MSTE FLYWHEEL PROJECT REPORT

Submitted to

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by

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Executive Summary:

The goal of the MSTE flywheel project is to transform a steady state inertia dynamometer into a transient inertia dynamometer. The flywheel will replicate track data for the MSTE Go-kart team to use for testing. The flywheel will replicate the data as accurately as possible to the actual racetrack data. The system will keep the flywheel engine idle so that the engine does not stop running. The controller can be commanded to run at full throttle, then a dwell time after acceleration ends. Finally braking is applied and the throttle will go to the closed position. A report can be downloaded and reviewed after the cycle is complete.

Table of Contents:

Revision History:

Version	Date	Revised By	Description
1.0	March 27th, 2024	Dami Abegunde, Gabrielle Franco, and Kaleb Hill	Rough Draft
1.1	April 1st, 2024	Kaleb Hill	Rough Draft Updates
1.2	April 20th, 2024	Kaleb Hill	Final Draft: Test Results and other updates
1.3	April 23rd, 2024	Dami Abegunde, Gabrielle Franco, and Kaleb Hill	Final Draft: Finishing up report for review

Introduction:

The main objective of the project is to design a controller system that will evolve from a steady state inertia dynamometer to a transient inertia dynamometer by the last week of April 2024. The proposed system will "consume" previously recorded track data from a Purdue grand prix circuit lap and faithfully reproduce the torque and rpm values on a connected flywheel with the resulting graphs and report displayed on a computer for the engineer. The goals of the project changed as the difficulty of the project was realized. The newest objective involves creating a system for the flywheel so that the engine can idle, run full throttle, and gradually apply brake force.

Specification Requirements:

In Scope:

- The flywheel engine does not die while idling.
- Full throttle ramp up and dwell time.
- The flywheel brake system can gradually apply brake pressure.
- Circuit Design
- Program that can input track data and exports the final report of the flywheel run.

Out of Scope:

- Part Mounting
- Providing Engine, CCU, and RPM Sensor
- Flywheel Location / Safety Measures

Original Scope:

- Flywheel Replicates real world track data.

High Level Design:

High Level Control System:

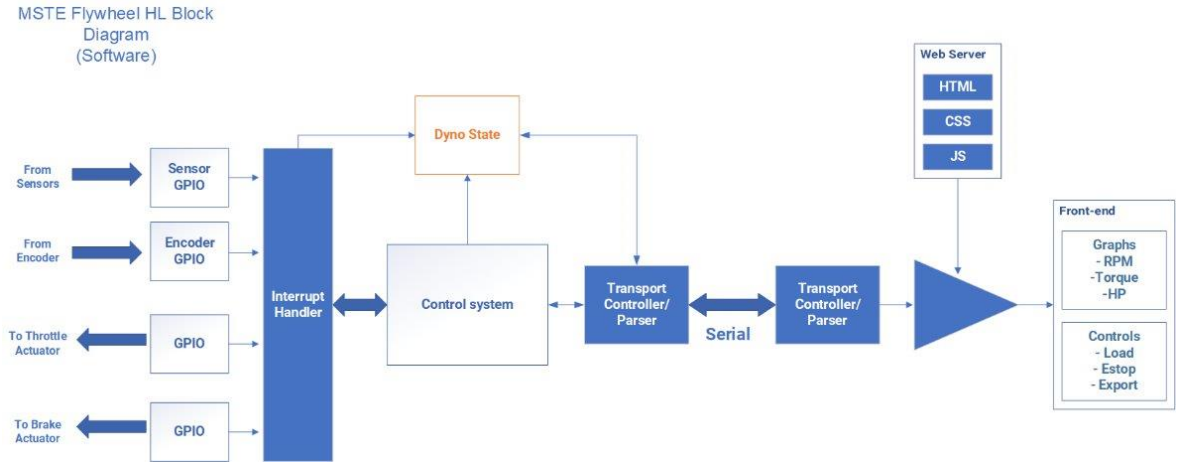


Figure 1: High Level Control System Idea.

Interrupt Handler: Handles specific interruptions based on software and hardware interruptions.
Dynamometer State: The CAN BUS will be recording the dyno state continuously and sending data to the CCU.
Transport Controller & Parser: Error handling is used to ensure data collection is done smoothly.
Serial: The serial connection is the USB connection to the laptop being used by the end user.
Web Server: Where our GUI design is hosted for the end user to see and collect the data.
Front-end: What the end user sees.

High Level Flywheel Chassis:

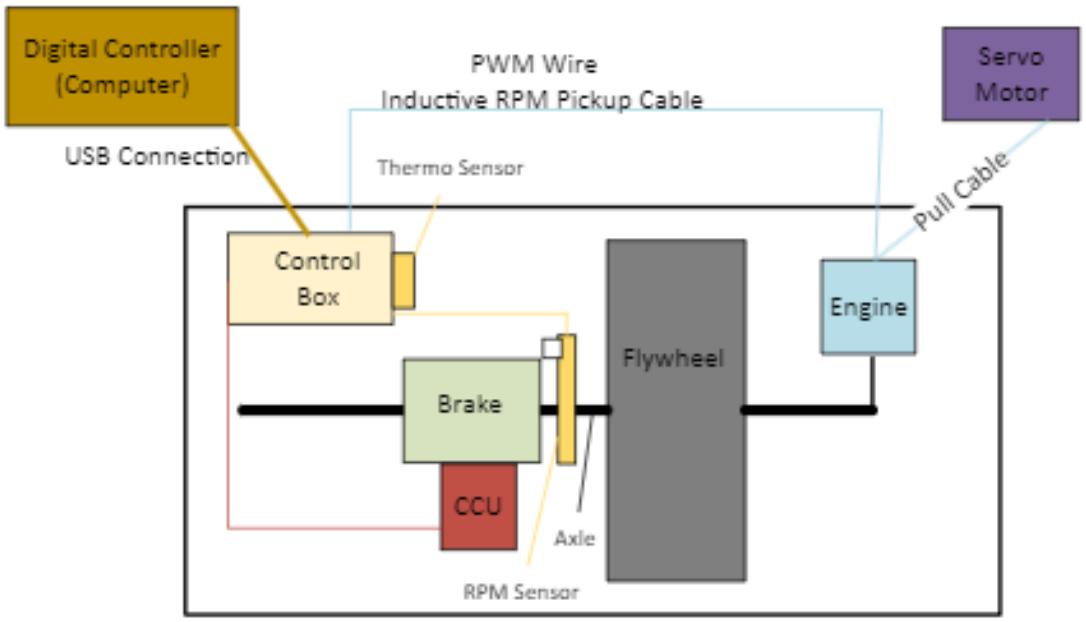


Figure 2: Flywheel Chassis Design Concept.

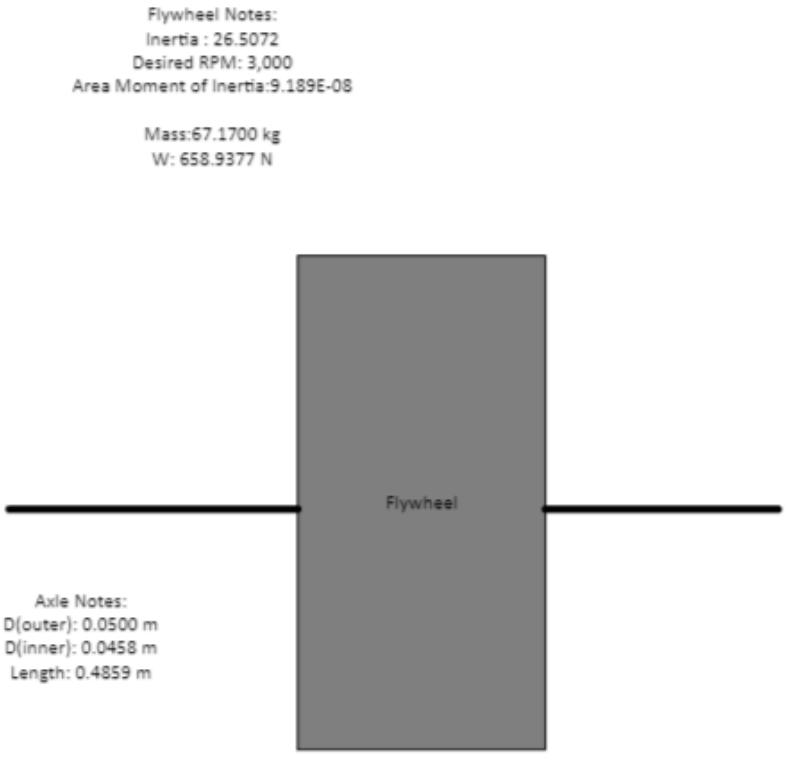


Figure 3: Dynamometer Specifications:

ZM022-3 CCU
Clutch Control Unit
Manufacturer: Shiftec

Voltage: 10v-16v
Current max: 4.5A at 12V, 20°C
Air supply: 8-9.5 Bar
Ambient temperature: -10°C +70°C
Max Operating pressure: 10 bar

Dimensions:

Length	141	mm	
Width	61	mm	
Height	99	mm	
Weight	1120	g	(all excluding master cyl)

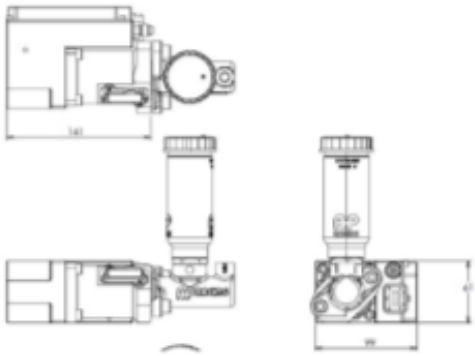
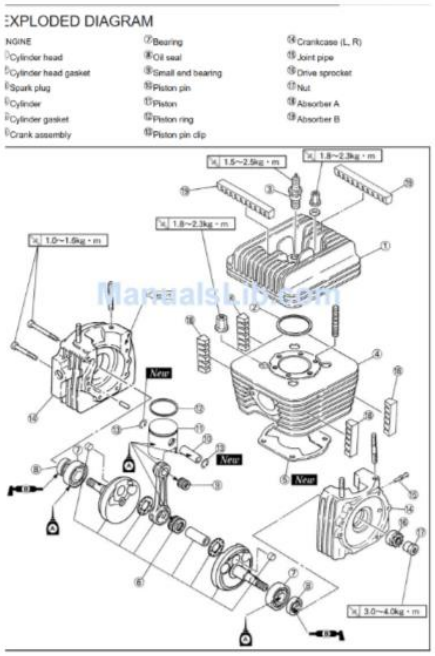


Figure 4: Clutch Control Unit Specifications:



Yamaha KT100SEC Engine
Manufacturer: Fox Valley Kart
Single Cylinder, 2-stroke
Carburetor: WALBRO WB-21

Coil:
Primary Winding resistance: 0.8~1Ω
Secondary Winding resistance: 10KΩ

Starter Motor:SM05-289
Operating Voltage: 12V
Output: 0.3kW
Starter Relay: B768042
Coil resistance (Starter Relay): 4.4Ω

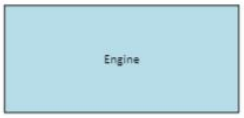


Figure 5: Yamaha KT100 Racing Engine Specifications:

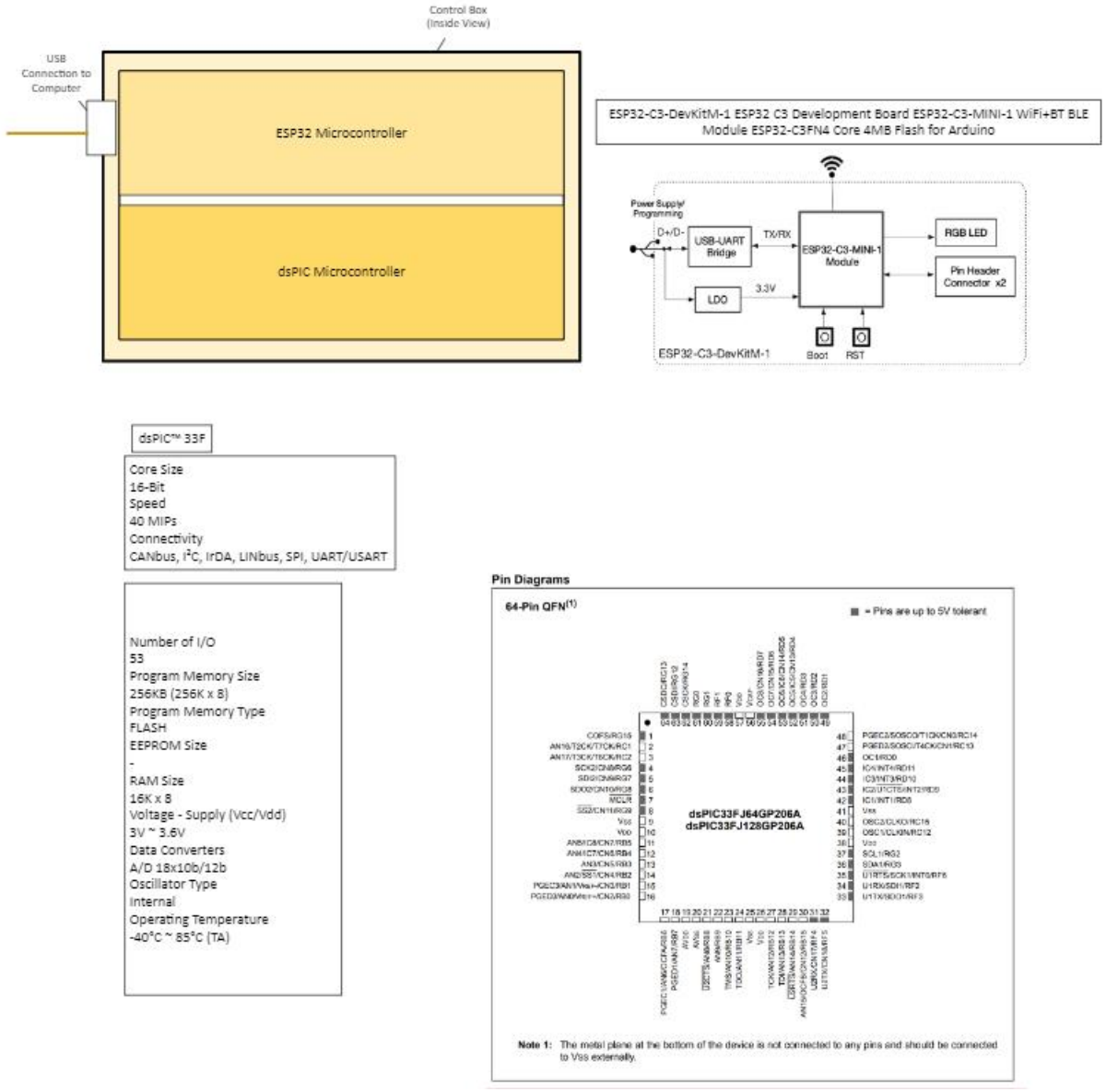


Figure 6: Microcontroller Specifications:

