ENGR 21:
Computer Engineering Fundamentals

Instructor: Emad Masroor

Lec 1.1
Tue Sep 2, 2025

Introductions

Prof. Emad Masroor

- B.S. Mechanical Engineering — Cornell University — May 2017
- Ph.D. Engineering Mechanics — Virginia Tech — May 2023
- Research: Fluid Dynamics (theory, experiment, computation)
- Teaching this semester: E21, E59

When I'm not being a professor, I'm …

- Reading! Currently:
  - *Machines Like Me* by Ian McEwan
  - *God in Search of Man* by Abraham Joshua Heschel
- Traveling
  - 15 countries & 30 U.S. States
- Exploring Philadelphia
- Learning to play the piano
- Learning to read Persian poetry

Introductions

Please say:

- Preferred name
- Class year (sophomore, etc)
- A recent book, movie, or other piece of art you have enjoyed

What will you learn in E21?

Comp Engr Fund.

- At most universities, Computer Engineering & Electrical Engineering.

E15 Embedded Systems
E19 Numerical Methods

> E21

1. First course in programming.
2. Embedded Systems
3. Numerical Methods for eng.

How to make a computer do things that engineers need to do.

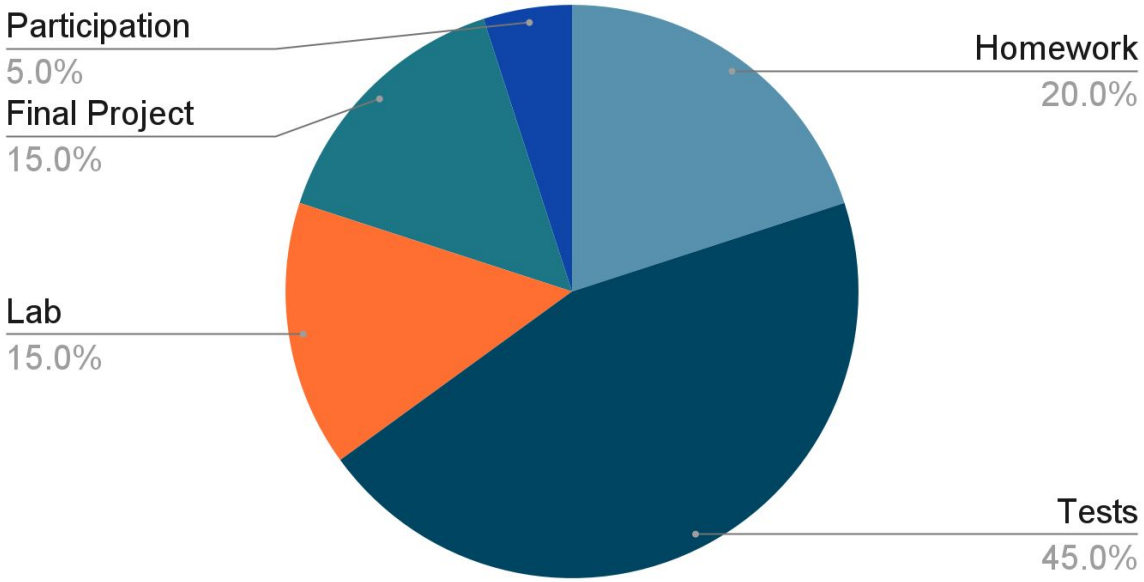
NOT
"How computers work"

Course Logistics

https://emadmasroor.github.io/E21-F25

- Lectures Tuesday and Thursday 8:30 – 9:45 Singer 033
- Labs Monday or Thursday 1:15 – 4:00
- Tests in-class, usually Thursday
- HW due on Tuesday

Grade breakdown:



Your teaching team for E21

Wizards

- Ian Forehand
- Paolo Bosques-Paulet
- Brad Johnston
- Emily Chen
- Nick Fettig

Graders

- Owen Hoffman
- Howard Wang
- Hannah Poon
- Liam Worden

You can find this information at: https://emadmasroor.github.io/E21-F25/#teaching-team

E21 online

Moodle page All enrolled students automatically added	Submit HW (via Gradescope) View grades
Course website https://emadmasroor.github.io/E21-F25/	View syllabus Homework assignments (files, instructions) Resources & links
Ed Discussion (formerly Ed Stem) All enrolled students automatically added	Ask questions Receive answers from peers + teaching team

