

JERRY FU | PROJECT PORTFOLIO

WIRELESS SPLIT ERGONOMIC KEYBOARD (IN PROGRESS)

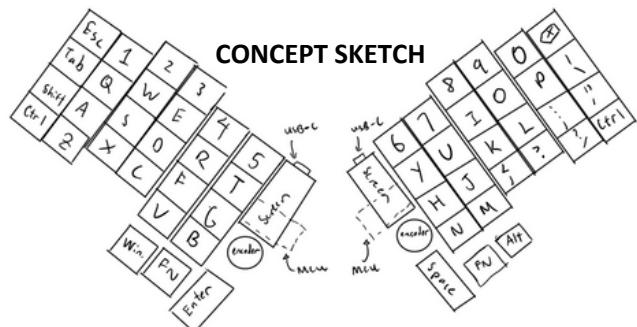
[KICAD](#)[PCB DESIGN](#)[BLE](#)[FIRMWARE](#)[CAD](#)[FIRMWARE](#)

Goal

Design a **wireless** split mechanical keyboard for **ergonomic** typing and long-term comfort

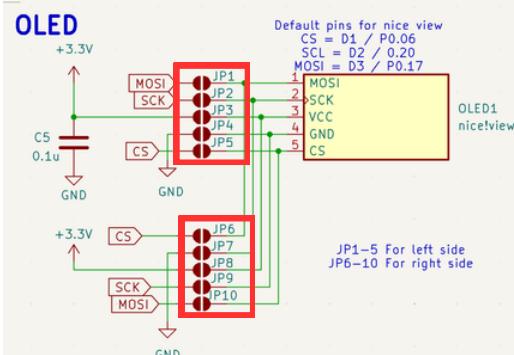
Specs

- **Reversible** PCB Design
- **Li-Po** Battery Power
- Bluetooth Low Energy (**BLE**)
- **OLED** displays for system status
- Rotary encoder for volume control
- **LED** Backlighting

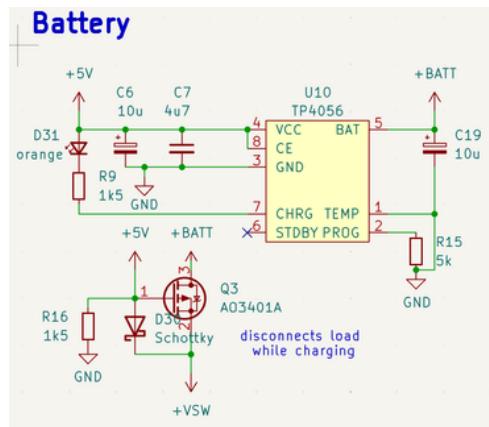


- Developed **ergonomic** PCB form factor

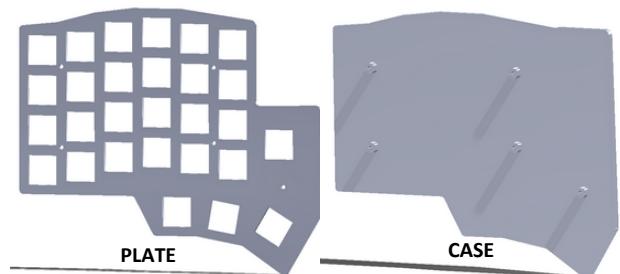
SOLDER PADS FOR REVERSIBLE TH OLED



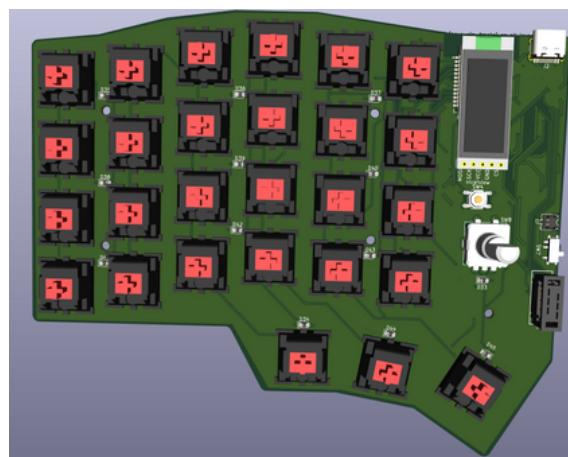
- Implemented **reversible** design for both SMD and TH components



