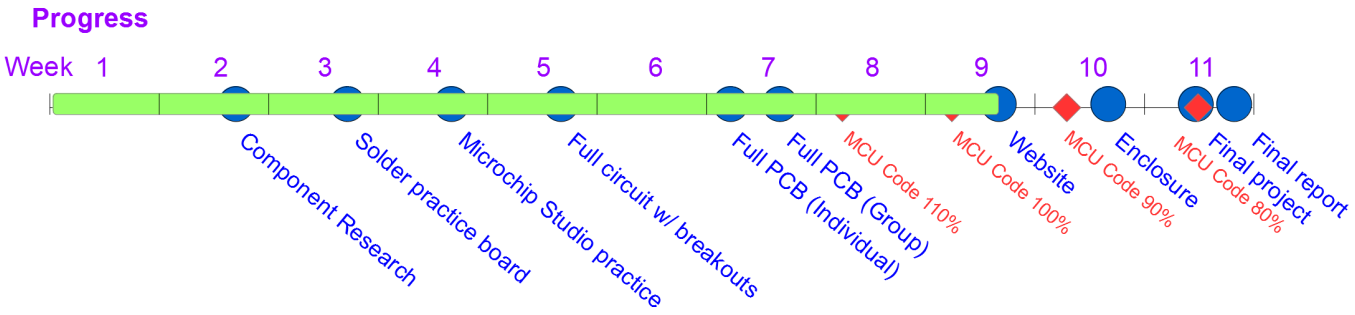
EE 326: Electronic System Design 1

Task 8: Final Design

Due: Mar 19, 2025 (final demo, code, and website)
Mar 21, 2025 (report)



To get credit for your work, please upload the following to Canvas. (Purple corresponds to group submissions, blue corresponds to individual submissions.)
1) Your final demonstration videos (any video format, one submission per group).
2) Your finalized Microchip Studio project (as a zip file, one submission per group).
3) Your website (as a zip file, one submission per group).
4) Your report (as a PDF, individual submission).

For this assignment, you will complete your project and write a final report. The specifications are below.

Final demonstration. Please demonstrate the following in video format. You may create as many videos as necessary.

- Part 1: Website (focusing on browser window)
  1. Go to the camera's IP address, showing that it opens the home page.
  2. Click on each link in the navigation bar, making sure that the wifi file management link opens a new tab (but the others do not).
  3. Go to the webcam link and show that images are streaming.
  4. Click on "Stop Webcam", and show that images stop streaming, and that the button name changes to "Start Webcam".
  5. Click on "Start Webcam", and show that images start streaming again, and that the button name changes to "Stop Webcam".

- Part 2: User interface and enclosure (focusing on physical camera)
  1. Show your final PCB in its enclosure, and point out the various features (e.g. holes for buttons, LEDs, and camera lens).
  2. Shake the enclosure with the PCB inside to show that everything is well-fitted and nothing is loose. If anything is loose, please explain.
  3. Plug in your camera using a barrel jack adapter, press the button for provisioning mode, and show that the indicator LEDs blink properly (i.e. fast blinking for the WLAN and AP LEDs). If you don't have a pin to press the button through the enclosure, you may open it. However, please put the cover back on to show the LEDs through the proper holes.
  4. Configure the webcam's wifi, and show that the LEDs go back to blinking normally.

- Part 3: Firmware (focusing on Tera Term or equivalent)
  1. Navigate away from the webcam page so that streaming is not happening.

2. Press the reset button on your camera (resetting the MCU), and show the initialization procedure on Tera Term (showing things like the pin settings and the word SUCCESS). Wait for it to settle into a waiting state.
3. Open the webcam page, and go back to Tera Term, where the screen should show "WebSocket client connected from ..." and then "Received image (XXXX bytes)" over and over.
4. On the webcam page, click the "Stop Webcam" button, and go back to Tera Term. You should see the transfers stop.
5. On the webcam page, click the "Start Webcam" button, and go back to Tera Term. You should see the transfers start again.
6. Press the provisioning button on your camera, and show what happens on Tera Term. It should go into provisioning mode.
7. Configure the webcam's wifi, and show that the webcam acquires an IP address and is ready for streaming.

