Executive Project Summary:

The original design of the project was to make a safety bike light system that had the functionality of a car's light system. It was one of the 4 available projects to Junior design students this term. We were assigned 5 engineering and customer requirements to fulfill with 2 custom requirements added as well. Attached below are the engineering and custom requirements;

Customer and Engineering Requirements:

The system should be robust.

- Engineering Requirement: The system should maintain all functionality with no interruptions after dropping 3 feet onto pavement.

The system should be safe.

- Engineering Requirement: The system must use MC4 (or similar weatherproof) connectors, have a disconnect switch, and not have any exposed conductors. Wires must be organized in split loom or other protective materials. All devices must be rated at least IP64 (https://en.wikipedia.org/wiki/IP_Code).

The system turn signals should be automatic.

- Engineering Requirement: The system turn signals should turn off within 15 feet of completing a turn.

The system brake lights should be automatic.

- Engineering Requirement: The system brake lights should linearly adjust to maximum brightness and flashing speed as the bicycle slows down until fully stopping.

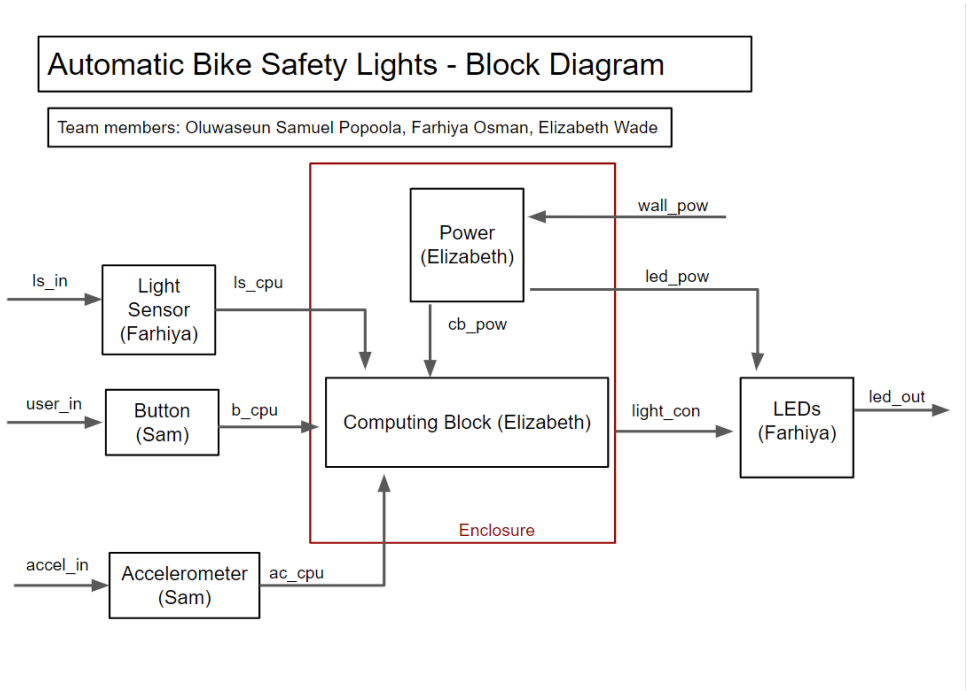
The system should be visible.

- Engineering Requirement: All system lights should be visible by a driver with 20/20 vision from 40 feet away in complete darkness with a light output of at least 1000 lumens.

Extra Requirements:

- The system will have a rechargeable battery that will last for 2 hours.
- The system will automatically turn on a white light for safety when biking in the dark. It will turn off during the daylight hours.

The first topic of discussion was assigning blocks. We were each assigned 2 blocks each. The attached picture of the top level-block diagram shows the result of our general design of the system and how we decided to split it up into blocks.



Extra blocks were assigned to group members. The PCB was assigned to Sam and the enclosure to Elizabeth.

We then moved to the block research phase where each member did research on their block and came back to the group with a component to fulfill the blocks requirement. During this phase is when we ran into our first issue.

As our team was building our project we had some issues with storing the most up to date accelerometer value. This was because the accelerometer write function was changed every iteration of the top level loop in arduino(where all the code for this project was done). This was solved by storing the three most recent accelerometer values into different variables and checking them periodically.