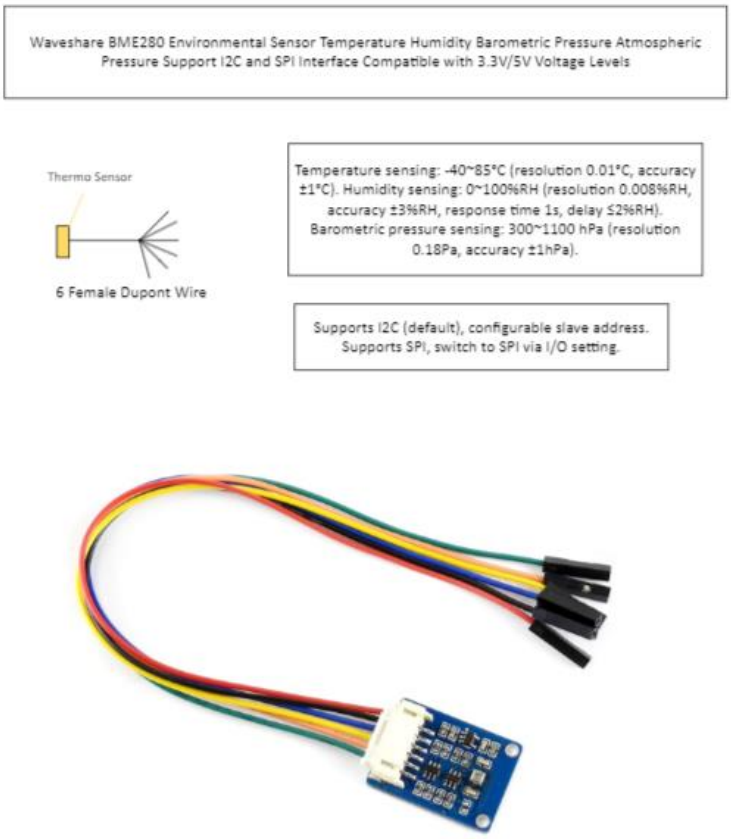


Figure 7: BME280 Environmental Sensor Specifications:

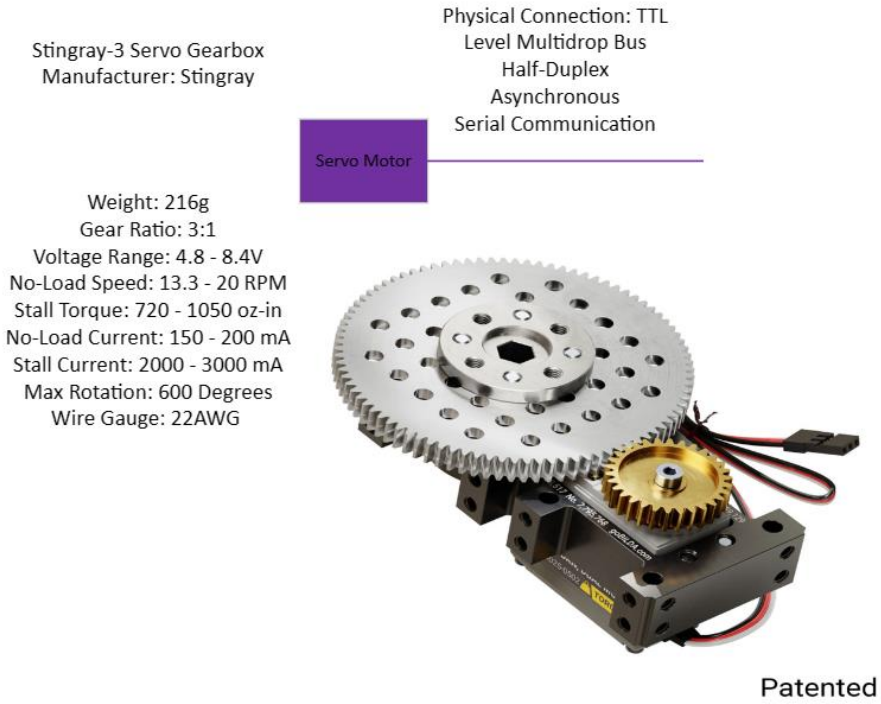


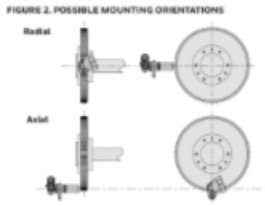
Figure 8: Servo Motor Specifications:

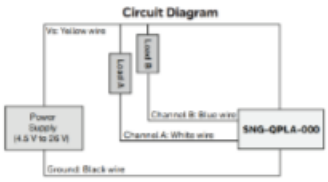
Notes:
Name: Winwood Dual Piston Brake – 1 Caliber
Model: HZ-4060

Figure 9: Brake Specifications:

SNG-QPLA-000
Digi Key Part #: 480-6270-ND
SENSOR HALL DIGITAL CABLE LEADS
Manufacturer: Honeywell Sensing and Productivity Solutions

Output type: Digital
Frequency: 3Hz-20kHz
Voltage Supply: 4.6V-26V
Supply Current: 12mA-18mA
Load Current: 40mA
Operating temperature: -40°C
+150°C





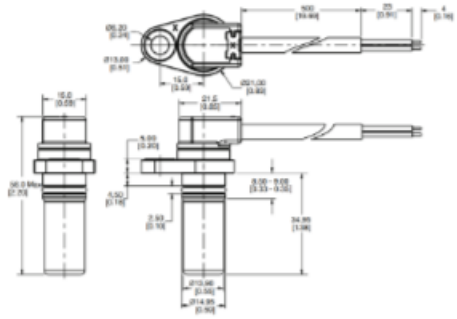


Figure 10: RPM Sensor Specifications:

High Level Graphical User Interface:

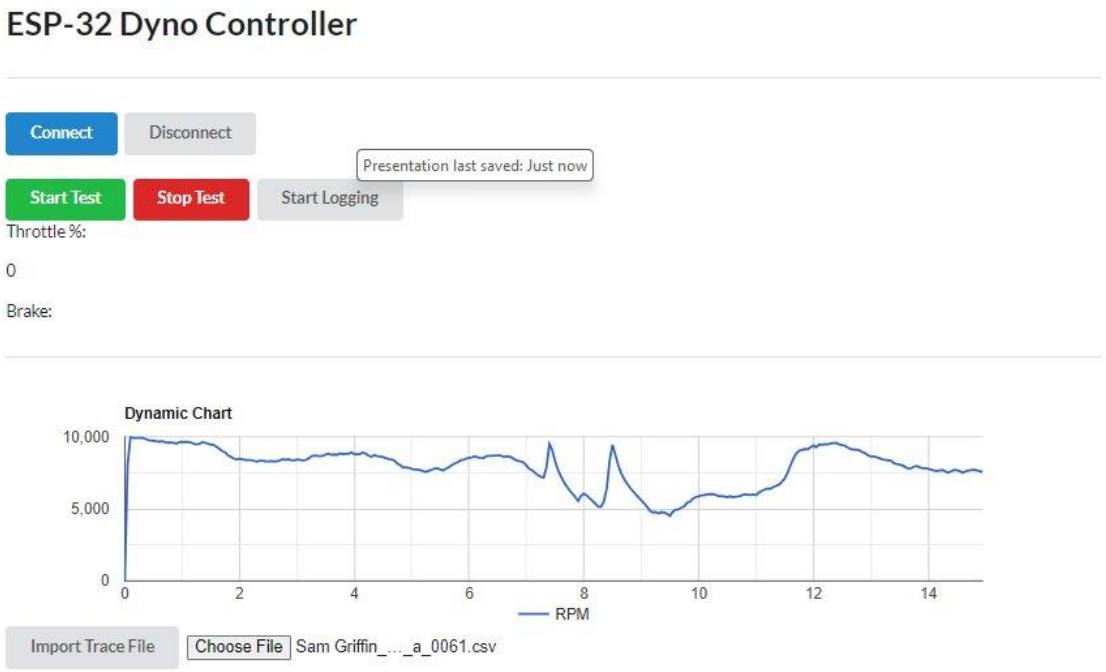


Figure 11: Graphical User Interface Design.

Figure 11 illustrates the proposed locally hosted web-based application that is used to present dynamometer test results to the operator and allow them to tweak and modify the dynamometer's configuration. RPM data and other values are shared between the microcontroller and Computer over a serial USB connection.

Connect / Disconnect: Allows the user to establish a connection or disconnect from the microcontroller.
Throttle %: This is a gauge that shows the current throttle angle.
Brake: This will show the current brake force being applied.
Main Graph: The main graph displays real-time rpm, torque or horsepower values generated by the dyno for the operator to compare.
Import Trace File: This allows for the user to import the .csv file that has track data from a motorsports race.
Start and Stop: The buttons will simply start and stop the data test.

Low Level Design:

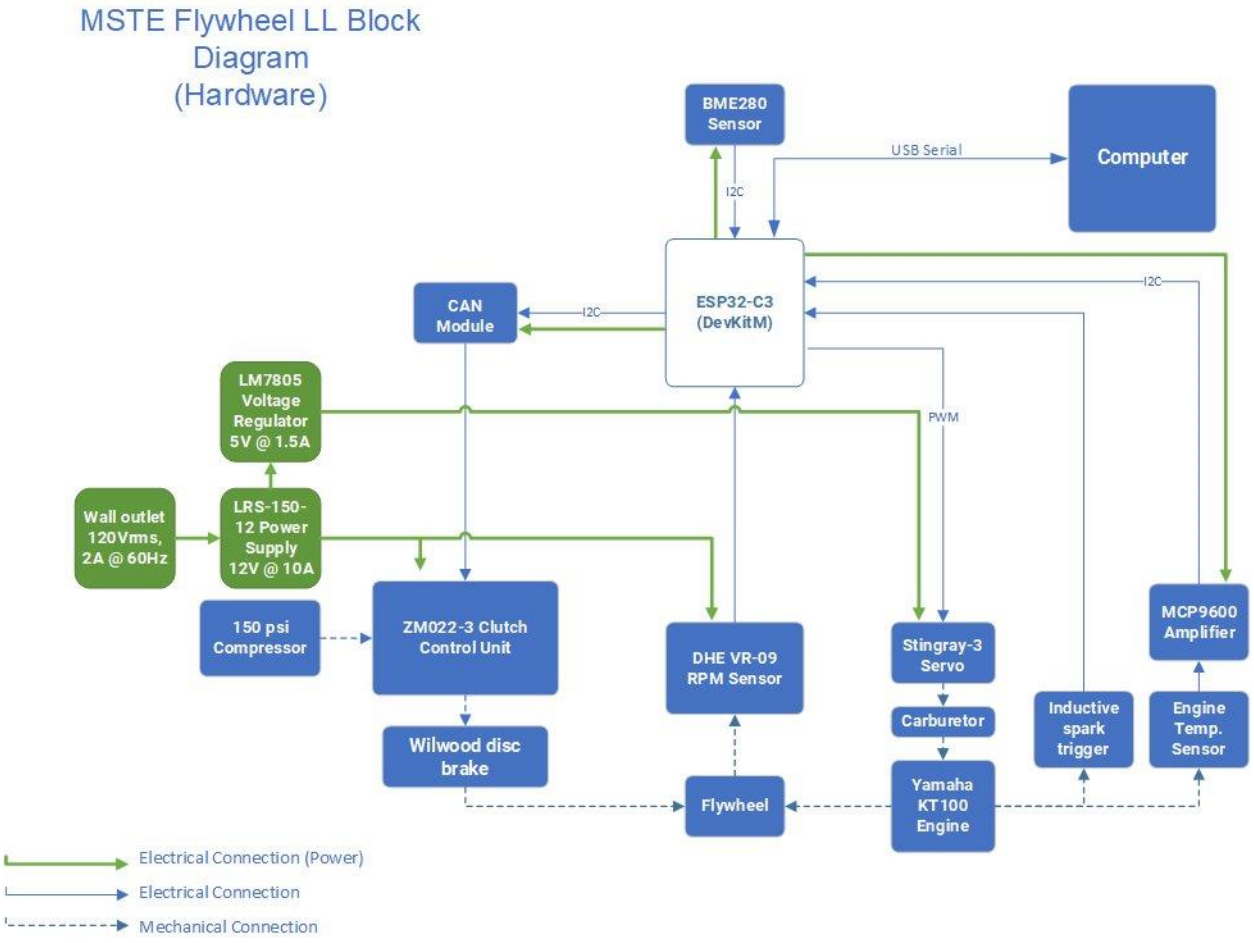


Figure 12: Low Level Control System Concept.

Design Updates:

Old Component:	New Component:	Reason:
ESP32 Microcontroller Microstick II	Arduino NANO	The original design has the ESP32 running the system and the Microstick would be the communicator gathering all the data for the ESP32 to use. During testing we found the Arduino NANO made running the system very simple for test, however the original plan is still a viable option for the final design.
Robotis Servo	Stingray Servo Motor	The Robotis was picked during the first semester of our design, therefore our knowledge of the system was still fresh. The Stingray works much better for pulling the throttle cable due to the design of the motor.
N/A	Brake Pressure Sensor	The brake pressure sensor could be critical to getting the brakes to work effectively, however this component was introduced after midterm, so it was out of scope for the design at that stage. Check datasheet references for more information on the component.

Testing Specifications:

The testing method includes testing each component individually and then bringing them together to test for engine idling, throttle control, break control, and data report.

Component Name:	Desired Result:	Actual Result:	Notes:
Servo Motor	Servo motor can allow the engine to run full throttle or idle the engine by opening the throttle to ~50%.	Servo motor successfully opens and closes the throttle. 100° is closed state and 120° is fully open. The servo angle for engine idle is ~108°.	The cable stop "FIGURE" that is used to keep the throttle cable on the servo motor rotates separately from the servo motor, making it difficult to keep slack on the cable low.
RPM Sensor	RPM sensor measures pulses of the flywheel turning in RPM.	The RPM reads flywheel pulses; however, due to control system no being complete, the sensor only reads the low RPM values of hand turning the wheel.	The RPM sensor needs to be remounted to the flywheel. When the system runs, the mounting plate shakes causing discrepancies in data.
Tach RPM Signal Adapter	Reads RPM data with about 98% accuracy to what the MYCHRON5 data logger reads.	The RPM reads ~98% accuracy to what the Motorsports team data logger reads.	The wrapping for the signal wire needs to be around 5-8 coils as per the specification sheet "FIGURE".
Temperature, Humidity, and Pressure Sensor	Gauges ambient temperature to +/- 1℃ accuracy as per the specification sheet.	THP sensor reads ambient temperature with around a +/- 1℃ accuracy based on thermometer.	N/A
Clutch Control Unit / Brake Control	The CCU can gradually put pressure on the brakes for deceleration.	The CCU can engage the brakes at 100% immediately, but currently does not gradually apply pressure as the air pressure drops when the brakes are engaged.	A possible solution is to supply a consistent air source as opposed to using a tank.
Idle Engine Control	The Engine can be made to idle at around 3000-5000 RPM	The control system implemented allows the servo to open the throttle 50%, keeping the engine from dying "FIGURE".	A PID control loop will be an effective system for idle engine, more testing is needed for the PID values to be finetuned.
Report Data	GUI can generate a report of the dataset from the flywheel.	The GUI can generate a report, however since the complete system is not functional, we can only retrieve faux data.	N/A

Conclusion:

The current state of the dynamometer is not a full control system; however, the pieces are there to be put together. The engine currently idles around 3000-5000 RPM but there are some discrepancies where the race engine spikes in RPM drastically. Fully implementing the temperature sensor into the control system and designing code that changes the RPM based on the ambient temperature is a solution that needs tested. Furthermore, the clutch control unit fully engages the brake, there are a few implementations that still need to be put in place for the system to function properly. Implementing a consistent air supply, Hall effect Sensor, and the Brake Pressure sensor all need to communicate to implement a full brake system.