- Designed **Li-Po** charging and power management circuit
- Performed **power analysis** to estimate battery life



- Created case and plate using **CAD**



FRONT 3D MODEL

To-Do

- Program firmware using RTOS / ZMK
- Order PCBs and 3D print case and plate
- Validate hardware functionality and wireless performance



VOLTAGE AND CURRENT MONITORING BOARD | UBC AERODESIGN



ALTIUM

PCB DESIGN

POWER

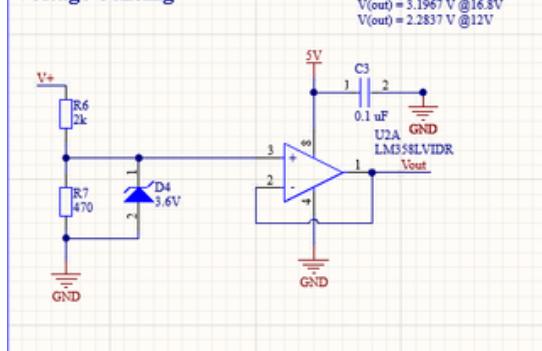
CIRCUIT DESIGN

PROTOTYPING

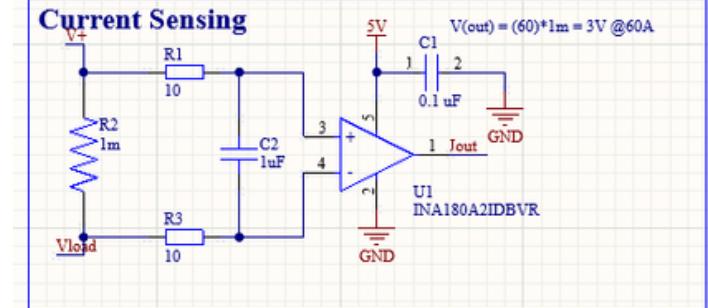
Goal

- Design a **compact** and **inexpensive** PCB for real time voltage and current monitoring
- Accurately measuring up to **16.8V** and **60A**

Voltage Sensing



Current Sensing

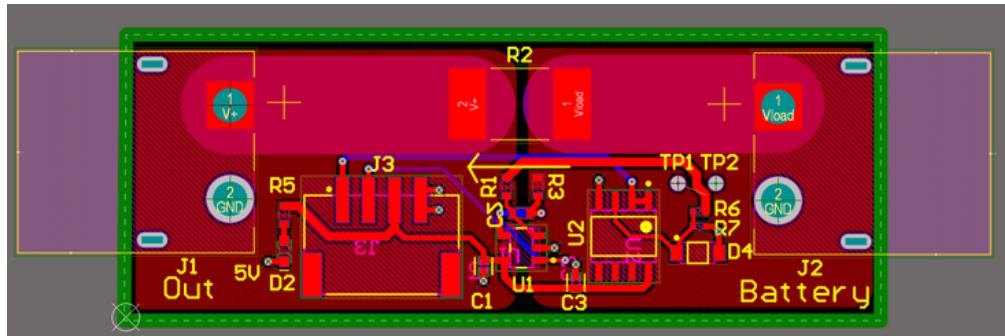


Process (Voltage Sensing)

- Designed a voltage divider to scale voltage into ADC readable range (3.3V)
- Added **ESD** protection with zener diode

Process (Current Sensing)

- Selected a **shunt resistor** and **current-sense amplifier**
- Calculated **power dissipation** and **offset error** to ensure accuracy

