PROFESSIONAL MASTER’S DEGREE
Embedded Systems Engineering & the Internet of Things

Get the practical knowledge and industry context you need to successfully and creatively contribute to the growing Internet of Things.

The Department of Electrical, Computer and Energy Engineering at the University of Colorado Boulder is excited to offer an Embedded Systems Engineering (ESE) professional master’s program. Our world-class program was built from the ground up with comprehensive coverage of essential technologies, tools and trends. It is structured to provide you with a broad, versatile skillset and relies on active industry input for curriculum updates.

The program is offered under the College of Engineering and Applied Science’s Professional Master of Science or Master of Engineering degree. Through core courses (offered twice a year for maximum flexibility) and a growing slate of electives, students enrolled in the ESE program may pursue a 9-credit hour certificate or 30-credit hour degree.

With our newly added ESE courses, you now have access to everything you need to complete a master’s degree in this dynamic field.

Why Embedded Systems?

Engineers with versatility in essential embedded technologies, markets and trends are highly sought-after by companies that want to capitalize on the ever-expanding Internet of Things.

In a challenging business environment, you will exude a practical sense of what is creatively possible, opening new revenue opportunities for your company and new career opportunities for yourself.

As an ESE graduate, you will be prepared to hit the ground running, armed with state-of-the-art technology, tools and techniques.

For more information, visit www.colorado.edu/ecee/embedded-systems
## ESE Program Coverage

### Essential Technologies
- Communication Protocols
- Controller (MCU/MPU/DSP)
- Electromechanical
- Emerging Technologies
- Human Interface and Display
- Memory (V, NV)
- Operating System/Firmware
- Power Management
- System Control
- Sensors, Signal Chain/Data Conversion

### Primary End Markets
- Aerospace/Military
- Alternative Energy
- Consumer
- Emerging Markets
- Industrial
- Medical
- Networking/Communications
- Security
- Transportation

### Current Trends
- ARM Processors
- Autonomous Vehicles and Unmanned Aerial Vehicles
- Capacitive Touch
- Computer/Machine Vision
- Consumer Wearables
- FPGA/SoC
- Home Automation
- Imaging
- IoT Enablement
- Memory/Storage
- Sensors/MEMS
- Smartphone Apps
- Solid State Lighting
- Wireless Protocols & Devices

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## ESE Program Courses

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<tr>
<th>Course Name</th>
<th>Emphasis</th>
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<tr>
<td>*Mastering Embedded Systems Architecture</td>
<td>Processor/OS selection and architecture migration</td>
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<tr>
<td>*Programmable Logic Embedded System Design</td>
<td>FPGA/SoC solutions; embedded ARM to SI and PDN challenges</td>
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<tr>
<td>*Embedded System Design</td>
<td>Embedded system design fundamentals</td>
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<td>*Real-Time Embedded Systems</td>
<td>RTOS implementation and rate monotonic theory</td>
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<tr>
<td>*IoT Embedded Firmware</td>
<td>Designing for IoT connectivity, security and energy efficiency</td>
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<tr>
<td>*Embedding Sensors and Actuators</td>
<td>Sensor signal capturing, filtering and processing</td>
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<tr>
<td>*Principles of Embedded Software</td>
<td>Rigorous embedded software concepts, languages and tools</td>
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<tr>
<td>*Advanced Practical Embedded Software Design</td>
<td>Embedded software complexities (OS, kernels, bootloaders, drivers, etc.)</td>
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<tr>
<td>Advanced Computer Architecture</td>
<td>Design of high-performance computer systems</td>
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<tr>
<td>Embedded Machine Vision and Intelligent Automation</td>
<td>Intelligent machine vision algorithms and related embedded applications</td>
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<tr>
<td>Developing Industrial Internet of Things</td>
<td>Current technology trends, application case studies</td>
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<tr>
<td>*Low-power Embedded Design Techniques</td>
<td>Energy sourcing &amp; power conversion; MCU selection; battery management</td>
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<tr>
<td>Embedded Interface Design</td>
<td>Techniques for optimal environmental capture and conveyance of results</td>
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<td>Practical PCB Design and Manufacture</td>
<td>Prototyping basics to production PCB design around SI and PI</td>
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<tr>
<td>High Speed Digital Design</td>
<td>High-speed interconnect design methodology, analysis, measurement</td>
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<tr>
<td>Introduction to Computer Security</td>
<td>Principles and practices around software, host systems and networks</td>
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<tr>
<td>ASIP and IP Core Processor Design</td>
<td>Development of optimized processor architecture for end applications</td>
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*Core Course