Research References:

[1] Ahmad, Fauzi, et al. Modeling and PID Control of Antilock Brake System with Wheel Slip Reduction to Improve Braking Performance, Jan. 2013.

[2] Schmidt, Ethan. Inertia Dyno Design and Table Manufacturing, Butler University, Indiana University Purdue University, 2007.

[3] Todd, Darren. “Inertia Dyno Design Guide.” DTec, www.dtec.net.au/. Accessed 6 Dec. 2023.

[4] Wang, Yu, and Kim Stelson. “IEEE: Modeling, Control, and Experimental Validation of a Transient Hydrostatic Dynamometer.” Modeling, Control, and Experimental Validation of a Transient Hydrostatic Dynamometer, Dec. 2021.

[5] Zhai, Yao. “Design of Switching for Adaptive Cruise Control under String Stability Constraints.” Purdue University, 2010.

Datasheet References:

[1] Adafruit. (2024, March 11). Arduino NANO. [Online]. Available: A000005-datasheet.pdf (arduino.cc): Accessed: April 23, 2024.

[2] Adafruit. (2015, February). Precision Thermocouple to Digital Converter with Linearization. [Online]. Available: MAX31856.pdf (adafruit.com). Accessed: April 23, 2024.

[3] Bosch. (2014, November 11). BME280 Combined Humidity and Pressure Sensor. [Online]. Available: BME280 Environmental Sensor - Waveshare Wiki. Accessed: April 23, 2024.

[4] Espressif. (2020, September 10). ESP32-DevKitM-1. [Online]. Available: ESP32-DevKitM-1 - ESP32 - — ESP-IDF Programming Guide latest documentation (espressif.com). Accessed: April 23, 2024.

[5] Mean Well. (2020, October 14). 150W Single Output Switching Power Supply. [Online]. Available: 未命名 -1 (mouser.com). Accessed: April 23, 2024.

[6] Microchip Technology. (2011, August 02). Microstick II. [Online]. Available: Microstick II Information Sheet (microchip.com). Accessed: April 23, 2024.

[7] MOTEC. (2015, January 5). Professional Pressure Sensor. [Online]. Available: Professional Pressure Sensor (milspecwiring.com). Accessed: April 23, 2024.

[8] Shiftec. (N/A). ZM022-1 Clutch Control Unit. [Online]. Available: Clutch_Control_Unit_-_CCU_-_ZM022.pdf (shopify.com). Accessed: April 23, 2024.

[9] Stingray. (N/A). Stingray-3 Servo Gearbox. [Online]. Available: Stingray-3 Servo Gearbox (0.51 sec/60°, 20RPM, 1050 oz-in Torque, 600° Rotation) - goBILDA®. Accessed: April 23, 2024.

[10] TE Connectivity. (2010, April). AMP SUPERSEAL Connectors 1.0 mm System. [Online]. Available: 01- (te.com). Accessed: April 23, 2024.

[11] Texense. (N/A). VR-09-B Speed Sensor. [Online]. Available: VR-Ø9-B - Texense - Embedded Sensors. Accessed: April 23, 2024.

Appendices:

Schematics:

- **Original Circuit Schematic (With ESP-32):**

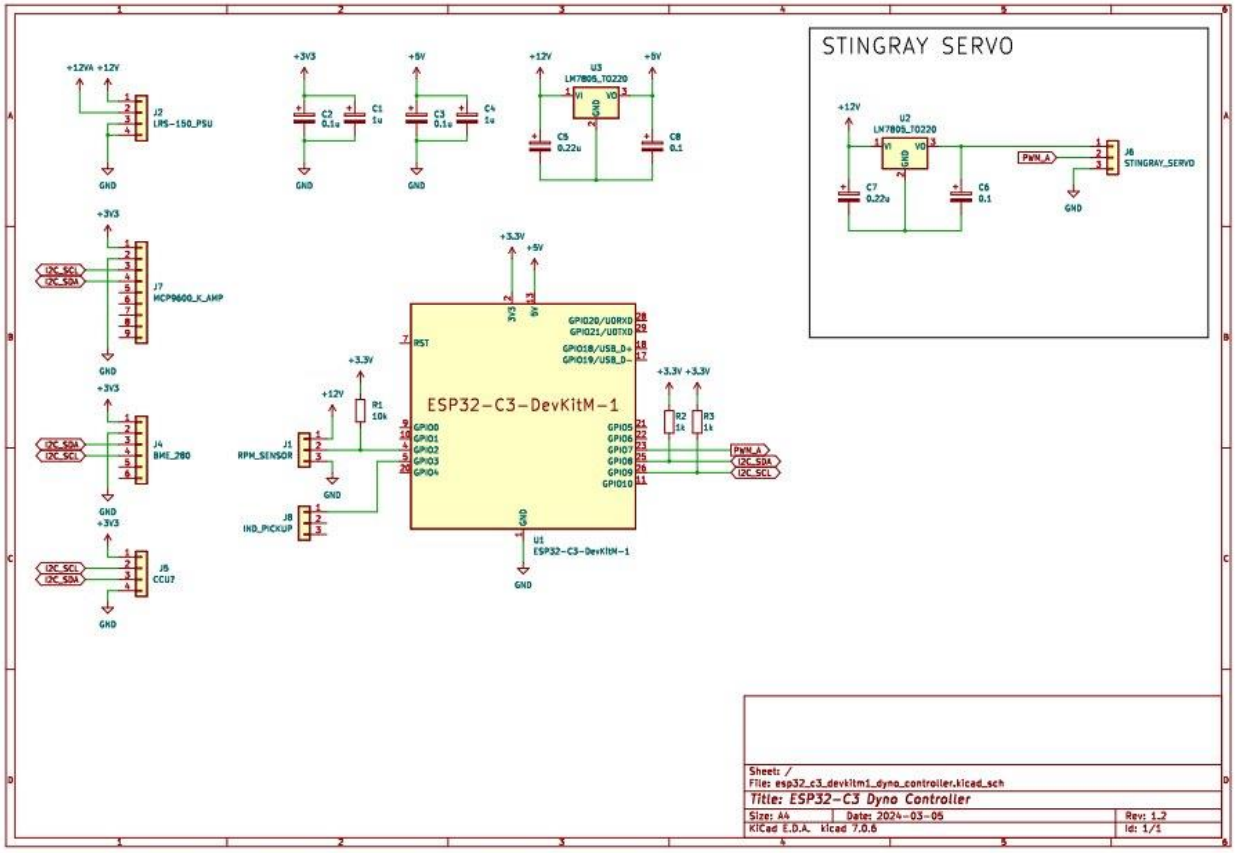
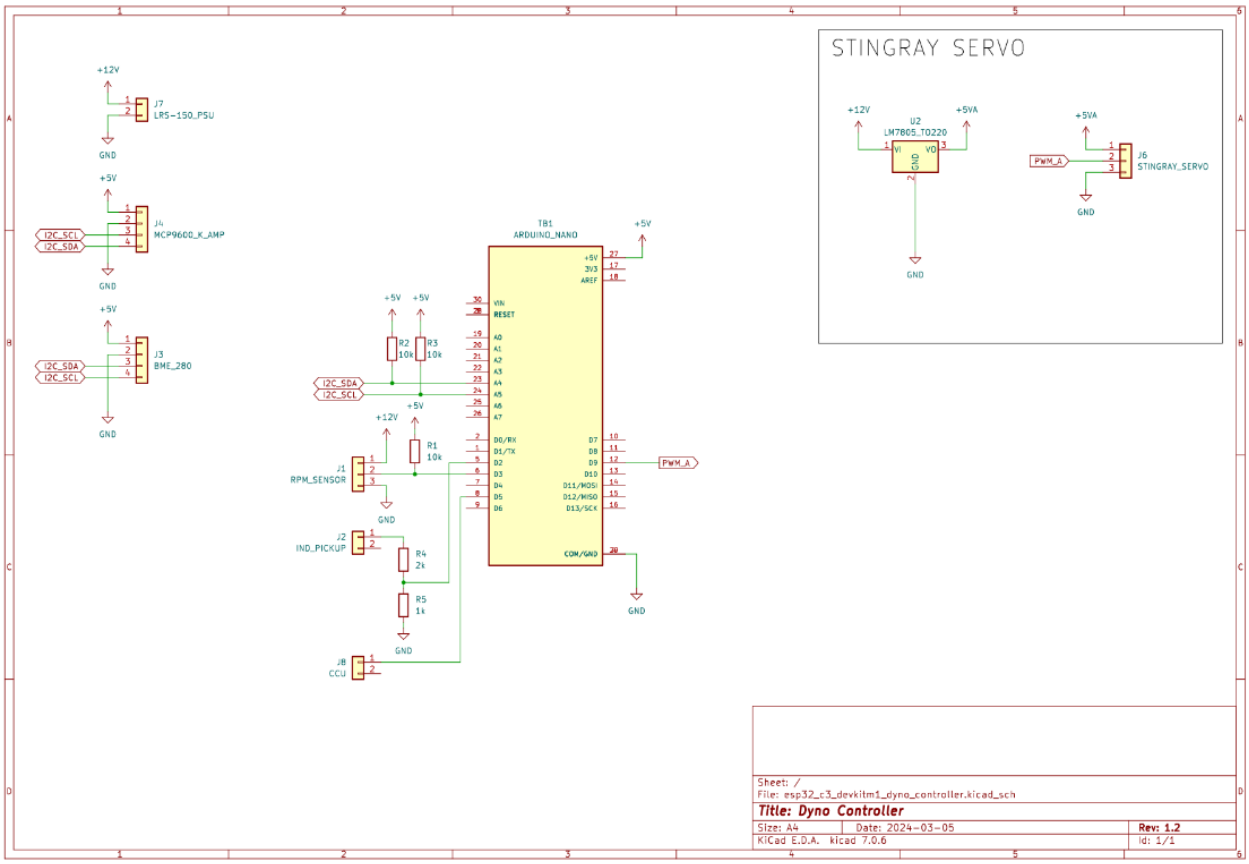
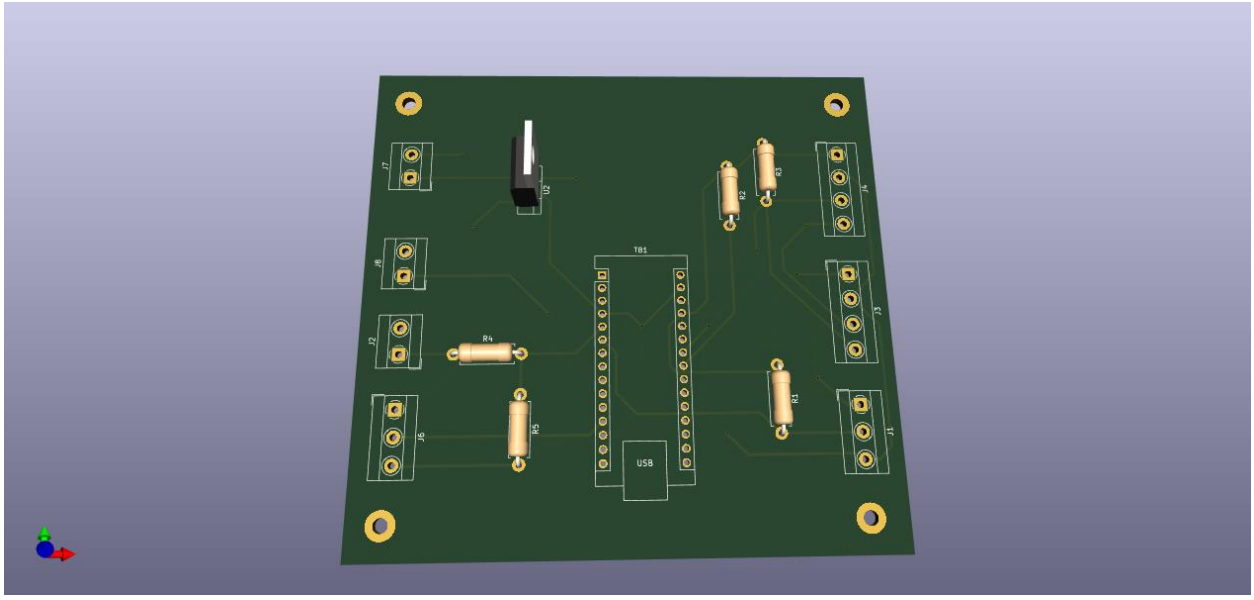


Figure 13: Circuit Schematic with ESP32.

- **Final Circuit Schematic (With Arduino NANO):**



- **Final Circuit Schematic (3D Model):**



- **Circuit Board Size (With mounting hole):**

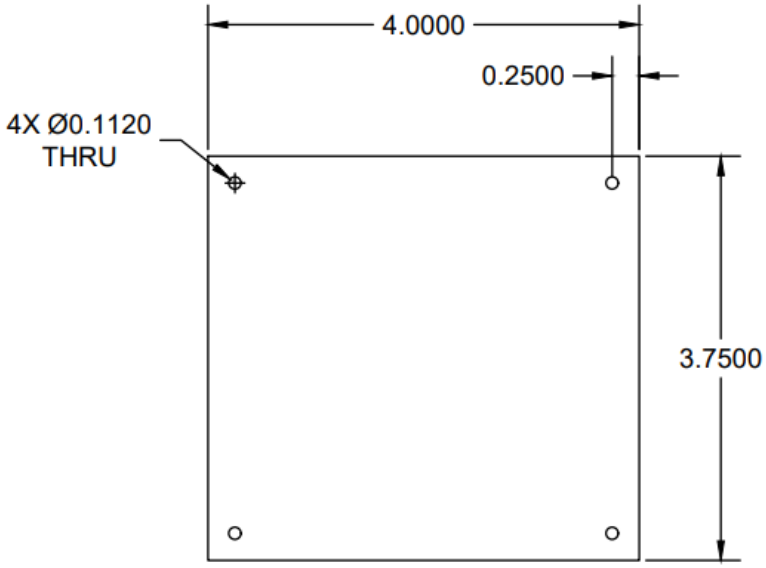


Figure 14: Printed Circuit Board Sizes.

