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MS & PhD in Electrical Engineering

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Overview

Electrical Engineering — Advanced Education for a Career that will Revolutionize the World

A Masters and/or Ph.D. Degree in Electrical Engineering (EE) from University of Central Florida provides endless opportunities for exciting, rewarding and successful careers in a field that revolutionizes the world. There is a vast array of opportunities in electrical engineering to impact the way the world produces, operates and maintains energy, power, equipment, services, networks, microelectronics, signal processing and so much more.

The Electrical Engineering degree program in the School of EECS produces graduates with a high level of competency in understanding, applying, and enunciating the modern concepts, principles, methods, and theories necessary for the design and implementation of electrical-, electronics- and computer-related fields. The Electrical Engineering graduate program also gives students an in-depth education that will meet the needs of business and industry in Florida and throughout the United States now and for decades to come.

The Electrical Engineering Program offers Masters and Ph.D. degrees with specialization in many areas of Electrical Engineering including:

- Energy
- Controls & Robotics
- Communications
- Signal Processing
- Power Electronics & Electronics
- Solid State Microelectronics
- Electromagnetics
- Electro-optics
- Networks
- Circuits & Systems
- Nanotechnology
- Semiconductors
- Microwaves & Antennae

E-mail: graduate@eecs.ucf.edu
Phone: (407) 823-EECS
Ask for the EECS Graduate Front Desk

For specific questions:
Dr. Michael Georgiopoulos
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School of Electrical Engineering and Computer Science (EECS)
Graduate Office
4000 Central Florida Blvd.
PO Box 162362
Orlando, FL 32816-2362

For more information on Graduate Studies and Research in the School of EECS:

- EECS Graduate Publications (Link Needed)
- Current and Recent EECS Research Grants
- Ph.D. Graduates Theses Dissertations (Link Needed)
- Masters Theses Dissertations (Link Needed)

The EE program has a long and respected history, as Electrical Engineering was approved to offer a Bachelors in EE in 1967. The Masters in EE was approved in 1971 and the Ph.D. in EE began in 1983.

Students successfully completing the EE graduate program with a Masters and/or Ph.D. will have exhibited breadth as well as depth of capability involving both theoretical aspects of Electrical Engineering and practical considerations of computing.

Benefits & Features

- Courses are taught by experienced faculty members from top institutions around the world. They bring with them diverse backgrounds in industry, academics and research.
- EECS educators are recognized professionals and researchers who are known internationally and nationally for their outstanding achievements.
- Online lectures and webcasts are combined with face-to-face classes to provide flexible learning and content delivery.
- Funding opportunities of several types are available for national and domestic students. Graduate students may receive financial assistance through fellowships, assistantships, tuition support, or loans. For more information, see Financing Grad School, which describes the types of financial assistance available at UCF and provides general guidance in planning your graduate finances. The Financial Information section of the Graduate Catalog is another key resource.

The History of Electrical Engineering at EECS:

Electrical Engineering at UCF has a long and well established history since 1967. The EE program is designed as a terminal degree especially suited to enhance career advancement and to provide the theoretical foundation to take advantage of the changing technological world in which we live.

Orlando, one of the nation's most dynamic metropolitan areas and noted for its quality of life and vacation attractions, is the center of Florida's I-4 High Technology Corridor. This synergistic region is adjacent to University of Central Florida and UCF's Research Park, which is one of the nation's most successful research parks. UCF and its Research Park offer educational, research and career opportunities in a huge number of electrical engineering careers, including electronics, energy networks, power electronics, optics, lasers, solid state, microelectronics, control, communications and much more.

Electrical Engineering is part of the well-known School of Electrical Engineering and Computer Science (EECS). The School of EECS currently has more than 60 full-time faculty members who are teamed with several outstanding lecturers and visiting professors. MS and Ph.D. Electrical Engineering students are often supported through graduate teaching/research assistantships, and all receive a broad background in the areas of Electrical Engineering. At the same time, each student will specialize in a research area under the individualized direction of an EECS faculty advisor. Research interests of the faculty include Control, Communications, Energy, Electronics, Solid State, Microelectronics, Electromagnetics, Electro-optics, Power Electronics, Computer Networks, Signal Processing and much more. Visit our Research page for more information.

