

## **EE / CprE / SE 492 Weekly Report**

October 30 - November 13, 2025

sddec25-08

Smart Home Control Unit for Energy Optimization

Faculty Advisor / Client: Md Maruf Ahamed

### **Team Members:**

- Alexander Ryan
- Mitchell Jensen
- Arie Kraayenbrink
- Gamage Binula Karunaratne
- Erik Schmidt

### **Summary of Work:**

This week, the Smart Home Control Unit team made significant progress across all major subsystems. The team focused on completing the light dimmer prototype, advancing zone controller software, refining the GUI design with HA API integration, and finalizing PCB design and sensor firmware. Key activities included researching voltage regulation to power components from 120VAC, rebuilding the zone controller due to a faulty relay board, implementing GUI design improvements, and preparing all components for the final demonstration. The team is now in the final stages of development with emphasis on integration and demo readiness.

### **Work Period Accomplishments:**

- Light Dimmer Prototype Development: Mitchell, Arie, and Binula collaborated on the dimmer prototype, conducting research on voltage control methods to enable powering the ESP and dimmer chip from standard wall receptacles (120VAC).
- Zone Controller Progress: Arie rebuilt the zone controller after identifying a faulty relay board and began programming the zone controller firmware. Replacement parts were ordered to support dimmer control functionality.
- ESP-Dimmer Integration Research: Binula researched connection methods between the ESP32 and dimmer chip to enable programmable lighting level control.
- PCB Design Completion: Erik completed the PCB design and coordinated with ETG for manufacturing; refined sensor firmware development is ongoing.

- GUI and API Integration: Alexander created an updated GUI design incorporating requested features, updated project documentation on the SD website, and began analyzing HA (Home Assistant) API requirements for system integration.

**Plans for Coming Week + Action Items:**

- Alexander Ryan- Start final GUI implementation and hook into HA API
- Mitchell Jensen - Continue work on the light dimmer and voltage regulator system to power the ESP and dimmer chip off of 120 VAC. Start preparing for final demo
- Arie Kraayenbrink- Work with the team on the light dimmer. Finish zone controller software. Start preparing for the final demo.
- Gamage Binula Karunaratne- Finish the dimmer. Start working on the connection between the ESP and Dimmer Chip.
- Erik Schmidt- After getting the PCB, solder the parts, finalize the design, make a chassis for the sensor.

**Pending Issues:**

- Alexander Ryan- No issues
- Mitchell Jensen- No Issues
- Arie Kraayenbrink- No issues
- Gamage Binula Karunaratne- No issues
- Erik Schmidt- No issues

**Individual Contributions:**

Team Member	Contribution	Weekly Hours	Total Hours
Mitchell Jensen	Worked on dimmer with Arie and Binula. Researched voltage control to be able to power ESP and dimmer chip off of wall receptacle	8	24.5
Arie Kraayenbrink	Worked on dimmer. Rebuilt zone controller because of bad relay board. Started on programming zone controller. Ordered replacement parts for dimmer control.	10	33

Binula Karunaratne	Worked on the dimmer prototype with Arie and Mitchell. Researched on how to connect the ESP to the Dimmer chip to control the lighting levels.	8	24.5
Erik Schmidt	Completed PCB design Talked to ETG about printing PCB, Worked on refining sensor firmware	6	22.5
Alexander Ryan	Created new design implementing requested features in the GUI. Added design docs + updated website with updated information on SD website. Looked into HA API documentation to work out requirements	6.5	27