ELECTRICAL ENGINEERING - PROFESSIONAL MASTER OF SCIENCE (MSEE)

The professional Master of Science degree in electrical engineering is a professional degree composed of advanced courses relevant to working engineers.

The department offers two degree tracks, both of which result in a professional Master of Science degree in electrical engineering (MSEE).

Program Tracks

Embedded Systems Engineering (ESE) Track
The Embedded Systems Engineering (http://www.colorado.edu/ecee/graduate-program/degrees/embedded-systems) (ESE) track provides comprehensive coverage of essential embedded technologies, current tools and trends. It is structured to provide students with a broad, versatile skill set and is coupled with industry input for continuous curriculum updates.

Through flexible core course options and electives, students enrolled in the ESE program pursue a 30-credit-hour MS degree. Many courses offer distance learning options through CU Boulder Connect.

Power Electronics (PPE) Track
Power Electronics (http://www.colorado.edu/ecee/graduate-program/degrees/power-electronics-certificate) is a key enabling technology in essentially all electronic systems and is increasingly important in the grid interface of renewable energy sources and in efficient electrical loads. The necessity for power electronics technology in these rapidly expanding areas creates an increasing need for design engineers equipped with knowledge and skills to actively participate in multidisciplinary teams.

Through flexible core course options and electives, students enrolled in this program pursue a 30-credit-hour MS degree. The program is intended for students and engineers with a BS degree in electrical engineering or the equivalent. Entering students must have adequate knowledge of circuits and electronics, as taught in undergraduate courses intended for EE majors.

Distance Education Option

Students can take individual courses toward a master's degree or graduate certificate through distance education (online). For more information, connect with the graduate program advisor or visit the Graduate School’s Distance Education (https://www.colorado.edu/graduateschool/distance-educa­tion) webpage.

Requirements

Admission
A minimum undergraduate GPA of 3.00 is required for application to the master’s program. Students who are interested in the PhD degree and have strong academics (including 3.50 or higher GPA) should apply directly to the PhD program (catalog.colorado.edu/colleges-schools/engineering-applied-science/programs-study/electrical-engineering/electrical-engineering-doctor-philosophy-phd).

Course Requirements

The following course requirements are subject to change; for the most current information, visit the department’s Embedded Systems Engineering (http://www.colorado.edu/ecee/graduate-program/degrees/embedded-systems) or Power Electronics (http://www.colorado.edu/ecee/graduate-program/degrees/power-electronics-certificate) webpages.

Students must complete a total of 30 credit hours (including both course and thesis hours) with a grade of C or better and a cumulative GPA of at least 3.00. At least 24 credit hours must be completed at the 5000-level or above, and at least 18 of those credits must be in sufficiently technical ECE courses.

Program Tracks

Embedded Systems Engineering (ESE) Track

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESEC 5613</td>
<td>Embedded System Design</td>
<td>15</td>
</tr>
<tr>
<td>ESEC 5623</td>
<td>Real-Time Embedded Systems</td>
<td></td>
</tr>
<tr>
<td>ESEC 5803</td>
<td>Mastering Embedded Systems Architecture</td>
<td></td>
</tr>
<tr>
<td>ESEC 5863</td>
<td>Programmable Logic Embedded System Design</td>
<td></td>
</tr>
<tr>
<td>ESEC 5823</td>
<td>Internet of Things Embedded Firmware (IoT Embedded Firmware)</td>
<td></td>
</tr>
<tr>
<td>ESEC 5053</td>
<td>Special Topics (Embedding Sensors and Actuators)</td>
<td></td>
</tr>
<tr>
<td>ESEC 5023</td>
<td>Special Topics (Low Power Design Techniques)</td>
<td></td>
</tr>
<tr>
<td>ESEC 5813</td>
<td>Principles of Embedded Software</td>
<td></td>
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</table>

ESE Program Electives

Choose two of the following (or additional ESE core courses): 6

- ESEC 5593 Advanced Computer Architecture
- ESEC 5763 Embedded Machine Vision and Intelligent Automation
- ESEC 5653 Real-Time Digital Media
- ESEC 5032 Special Topics (Intro to Computer Security)
- ESEC 5035 Special Topics (Developing Industrial Internet of Things)
- ESEC 5053 Special Topics (Embedded Interface Design)

Open 5000-Level Electives

Choose three 5000-level electives from the ESE core, ESE electives or other ECEE courses in other departments, with approval of academic advisor. 9

Total Credit Hours 30

For more information, visit the department’s Embedded Systems Engineering (http://www.colorado.edu/ecee/graduate-program/degrees/embedded-systems) webpage.

Power Electronics (PPE) Track

This curriculum is built around a core of three theory courses and two laboratory courses that provide practical laboratory and design experience of specific relevance to the practice of power electronics.
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<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECEN 5797</td>
<td>Introduction to Power Electronics</td>
<td>3</td>
</tr>
<tr>
<td>ECEN 5807</td>
<td>Modeling and Control of Power Electronic Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECEN 5817</td>
<td>Resonant and Soft-Switching Techniques in Power Electronics</td>
<td>3</td>
</tr>
<tr>
<td>ECEN 5517</td>
<td>Power Electronics and Photovoltaic Power Systems Laboratory</td>
<td>3</td>
</tr>
</tbody>
</table>

**Required Laboratory Courses**

Select one 5000-level project laboratory in power electronics (offered every fall).

**Electives**

Select one of the following power electronics electives:

- **Electric Vehicles**
  - ECEN 5017 (Special Topics: Power Electronics for Electric Drivetrain Vehicles; fall)
  - ECEN 5XX7 Electric Machines
  - ECEN 5737 Adjustable-Speed AC Drives (spring)

- **Analog and Mixed-Signal IC Design**
  - ECEN 5827 Analog IC Design (fall)
  - ECEN 5837 Mixed-Signal IC Design Lab (alternate spring semesters)
  - ECEN 5XX8 Integrated Circuits and Devices for Power Electronics (alternate spring semesters)

- **Grid Integration of Renewables**
  - ECEN 5XX7 Control of Power Electronics in AC Systems and Micrograms
  - ECEN 5XX7 Renewable Energy and the Future Power Grid
  - ECEN 5XX7 Advances in Control and Optimization of Power Systems
  - ECEN 5XX7 Power System Analysis

**Technical Electives**

Choose three technical electives with advisor approval. Recommended electives include courses in control systems, RF/microwaves and engineering management.

**Open Elective**

Choose an additional elective course.

Total Credit Hours 30

For more information, visit the department’s Power Electronics (http://www.colorado.edu/ecee/graduate-program/degrees/power-electronics-certificate) webpage.

**Time Limit**

All degree requirements must be completed within four years of the date of commencing course work. Most students complete the degree in one-and-a-half to two years.