Ph. D. in EE Curriculum

In this section, you will find information on:

The Electrical Engineering Ph.D. program prepares students in the highest level of theory and practice of Electrical Engineering, aiding with the development of research and instruction skills for positions in academia, industry and government sectors.

The EE Ph.D. program produces professionals trained at the highest possible academic level in the theory and practice of Electrical Engineering in order to meet current and projected market demands for Electrical Engineering experts. EE Ph.D. students from the School of EECS at UCF graduate with proven abilities in research and instruction and have expertise suitable for positions in industry, academia and government.

Students in the program receive a broad background in the areas of Electrical Engineering theory while specializing in a research area. Research interests of the Electrical Engineering faculty include: energy, nanotechnology, controls, satellite communications, signal processing, power electronics, solid state microelectronics, electromagnetics, antennae, sensors, electro-optics, circuits, systems, microwaves, systems biology, networks, semiconductors and much more.

Ph.D. Curriculum Requirements

The Electrical Engineering PhD program requires a minimum of 72 credit hours beyond the bachelor's degree. Of these 72 hours, a minimum of 42 credit hours must be regular classroom course work and a minimum of 15 credit hours up to a maximum of 24 credit hours of dissertation hours can be credited toward the degree. No more than 12 credit hours of Independent Study are allowed as a part of the 36 hours of regular classroom course work. The remaining hours can be a combination of classroom course work and/or pre-candidacy doctoral research.

Total Hours Required for Ph.D. — 72 Credit Hours Minimum beyond the Bachelor's Degree; 42 Credit Hours Minimum beyond the Master's Degree.
Students admitted with an earned master's degree from a regionally accredited institution or recognized foreign institution may be eligible to have up to 30 credit hours of their doctoral program waived without a course-by-course review of completed course work. The student's doctoral adviser in conjunction with the doctoral program director will determine the number of hours to be allowed. These hours will be credited such that classroom course work will be credited against the required doctoral classroom course work with the exception that only six hours of Independent Study will be allowed and credited against the 12 credit hours of Independent Study allowed in the doctoral program. Thesis hours can also be credited as pre-candidacy doctoral research hours.

The program of study must be developed in consultation with an adviser within the first 9 credit hours of course work, and this requirement is strictly enforced by the program. The program of study must meet all the university requirements specified in the graduate catalog and must also meet departmental approval.

Regular Course Work - 36 credit hours

- No more than 12 hours of independent study and no directed research
- Courses may be chosen from the suggested lists below.

Suggested Courses for the EE Doctoral Program
The School of Electrical Engineering and Computer Science (Electrical Engineering Program) supports a number of technical research areas in which an Electrical Engineering PhD student is expected to do research. These technical areas are (in alphabetical order): Electromagnetics and Optics (EO), Signal Processing and Systems (SPS), and Micro-Systems and Nano-Systems (MNS). The Micro-Systems and Nano-Systems area covers the typical Electrical Engineering topic areas of Electronics, Power Electronics and Micro-Electronics, while the Signal Processing and Systems area covers the typical electrical topic areas of communications, controls, and signal processing.

In each one of these areas there is a suggested list of courses recommended for PhD students with research focus in one of these designated areas. Students are allowed to take courses from the suggested list of courses in areas other than their research (technical) area, but a good number of their courses should be chosen from courses in their research (technical) area of interest. A program of study, which lists all the courses that a PhD student is planning to take during his/her PhD studies, must be completed by the student no later than the completion of 9 credit hours into the program. This program of study is completed by the student after appropriate coordination with the academic/research adviser.

Suggested Courses for Electromagnetics and Optics (EO)