Code:

~Code was done in visual studios code~

- HTML Code:

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>ESP-32 Dyno Controller</title>
    <script
      defer
      type="text/javascript"
      src="https://www.gstatic.com/charts/loader.js"
    ></script>
    <script defer src="./assets/main.js"></script>
  </head>
  <body>
    <p>ESP-32 Serial Test</p>
    <div id="main-graph"></div>
    <button onclick="connectDevice()">Connect</button>
    <button onclick="disconnectDevice()">Disconnect</button>
    <br />
    <br />
    <input type="file" id="csv-file-picker" accept=".csv" />
    <button onclick="importTraceFile()">Import Trace File</button>
    <br />
    <br />
    <p>Throttle %:</p>
    <p>0</p>
    <p>Brake:</p>
    <p style="color: red">DISABLED</p>
  </body>
</html>
```

- Main.ino File Code:

```
#include "stingray.h"
#include "pickup.h"
#include "rpmsensor.h"
#include "ccu.h"
#include "bme280.h"
#include "config.h"
#include <PID_v1.h>

double Setpoint, Input, Output;
double Kp = 5, Ki = 0, Kd = 0;
PID myPID(&Input, &Output, &Setpoint, Kp, Ki, Kd, DIRECT);

unsigned long previousMillis1 = 0;

float targetRPM = 6000.0;
float currentRPM = 0.0;
float rpmBuffer[12] = {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0};
static int currentServoPosition = 100;

static bool testEnable = false;

void appendToBuffer(float *buffer, float value)
{
    for (int i = 0; i < 11; i++)
    {
        buffer[i] = buffer[i + 1];
    }
    buffer[11] = value;
}

```

```
31  void updateServoPosition()
32  {
33      // if RPM is less than target RPM, increase servo position to open
34      if (currentRPM < targetRPM)
35      {
36          if (currentServoPosition < SERVO_END_POS_DEG)
37          {
38              currentServoPosition += 2;
39          }
40      }
41      else
42      {
43          if (currentServoPosition > SERVO_START_POS_DEG)
44          {
45              currentServoPosition -= 2;
46          }
47      }
48  }
49
50  void moveServo()
51  {
52      unsigned long currentMillis = millis();
53
54      if (currentMillis - previousMillis1 >= SERVO_DELAY_MS)
55          ;
56      {
57          setServoAngle(currentServoPosition);
58          previousMillis1 = currentMillis;
59      }
60  }
61
```

```
62  void setup()
63  {
64      Serial.begin(SERIAL_BAUD_RATE);
65      while (!Serial)
66      {
67          delay(10);
68      }
69      Serial.println("Serial started");
70
71      initializeInductivePickup();
72      initializeRPMSensor();
73      initializeServo();
74      // initializeBME280();
75      initializeCCU();
76
77      pinMode(PIN_CONTROL_ENABLE, INPUT_PULLUP);
78
79      Input = currentRPM;
80      Setpoint = targetRPM;
81
82      // //turn the PID on
83      // myPID.SetMode(AUTOMATIC);
84      // myPID.SetSampleTime(0);
85      // myPID.SetOutputLimits(SERVO_START_POS_DEG, SERVO_END_POS_DEG);
86  }
87
```

```
88  void loop()
89  {
90      // push new value to buffer
91      appendToBuffer(rpmBuffer, getInductivePickupRPM());
92
93      // calculate average
94      float sum = 0;
95      for (int i = 0; i < 12; i++)
96      {
97          sum += rpmBuffer[i];
98      }
99      currentRPM = sum / 12;
100
101     // if (digitalRead(PIN_CONTROL_ENABLE) == HIGH) {
102     //     updateServoPosition();
103     //     moveServo();
104     // }
105
106     // if (digitalRead(PIN_CONTROL_ENABLE) == HIGH) {
107     //     Input = currentRPM;
108     //     myPID.Compute();
109     //     currentServoPosition = constrain(Output, SERVO_START_POS_DEG, SERVO_START_POS_DEG);
110     //     moveServo();
111     // }
112
```

```
113         if (Serial.available())
114         {
115             char command = Serial.read();
116             if (command == '<')
117             {
118                 testEnable = true;
119             }
120         }
121
122         // Servo sweep test
123         if (testEnable)
124         {
125             int pos;
126             for (pos = 100; pos <= 110; pos += 1)
127             { // goes from 0 degrees to 180 degrees
128                 // in steps of 1 degree
129                 setServoAngle(pos); // tell servo to go to position in variable 'pos'
130                 delay(20);          // waits 15 ms for the servo to reach the position
131             }
132             delay(500);
133             for (pos = 110; pos >= 100; pos -= 1)
134             {                       // goes from 180 degrees to 0 degrees
135                 setServoAngle(pos); // tell servo to go to position in variable 'pos'
136                 delay(20);          // waits 15 ms for the servo to reach the position
137             }
138             delay(500);
139         }
```

```
140
141         Serial.print(getInductivePickupRPM());
142         Serial.print(", ");
143         Serial.print(getInductivePickupFrequency());
144         Serial.print(", ");
145         Serial.print(currentServoPosition);
146         Serial.print(", ");
147         Serial.print(getFlywheelRPM());
148         Serial.print(", ");
149         Serial.print(getFlywheelFrequency());
150         Serial.println(", ");
151         // Serial.print(getBME280Temperature());
152         // Serial.print(", ");
153         // Serial.print(getBME280Pressure());
154         // Serial.print(", ");
155         // Serial.println(getBME280Humidity());
156     }
```

- Config.h Code:

```
#ifndef config_h
#define config_h

// Pin definitions
#define PIN_SERVO 9
#define PIN_IND_PICKUP_SENSOR 2 // dont change
#define PIN_CONTROL_ENABLE 6
#define PIN_RPM_SENSOR 3 // dont change
#define PIN_CCU 5

// Servo definitions
#define SERVO_START_POS_DEG 102 // closed throttle position
#define SERVO_END_POS_DEG 120 // open throttle position
#define SERVO_DELAY_MS 20

// Inductive pickup definitions
#define ENGINE_IDLE_RPM 5000
#define ENGINE_MAX_RPM 20000
#define ENGINE_MAX_RPM 0

// Serial communication definitions
#define SERIAL_BAUD_RATE 115200

// RPM sensor definitions
#define TRIGGER_WHEEL_DIV 8.0

#endif
```

- Servo.cpp Code:

```cpp
#include <Arduino.h>
#include <Servo.h>
#include "stingray.h"
#include "config.h"

Servo servo;

void initializeServo() {
    // Set servo pin as output
    pinMode(PIN_SERVO, OUTPUT);

    // Attach servo to pin
    servo.attach(PIN_SERVO);

    // Set initial position
    servo.write(SERVO_START_POS_DEG);
}

void setServoAngle(int servoAngle) {
    // Set servo position
    servo.write(constrain(servoAngle, SERVO_START_POS_DEG, SERVO_END_POS_DEG));
}
```

- Servo.h Code:

```cpp
#ifndef stingray_h
#define stingray_h

// initialize the servo
void initializeServo();

// set the servo angle
void setServoAngle(int servoAngle);

#endif
```

- CCU.cpp Code:

```cpp
#include <Arduino.h>
#include "ccu.h"
#include "config.h"

void initializeCCU() {
    // Set CCU pin as output
    pinMode(PIN_CCU, OUTPUT);
}

void setCCUDemand(int demand) {
    analogWrite(PIN_CCU, demand);
}
```

- CCU.h Code:

```cpp
#ifndef ccu_h
#define ccu_h

// intitialize CCU
void initializeCCU();

// Supply CCU brake demand
void setCCUDemand();

#endif
```

- BME280.cpp Code:

```cpp
#include <Arduino.h>
#include "bme280.h"
#include "config.h"
#include <Wire.h>
#include <SPI.h>
#include <Adafruit_Sensor.h>
#include <Adafruit_BME280.h>

Adafruit_BME280 bme; // I2C

void initializeBME280() {
    Serial.println("BME280 Initializing");
    if(!bme.begin(0x77)) {
        Serial.println("Could not find a valid BME280 sensor, check wiring!\n");
        while(1);
    }
    Serial.println("BME280 Initialized Success");
}

double getBME280Temperature() {
    return bme.readTemperature();
}

double getBME280Pressure() {
    return bme.readPressure() / 100.0F;
}

double getBME280Humidity() {
    return bme.readHumidity();
}
```

- BME280.h Code:

```
#ifndef bme280_h
#define bme280_h

// initialize BME280 sensor
void initializeBME280();

// get temperature from BME280 sensor
double getBME280Temperature();

// get pressure from BME280 sensor
double getBME280Pressure();

// get humidity from BME280 sensor
double getBME280Humidity();

#endif
```

- RPM.cpp Code:

```cpp
#include <Arduino.h>
#include "config.h"
#include "rpmsensor.h"

float pulsePeriodMs = 0;
float fullPeriod = 0;
float pulseFrequencyHz = 0;
volatile unsigned long previousMicros = 0;
volatile unsigned long elapsedTime = 0;

// Interrupt service routine
void fallInterrupt() {
  // Get current time in microseconds
  unsigned long currentMicros = micros();

  // If previousMillis is not 0, calculate elapsed time
  if (previousMicros != 0)
  {
      elapsedTime = currentMicros - previousMicros;
  }
  previousMicros = currentMicros;

  // Convert microseconds to milliseconds
  pulsePeriodMs = elapsedTime * 0.000001;

  // Calculate period for full rotation in seconds
  fullPeriod= pulsePeriodMs * TRIGGER_WHEEL_DIV;

  // Calculate frequency in Hz (1/period in seconds)
  pulseFrequencyHz = 1.0 / fullPeriod;
}

void initializeRPMSensor()
{
  // Set RPM sensor pin as input with pull-up resistor
  pinMode(PIN_RPM_SENSOR, INPUT_PULLUP);

  // Attach interrupt to RPM sensor pin
  attachInterrupt(digitalPinToInterrupt(PIN_RPM_SENSOR), fallInterrupt, FALLING);
}

float getFlywheelRPM()
{
  // Calculate RPM from frequency
  float pulseRPM = pulseFrequencyHz * 60.0;

  // Return RPM
  return pulseRPM;
}

float getFlywheelFrequency()
{
  // Return frequency
  return pulseFrequencyHz;
}
```

- RPM.h Code:

```
#ifndef rpmsensor_h
#define rpmsensor_h

// initialize RPM sensor
void initializeRPMSensor();

// Update period, frequency and RPM variables in the interrupt
void fallInterrupt();

// get flywheel RPM
float getFlywheelRPM();

// get flywheel frequency
float getFlywheelFrequency();

#endif
```

- Tachometer.cpp Code:

```
#include <Arduino.h>
#include "pickup.h"
#include "config.h"

float pulsePeriodS = 0;
float pulseFrequencyHzB = 0;
volatile unsigned long previousMicrosB = 0;
volatile unsigned long elapsedTimeB = 0;

// Interrupt service routine
void fallInterruptB() {
  // Get current time in microseconds
  unsigned long currentMicros = micros();

  // If previousMillis is not 0, calculate elapsed time
  if (previousMicrosB != 0)
  {
      elapsedTimeB = currentMicros - previousMicrosB;
  }
  previousMicrosB = currentMicros;

  // Convert microseconds to seconds
  pulsePeriodS = elapsedTimeB * 0.000001;

  // Calculate frequency in Hz (1/period in seconds)
  pulseFrequencyHzB = 1.0 / pulsePeriodS;
}

void initializeInductivePickup()
{
  // Set RPM sensor pin as input with pull-up resistor
  pinMode(PIN_IND_PICKUP_SENSOR, INPUT_PULLUP);

  // Attach interrupt to RPM sensor pin
  attachInterrupt(digitalPinToInterrupt(PIN_IND_PICKUP_SENSOR), fallInterruptB, RISING);
}

float getInductivePickupRPM()
{
  // Calculate RPM from frequency
  float pulseRPM = pulseFrequencyHzB * 60.0;

  // Return RPM
  return pulseRPM;
}

float getInductivePickupFrequency()
{
  // Return frequency
  return pulseFrequencyHzB;
}
```

- Tachometer.h Code:

```
#ifndef pickup_h
#define pickup_h

// initialize inductive pickup sensor
void initializeInductivePickup();

// Update period, frequency and RPM variables in the interrupt
void fallInterruptB();

// get inductive pickup sensor RPM
float getInductivePickupRPM();

// get inductive pickup sensor frequency
float getInductivePickupFrequency();

