Automatic Bike Lights 3000.01 - Bike 08 - ECE342-W2022

Introduction

The Automatic Bike Lights (ABL) 3000.01 is an automatic bike light safety system designed to provide automatic turn and brake signals to cyclists. The 3000.01 implements these functions while remaining durable, waterproof, and easy to install.

Design Requirements

Our group was tasked with designing a bike light system with automatic turn and brake signals. Our system had to withstand a fall of 3 feet, be waterproof, have functioning and visible brake lights and turn signals that automatically turn off without input, have a two-hour battery life, and be simple to install by a lay person.

Project Development

Our group approached the project in three phases: design, construction, and testing. In the design phase, we discussed potential solutions for the design requirements. We realized that we could use a gyroscope and accelerometer to detect when a cyclist has stopped or completed a turn. We then wrote code on an Arduino Nano to read the gyroscope and accelerometer, designed a custom printed-circuit board (PCB) for the front controls that a cyclist could interact with, and created preliminary enclosures to see what would work. In the construction phase, we started to assemble individual components into modules. We got our light-emitting diodes (LEDs) to interface with the Arduino and revised our code accordingly. Enclosures were redesigned to accommodate our changing needs. In the testing phase, we assembled all of the primary modules and mounted them on the bike. Then, we were able to precisely calibrate the rotation and acceleration values that would trigger the brake lights to stop.

Project Timeline
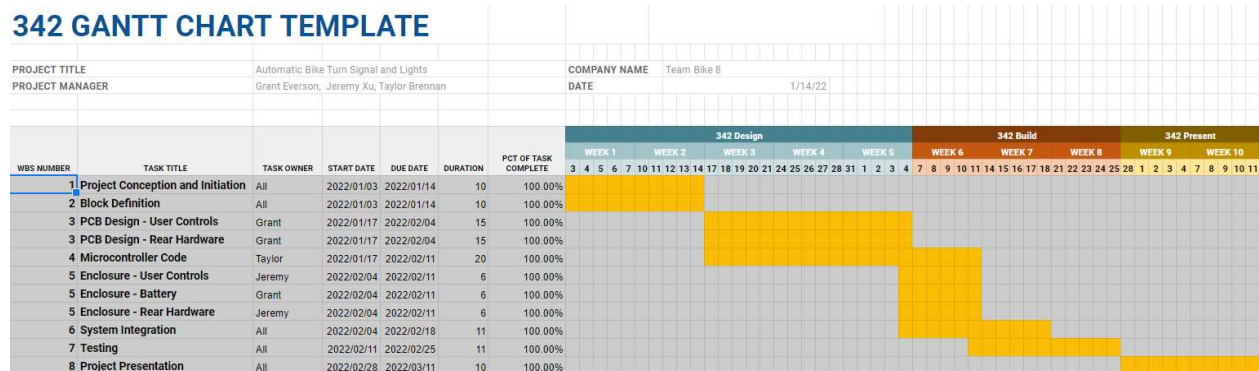
Key Lessons

We learned many practical skills during this project. This was the first time that we used computer-aided design (CAD) to create PCBs and 3D-printed enclosures. Additionally, we learned valuable project management skills by creating a project timeline and recording our progress.