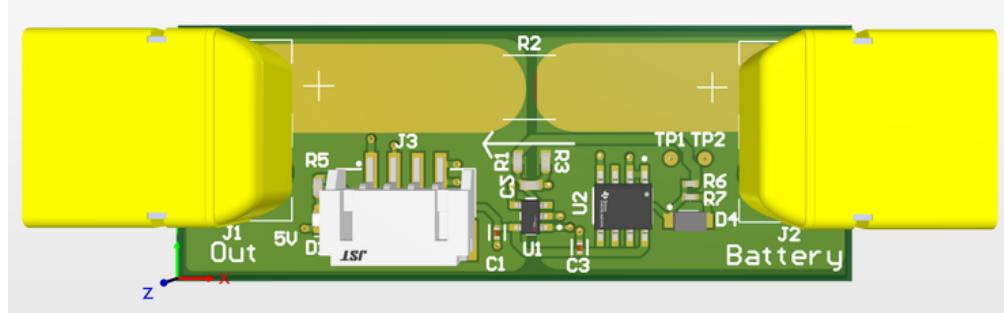


Process (Layout)

- Used **4-layer** stackup and exposed copper to boost current carrying capacity

Results

- Finished size was **<15cm²** (**<2.3 in²**)
- Achieved **accurate** voltage and current measurement across the full operating range



CUSTOM MECHANICAL KEYBOARD PCB

[KICAD](#)[SOLDERING](#)[PCB DESIGN](#)[FIRMWARE](#)[DFM](#)

Goal

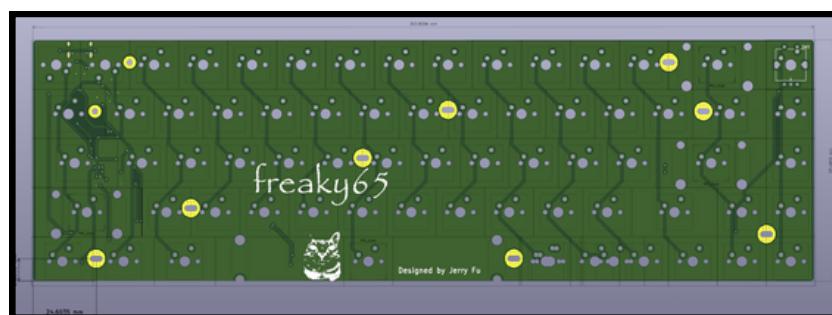
- Design and fabricate keyboard PCBs
- Integrate custom functions such as RGB lighting, volume control, custom key mapping
- Optimize BOM and manufacturing to undercut market price PCBs

Process

- Designed a switch matrix for keyswitch inputs
- Programmed STM32 firmware using QMK
- Calibrated mechanical alignment for keyswitch layout and mounting holes to ensure DFM compliance

Results

- Built two fully functional keyboards
- Overall finished product was 2.5x cheaper than other PCBs



