**Project Purpose**

This project aims to implement a unique automated version of Connect 4, allowing players to practice online against a computer or another player.

**Proposed Solution**

The project will be a small integrated system that will control DC motors, solenoid motors, Infrared sensors, wall power supply, and web app interface.

A database will be used in this project to store past games' player's win streaks and be used to play the game on the web browser. It will also log events and flags if something unexpected occurs during gameplay.

**Specifications**

* Infrared sensor for disc placement detection
* Have a hooper system to drop the disc on the computer player, turn
* Update the Web browser to show the placement of the piece
* DC motor as a left-to-right movement for piece dropper
* Solenoid motor in the hopper for disc release
* Micro-board send Post requests to server
* Record the position of a dropped piece
* LCD Screen to show players Turn
* Record win streak and save games in log files

**Innovation Strategy**

We will explore a new microcontroller, the Raspberry Pi Pico W, which hasn’t been introduced into the program. Additionally, we will further explore components that have not been implemented into the program, such as:

* MQTT Protocol
* IP/DNS/MAC Addresses
* 3D Design for loading player chips
* Real-Time Processing

**KNOWLEDGE AND SKILL GAPS:**

Familiar Areas:

* Solenoids, sensors, and motors are crucial parts of the project that we know more about.

Areas Needing More Research:

* Syncing software and hardware over Wi-Fi
* Design of the hopper system
* Power management
* Dropping system
* Calibration of motors and sensors

Potential Concerns:

* Ensuring seamless integration between hardware and software components
* Effective power management and system calibration

**Resource Requirements**

Components needed for build:

* MicroController (Raspberry Pi Pico W) 1x
* Sensors and LEDs (Infrared Sensor) 7x
* DC/Stepper Motor 1x
* Solenoids 2x
* Game Board 1x
* Power Supply
* 3D model for hopper
* LCD screen 1x
* Database 1x
* Web Server with IP or Domain

**Timeline**

| **Week** | **Activity** |
| --- | --- |
| **1** | During weekdays   * Course Introduction * Project Inception Exercise |
| **2** | During Weekdays   * Project Proposal Draft * 2 min presentation on the Project * Project Proposal submission   During Weekend   * Order Parts * Start to explore the IDEs/Software that are being used * Learn about MQTT on how it works * Learn about SSL/TLS and DNS |
| **3** | During Weekdays   * Design motor driver circuits (Main DC Motor) * Add Firmware Feature: Motors and Infrared Sensor * Start building Logic on “AI bot” to make for the automated Connect 4 game * Connect the circuit to check for sensor/motors feedback   During Weekends   * Master the logic on how it will be done through research and understanding * Double check for all the feedbacks are valid |
| **4** | During Weekdays   * Start to implement logic on the MCU ( on “AI bot”) * Implement the feedback on the MCU (Sensor and motors)   During Weekends   * Do the same work on the MCU   ~ Wouldn't be a easy process so this may take time depending on how easy it would be for us to diversify into different system |
| **5** | During Weekdays   * Add firmware feature: Managing network interface * Add firmware feature: Store system event and sensor data in database * Install and Configure MQTT * Testing MQTT plus using the feature firmware for storing data   During Weekends   * Progress on what was worked on weekdays * Start the UI web-browser (Maybe Web-app Depending on how motivated we are at this time) |
| **6** | During Weekdays   * Fiddling around with the same thing checking/debugging if the transmitted data are valid and is working * Working on the FIrmwares * Work time |
| **7** | * Work Time * Start to design the structure of the project * Print the 3d model |
| **8** | * Work Time * Debug Any features * Work on SSL/TLS connection and firmware having a dynamic DNS service |
| **9** | * Progress Report Submission * Debug and work on Fixing * Add any other feature/QOL extensions (Work on it if there is time) |
| **10** | * Debugs/Adding extension features * Work on prototype |
| **11** | * Debugs/Adding extension features * Work on prototype |
| **12** | * Debugs/Adding extension features * Work on prototype |
| **13** | * Debugs/Adding extension features * Work on prototype |
| **14** | * Test system integration * Prototype Grading |
| **15** | * Final Technical Report submission * Final presentation rehearsals * Final presentation * Project demonstrations |