Presenting CU Boulder’s Professional Master’s Program in Embedded Systems Engineering

Introduction

Based on clear demand from industry and from our growing graduate student population, our Department of Electrical, Computing, and Energy Engineering (ECEE) is launching a new Professional Master’s program for Embedded Systems Engineering.

CU-Boulder’s College of Engineering and Applied Science has transformed our ME degree to focus on highly employable disciplines and skills based on industry needs. The ECEE Department is embracing this transformation now as an ideal opportunity to expand the high quality and technical Embedded Systems Certificate we have long offered into a wide array of courses leading to a full Master’s Degree.

Adding several new embedded systems courses to our program now enables greater options for earning the certificate, while also offering enough embedded courses to complete a full Master’s degree. Students pursuing this degree, as well as non-degree students pursuing a Professional Certificate in Embedded Systems Engineering (ESE), will also have access to many excellent graduate level courses offered by ECEE’s highly reputed faculty in Computer Engineering, Communications, Controls, Optics, RF and Microwave, and more.

Our ESE program expansion continues as a work in progress, with five new courses already added in the 2015-16 academic year, and eight courses being offered concurrently in the spring 2016 semester. We will focus admissions on candidates expressing career ambitions in embedded systems, who also possess meaningful embedded systems fundamentals background and strong academic performance.

For details not covered below, further information may be found here on our embedded systems website. Updates will be posted as they become available.

http://ecee.colorado.edu/academics/cert_programs/embedded.html

Frequently Asked Questions and Answers

What is the ESE program?

Our Embedded Systems Engineering (ESE) Professional Master’s program offers a wide variety of technical embedded systems courses in CU Boulder’s Electrical, Computer, and Energy Engineering Department (ECEE) in the College of Engineering and Applied Science. Curriculum is systemically kept current and strategically comprehensive across essential embedded systems technologies, design engineering techniques, development tools and key trends. Our program will generate creative, workforce-ready graduates equipped with versatile embedded engineering skills and thought leadership stemming from a greater context around organizational and business dimensions as well.
What are the pre-requisites for ESE students?

Embedded Systems Engineering courses at CU-Boulder engage high-caliber students from around the world. The courses typically run at a fast pace, often involving intense hands-on projects. In order to be successful in these courses, students must have foundational knowledge and experience in embedded systems architecture, components, circuits, C programming and some assembly language, some operating system coursework, use of lab equipment such as oscilloscopes, multi-meters, function generators, digital logic analyzers and protocol analyzers, etc. Typically, students (both Master’s degree and non-degree) who enter our program have a BS Electrical, Computer, or Software engineering degree or equivalent, and have some embedded systems experience through undergraduate projects and internships. Students may be either degree-seeking (i.e. admitted to our Graduate School), or non-degree seeking, often pursuing a Professional Certificate in Embedded Systems Engineering.

Please review course-specifics here, including any prerequisites, and seek clarification as needed with course instructors.

Is a GRE exam required for admission to the ESE program?

No, not specifically for the ESE program. For those pursuing admission to our Graduate School to obtain a Master’s degree, please refer to details of the application process and requirements per above. Admission to our ME degree does not require a GRE exam, while admission to MS does.

What is the schedule for ESE courses?

Please refer to the ECEE online course schedule under Quick Links for schedule and classroom details for the upcoming semester.

How much space is available in ESE courses?

When registering for courses through MyCUInfo, you will see the number of currently available slots for the appropriate course section based on your student type. ESE courses have on-campus sections for students who attend class in person (degree and non-degree), and most ESE courses (after first run) also include distance sections, offered for degree-seeking and non-degree-seeking students without consistent access to main campus. Slots are allocated to both on-campus and distance sections.

How and when do I enroll in ESE courses?

Graduate students in our Professional Master’s Program with an ESE subplan will receive ESE course enrollment priority over other graduate students. Complete details on the graduate student application process (Admission Requirements, Application Deadlines, How to Apply instructions for both VISA and domestic students) may be found under the Prospective Students section of our ECEE web site.

If you are an existing ECEE graduate student and want to enroll in the ESE program, please contact our Graduate Advisor, Adam Sadoff, adam.sadoff@colorado.edu, (303) 735-0490.

Non-degree students, for example those in industry pursuing a Professional Certificate in Embedded Systems Engineering, may also enroll in ESE courses through the Division of Continuing Education (conted.colorado.edu or 303-492-5148). The process begins here. Our Continuing Education division works closely with Be Boulder Anywhere (BBA), which is our overarching division for distance learning. BBA focuses on distance, degree-seeking students, while Continuing Education handles non-degree students. Most (except first run) ESE courses offer distance learning options to provide flexibility.
for those in industry or non-local graduate students. Please refer to Be Boulder Anywhere (BBA) embedded program and BBA FAQs for further information.

Refer to the campus Academic Calendar for important deadline dates.

Which ECEE courses (including the ESE program) will offer distance learning options?

See the “BBA” column of the ECEE online course schedule under Quick Links for distance course designations.

What is the tuition cost for ESE program?

Academic year 2015-16 tuition rates for graduate students enrolled in Professional Master’s programs (e.g. the ESE program in the ECEE department) are $860 per student credit hour for Colorado residents, and $990 per student credit hour for non-residents. Graduate students may be enrolled in only one Professional Master’s program at a time. Please refer to officially published tuition rates from the Bursar’s Office. Non-degree student tuition rates for ESE courses will generally follow the same rates as for graduate students. Tuition rates are administered through the respective enrollment processes for degree and non-degree students.

Are there any TA, RA, GA or GPTI opportunities in the ESE program?