#endif
```

Flowcharts:

- Throttle PID Control Loop:

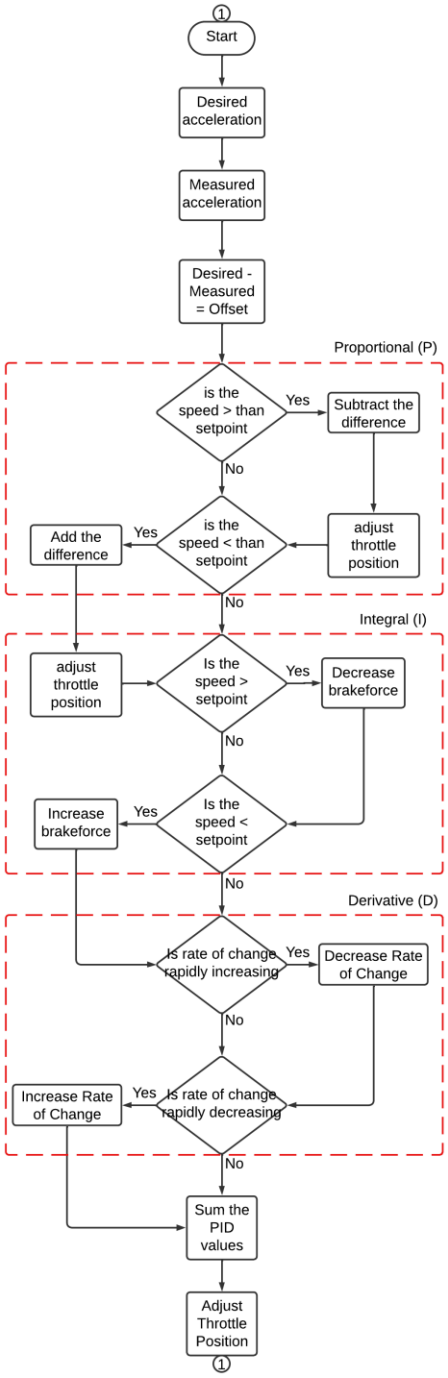


Figure 15: Throttle PID control loop flowchart.

- Brake PID Control Loop:

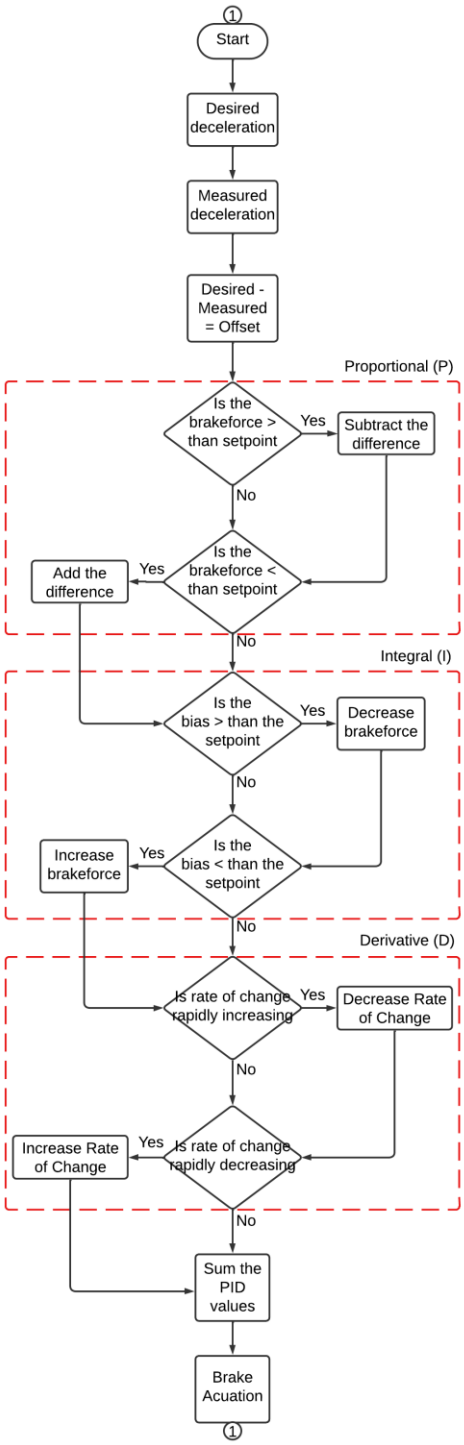


Figure 16: Brake PID control loop flowchart.

- Control System (Main):

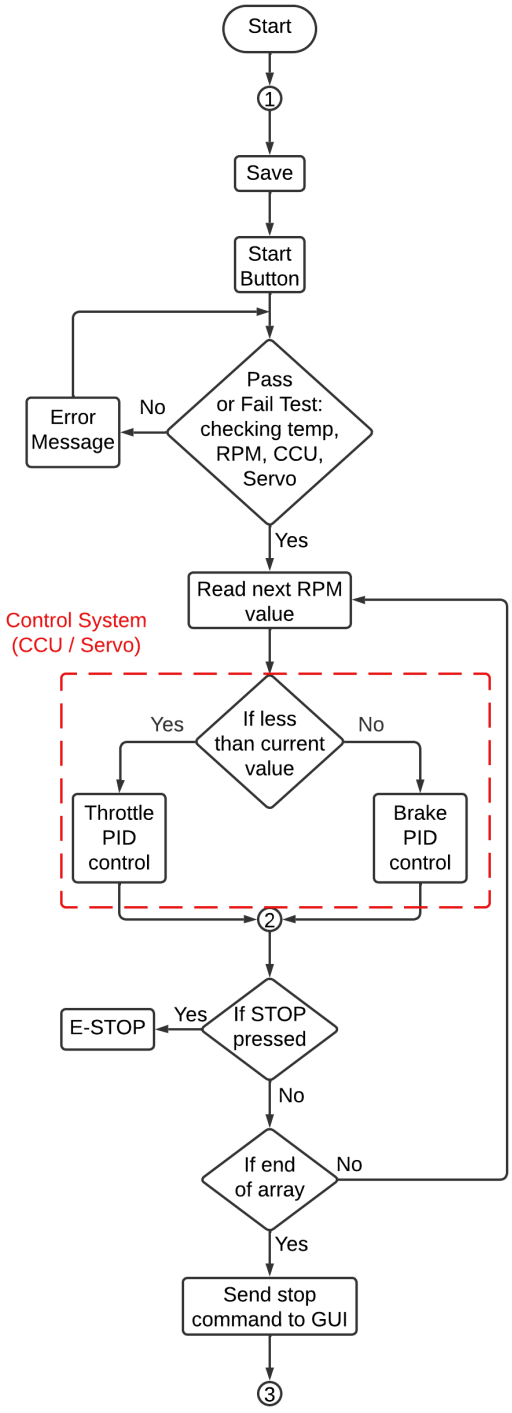
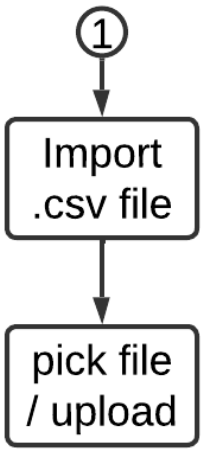
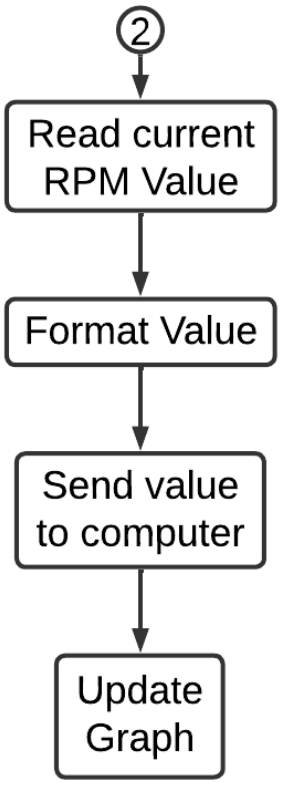


Figure 17: Control system flowchart.

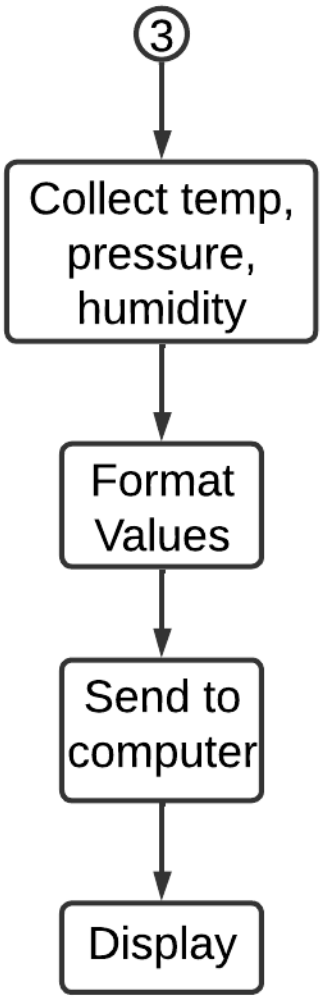
- Control System (1):



- Control System (2):

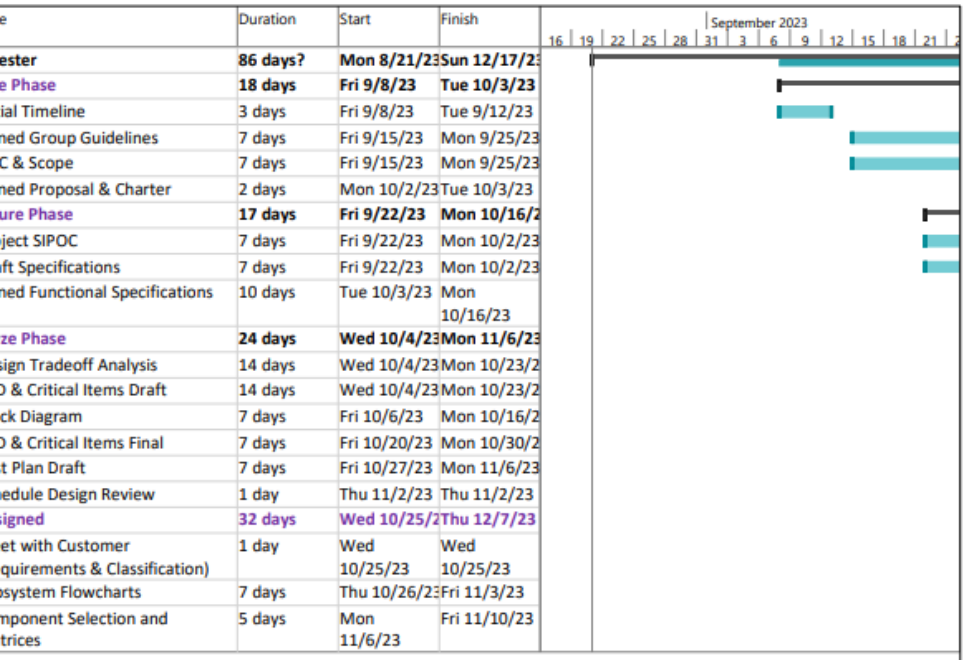


- Control System (3):

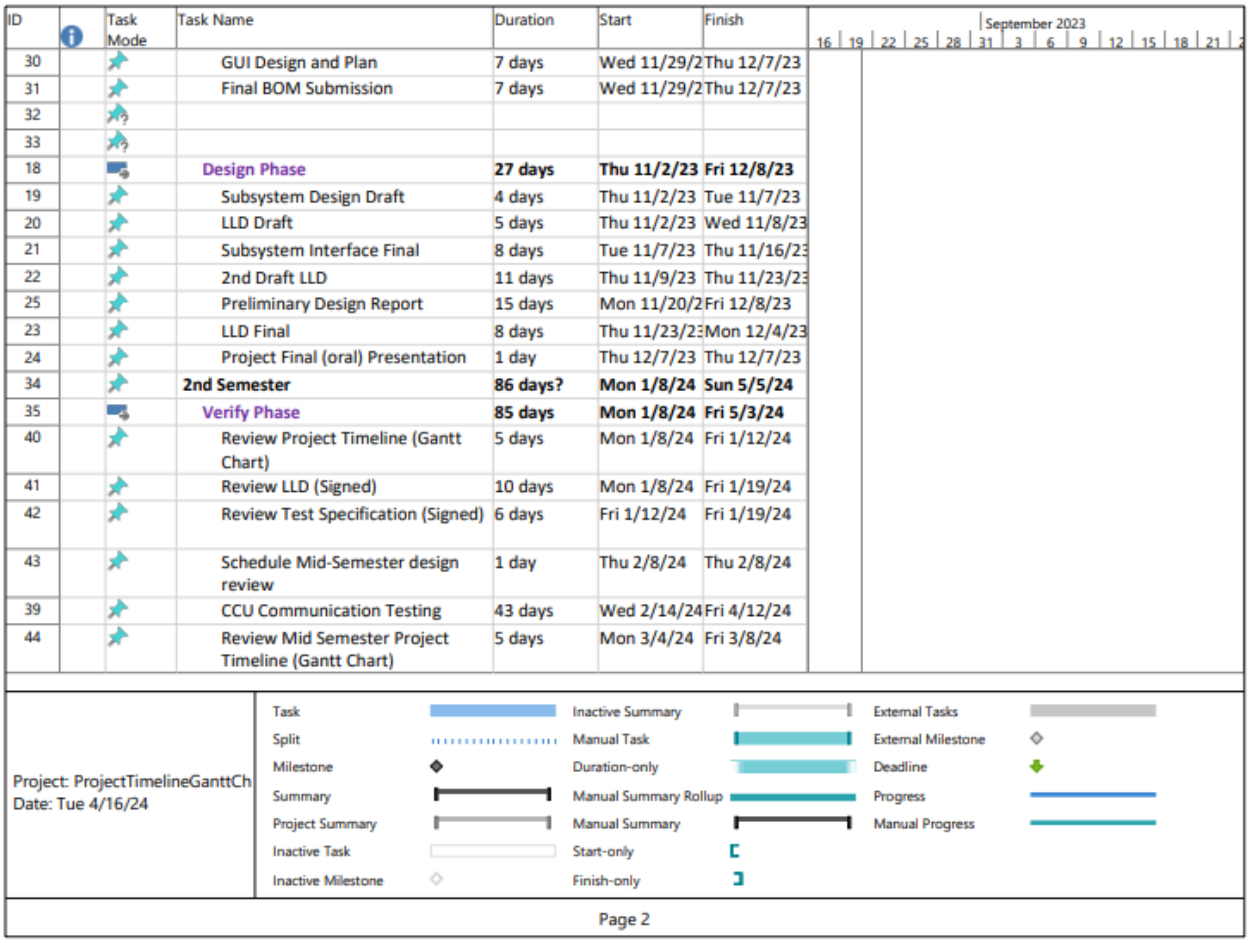


Gantt Chart:

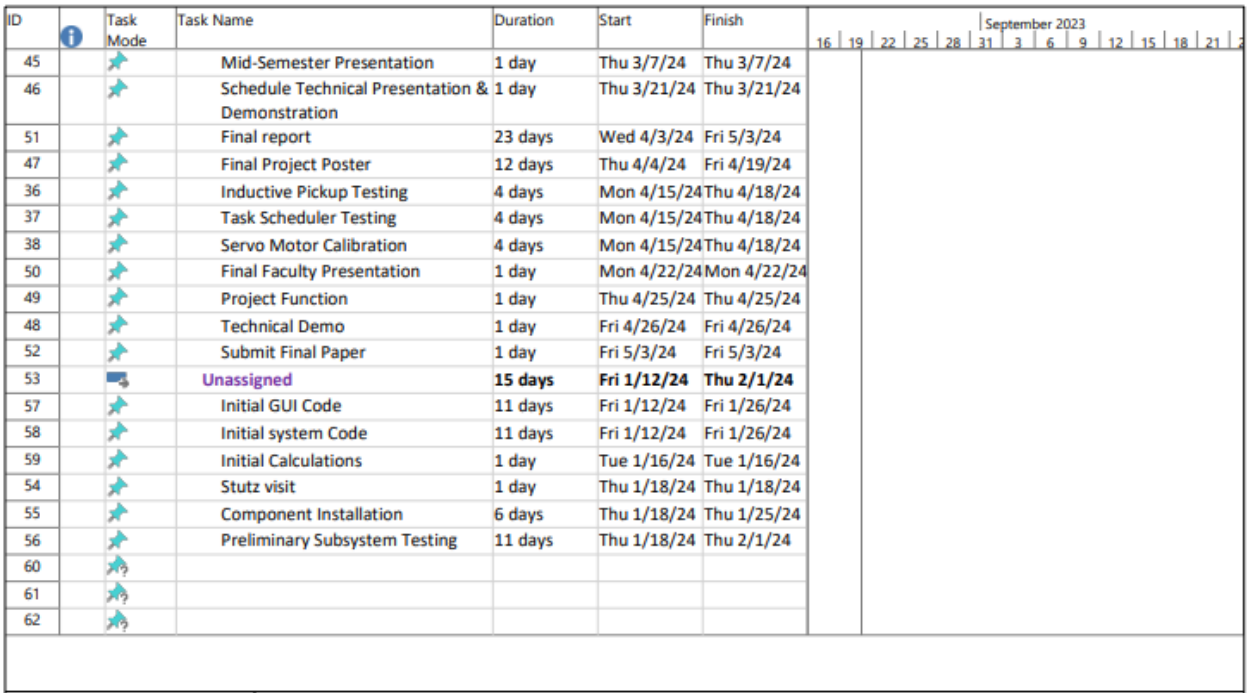
ID	Task Mode	Task Name	Duration	Start	Finish
1		**1st Semester**	**86 days?**	**Mon 8/21/23**	**Sun 12/17/23**
2		**Define Phase**	**18 days**	**Fri 9/8/23**	**Tue 10/3/23**
6		Initial Timeline	3 days	Fri 9/8/23	Tue 9/12/23
3		Signed Group Guidelines	7 days	Fri 9/15/23	Mon 9/25/23
4		VOC & Scope	7 days	Fri 9/15/23	Mon 9/25/23
5		Signed Proposal & Charter	2 days	Mon 10/2/23	Tue 10/3/23
7		**Measure Phase**	**17 days**	**Fri 9/22/23**	**Mon 10/16/2**
8		Project SIPOC	7 days	Fri 9/22/23	Mon 10/2/23
9		Draft Specifications	7 days	Fri 9/22/23	Mon 10/2/23
10		Signed Functional Specifications	10 days	Tue 10/3/23	Mon 10/16/23
11		**Analyze Phase**	**24 days**	**Wed 10/4/23**	**Mon 11/6/23**
13		Design Tradeoff Analysis	14 days	Wed 10/4/23	Mon 10/23/2
14		HLD & Critical Items Draft	14 days	Wed 10/4/23	Mon 10/23/2
12		Block Diagram	7 days	Fri 10/6/23	Mon 10/16/2
15		HLD & Critical Items Final	7 days	Fri 10/20/23	Mon 10/30/2
16		Test Plan Draft	7 days	Fri 10/27/23	Mon 11/6/23
17		Schedule Design Review	1 day	Thu 11/2/23	Thu 11/2/23
26		**Unassigned**	**32 days**	**Wed 10/25/2**	**Thu 12/7/23**
27		Meet with Customer (Requirements & Classification)	1 day	Wed 10/25/23	Wed 10/25/23
29		Subsystem Flowcharts	7 days	Thu 10/26/23	Fri 11/3/23
28		Component Selection and Matrices	5 days	Mon 11/6/23	Fri 11/10/23

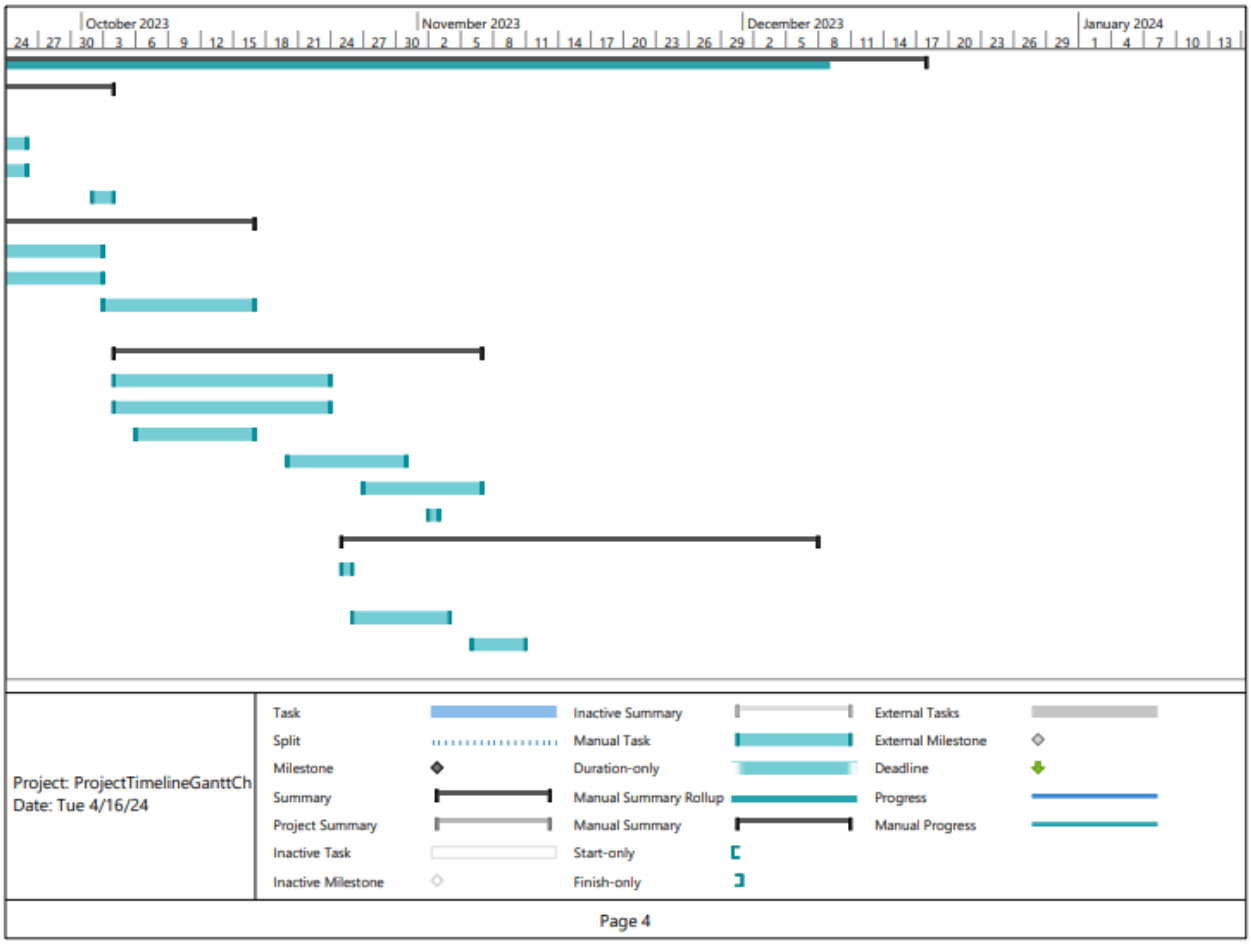


ID	Task Mode	Task Name	Duration	Start	Finish
30		GUI Design and Plan	7 days	Wed 11/29/2	Thu 12/7/23
31		Final BOM Submission	7 days	Wed 11/29/2	Thu 12/7/23
32					
33					
18		**Design Phase**	**27 days**	**Thu 11/2/23**	**Fri 12/8/23**
19		Subsystem Design Draft	4 days	Thu 11/2/23	Tue 11/7/23
20		LLD Draft	5 days	Thu 11/2/23	Wed 11/8/23
21		Subsystem Interface Final	8 days	Tue 11/7/23	Thu 11/16/23
22		2nd Draft LLD	11 days	Thu 11/9/23	Thu 11/23/23
25		Preliminary Design Report	15 days	Mon 11/20/2	Fri 12/8/23
23		LLD Final	8 days	Thu 11/23/23	Mon 12/4/23
24		Project Final (oral) Presentation	1 day	Thu 12/7/23	Thu 12/7/23
34		**2nd Semester**	**86 days?**	**Mon 1/8/24**	**Sun 5/5/24**