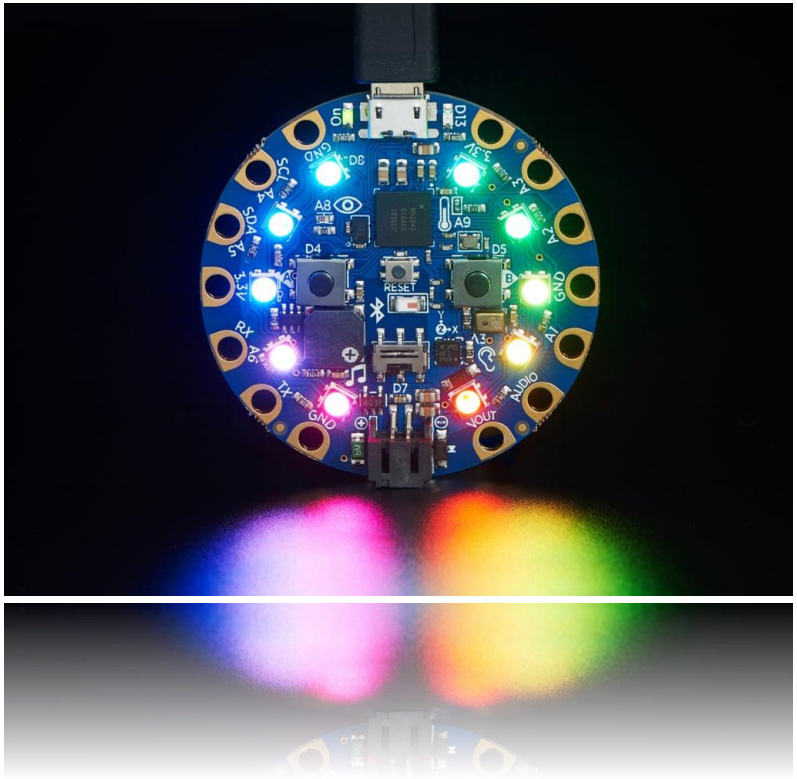
Circuit Playground Bluefruit

A versatile microcontroller for E21

You will get:

- A small circular circuit board
- A micro-USB to USB-A cable
- A USB-A to USB-C connector
- A Battery holder + batteries

Bring to lecture and lab!



Installations for today:

3 steps!

You don't need to install Python on your computer for now!
We will run code directly on the Circuit Playground Bluefruit

Find the links at

1. Install Circuit Python on your board

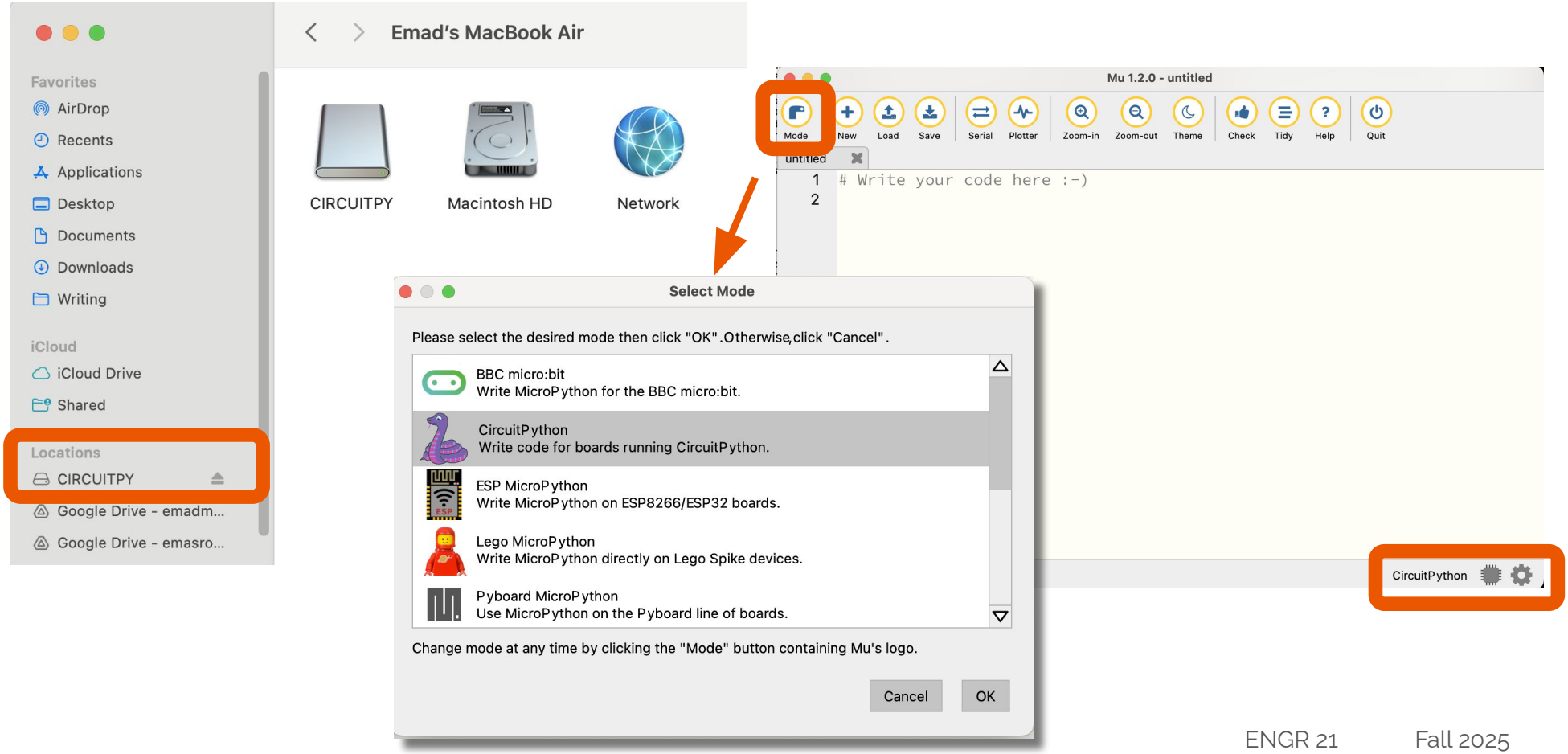
2. Install the 'Mu' Code Editor on your computer