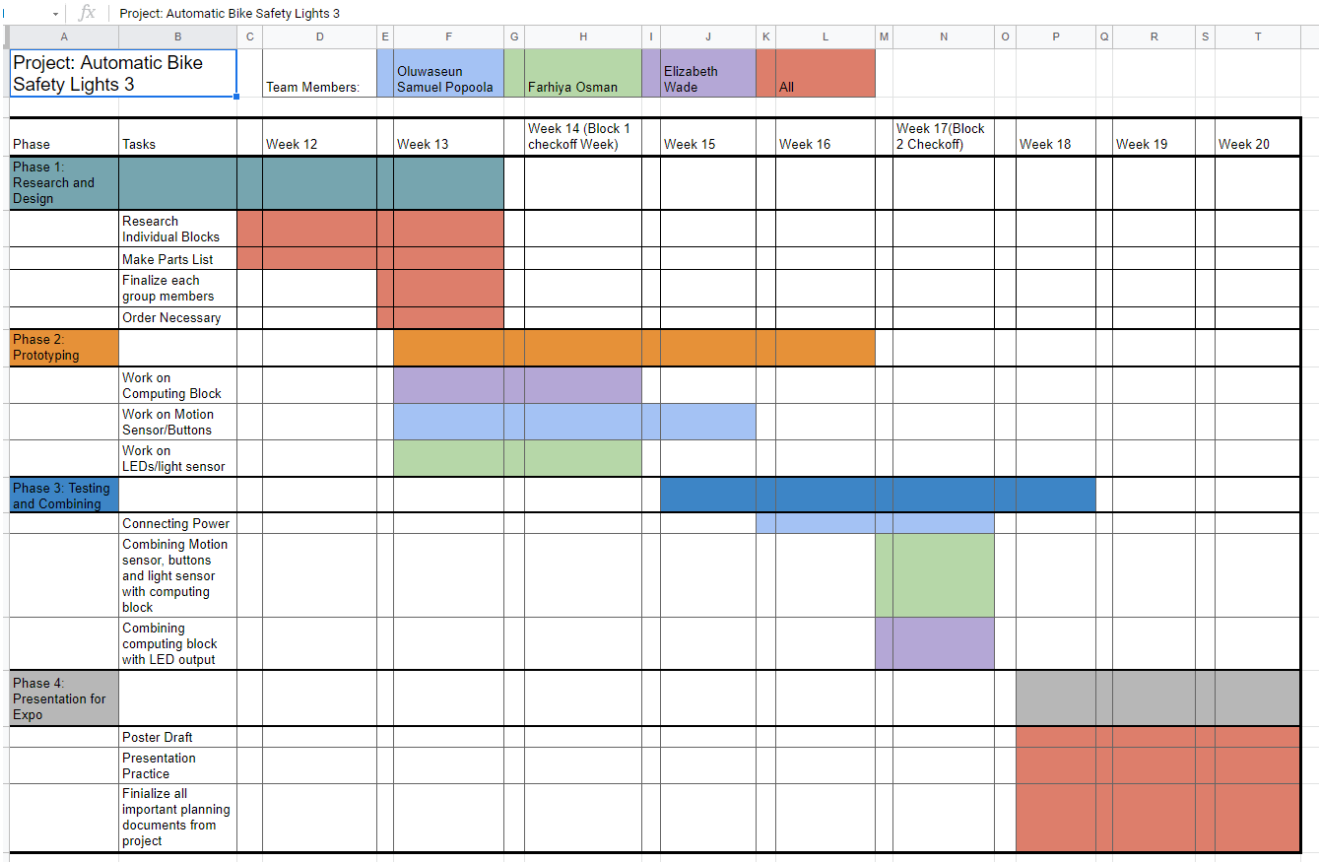
Another issue was an issue with the original IR receiver and transmitter solution for the button. This issue was because at the time, the light sensors were going to be placed on the middle brace of the bike along with the IR receiver for the button block. We ended up switching to hard wired push buttons. This was because the remote data was not reliable enough and had trouble communicating using interrupts. The hard wired push buttons worked more reliably.

Another challenge our group ran into was connecting our two separate enclosures since we decided to separate our LEDS and our buttons.This was resolved by using longer connectors and a black split wire to secure it.

In addition, one of our project's engineering requirements was to make sure our project could withstand a 3ft drop which was solved by building a protective enclosure. The last challenge our

group ran into was ensuring our battery met our rechargeable requirement. This was completed by calculating the correct Amp hours needed for a battery to last at least two hours.

Below is a Gant chart of the timeline for the project;



Project: Automatic Bike Safety Lights 3

Project: Automatic Bike Safety Lights 3			Team Members:	Oluwaseun Samuel Popoola	Farhiya Osman	Elizabeth Wade	All					
Phase	Tasks	Week 12	Week 13	Week 14 (Block 1 checkoff Week)	Week 15	Week 16	Week 17(Block 2 Checkoff)	Week 18	Week 19	Week 20		
Phase 1: Research and Design												
	Research Individual Blocks											
	Make Parts List											
	Finalize each group members											
	Order Necessary											
Phase 2: Prototyping												
	Work on Computing Block											
	Work on Motion Sensor/Buttons											
	Work on LEDs/light sensor											
Phase 3: Testing and Combining												
	Connecting Power											
	Combining Motion sensor, buttons and light sensor with computing block											
	Combining computing block with LED output											
Phase 4: Presentation for Expo												
	Poster Draft											
	Presentation Practice											
	Finialize all important planning documents from project											

A lot of lessons were learned over the 10 weeks we spent on the project as a team.
Being able to adapt designs and find quick alternative solutions was something we learnt. The reality that the research and integration process are not as seamless as one would hope and that there are usually some problems is also a lesson learnt. Another lesson would be to have started the integration process earlier, it would allow for more time to troubleshoot and find problems earlier in the fabrication process.