- EEL 5425 RF and Microwave Measurement Techniques (3 credit hours)
- EEL 5439 RF and Microwave Communication (3 credit hours)
- EEL 5462 Antenna Analysis and Design (3 credit hours)
- EEL 5482 EM Theory I (3 credit hours)
- EEL 5432 Satellite Remote Sensing (3 credits)
- EEL 5447 Introduction to Radar Systems (3 credit hours)
- EEL 5542 Random Processes (3 credit hours)
- EEL 6463 Antenna Analysis and Design II (3 credit hours)
- EEL 6488 EM Theory II (3 credit hours)
- EEL 6481 Numerical Techniques in Electromagnetics (3 credit hours)
- EEL 6489 Advanced Topics in Electromagnetics (3 credit hours)
- EEL 6504 Communication System Design (3 credit hours)
- EEL 6530 Communication Theory (3 credit hours)
- EEL 6564 Statistical Optics with Applications (3 credit hours)
- EEL 6XXX Microwave Remote Sensing (3 credit hours)
- EEL 6XXX Advanced Radar Systems (3 credit hours)
- MAA 5404 Complex Analysis (3 credit hours)
- MAP 5426 Special Functions (3 credit hours)
- MAP 5435 Advanced Mathematics for Engineers (3 credit hours)
- MAP 6424 Transform Methods (3 credit hours)
- OSE 5041 Introduction to Wave Optics (3 credit hours)
- OSE 5111 Optical Wave Propagation (3 credit hours)
- OSE 5115 Interference and Diffraction (3 credit hours)
- OSE 5143 Fiber Optics Communications (3 credit hours)
- OSE 5225 Radiometry and Detection (3 credit hours)
- OSE 5414 Fundamentals of Optoelectronic Devices (3 credit hours)
- OSE 5421 Integrated Optics (3 credit hours)
- OSE 6432 Fundamentals of Photonics (3 credit hours)
- OSE 6445 High Speed Photonics (3 credit hours)
- OSE 6455L Photonics Laboratory (3 credit hours)
- OSE 6615L Optoelectronic Device Fabrication Laboratory (3 credit hours)
- OSE 6560 Laser Engineering (3 credit hours)
- OSE 6211 Fourier Optics (3 credit hours)

Note: The aforementioned list is a representative list of courses recommended for the Electromagnetics and Optics area. However, additional courses pertinent to this area may be offered in a particular academic year at the discretion of the Electromagnetics and Optics committee.

Suggested Courses for Micro-Systems and Nano-Systems (MNS)

- EEL 5245 Power Electronics (3 credit hours)
- EEL 5317 Surface Acoustic Wave Devices and Systems (3 credit hours)
- EEL 5332 Thin Film Technology (3 credit hours)
- EEL 5352 Semiconductor Materials Characterization (3 credit hours)
- EEL 5353 Semiconductor Device Modeling and Simulation (3 credit hours)
- EEL 5355 Fabrication of Solid State Devices (3 credit hours)
- EEL 5370 Operational Amplifiers (3 credit hours)
- EEL 5378 CMOS Analog and Digital Circuit Design (3 credit hours)
- EEL 6354 Advanced Semiconductor Devices (3 credit hours)
- EEL 6317 Power Semiconductor Devices and Integrated Circuits (3 credit hours)
- EEL 6246 Power Electronics II (3 credit hours)
- EEL 6338 Advanced Topics in Microelectronics (3 credit hours)
- EEL 6354 Advanced Semiconductor Devices (3 credit hours)
- EEL 6371 Advanced Electronics I (3 credit hours)
- EEL 6372 Advanced Topics in Electronics (3 credit hours)

Note: The aforementioned list is a representative list of courses recommended for the Micro-Systems and Nano-Systems area. However, additional courses pertinent to this area may be offered in a particular academic year at the discretion of the Micro-Systems and Nano-Systems committee.

Suggested Courses for Signal Processing and Systems (SPS)

- EEL 5513 Digital Signal Processing Applications (3 credit hours)
- EEL 6502 Adaptive Digital Signal Processing Applications (3 credit hours)
- EEL 5820 Image Processing (3 credit hours)
- EEL 6823 Image Processing II (3 credit hours)
- EEL 5825 Pattern Recognition (3 credit hours)
- EEL 6812 Introduction to Neural Networks (3 credit hours)
- EEL 5630 Digital Control Systems (3 credit hours)
- EEL 5173 Linear Systems Theory (3 credit hours)

- EEL 6621 Nonlinear Control Systems (3 credit hours)
- EEL 6671 Modern and Optimal Control Systems (3 credit hours)
- EEL 6674 Optimal Estimation for Control (3 credit hours)
- EEL 6617 Fundamentals of Modern Multivariate Control (3 credit hours)
- EEL 6616 Adaptive Control (3 credit hours)
- EEL 6680 Advanced Topics in Modern Control Systems (3 credit hours)
- EEL 5XXX Autonomous Robotic Systems (3 credit hours)
- EEL 6XXX Cooperative Control of Networked Autonomous Systems (3 credit hours)

Note: The aforementioned list is a representative list of courses recommended for the Signal Processing and Systems area. However, additional courses pertinent to this area may be offered in a particular academic year at the discretion of the Signal Processing and Systems committee.

