Original Design Problem

Our project was a custom timer. The description of the assignment is as follows, “For this project, the individual will be required to make a timer. This timer will control a 7-segment display, a speaker, and use a potentiometer and/or switch for inputs.” Additionally, the custom timer is required to meet the following six customer and engineering requirements:

1. Customer Requirement: The system should be accurate.
   Engineering Requirement: The timer must be less than 1 second off every minute.

2. Customer Requirement: The system must be safe.
   Engineering Requirement: The system must use connectors, have a power disconnect switch, and adhere to IP43 rating.

3. Customer Requirement: The system should be intuitive.
   Engineering Requirement: Every switch and potentiometer on the user interface should have a label that can be read from three feet away by at least 2 people other than the project designer.

4. Customer Requirement: The alarm beep should have an easy tone to hear.
   Engineering Requirement: The alarm should be 440 Hz +/- 1 Hz.

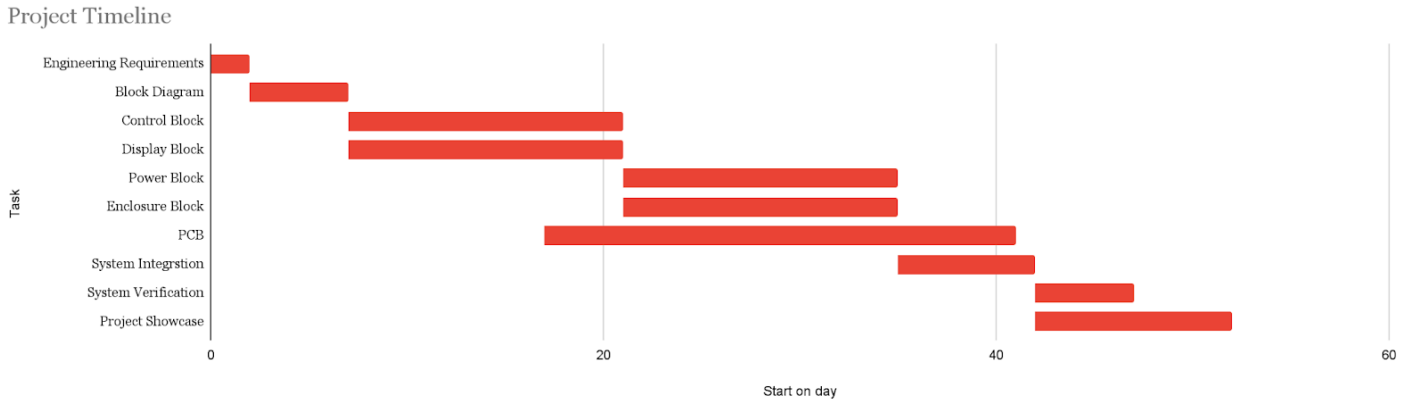
5. Customer Requirement: The system should have dimmable timer lights.
   Engineering Requirement: The LEDs on the timer display must have 3 brightness levels.

6. Customer Requirement: The system should be reliable.
   Engineering Requirement: The system must have a backup power supply that lasts for at least 5 minutes in case of a power outage.

Approach

The first step the team took was to think through all of the requirements, and consider a system that meets them all. Then the system was broken down into each step that would have to be completed for the system to be made. This was instrumental in deciding on the final form the project would take. These parts were grouped into four blocks that could be made and tested separately from each other. As a team, we assigned each team member two blocks based on personal interest in the content of the block and by the estimated time each block would take to implement. As each team member worked on their blocks, they maintained contact with the rest of the team, voicing concerns or changes they might have to make to their block. This was done so each person had a sense of the whole project and so the blocks could work together when they were all done. After all the blocks were created, they were combined into the whole system and tested to ensure the requirements were still met.

Project timeline Image



Lessons

Through this project, the team learned a lot more about technical teamwork, documentation, system testing, optimizing communication for ideal workflow and system integration, and troubleshooting (especially for PCBs and Arduino code). Additionally, PCB design using KiCAD was learned and familiarity with Arduino code was gained.