35		**Verify Phase**	**85 days**	**Mon 1/8/24**	**Fri 5/3/24**
40		Review Project Timeline (Gantt Chart)	5 days	Mon 1/8/24	Fri 1/12/24
41		Review LLD (Signed)	10 days	Mon 1/8/24	Fri 1/19/24
42		Review Test Specification (Signed)	6 days	Fri 1/12/24	Fri 1/19/24
43		Schedule Mid-Semester design review	1 day	Thu 2/8/24	Thu 2/8/24
39		CCU Communication Testing	43 days	Wed 2/14/24	Fri 4/12/24
44		Review Mid Semester Project Timeline (Gantt Chart)	5 days	Mon 3/4/24	Fri 3/8/24



ID	Task Mode	Task Name	Duration	Start	Finish
45		Mid-Semester Presentation	1 day	Thu 3/7/24	Thu 3/7/24
46		Schedule Technical Presentation & Demonstration	1 day	Thu 3/21/24	Thu 3/21/24
51		Final report	23 days	Wed 4/3/24	Fri 5/3/24
47		Final Project Poster	12 days	Thu 4/4/24	Fri 4/19/24
36		Inductive Pickup Testing	4 days	Mon 4/15/24	Thu 4/18/24
37		Task Scheduler Testing	4 days	Mon 4/15/24	Thu 4/18/24
38		Servo Motor Calibration	4 days	Mon 4/15/24	Thu 4/18/24
50		Final Faculty Presentation	1 day	Mon 4/22/24	Mon 4/22/24
49		Project Function	1 day	Thu 4/25/24	Thu 4/25/24
48		Technical Demo	1 day	Fri 4/26/24	Fri 4/26/24
52		Submit Final Paper	1 day	Fri 5/3/24	Fri 5/3/24
53		**Unassigned**	**15 days**	**Fri 1/12/24**	**Thu 2/1/24**
57		Initial GUI Code	11 days	Fri 1/12/24	Fri 1/26/24
58		Initial system Code	11 days	Fri 1/12/24	Fri 1/26/24
59		Initial Calculations	1 day	Tue 1/16/24	Tue 1/16/24
54		Stutz visit	1 day	Thu 1/18/24	Thu 1/18/24
55		Component Installation	6 days	Thu 1/18/24	Thu 1/25/24
56		Preliminary Subsystem Testing	11 days	Thu 1/18/24	Thu 2/1/24
60					
61					
62					

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November 2023
December 2023
January 2024
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Project: ProjectTimelineGanttCh
Date: Tue 4/16/24
Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
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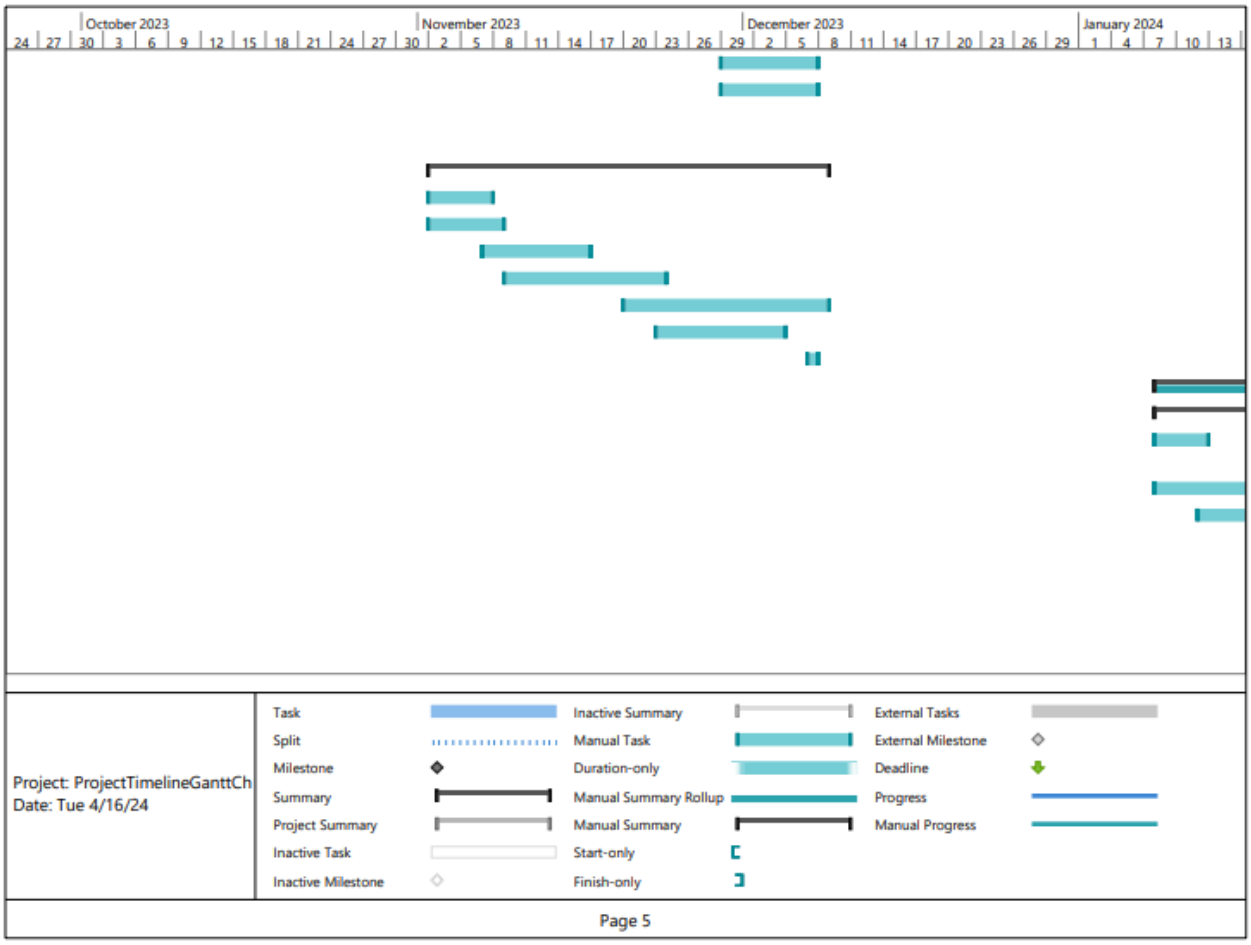
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress
Page 4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Page 5


October 2023
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Summary
Project Summary
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External Tasks
External Milestone
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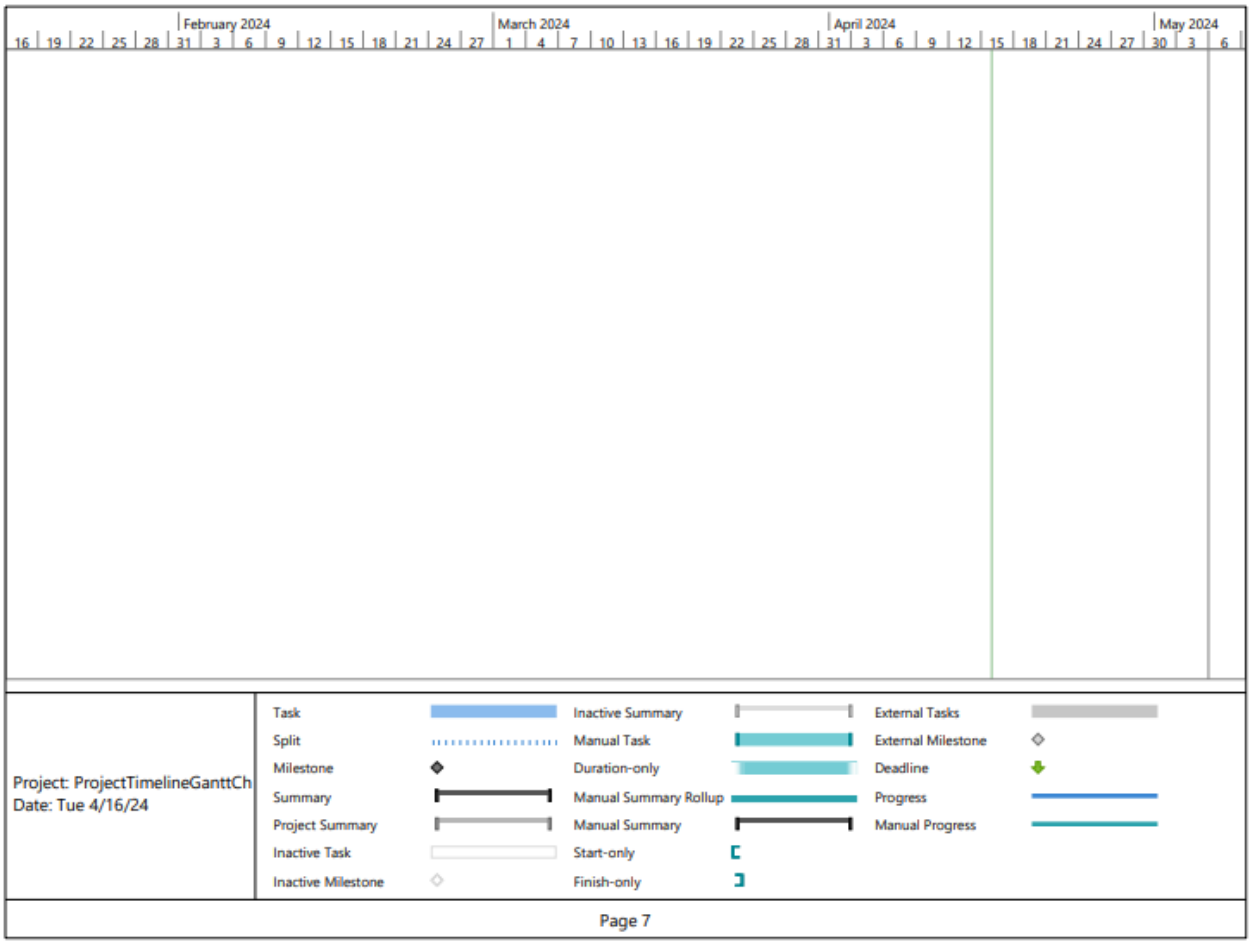
Manual Progress
Page 6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March 2024
April 2024
May 2024
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Project: ProjectTimelineGanttCh
Date: Tue 4/16/24
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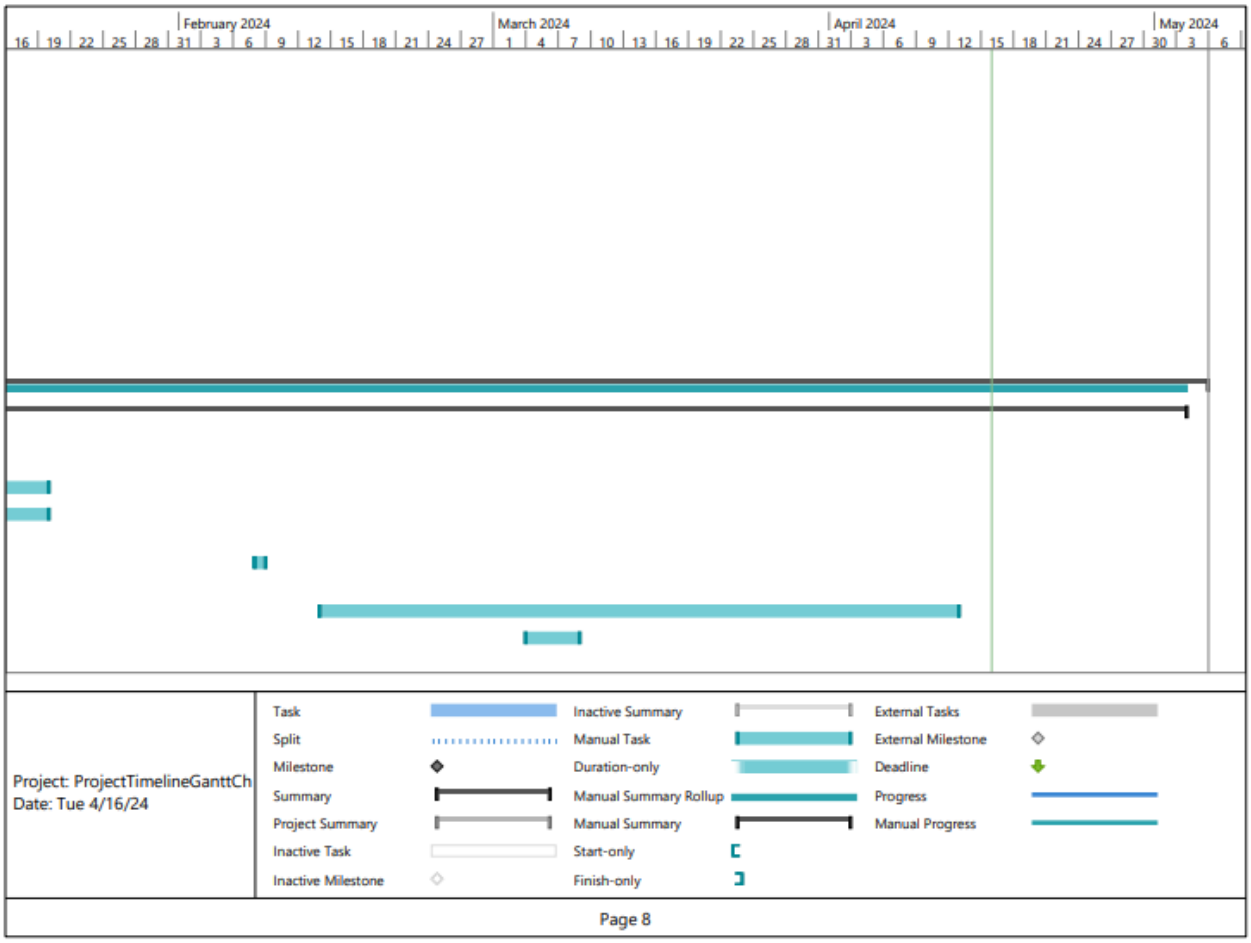
Page 7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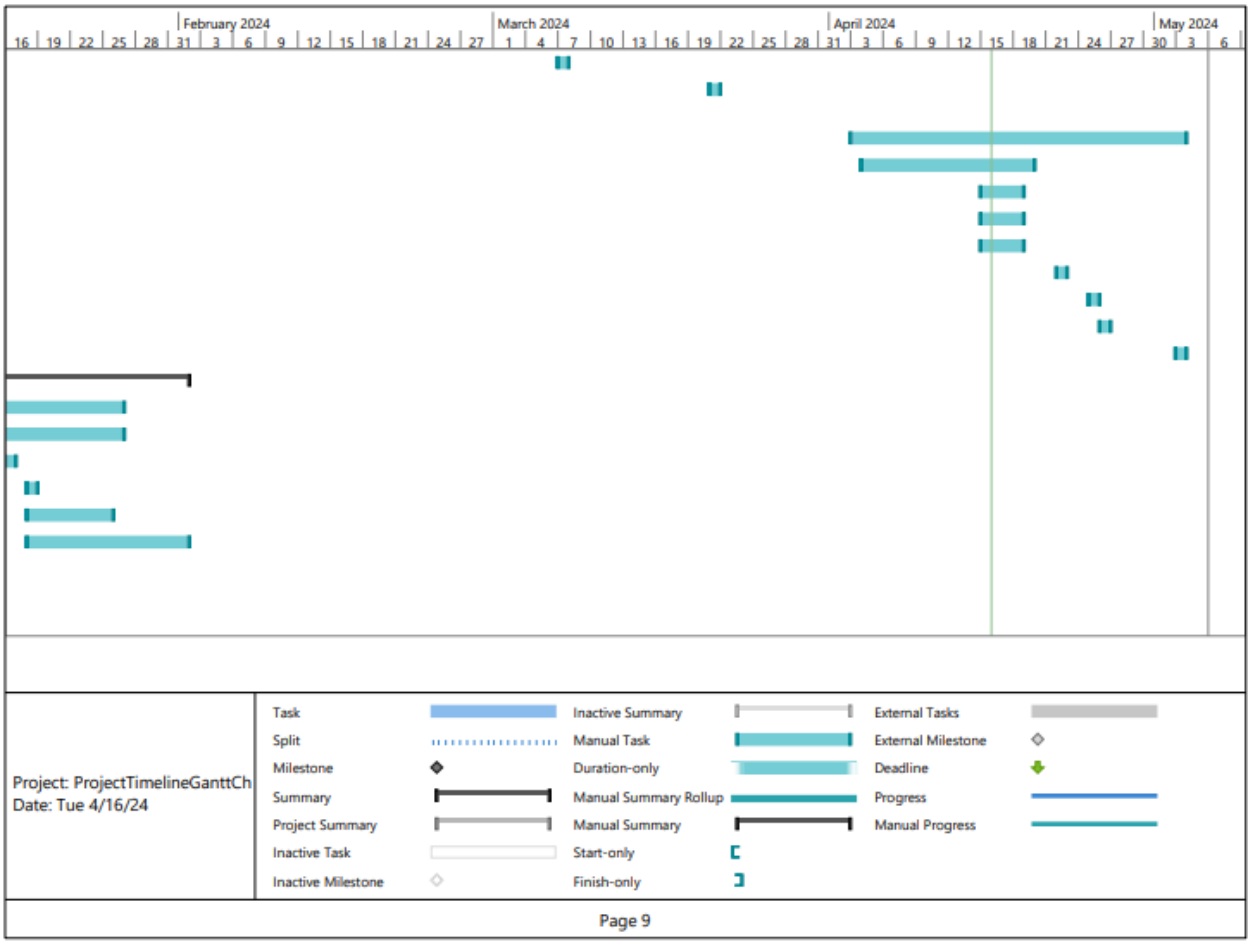