Students enrolled in the ESE program are eligible for an hourly appointment or fellowship, but are not eligible for TA, RA, GA or GPTI roles with a tuition waiver. Instead, Professional Master’s tuition rates for non-residents are substantially lower than traditional master’s degree rates. Moreover, our Professional Master’s program rates are completely linear to the credit hour load, and carry low differential between resident and non-resident rates.

What is the difference between ME and MS?

Historically, the technical courses taken by MS and ME students have been identical, but ME students had the option to take more ITP (Interdisciplinary Telecommunications) or EMEN (Engineering Management) courses, for example, than MS students. CU-Boulder’s College of Engineering and Applied Science is currently transforming our ME degree toward more industry-driven, technical Professional Master’s programs. Our ESE program will require a higher proportion of technical courses than ME students historically took.

The current Professional Master’s program in Embedded Systems Engineering leads to a Master of Engineering (ME) degree. Several students have asked about a Master of Science degree, and we are pleased to let you know that it is our intent to develop within the next year a professional engineering track in Embedded Systems Engineering that leads to a Master of Science (MS) degree – students in the current ME track may then switch to the MS track and receive the MS degree if they meet its curriculum requirements.

Does the ESE program exist under a designated STEM degree?

Yes. Since the ECEE Department offers the ESE program under the ME degree, the CIP code is 14.0101 with a CIP description of general engineering. This CIP code is listed on ICE website as a STEM-designated degree program, http://www.ice.gov/sites/default/files/documents/Document/2014/stem-list.pdf.
What is the course structure for ESE?

The ESE program requirements consist of 4 core ESE courses and 6 electives, comprising 30 credit hours. The ESE certificate requirements consist of 2 core ESE courses and 1 elective, comprising 9 credit hours. As ESE core courses and embedded specific electives are added, students may also access a wide selection of ECEE graduate courses in many disciplines to fulfill their electives and customize their career preparation.

As the program is expanded, core curriculum will center mainly on essential embedded technologies, while ESE electives will steer more towards applications.

Does the ESE program include research or thesis?

No. Our ESE program is a technical specialization under the ME degree and does not include research or thesis components as requirements. The main objective of the ESE program is workforce preparation around industry-driven highly employable engineering skills. As such, most ESE courses will involve hands-on projects and course assignment-related research around new technologies and applications.

Will the ESE program limit my options for pursuing a PhD afterwards?

Our ESE program is centered on preparing students for significant careers in industry, most of which neither require nor prefer a PhD. ESE students are eligible to apply to our PhD program.

What is the expected timeline for completing a masters degree through the ESE program?

The program allows flexibility. Full-time students typically complete a degree through the program in 2 years or less. Part-time students should complete a degree within 5 years.

What ECEE courses are available for credit under the ESE program? From other departments as well?

Required ESE course options as well as recommended electives are provided on our embedded systems web site. Further ESE program rules and guidelines will be posted there as well. Please also refer to the currently posted ECEE course schedule linked from our ECEE home page for further detail.

In the past, some embedded courses have been offered with less regularity as they require updating to meet our standards. As we expand our ESE program with more instructors, we will offer new versions of our best courses, and also develop new courses that provide wider coverage of embedded systems technologies and applications. Our Real-Time Embedded Systems (ECEN-5623) and Real-Time Digital Media (ECEN-5653) courses are currently under review. They are both being offered in summer 2015, and we intend to offer at least one of these in spring 2016. Meanwhile, several of our newest embedded courses are under development (see Introduction comments above as well): Mastering Embedded Systems Architecture, Mobile Computing and IoT Security, and Programmable Systems on a Chip. We will update our embedded systems web site and Fall Schedule throughout the next few months as the program progresses. We will offer these courses as soon as they are created, with fresh content, rather than wait another semester or two.

Can I still take Computer Engineering graduate courses in the ECEE department?

While our ESE program focuses on embedded-specific courses, electives under the 30-credit hours required to complete the ME degree may include other 5000-level graduate courses in our department, of which there are many to choose from. Enrolling in the ESE program provides access to the best of both worlds.
We believe there is significant industry and student demand for embedded systems engineering education. Our ESE program is essentially a spinoff from our Computer Engineering curriculum (expanding our embedded systems design certificate) into a more practical, industry-driven professional master’s degree. While ECEE Computer Engineering courses may be taken as electives under the ESE program to access broader subject matter, our embedded-centric courses may be preferred to ESE students as more become available.

Will the ESE program under ME degree be recognized by industry?

Employers will recognize relevant demonstrated and proven skills of our students, and benefit immediately from inherent versatility of our program graduates. In turn, program graduates will access more opportunities from which to choose, many of higher quality enabled by our ESE Program.

Thus far, our Professional Certificate in Embedded Design has been in high demand, and is a key reason behind our decision to accelerate ESE program expansion. The ECEE Department issued 86 Embedded Design Certificates from spring 2010 through summer 2014, averaging about 22 per year.

What are some prospective career paths I may pursue with an ESE certificate or Master’s Degree?

Example careers targeted by this program are (not limited to):

- Firmware Engineer
- Design Engineer
- Solutions Architect
- Embedded Systems Architect
- Software Engineer
- Embedded Software Engineer
- Systems Engineer
- (Field) Applications Engineer
- Embedded Software/Hardware Developer
- Technical Project Manager
- Product Engineer

Is there a Graduate Advisor for the ESE program?

Yes. For further inquiries or assistance, please contact our ECEE Graduate Advisor, Adam Sadoff, adam.sadoff@colorado.edu, (303) 735-0490.