgroup consists of:

Course	Title	Credits
Required Courses		
ECE 5101	Introduction to System Theory	3
ECE 6111	Applied Probability and Stochastic Processes	3
ECE 6122	Digital Signal Processing	3
Select one of the following:		3
ECE 6099	Independent Study in Electrical Engineering	
ECE 6121	Information Theory	
ECE 6151	Communication Theory	
ECE 6437	Computational Methods for Optimization	
Electives		

Two additional courses in agreement with the Advisory Committee	6
Total Credits	**18**

The General Examination for students in the Energy Systems subgroup consist of seven exams: three or four of ECE 5101 Introduction to System Theory, ECE 6111 Applied Probability and Stochastic Processes, ECE 6122 Digital Signal Processing, and ECE 6439 Estimation Theory and Comp Algorithms; three or four appropriate courses in Energy Systems.

For Student Holders of B.S. Degree

Students must take at least 30 credits of appropriate graduate course work and six credits of related area graduate course work. Of these a maximum of three credits may be ECE 6099 Independent Study in Electrical Engineering. The related area can be satisfied by six credits of graduate work in any single technical area (such as Computer Science, Statistics, Physics, Mathematics, or another Engineering field).

Requirements: ECE 6094 Seminar must be taken for credit at least two times. Attendance at this seminar is required every semester for full-time students. A minimum of 15 credits of GRAD 6950 Doctoral Dissertation Research.

The Ph.D. General Examination consists of the same as in the Ph.D. requirements for students starting with an M.S. degree.

The Ph.D. General Examination for Information, Communication, Decision, and Energy Systems students who are not in the Energy Systems subgroup consists of:

Course	Title	Credits
Required Courses		
ECE 5101	Introduction to System Theory	3
ECE 6111	Applied Probability and Stochastic Processes	3
ECE 6122	Digital Signal Processing	3
ECE 6439	Estimation Theory and Comp Algorithms	3
Select one of the following:		3
ECE 6099	Independent Study in Electrical Engineering	
ECE 6121	Information Theory	
ECE 6151	Communication Theory	
ECE 6437	Computational Methods for Optimization	
Electives		
Two additional courses in agreement with the Advisory Committee		6
Total Credits		**21**

The General Examination for students in the Energy Systems subgroup consist of seven exams: three or four of ECE 5101 Introduction to System Theory, ECE 6111 Applied Probability and Stochastic Processes, ECE 6122 Digital Signal Processing, and ECE 6439 Estimation Theory and Comp Algorithms; three or four appropriate courses in Energy Systems.

Computer Engineering Track Ph.D. Requirements

For Student Holders of M.S. Degree

Requirements: A minimum of five ECE or CSE graduate courses (15 credits). Of these a maximum of three credits may be ECE 6099 Independent Study in Electrical Engineering. The seminar ECE 6094 Seminar has to be taken for credit at least twice. A minimum of 15 credits of GRAD 6950 Doctoral Dissertation Research.

The Ph.D. General Examination consists of four exams on Computer Architecture, VLSI Design, Systems, and Algorithms. After the Plan of Study is approved, a Ph.D. Dissertation Prospectus should be submitted and presented before the advisory committee.

For Student Holders of B.S. Degree

Requirements: A minimum of 11 ECE or CSE graduate courses (33 credits). Of these a maximum of three credits may be ECE 6099 Independent Study in Electrical Engineering. The seminar ECE 6094 Seminar has to be taken for credit at least twice. A minimum of 15 credits of GRAD 6950 Doctoral Dissertation Research.

The Ph.D. General Exam consists of four exams on Computer Architecture, VLSI Design, Systems, and Algorithms. After the Plan of Study is approved, a Ph.D. Dissertation Prospectus should be submitted and presented before the advisory committee.

Learning Objectives

1. Knowledge: Demonstrate appropriate breadth and depth of disciplinary knowledge and comprehension of the major topics, theories, and issues of the discipline, including demonstration of specialized knowledge of a sub-field sufficient to carry out substantive independent research of creative pursuits
2. Research/applied skills: Use disciplinary methods and techniques ethically and professionally to apply knowledge, critically analyze, and, as appropriate to the degree, create new knowledge or achieve advanced creative accomplishments
3. Communication: Communicate proficiently and effectively to a specialist or non-specialist audience, verbally and in writing, a structured, coherent academic presentation, representation, or argument that cogently summarizes their research or creative pursuit, relevant literature, and its significance at the level appropriate to discipline