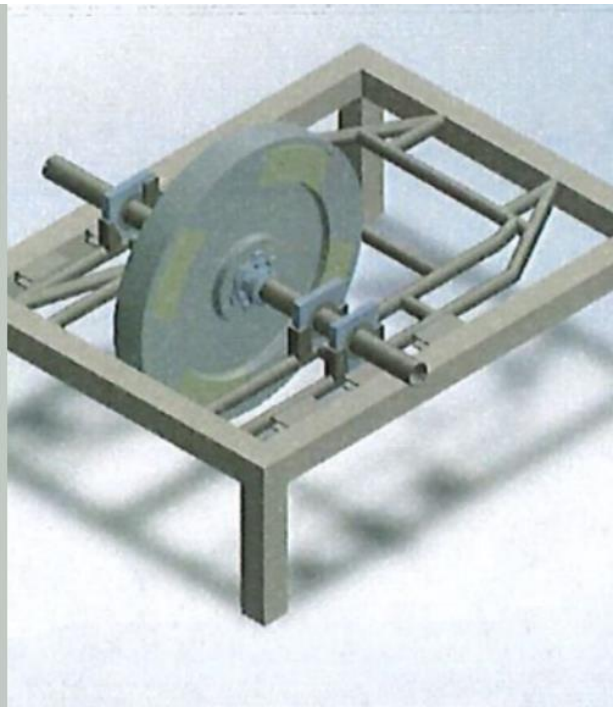


BOM:

Part Name	Description	Manufacturer	Part #	Source	Quantity	Cost ($)
CAN-BUS Shield	MCP25xx CAN-Bus Shield for Arduino Uno	SeeedStudio	B076DSQFXH	Amazon	2	$33.99
CCU Connector	26 pin CCU connector	TE Connnectivity	3-1437290-7	Digikey	2	$10.87
Connector Pins	AMP Superseal 1.0 Terminal Set	Racespec	N/A	Racespec	50	$0.38
dsPIC Microcontroller	DSPIC33FJ256GP506T-I/PT	Microchip Technology	DSPIC33FJ256GP506T-I/PTTR-ND	Digikey	2	$8.40
ESP32 Microcontroller	ESP32-C3-DevKitM-1	DIYmall	B09F5XRK12	Amazon	2	$21.98
Non-Inverting Buffer IC		Texas Instruments	SM74LVC244AN	Digikey	1	$1.10
Power Supply	12V 12.5A SMPS Power Supply	Mean Well	LRS-150-12	Mouser	2	$22
Proto-Board	ELEGOO 32 Pcs Double Sided PCB Board Prototype Kit	ELEGOO	B072Z7Y19F	Amazon	1	$9.99
Robotis Servo Motor	12 VDC 70 RPM DYNAMIXEL-X	ROBOTIS	2700-902-0147-000-ND	Digikey	2	$190.90
Stingray-3 Servo Motor	Stingray-3 Servo Gearbox (0.51 sec/60°, 20rpm, 1050 oz-in, 600°) (Feedback Mode)	Stingray	3215-0001-0003	Robotshop	1	$119.99
Thermocouple Amplifier	4-Wire SPI Thermocouple Amplifier	Adafruit	3263	Adafruit	1	$17.50
THP Sensor	Waveshare BME280 Environmental Sensor	Bicool	B088HJHJXG	Amazon	2	$15.90
					Total:	$775.66

First Semester Presentation Slides:

MSTE Flywheel



Senior Design Capstone

December 07, 2023

Faculty Advisors: Elizabeth Freije, Phillip Pash

Team: Dami Abegunde, Gabrielle Franco, Kaleb Hill

Agenda

01 Concepts & Definitions

02 Introduction

03 Project Requirements & Specifications

04 Scope

05 Project Timeline

06 System Decisions

07 Hardware and Software Specifications

08 Hardware Design

09 Software Design

10 User Interfaces

11 Budgeting and Bill of Materials (BOM)

12 Control System

13 Test Plan

4/5/2024

2

Concepts and definitions

Inertia Dynamometer: A subset of dynamometers that repeatedly measures and calculates power to produce an accurate graph of engine power characteristics.

Transient Analysis: The study of a systems behavior and response over a period of time or from one state to the other

RPM trace profile: A plot of engine rotational speed (rpm) over time collected from the Purdue grand prix track lap

Introduction

Objective

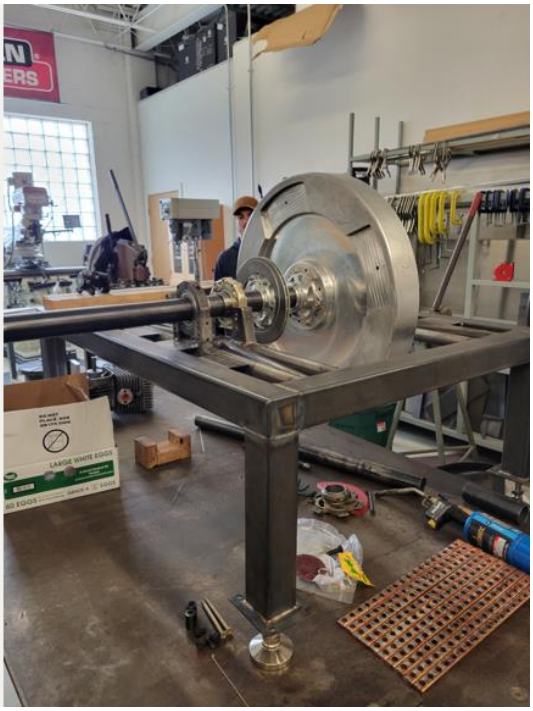
Design a control system for the MSTE department to evolve a steady-state inertia dynamometer to a transient dynamometer by April 2024.

Need Statement

The MSTE department needs a test system to accurately simulate dynamic and variable loads on Purdue Grand Prix Go-Kart engines

Customer

Customer: MSTE Department || Chris Finch



Requirements & Specifications

- Must accurately emulate real-world RPM trace profiles of an internal combustion engine.
- Intuitive web-based user interface for data visualization.