3D MODEL



PCB



FINISHED KEYBOARDS



GPS BREAKOUT BOARD | UBC AERODESIGN

ALTIUM

PCB DESIGN

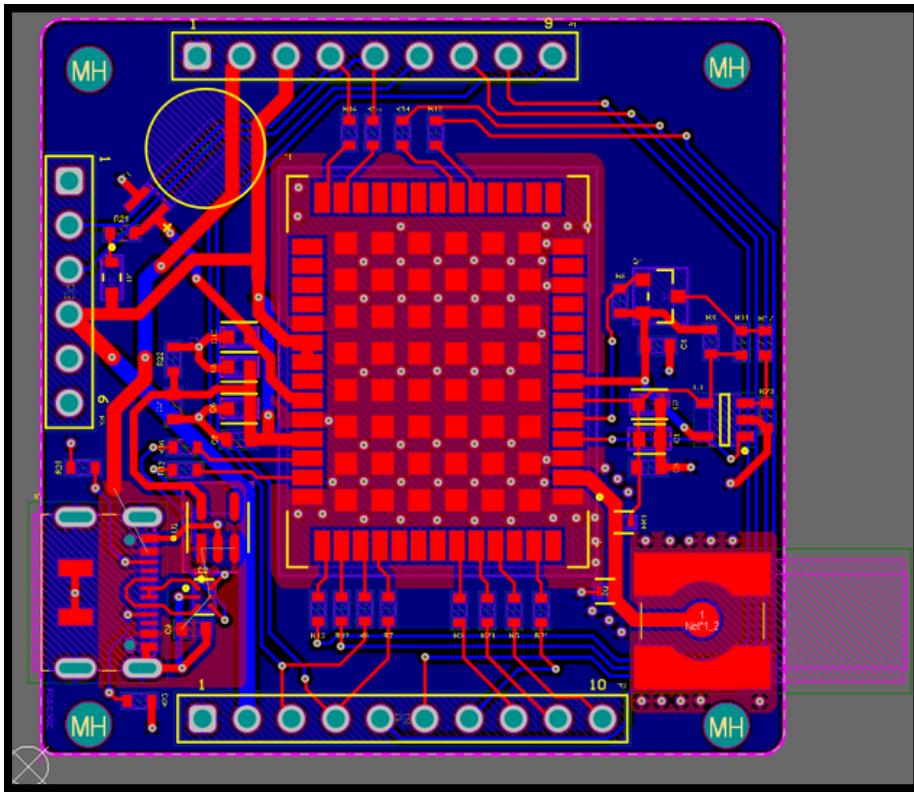
RF

DOCUMENTATION

PROTOTYPING

Goal

- Design a **custom PCB** for **GPS** navigation in an autonomous aircraft payload delivery system
- Ensure all **SAE Aerodesign rules and constraints** followed

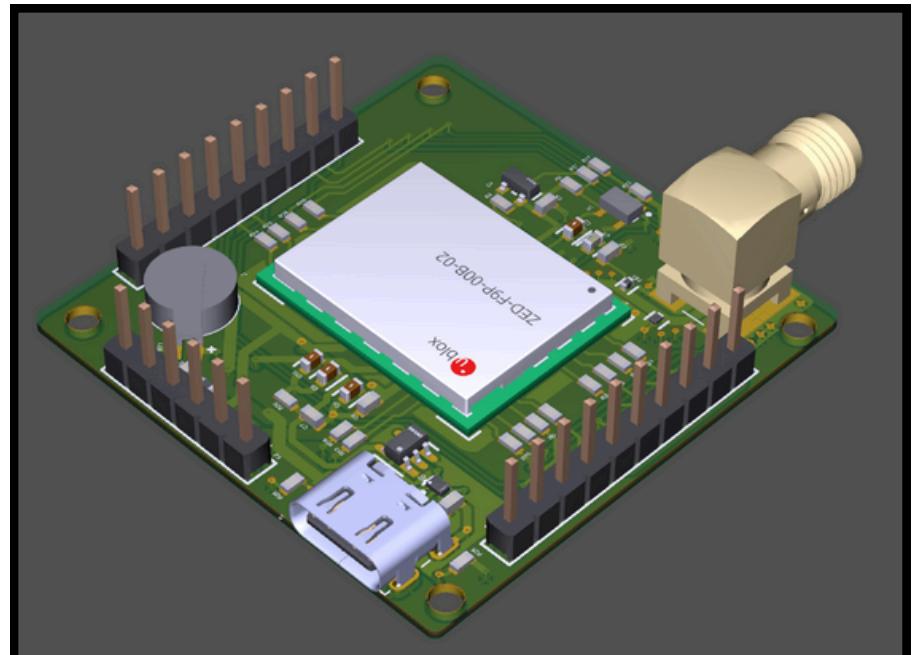


PCB LAYOUT

Process

- Designed antenna **RF circuitry** to ensure optimal signal feed
- **Minimized** current draw and **integrated** backup battery for power system compatibility
- **Optimized** PCB design to meet spatial constraints and mounting specification
- Conducted **design reviews** with senior members to validate design choices

3D MODEL



Results

- **Understood** how to design RF circuitry
- **Integrated** a design into a complex aircraft system, ensuring **compatibility**

