Graduate Certificate
Department of Electrical and Computer Engineering
Embedded Systems

Proposal Description

The Electrical and Computer Engineering (ECE) Department offers a graduate certificate in Embedded Systems consisting of five courses from its graduate curriculum. The Embedded Systems certificate is meant to provide a coherent foundation for graduate students interested in learning how computing components can be embedded in many of the systems we use every day. This certificate covers issues related to the design of small computing devices, the security of the devices, and the interconnection of the associated components. To receive the certificate, students take the following required and elective courses:

Required courses

- ECE688F: Graduate Project (1st semester)
- ECE688P: Graduate Project (2nd semester)

Elective courses (students choose 3 out of 5 courses)

- ECE510: Foundations of Computer Systems
- ECE568: Computer Architecture
- ECE636: Reconfigurable Computing
- ECE622: Embedded Systems: Design, Modeling, and Verification
- ECE658: VLSI Design

To receive the Embedded Systems certificate, students must develop and complete a project in embedded systems as part of the ECE688F/P sequence. All courses listed are three credits. There are no prerequisite courses required for these courses. The elective courses can be taken in any order although it is recommended that if a student chooses to take ECE510, this course should be taken first. ECE688F must precede ECE688P. Per UMass regulations, students must achieve a 3.0 GPA in the certificate courses to receive a certificate.

The courses provide a solid basis of state-of-the-art knowledge in embedded systems. ECE510 provides appropriate background in advanced computer engineering fundamentals for students so that students may have a solid foundation for the remaining four certificate courses. ECE568 provides a review of contemporary computer architecture. ECE622 examines the modeling and verification of embedded systems. ECE658 introduces the fundamentals of digital circuit design and layout on silicon chips. ECE636 describes the state of the art in using field-programmable devices for computation. Finally, ECE688F/P provide the students an opportunity to work in a

small group to complete a hands-on project related to embedded systems. The students also learn technical presentation and writing skills as part of the project courses.

Current ECE Masters of Science (MS) students and non-matriculating students may apply for the certificate program. Non-matriculating students should have sufficient technical background, as determined by the ECE Graduate Program Director, to join the certificate program. Acceptance into the certificate program does not automatically qualify a student for the ECE MS program, although the student may attempt to join the MS program at any time. If a student joins the ECE MS program after completing the certificate, all 15 credits can be applied to the ECE MS degree. Completion of the certificate does not imply admission to the University in a specific academic program. If a student completes a graduate certificate in Embedded Systems, the student is ineligible for an ECE graduate certificate in Computer Networking, Internet of Things, or Computer Systems Security.

Purposes and goals

By completing the courses associated with this certificate, students will become familiar with the state-of-the-art in the design, testing, and use of embedded systems. Powerful computing devices are increasingly dedicated to serve as the brains of everyday systems such as televisions, kitchen appliances, and transportation systems. Understanding the real-time operation of these systems is key to their design, development, and deployment.

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