

**EE/CprE/SE 492 STATUS REPORT 02**  
**1/31/25 – 2/13/25**

**Group number: *sdmay25-17***

**Project title: *Microbial Pill Sensor***

**Client &/Advisor: *Dr. Meng Lu***

***Team Members/Role:***

***Roles still subject to change as we transition from research to design phase.***

- ***Wes Ryley:*** Data Transmission Design Lead
- ***Rakesh Penmetsa:*** Bacteria Housing Design Lead
- ***Alex Upah:*** Biosensor Design Lead
- ***Cade Kuennen:*** PCB Design Lead

**Weekly Summary**

This week, the project group continued working on their respective portions of the project. Major milestones that were hit over this report's dates include ordering PCB's and necessary components, which we expect to receive within the next couple of weeks. We also had our first instructor check-in meeting with Dr. Fila where we discussed where we believe the state of the project is as well as the next steps to be taken and challenges we have faced during 491.

**Past week accomplishments**

Cade Kuennen:

- Worked on reworking the MCU PCB design to make sure they meet the specified minimum sizing requirements (diameter = 20mm), and to take out the matching network which was deemed too complex and time consuming for projects scope.
- Worked on designing an alternative version of the MCU PCB that utilizes the complete ESP32-C3-WROOM-02U and a larger diameter (d=30mm) instead of our decomposed version. This work was decided to be completed due to team discussion where it was identified that it may be more useful to have a larger PCB that can complete the full projects functionality instead of a smaller one that cannot send data via BLE.

Alex Upah:

- Reviewed photodetection circuit and component datasheets to ensure photodetector was properly implemented in circuit design prior to PCB fabrication

- Discussed with Dr. Lu availability of filter options within lab to use for device
- Developed testing plan for circuit and optical components to ensure proper functionality and compute figures of merit for biosensing device.

Wes Ryley:

- Came to the conclusion that due to Network issues, the BLE connection is not going to work, therefore the GUI had to be updated to remove the need for establishing a BLE connection before operating functions.
- Developed new code based on the previous model that inputs transferred data through the wired connection and operates them as usual.
- Started developing this updated code into the Google Colab software which will be the main operating system from now on as a way to improve data storage and efficiency for long term testing.
- Created list of operational functions that should be included in the new code:
  - Select dates and times for data display
  - Implement a way to separate data based on different parameters that may be needed
  - GPS location development

Rakesh Penmetsa:

- Designing the new cell housing based on new changes in PCB design and decided on the material to be used for making the housing

### **Pending issues**

Team:

- Need to discuss with Dr. Lu how to proceed if decomposed MCU PCB does not work, whether moving to larger size and using full ESP32 C3 will provide a better alternative for testing.

Cade Kuennen:

- Need to discuss with Dr. Lu how we want to handle missing matching network component of the device. Determine whether the fabricated PCBs should include the matching network and leave configuration of matching network for future development.

Alex Upah:

- Need to finalize purchase of necessary optical filter component and test with basic green and blue LED components.

Wes Ryley:

- Since there is no BLE usage anymore, should the GUI still have functionality for selecting a device?

Rakesh Penmetsa:

- Working in cell housing design to make sure the design is air tight.

### Individual contributions

<u>NAME</u>	<u>Individual Contributions</u> (Quick list of contributions. This should be short.)	<u>Hours this week</u>	<u>HOURS cumulative</u>
Cade Kuennen	Completed rework of the MCU and Optical PCBs to ensure sizing requirement is met. Designed an alternative version of MCU PCB utilizing ESP32-C3-WROOM-02U	14	18
Alex Upah	Reviewed photodetection circuit and components, discussed filter options and availability, started developing test plans for circuit and optical components	8	12
Wes Ryley	Reviewed the previous GUI code to better fit new scope without BLE connection. I decided to change the GUI to process without BLE but develop a system later that could be implemented if the option for BLE were to become available in the future. I began working on Implementing data collection to transfer to google sheets document for storage and long-term data acquisition.	8	12
Rakesh Penmetsa	Worked on housing design	9	13

### Plans for the upcoming week

Cade Kuennen:

- Plan to look over PCBs with Dr. Lu and decide whether it would be best to continue work on decomposed MCU PCB design or utilize the alternative (but larger) design utilizing the ESP32-C3-WROOM-02U. This would allow the team to conduct a more complete set of testing when it comes to data transfer via BLE.

Alex Upah:

- Plan to finalize testing document and send it to the rest of the group.
- Once PCBs and filter components are acquired, start testing to determine functionality of device.
- If the device is functional, move to the next steps of testing to obtain figures of merit for the device such as sensitivity and specificity.
- Plan to help Rakesh with improving housing design to ensure waterproofing and assembly of entire housing module until testing becomes available.

Wes Ryley:

- Over the course of the next two weeks, finish implementing data collection through a wired transmission to the dedicated excel sheet for a specific device.

- Work with Dr. Lu and Alex to determine how much storage we want and the layout of the system. All other functions should be straightforward and can be implemented.

Rakesh Penmetsa:

- To complete the housing design and submit the design to make C.N.C. model
- And Test the cell housing

**Summary of weekly advisor meeting** *(If applicable/optional) s*

*(Provide a concise summary on the contents and progress made during the advisor meeting.)*