

CLASS 1: COURSE OVERVIEW

ENGR 102 – Introduction to Engineering

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Course Overview

ENGR 102 – Course Overview

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- Many modern engineering systems are ***electronically controlled***
 - They include a microcontroller
 - We call these ***embedded systems***
- ENGR 100/102 provide a brief intro to the basic ***components of embedded systems***
 - Mechanical
 - Electrical
 - Computer programming
- Building toward the ***ENGR 103 project***:
 - Design and fabrication of an embedded system
 - Hand-crank battery charger

Embedded Systems

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- ***Embedded systems:***
 - ***Microcontroller***-based systems
 - Mechanical, electrical, mechatronic systems
 - ***Programmed*** to provide desired system functionality
- Embedded systems are ***everywhere***, e.g.:
 - Automotive systems
 - Home appliances
 - Mobile phones
 - Industrial robotics
 - IoT devices
 - Smart watches, ...



Microcontrollers

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□ **Microcontroller**

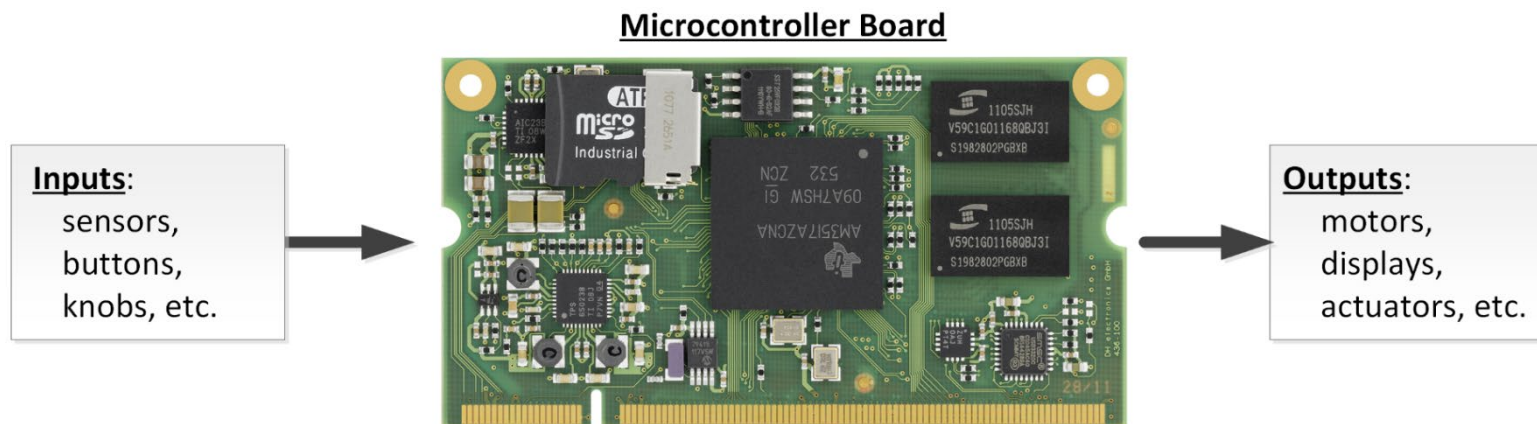
- A single-chip computer with integrated memory and input/output peripherals
- Typically less computing power, but more functionality than a microprocessor
- The *brain* of an embedded system
- Must be programmed to do what we want
 - Microcontroller code is called *firmware*



Embedded System Components

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- **System** to be controlled
 - Electrical, mechanical, mechatronic, etc.
- **Microcontroller**
 - Typically on a printed circuit board (PCB)
- **Inputs**
 - From sensors, knobs, buttons, network, etc.
- **Outputs**
 - To motors, displays, actuators, network, etc.
- **Firmware**
 - Computer code defining system behavior