2 DEGREE OF FREEDOM LASER PROJECTOR | [VIDEO](#)

ALTIUM

SOLIDWORKS

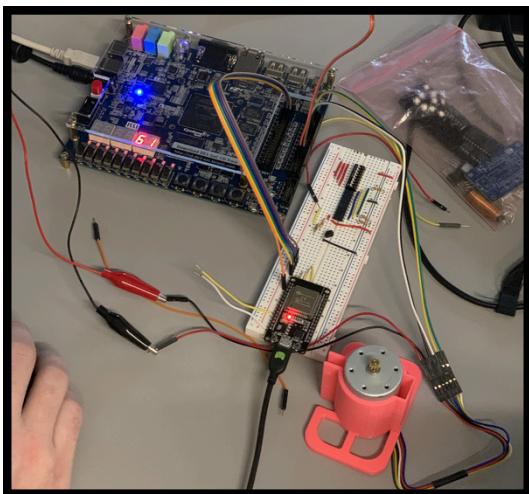
PCB DESIGN

RT CONTROL

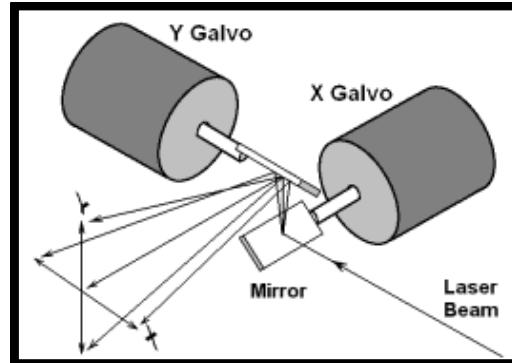
PROTOTYPING

Goal

- Collaborated in a team of 4 to design a motor controlled laser projector
- Complete the project within an **\$800 budget**
- Established Requirements, Constraints, and Goals (RCGs) to guide the project



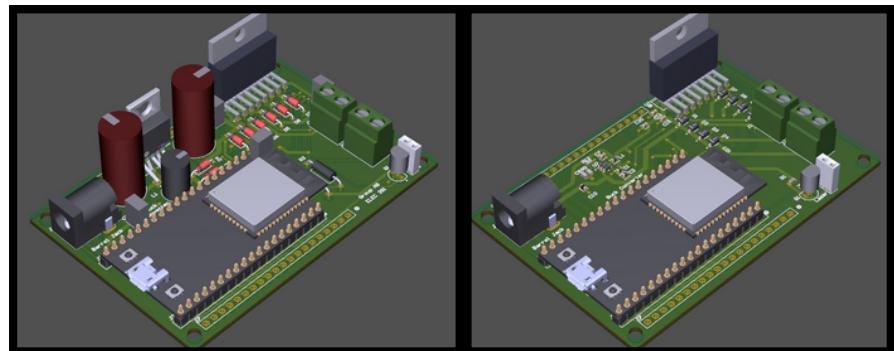
INITIAL CONCEPT



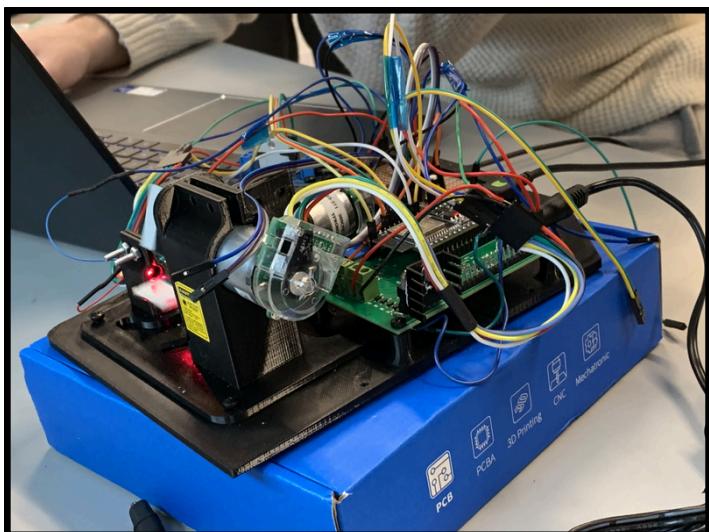
BREADBOARDED CIRCUIT

Process

- Used mirrors and **PID tuning** to accurately control motor movements for animations.