3. Download and copy libraries to your board under `lib`

https://emadmasroor.github.io/E21-F25/Resources

CircuitPython on the Circuit Playground Bluefruit

Once you have installed Mu on your computer and CircuitPython on your board, you should see:



Running some code on your Circuit Playground

We will load some code onto the Circuit Playground Bluefruit that will:

1. Light up a purple pixel
2. Beep at middle-A frequency when you press one button
3. Beep one octave lower when you press the other button

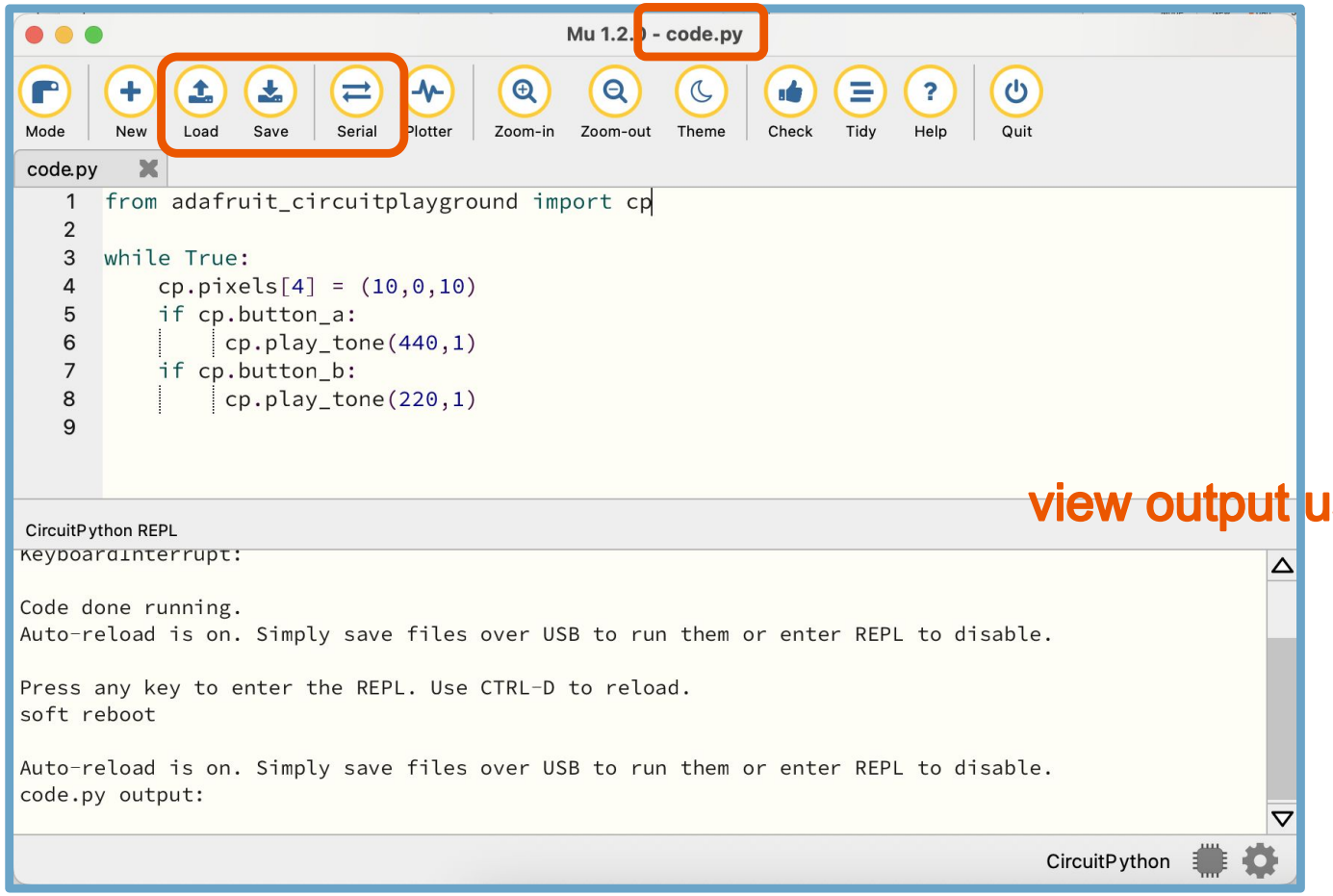
Find the code at https://emadmasroor.github.io/E21-F25/Resources.html