ENGR 102 Course Overview

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Week	Topics	Lab
1	Intro to embedded systems EE overview	Lab 1: Microcontrollers
2	Electrical fundamentals Voltage, current Fundamental laws	Lab 2: Lab tools
3		Lab 3: Soldering
4	Algorithmic thinking Flowcharts, algorithm design	Lab 4: Analog & digital inputs/outputs
5		Lab 5: Power measurement
6	Python intro Data types Mathematical operations Conditional statements	Lab 6: Flowcharts
7		Lab 7: Writing to an LCD
8	More electrical fundamentals Solar panels Batteries Motors/generators	Lab 8: Solar panel
9		Lab 9: Solar battery charger
10		

Hardware

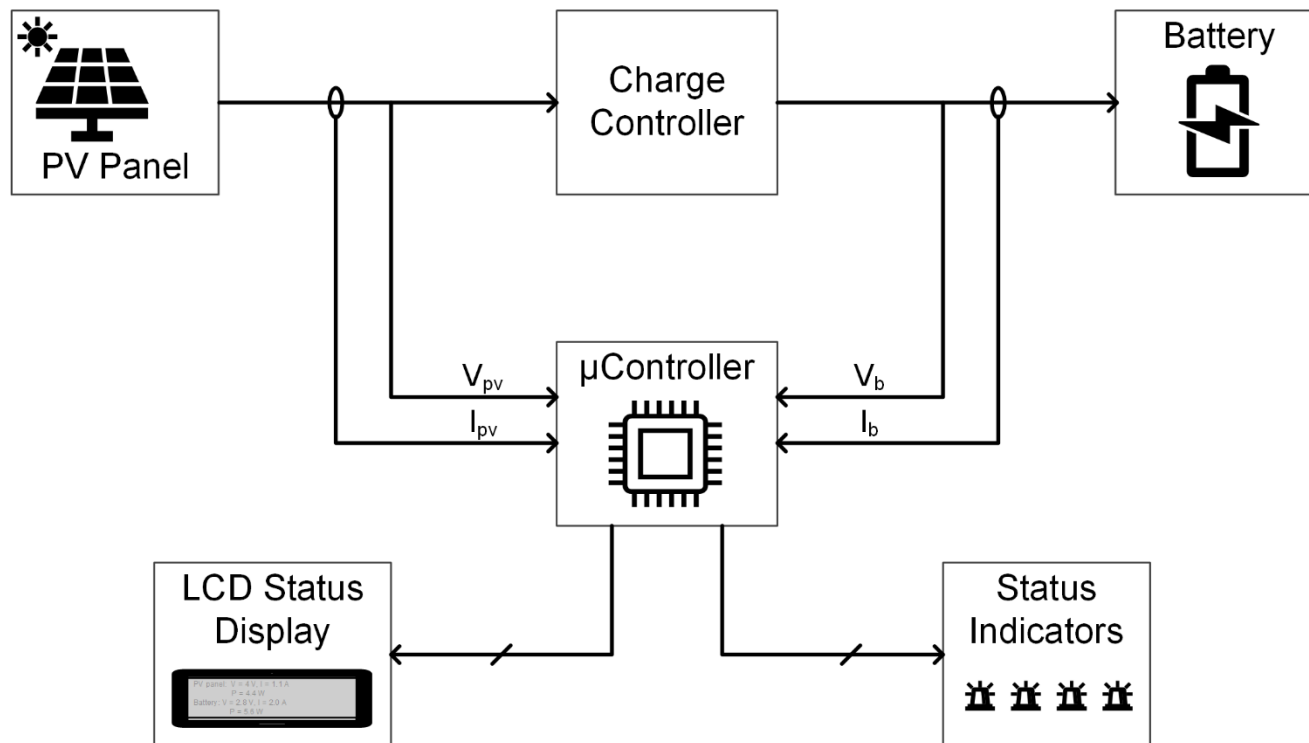
Programming

Hardware & Programming

ENGR 102 – Labs

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- All ENGR 102 labs build toward construction of a final embedded system:
 - ***Solar battery charger***

