ECE 4760/5730

Digital systems design using microcontrollers

ece4760.github.io

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Today’s objectives:

- What is the structure of the course?
- What hardware will we be using?
- What will we build with that hardware?

General structure of the course

Three laboratory assignments

- Each lasts three weeks, and each starts *immediately* after the previous one ends
- Each culminates with a demonstration of what you've built
- Each laboratory assignment has an associated lab report
- Each will put some additional tools in your tool belt

No tests, no graded homework (except lab reports)

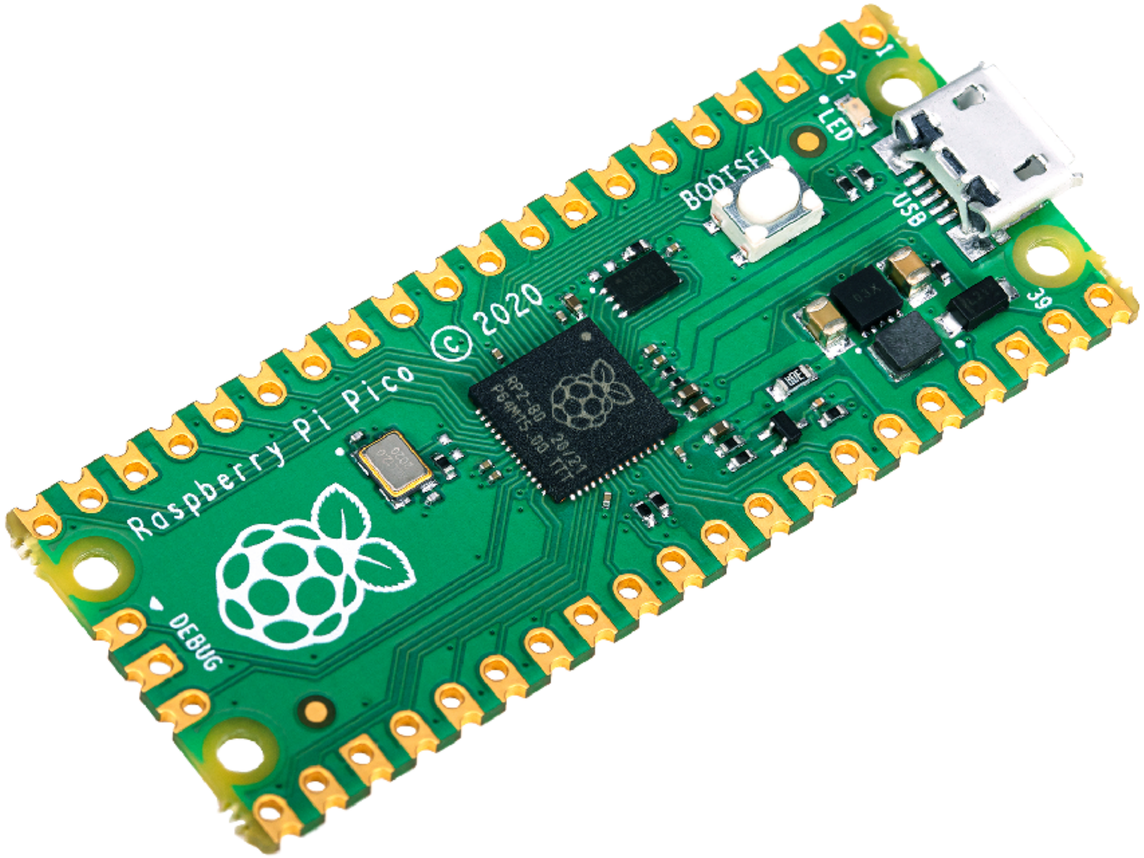
- All of your learning will take place in the laboratory
- The purpose of these lectures is to help you in the laboratory
- Completing the assignments in time will require out-of-lab work and preparation

4-week, open-ended final design project

- You are free to build anything that you would like (that is legal, and within reason)
- You will create a webpage associated with your project, which you may opt-in to have included on the course website

See the course website for more information.

Raspberry Pi Pico (RP2040)



RP2040: Bells and Whistles

- Dual ARM Cortex-M0+ cores
- 12 DMA channels
- 2 UARTs
- 2 SPI channels
- 2 I2C channels
- 16 PWM channels
- USB 1.1 controller
- 30 GPIO pins
- 12-bit ADC with five-input MUX
- 8 PIO state machines
- 8-cycle integer divider
- Interpolator
- 264kB on chip SRAM
- QSPI interface to external flash

Demonstrations of lab exercises

Each lab assignment aims to achieve the following:

- Designed to be self-motivating, and to culminate with something with which you (and anyone else) can play and interact
- Designed to be extensible. Students that develop a fascination with a particular lab can run with that fascination, and there are places to run to
- Designed to appeal to students with a variety of interests
- Designed to add tools to your tool-belt, for potential later use in your final project
- When possible, designed to change the way that you view/understand the natural and constructed worlds.
- Has a Cornell connection
- Hunter finds them interesting!!

Lab Demos

Final Projects

Entirely open-ended!

- Anything audio (synthesizers, autotunes, birdsong/whalesong generators, head transfer functions, FFT-based projects, etc.)
- Anything computer graphics (video games, fractal landscapes, particle system animations, physics simulations, diffusion reaction systems, cellular automata)
- Network/internet-based projects (may require CIT permission)
- Robotics projects
- Artistic projects
- Start thinking now! What are you curious about? What are your hobbies?

Week 1 Logistics

- We will have lab this week!
- Do the reading for Lab 1
- We'll select lab groups in lab