Project Summary

This design aims to accurately time a defined interval and alert the user when the interval of time has passed with an alarm which is easy to hear. The design must also be pleasant to use which means having an adjustable brightness setting for the display and labels for the buttons, switch, and potentiometer which can be easily read from a few feet away. Finally, the design must also be of a reasonable size so that it does not take up too much space.

The project was broken down into 4 pieces so that it could be worked on in parallel by two team members. The first piece is a user input block which includes a potentiometer which outputs voltage to two nodes and is used to control the brightness of the display. It also includes two buttons which can increase the minutes or decrease the seconds in order to allow for precision and ease of use. And a switch which will be used to count down the timer when activated.

The second piece is a power distribution circuit which includes a PCB. The PCB is a voltage regulator and it can endure inputs of at least 20V and output a voltage which is regulated to be no larger than 6.5V. This is to protect the circuits from damage if too much voltage is applied. The rest of the circuit takes this 6.5V value and creates nodes which are valued at 5V, 3.3V and ground so that the other components can be supplied the proper amount of power to ensure operation without breaking.

The third piece is the programming done on a DE10-lite board which is used to store the current value of the timer and oversee interactions between the user and the software. The DE10-lite uses 5 inputs which are active low to determine what the value of the timer is and if it is counting down or not. 2 of the 5 inputs are also used to determine the brightness of the display. There is also 1 output pin used on the DE10-lite which is used to output a 440 Hz signal when the timer is both counting down and has already reached zero.

The final piece is the seven segment display program which uses Verilog to convert a decimal value to a valid time and outputs the result to 4 seven segment display parts. These 4 pieces were then connected and sealed in a casing, and a speaker was attached to the output pin on the DE10-lite so that the 440 Hz signal could be heard.

10-Week Timeline of the Project:
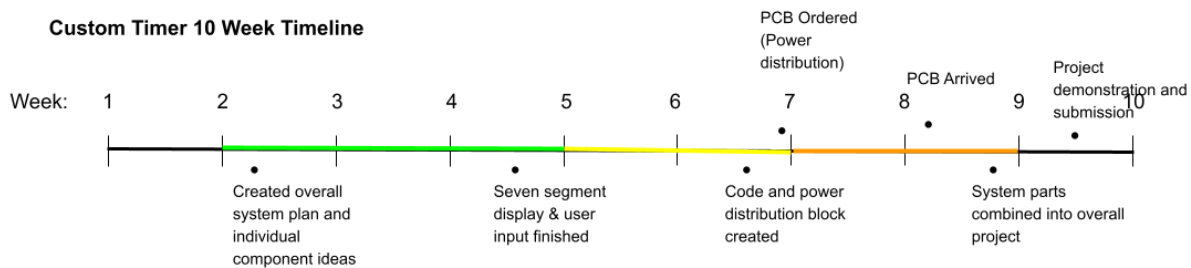
As a team, we believe the most important part of this project was having very quick and effective communication. It was very valuable to be able to keep each other updated with any problems we were facing or what was being accomplished so that we could stay on track and make sure everything was coming along as scheduled. We also believe that it is very important to be open to flexibility and feedback and when you stick to a plan too rigidly it tends to not be what you expected and it would have been easier if you would try something different.