DIFFERENT PCB DESIGNS



COMPLETED PROTOTYPE

Results

- Successfully drew shape animations
- Completed the project **\$300 under budget**
- Understood how to navigate **open-ended** design challenges
- Gained practical experience in **teamwork** and **prototyping**

MAGNETIC FIELD CONTROLLED CAR | [VIDEO](#)

PROGRAMMING (C)

CIRCUIT DESIGN

DOCUMENTATION

CIRCUIT ANALYSIS

TEAMWORK

Goal

- Design and build a transmitter and receiver circuit for a vehicle with 2 modes
- Tracking:
 - Vehicle maintains a 50 cm distance from the transmitter
- Command:
 - Decode movement instructions from the receiver

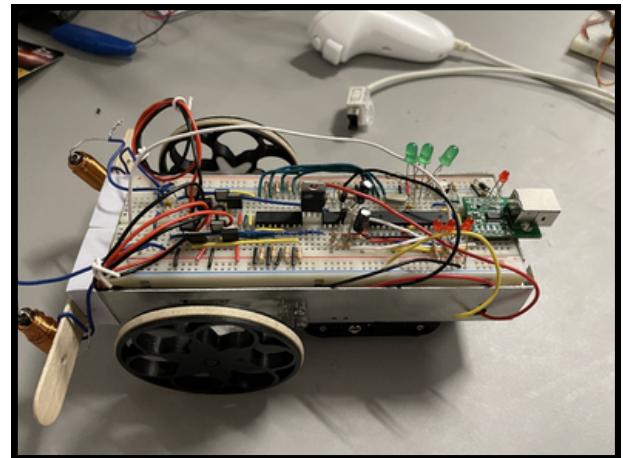
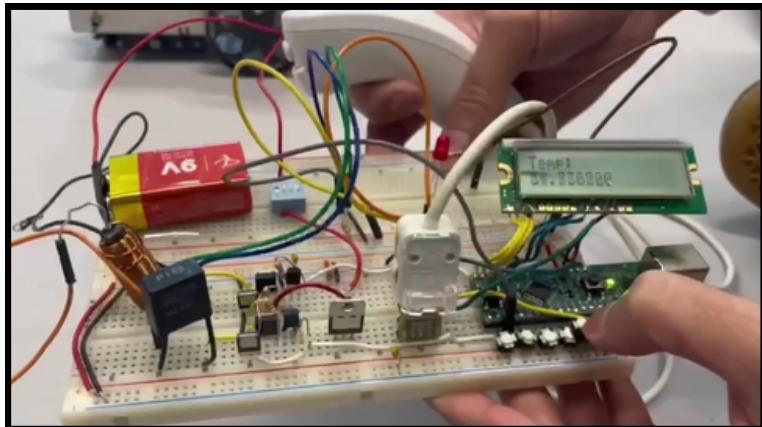
Process

- Analyzed IC datasheets and designed circuits for motor control and signal transmission.
- Programmed microcontrollers in C
- Debugged using multimeter and oscilloscope to ensure correct ADC and DAC readings

Results

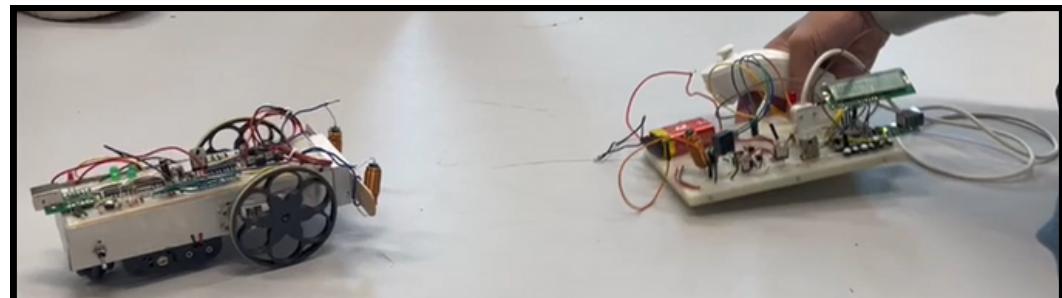
- Successfully fit specifications
- Additional features included:
 - Wii Nunchuck for command mode
 - Dance mode
 - Temperature Sensor

