Project Summary

Team Members: Gabriel Naomi, Asa Wiese

Our task was to create a functional oscilloscope which could read two analog signals at the same time, displaying each respective voltage waveform in real time on a display. There were numerous design choices and problems that needed to be addressed, such as what microcontroller to use to convert analog signals to digital signals, how to design the simplest PCB to acquire the analog signals, and what user interfaces to incorporate to best accommodate the user experience.

The project building approach started with choosing the Arduino Uno as the microcontroller which would handle the signal processing, triggering, scaling, and on-board analog-to-digital conversion. This relatively cheap, user-friendly device has an Integrated Development Environment which allows developers to readily change the intended functionality of the Arduino board which greatly assists the coding process to properly process incoming data and display it via a Serial Plotter which is built-in to the Arduino IDE, a downloadable software for the Arduino Uno. The Serial Plotter graphs the voltage waveforms onto the display for the user to view.

We decided to use the same BNC connectors that are commonly used within the Electrical Engineering curriculum to acquire the analog signals as we were familiar with how to use these probes. The BNC connectors are then connected to a simple PCB design. The PCB was created for the simple purpose of converting the analog signal from the BNC Connector probes to a wired analog signal which is then plugged into an Arduino Uno microcontroller. The Arduino Uno collects the data and converts the analog signal to a digital signal which can be displayed on a laptop or other device with a USB connection. Only two connections are necessary so that the user can view the desired voltage waveform on the laptop screen: connecting to the signal via the BNC connector and connecting the Arduino Uno to the user's laptop via a USB connection.

Our greatest challenge was determining what processing software to use to display the intended signals onto the laptops screen. We found that there were a great number of options with regards to available code and software whose purpose was to scale, sample, trigger, and display the data. However, it was essential that we adapted code that could be understandable, easily modifiable, and readable so that it could be used for our intended purposes.