Dissertation — 15 - 24 Credit Hours Minimum

- EEL 7980 (15 credit hours minimum)

Qualifying Review

The Qualifying Review relies on annual appraisals of the student's progress conducted by the student's research/academic adviser. The student's appraisal template that the adviser completes will assess the student's academic performance (course performance) and research performance (student's performance at the research adviser's lab and co-authorship of peer-reviewed publications).

On an annual basis, and based on the completed student's appraisal template, as well as additional student documentation (up to the discretion of the EECS Graduate Committee), the EECS Graduate Committee will rank the student's performance as "Above Expectation," "At Expectation," or "Below Expectation" toward the completion of the PhD degree. The evaluation by the EECS Graduate Committee will have detailed justification for the student's ranking, and the ranking and its associated justification will be provided to the student and the student's adviser.

Students will be notified (no earlier than the end of the first year of their studies and no later than the end of the second year of their PhD studies) whether they have passed the Qualifying Review or not, that is, whether they are eligible to continue in their PhD studies. A student who passes the Qualifying Review will continue with the completion of the rest of the PhD program's milestones (i.e., Candidacy Examination, Dissertation Proposal Examination, and Dissertation Defense). A student who fails the Qualifying Review will be dismissed from the program and will be given the opportunity to finish their Master's degree (if applicable).

A student who in the EECS Graduate Committee's opinion fails the Qualifying Review will be given the opportunity to request a reevaluation of his or her case by the committee. The decision of the EECS Graduate Committee, as a result of this reevaluation, is final.

Annual appraisals will end after the student has passed the Qualifying Review.

Dissertation Committee

Doctoral students must have a Dissertation Advisory Committee prior to the Candidacy Examination. The Committee will consist of a minimum of four members. At least three members must be qualified regular faculty members from the students department (or college, if a college-wide program) at UCF, one of whom must serve as the chair of the committee. One member must be from either outside the School of EECS or outside the university.

The committee chair must be a member of the department graduate faculty approved to direct dissertations. Joint faculty members serve as department-faculty committee members. Adjunct faculty and off-campus experts may serve as the outside-the-college person in the committee. Program areas may further specify additional committee membership. The College of Graduate Studies reserves the right to review appointments to advisory committees, place a representative on any advisory committee, or appoint a co-advisor.

In unusual cases, two professors may chair the committee jointly with approval from the program director. Joint faculty members may serve as committee chairs, but off-campus experts and adjunct faculty may not serve as committee chairs. All members vote on acceptance or rejection of the dissertation proposal and the final dissertation. The dissertation proposal and final dissertation must be approved by a majority of the advisory committee.

Candidacy Examination

After passing qualifiers, students are required to successfully complete the candidacy examination. The purpose of this examination is for the student to demonstrate readiness for preliminary research in a chosen field of study. This exam is administered by the student's dissertation advisory committee and is comprised of written and oral portions. Preparedness for taking the candidacy examination requires the acceptance of a professional paper by a peer-reviewed conference or journal that is deemed acceptable to the student's advisory committee. It is expected that the requirements for candidacy will be satisfied within the first twenty-four months of graduate work. Candidacy is normally taken near the completion of required course work and must be passed before registering for doctoral dissertation hours (EEL 7980). Continuous enrollment in at least 3 hours of doctoral dissertation hours is required once a student starts taking 7980 credits.

After passing the candidacy examination, the student will write a dissertation proposal and present it orally to the dissertation advisory committee for approval. The proposal must include a description of the research performed to date and the research planned to be completed for the dissertation.

Time Limitation

Students have seven years from the beginning of regular graduate status in the Ph.D. program to complete all requirements for the degree, although most students finish within 4 to 5 years.

Dissertation and Oral Defense

Students must write a dissertation on their research that describes a significant original contribution to the field of computer science. The oral defense of the dissertation is reviewed by the research committee. The dissertation must be approved by the dissertation adviser and committee, the school director or designee and the dean of the college or designee. Format approval from the Thesis and Dissertation Editor and final approval of satisfaction of degree requirements by the Division of Graduate Studies is required.

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