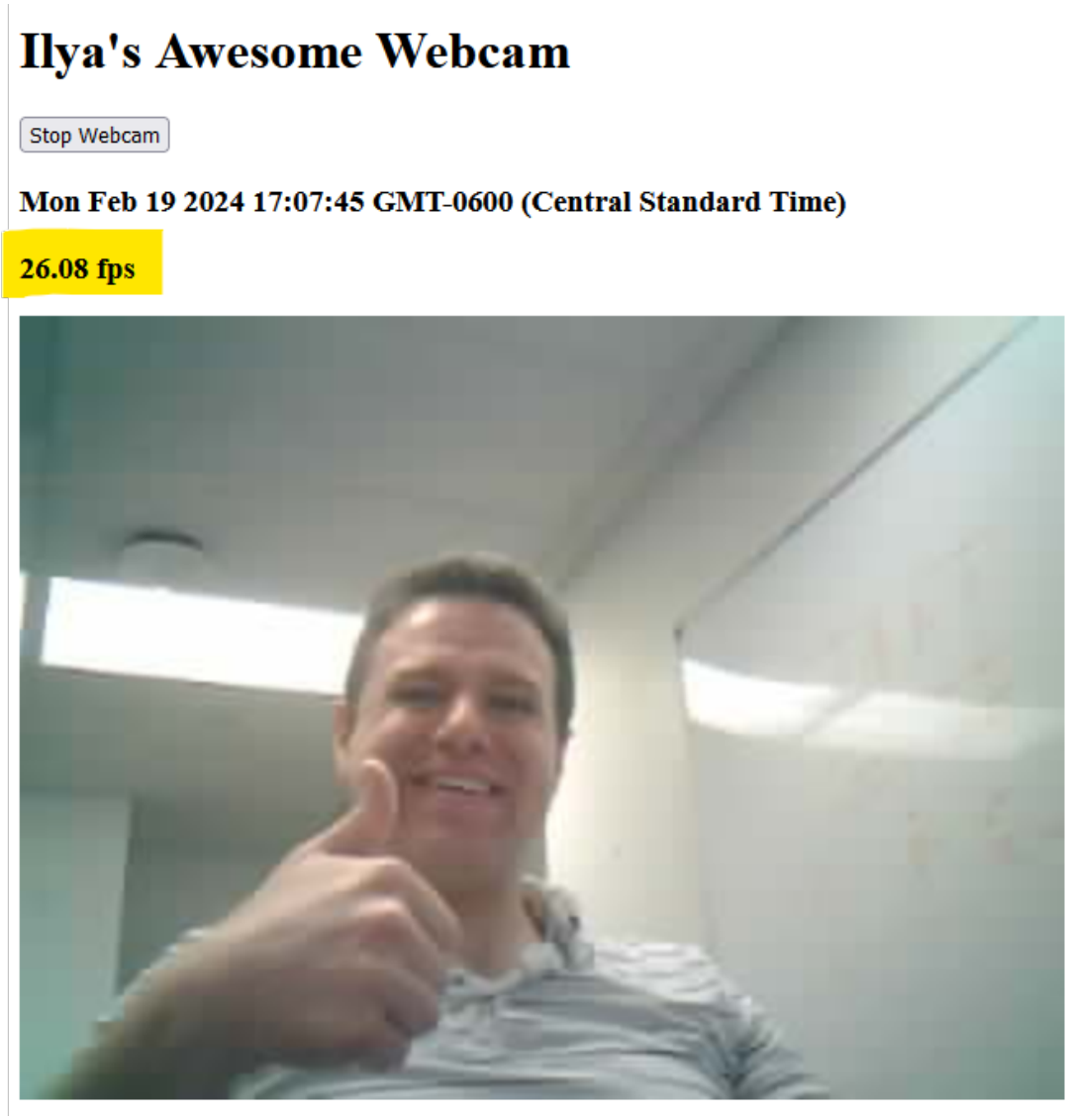
Final report. Each student must submit their own report. You may have the same "Introduction" and "Design Process" as your group members, but "Teamwork", "Learning", and "Conclusion" must be individual. Please include at least the following, separated by appropriate section headings. Use pictures and code snippets as appropriate. You report should be ∼10 pages long, including everything.

- Introduction
  - Briefly introduce the project.
- Design Process
  - Discuss how you approached your:
    - PCB design.
    - C code.
    - Website.
    - 3D design.
  - Discuss what you learned through the design process.
    - What challenges did you encounter?
    - How did you overcome these challenges?
  - What would you change if you had the chance to start over? Mention what you would change in:
    - Your approach to the problem.
    - Your actual design.
- Teamwork
  - Did you contribute fairly to your team effort? Do you think that you did an unfair amount of work, either too much or too little, as compared to your partner?
- Learning
  - Why did you take this class and what did you hope to learn?
  - Did you learn as much as you hoped to in this class?
  - Were there any topics that you hoped to learn but did not?
  - Do you have any suggestions for improvement of the class format or structure to increase learning?
  - Do you think the workload was too high, appropriate, or too low? Please elaborate on your response. If too high, could it be lowered without decreasing the amount learned? If too low, what would you like to see added?
- Conclusion
  - Sum up your thoughts to this project, the class, and your overall experience.

Extra Credit Opportunity

You may notice that the video stream is not particularly fast. There are several ways to speed it up. In my own camera, I am able to achieve up to ∼25 frames per second at 320x240 resolution. If you are able to speed up your camera beyond 10 frames per second (consistently, not in bursts), you may get some extra credit. This will likely involve changing the structure of your code beyond the one proposed in the firmware documentation. To get extra credit, you must:

1. Modify your HTML and JavaScript code to display the frame rate somewhere on your webcam page. An example is shown below. This should be visible in your demo for the next item. Also, your submitted files for this Task should reflect this change.
    - As a suggestion, I used a moving average buffer of length 20 to get a more stable frame rate, as network latency and variable file size make the rate very unstable.
2. Show me your improved frame rate in your video streaming demo (which will also show the numerical frame rate from above).
3. Describe in your report, at the end, what you did to speed it up.



FAQ

Q. How much detail should we go into when describing the processes we used? Is it enough to include just how we approached, for example, the functions in the code or should we also give a function-by-function explanation of the code?

A. You do not need to give a function-by-function explanation. It is sufficient to describe your approach, with perhaps some details on the fully custom functions (e.g. the image length function).

Q. Is 10 pages a minimum or a maximum? What font should we use? What margin sizes?

A. 10 pages is just a guideline based on what I have seen in the past in terms of being able to detail your whole project. It is just an average. The grade is based purely on content, not length. The same goes for font, margins, etc; just make sure to answer every question with illustrations as necessary.