RECEIVER
CIRCUIT



TRANSMITTER
CIRCUIT

TRACKING
MODE



PCB DESIGN PROTOTYPING COURSE

PCB DESIGN

MULTIMETER

SOLDERING

MANUFACTURING

Goal

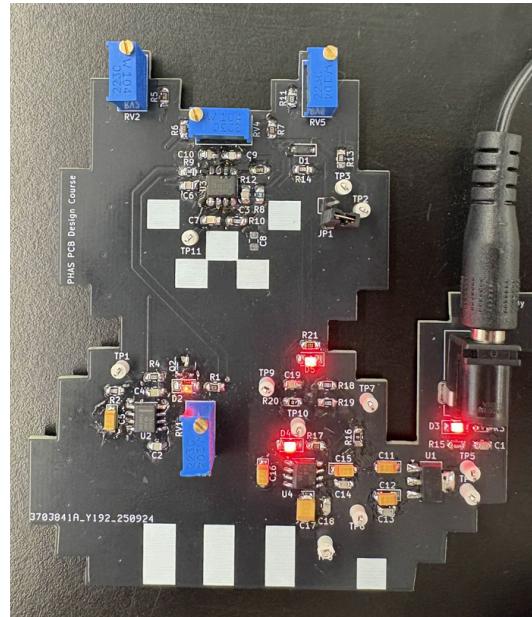
- Complete a 30 hr course on PCB design
- Design a signal generator board from schematic to assembly and validation.

Process

- Learn fundamentals of PCB design
- Designed schematic and PCB layout in KiCad
- Performed electrical validation using a multimeter
- Solder all SMD and TH components

Results

- Understood common industry design best practices
- Successfully designed and validated signal generator



FINISHED
BOARD

REFLOW OVEN CONTROLLER | [VIDEO](#)

ASSEMBLY

DOCUMENTATION

SOLDERING

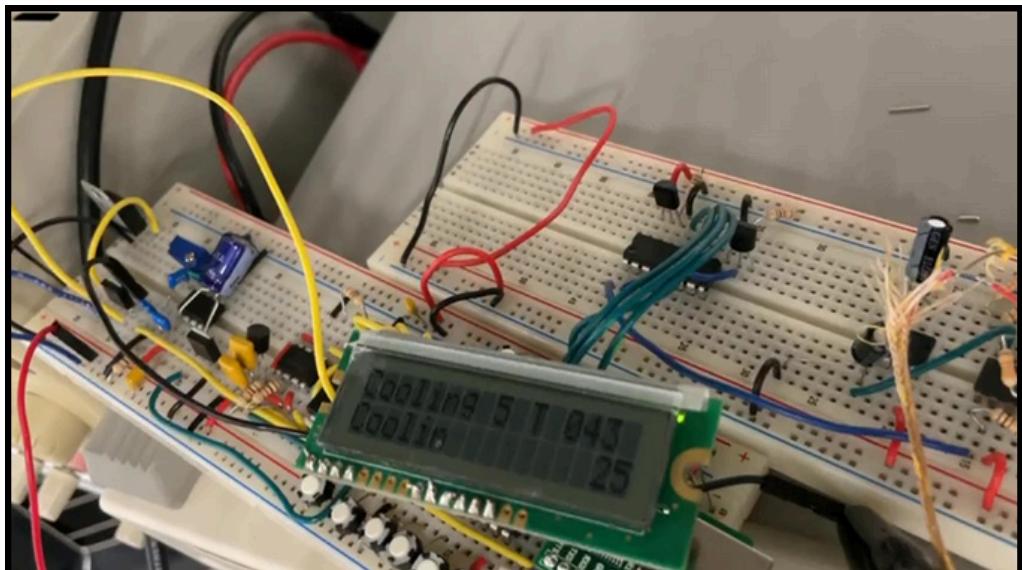
CIRCUIT DESIGN

Goal

- **Design and build** a controller for reflow soldering
- Fabricate a working **PCB** with SMT components

Process

- Designed **state-machine** control logic for reflow sequencing
- Integrated temperature-sensing IC and ADC sampling on MCU
- Built **LCD UI** for temperature display and reflow profile configuration



CONTROLLER CIRCUIT

Results

- Successfully reflow soldered two **PCBs**
- Implemented **failsafes** to prevent oven overheating