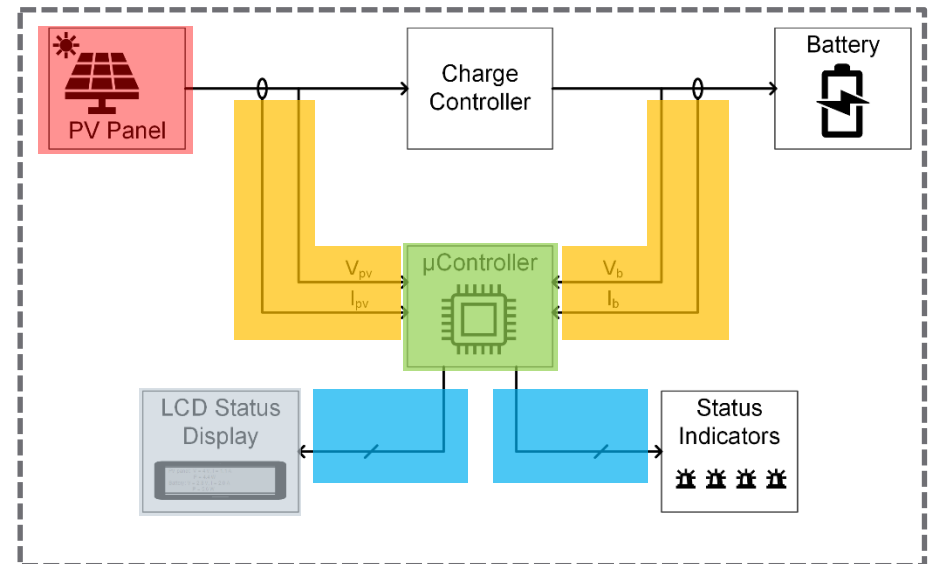


ENGR 102 – Labs

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□ Hardware labs:

- Lab 1: microcontroller introduction
- Lab 4: Analog & Digital Inputs/Outputs
- Lab 5: Power Measurement
- Lab 7: Writing to an LCD
- Lab 8: PV Panel Characterization
- Labs 9 & 10: Solar Battery Charger

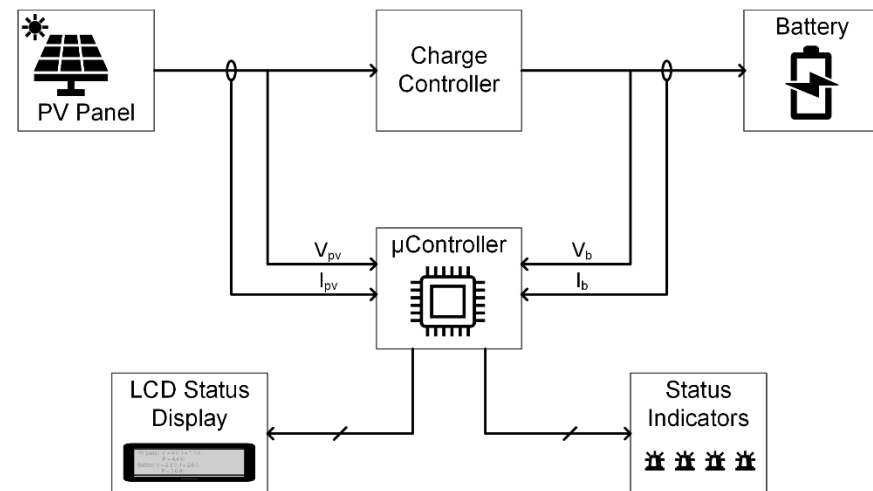


ENGR 102 – Labs

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□ Programming labs:

- ▣ Lab 1: Microcontroller Introduction
- ▣ Lab 4: Analog & Digital Inputs/Outputs
- ▣ Lab 5: Power Measurement
- ▣ Lab 6: Flowcharts
- ▣ Lab 8: PV Panel Characterization
- ▣ Labs 9 & 10: Solar Battery Charger



ENGR 102 – Labs

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- **Tools and prototyping labs:**
 - ▣ Lab 2: Lab Tools & Equipment
 - ▣ Lab 3: Introduction to Soldering

