E21 Final Project

Oct 28, 2025

Recruit your teammate(s)

Projects will be completed in teams of 2 or 3 students.

No singletons, sorry!

Please fill out [this questionnaire](#) by the end of the day Thursday.

Two project tracks

Embedded

- Must be implemented in CircuitPython on Circuit Playground Bluefruit

- Budget of up to $50 per group (excluding shipping) at approved vendors:

  - Adafruit
  - Sparkfun
  - Digikey
  - McMaster-Carr

- Additional materials are available in our shops – please inquire

Numerical

- Must be implemented in desktop Python

- Must involve modeling or simulation of the physical world in some way

Regardless of track

- You may use any external modules/libraries you want

- Your project must contain a substantial amount of your own novel code

- Cite any sources you use for research or coding tips

Some example project ideas

Embedded

- Make a micro-sized robot arm with a gripper using laser-cut or 3D printed parts

- Implement a "Simon"-style memory game on the CPB

- Build something with an [ultrasonic](#) or [IR distance sensor](#)

- Choose another interesting [sensor](#) or [actuator](#) and integrate it into a project

Numerical

- Use [Euler's method](#) or a [Runge-Kutta method](#) to implement an *N*-body gravitational simulator (e.g. sun/earth/moon)

- Simulate the zombie apocalypse using the [SIR disease model](#)

- Use numerical optimization to algorithmically improve your E6 truss design
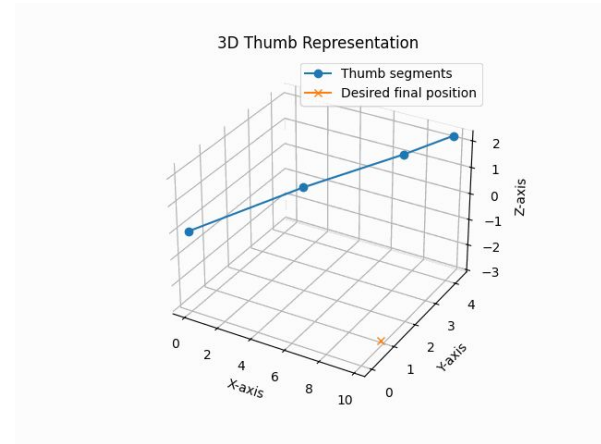
Example E21 Projects from last year

Embedded

- Joystick-controlled ball throwing robot
- 2D Temperature data logger
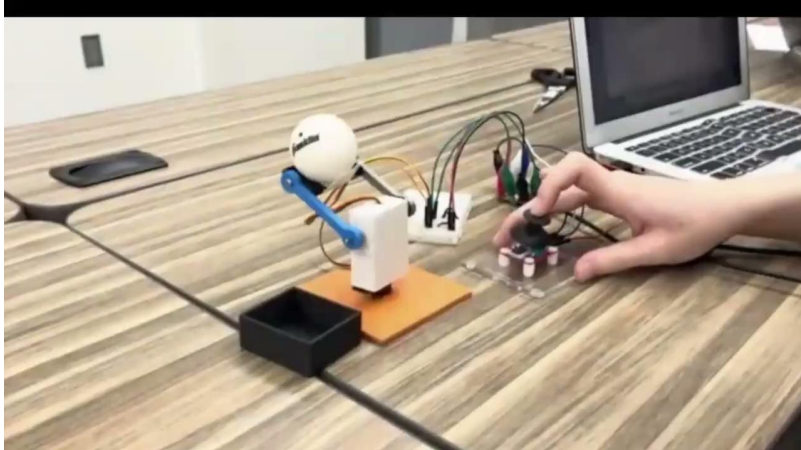
Numerical

- Numerical modeling of the heat equation using Euler and finite difference methods
- Optimizing highways between cities
- Kinematics and motion planning of the human thumb

Present your results

Prepare an interactive poster presentation that answers these important questions / prompts:

- What was your objective / goal for the project?
- Explain any important background theory or principles
- Highlight an important code snippet and explain what it does
- Present your results using videos, animations, or graphs as appropriate
- Comment on the degree to which you achieved your goal
- How would you improve on the project if you had more time to work on it?

All team members should be present for the poster session

Interactive Q&A

You will have to present your poster for part of the poster session. When not presenting, you should learn about the other projects and ask questions.

- In your final submission, you will be asked to review at least three other projects, so make sure you interact with the presenters and ask questions

- Afterward, we'll send you the (positive and/or constructive) feedback that your peers gave about your project

- You are welcome to review more than three projects if you desire

Final reflection

After videos are submitted you will also complete a brief reflection exercise that focuses on your work process and a self-assessment. Prompts will include:

- How did the project progress? Did you run into any speed bumps? How did you overcome them? What would you do differently if you could do it over?

- Did everyone contribute equally to all tasks? If not, who did what?

- Compare and contrast your project to at least three other groups in terms of
  - technical merits
  - presentation quality

Important dates

- Tue 10/28   Final project announced
- Thu 10/30   Deadline to fill out group questionnaire
- Mon 11/3   Professors arrange groups for any solo students
- Fri   11/14   Project proposal listing products to order from approved vendors
- Mon 11/17   Professors order parts from vendors
- Mon 11/24   Begin working on projects in class and lab
- Wed 12/17   Set up posters the night before
- Thu 12/18   Poster Session in Singer Commons 9:00 AM to Noon
- Fri   12/19   Final submission to moodle
  - Submit your poster, code, Q&A reviews, and reflection

Grading

Points will be assigned according to the following breakdown:

- Technical content   40%
- Presentation quality   40%
- Participation (Q&A)   10%
- Reflection   10%