For now, no coding knowledge is assumed! Just use the code on the website.

Two modes of running code on your board

1. Normal mode: Load a file, edit, and save it

Note: `CUIRCUITPY/code.py` is special. This is where your code should be saved

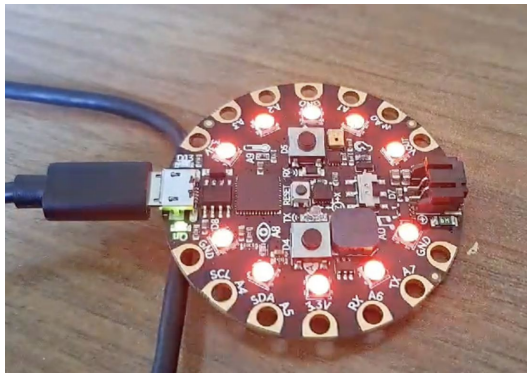


view output using the Serial button

Two modes of running code on your board

2. Serial/REPL mode: Interactively run code

… board will blink red



Mu 1.2.0 - code.py

Mode | New | Load | Save | Serial | Plotter | Zoom-in | Zoom-out | Theme | Check | Tidy | Help | Quit

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code.py

```
from adafruit_circuitplayground import cp

while True:
    cp.pixels[4] = (10,0,10)
    if cp.button_a:
        cp.play_tone(440,1)
    if cp.button_b:
        cp.play_tone(220,1)
```

2. Press CTRL+C

CircuitPython REPL

```
Auto-reload is on. Simply save files over USB to run them or enter REPL to disable.
code.py output:
Traceback (most recent call last):
  File "code.py", line 5, in <module>
  File "adafruit_circuitplayground/circuit_playground_base.py", line 573, in button_a
KeyboardInterrupt:

Code done running.

Press any key to enter the REPL. Use CTRL-D to reload.
```

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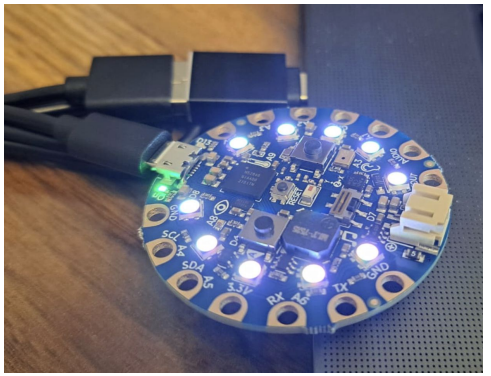
CircuitPython

… then glow white



Two modes of running code on your board

2. Serial/REPL mode: The symbol ">>>" indicates you are in the REPL "Read - Evaluate - Print Loop"