

Policy Statement for the Electrical and Computer Engineering (ECE) Graduate Certificates

I. Program History

The field of Electrical and Computer Engineering comprises numerous areas of specialization. Full-time workers who wish to expand their knowledge, and even prospective graduate students, may not be able or ready to begin graduate studies on a full-time basis. The proposed certificates will allow them to begin to acquire skills by focusing on specific areas of interest in ECE.

Specific educational and business goals of the proposed certificates are:

- Enhance the knowledge of professionals working in the field of Electrical and Computer Engineering.
- Support industry desire to provide their employees with incremental and meaningful continuing education in specific fields of Electrical and Computer Engineering.
- Attract prospective graduate students, not yet ready to begin full-time graduate studies, to the field of Electrical and Computer Engineering.

II. Admission Requirements

The ECE Graduate Certificates program has the following admission requirements for each one of the offered certificates:

- Applicants must hold a bachelor's degree from an accredited four-year College or University with a minimum grade point average of 3.0 on a 4.0 system.
- Applicants must have undergraduate degrees in Electrical and Computer Engineering or related disciplines. Applicants with degrees in other disciplines may be admitted depending on their experience in the relevant disciplines. Although it is expected that most applicants will be non-current UD students, applications are open to current UD graduate students.
- International applicants must demonstrate a satisfactory level of proficiency in the English language if English is not their first language. The University requires an official TOEFL score of at least 550 on paper-based or 79 on Internet-based tests. TOEFL scores more than two years old cannot be considered official. Alternatively, IELTS can be accepted in the place of the TOEFL. The minimum IELTS score is 6.5 overall with no individual sub-score below 6.0.

Applications for the Fall semester must be received by August 15, while the application deadline for the Spring semester is January 25. Admission to the ECE Graduate Certificate program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

III. Academic Requirements

The following Certificates are offered: (a) Embedded Systems and Integrated Circuits, (b) Computer Hardware and Software Design and Optimization, (c) Smart Grid and Energy Systems, (d) Large-Scale Data Analytics, (e) Machine Learning Foundations, (f) Signal

Processing and Imaging Systems, (g) Communication Systems, (h) Semiconductor Device Fabrication, and (i) RF Engineering. Applicants must select one of these nine Certificates when they apply to the program. All courses will be offered as regular on campus courses. Each Certificate requires satisfactory completion of three (3) graduate-level courses (9 credits) from within the list of ECE graduate courses corresponding to each Certificate. Each course must be completed with a grade no lower than B-. If the grade in one of the courses is below B-, the student may either retake the course or take another course from the same Certificate. The overall GPA across the three (3) graduate courses applied to the selected Certificate must be no lower than 3.0 and a cumulative GPA of 3.0 must be achieved even if a course is repeated or an additional course is completed to be eligible for the certificate to be awarded. Any particular course can only be applied towards a single certificate.

Students may apply the graduate courses of up to three (3) successfully completed certificates towards the degree requirements for a Master of Science in Electrical and Computer Engineering (M.S.E.C.E.). All the M.S.E.C.E. requirements must be satisfied within three years of the completion of the first certificate.

The course requirements for each Certificate are listed below.

(a) For the Embedded Systems and Integrated Circuits Certificate, applicants must select three (3) courses from the following:

- ELEG 622 Electronic Materials Processing
- ELEG 646 Nanoelectronic Device Principles
- CPEG 622 Embedded Systems Hardware/Software Co-Design
- CPEG 624 Analog Integrated Circuit Design
- CPEG 660 Introduction to VLSI Systems
- CPEG 853 Computer System Reliability

(b) For the Computer Hardware and Software Design and Organization Certificate, applicants must select three (3) courses from the following:

- CPEG 621 Compiler Design
- CPEG 622 Embedded Systems Hardware/Software Co-Design
- CPEG 652 Principles of Parallel Computer Architectures
- CPEG 655 High-Performance Computing with Commodity Hardware
- CPEG 853 Computer System Reliability

(c) For the Smart Grid and Energy Systems Certificate, applicants must select three (3) courses from the following:

- ELEG 617 Smart Grids
- ELEG 628 Solar Energy Tech and Applications
- ELEG 637 Energy Systems
- ELEG 657 Microgrids
- ELEG 684 Electric Vehicles

(d) For the Large-Scale Data Analytics Certificate, applicants must select three (3) courses from the following:

- CPEG 655 High-Performance Computing with Commodity Hardware
- CPEG 657 Search and Data Mining
- ELEG 815 Analytics I - Statistical Learning
- ELEG 817 Large-Scale Machine Learning

(e) For the Machine Learning Foundations Certificate, applicants must select three (3) courses from the following:

- ELEG 601 Convex Optimization
- ELEG 602 Advanced Machine Learning
- ELEG 815 Analytics I - Statistical Learning
- ELEG 817 Large Scale Machine Learning
- ELEG 845 Modern Machine Learning
- CPEG 657 Search and Data Mining

(f) For the Signal Processing and Imaging Systems Certificate, applicants must select three (3) courses from the following:

- ELEG 604 Digital Imaging and Photography
- ELEG 631 Digital Signal Processing
- ELEG 679 Introduction to Medical Imaging Systems
- ELEG 815 Analytics I - Statistical Learning

(g) For the Communication Systems Certificate, applicants must select three (3) courses from the following:

- ELEG 630 Information Theory
- ELEG 635 Digital Communications
- ELEG 642 RF Systems for Wireless Communications
- ELEG 811 Channel Coding Theory and Practice
- ELEG 812 Wireless Digital Communications

(h) For the Semiconductor Device Fabrication Certificate, applicants must select three (3) courses from the following:

- ELEG 622 Electronic Materials Processing
- ELEG 628 Solar Energy Technology and Applications
- ELEG 640 Opto-Electronics
- ELEG 646 Nanoelectronic Device Principles
- ELEG 650 Semiconductor Device Design and Fabrication
- ELEG 682 Optics and Photonics

(i) For the RF Engineering Certificate, applicants must select three (3) courses from the following:

- ELEG 641 Antenna Theory and Design
- ELEG 642 RF Systems for Wireless Communications
- ELEG 692 Radar Systems and Technology
- ELEG 842 Radio Frequency and Microwave Technology
- CPEG 624 Analog Integrated Circuit Design

IV. Assessment Plan

The ECE Graduate Certificates program will enable students to demonstrate their ability to understand and apply concepts in the areas of (a) Embedded Systems and Integrated Circuits, (b) Computer Hardware and Software Design and Optimization, (c) Smart Grid and Energy Systems, (d) Large-Scale Data Analytics, (e) Machine Learning Foundations, (f) Signal Processing and Imaging Systems, (g) Communication Systems, (h) Semiconductor Device Fabrication, and (i) RF Engineering. Student learning relative to this outcome can be directly assessed by the students' course grades in the selected three courses of their Certificate. In addition, the current and updated employment listing of the students will serve as indirect evidence of student attainment of the learning goal.

V. Financial Aid

University financial aid is not available to students enrolled in the ECE Graduate Certificates program.

VI. Department Operations

This program will be administered by the ECE Department through its Graduate Committee. The ECE Associate Chair for Graduate Studies will oversee the administration of the program with the support of departmental graduate support staff, and can approve necessary adjustments to meet the needs of the parties involved.