  - Controls and buttons for adjusting configuration.
  - Graphs for torque and rpm.
- RPM trace import and export.
- Safety and emergency stop features.

Project Scope

In Scope items

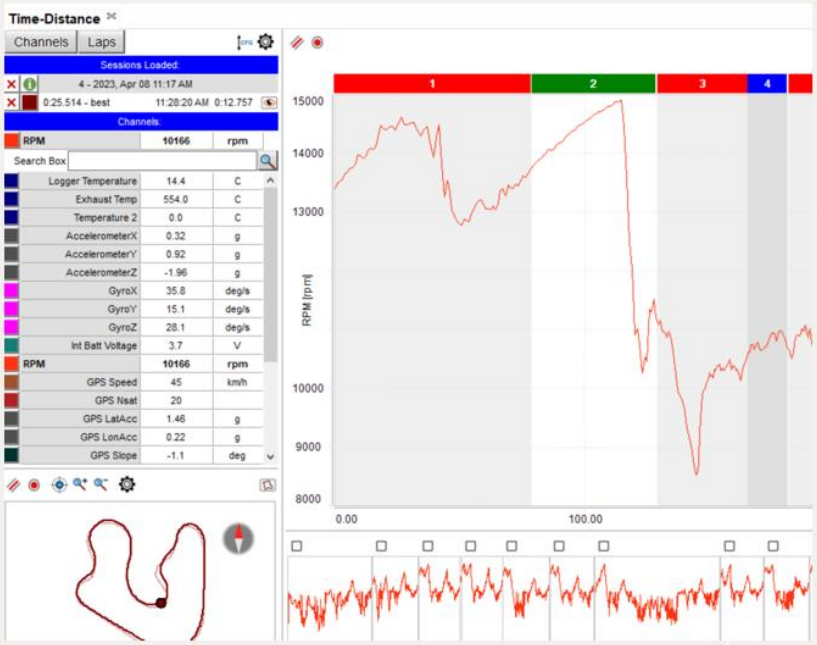
- Integration of control system with the inertia dynamometer.
- Control system and strategy design.
- User interface design.
- Reporting and data visualization.

Out of Scope items

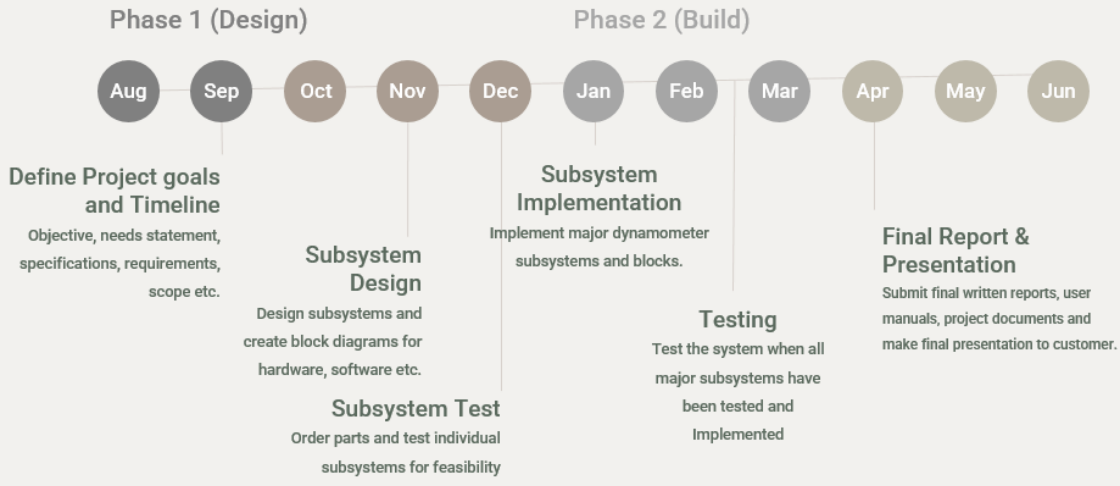
- Mechanical interfaces, components and hardware selection.
- Provision of internal combustion engine under test.
- Major inertia dynamometer modifications

RPM trace profile

- **Software**: Race studio 3
- **Format**: comma separated values (csv).
- **Source**: Purdue grand prix track lap



Project Timeline



System-Wide Decisions and Component Selections

- **Microcontroller**
  - ESP32-C3 (ESP32–C3-devkitM development board)
  - dsPIC33F
- **Sensors**
  - BME280 pressure, humidity, temperature sensor
  - Onboard 12v inductive pickup for engine RPM
  - Onboard analog differential engine temp sensor
  - DHE-VR-09 Wheel Speed Sensor (hall-effect)
- **Control system and strategy**
  - State Feedback loop (Main system)
  - Proportional-Integral (PI) feedback loop (throttle & brake control)
- **User Interface**
  - Locally hosted webpage
  - USB serial for communication with microcontroller
- **Power Supply**
  - LRS-150-12 12v 150W switch mode power supply
- **Braking system**
  - Shiftec ZM022-3 clutch control unit (CCU)
  - Shiftec electronic paddles
- **Throttle control (carburetor)**
  - Robotis XC430-W420 servo

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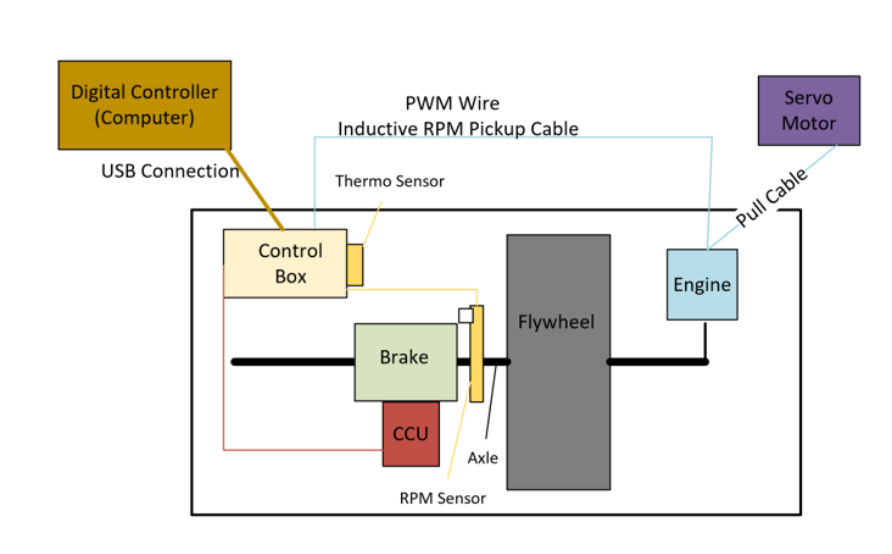
Major Subsystem Design



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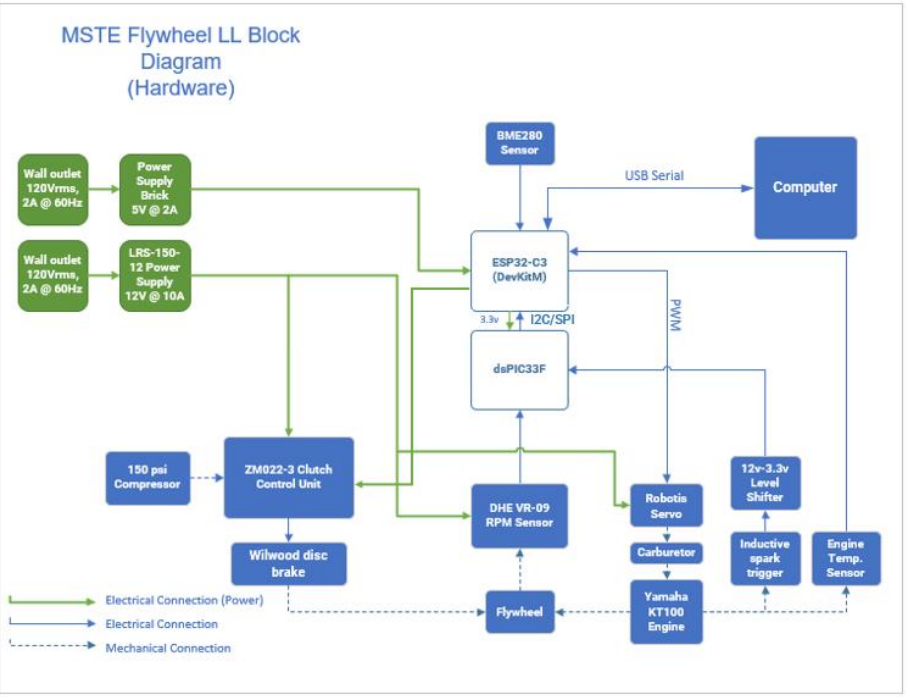
Hardware Block Diagram



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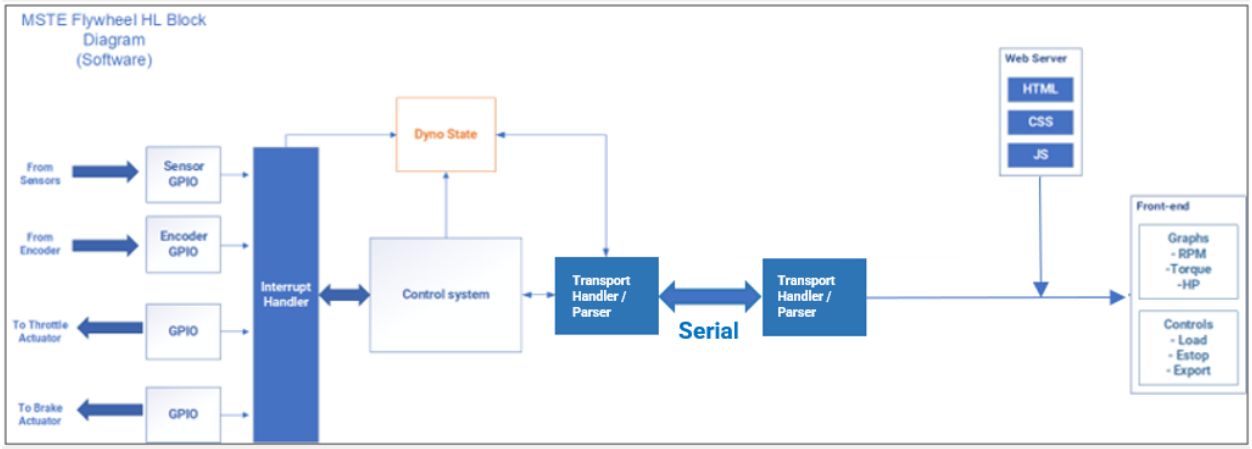
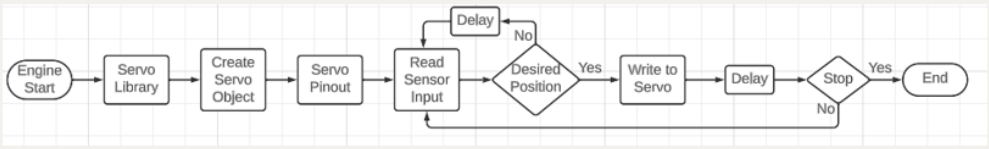
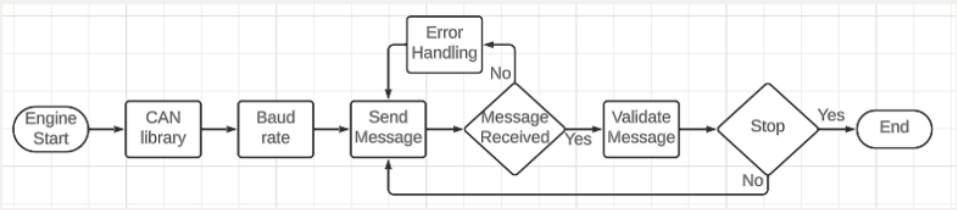
Software Block Diagram



Software Flowcharts

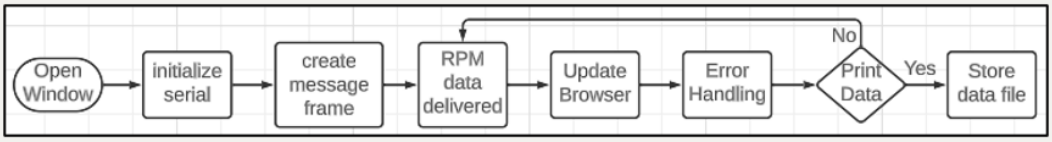


Servo Control Flowchart



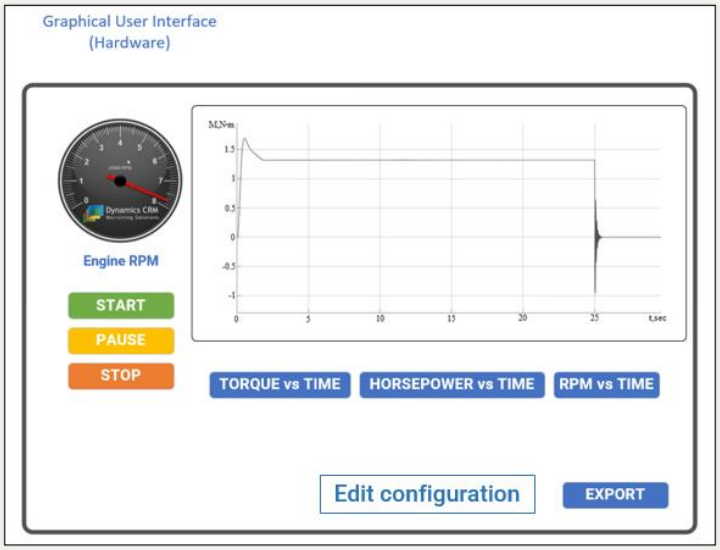
Clutch Control Unit Communication Flowchart

Software Flowcharts Contd.



Front-end Control Flowchart

User interface



- **Controls & Buttons**
  - Buttons to control system state (e.g., start, pause etc.)
  - Change control system config (e.g., PI values, serial speed etc.)
- **Graphs**
  - Torque, horsepower and RPM visualization
  - Compare input rpm trace and output
  - Markers for point-by-point comparison
  - Export data points as CSV

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Budgeting and Materials

- **Estimated Cost:** $500
- **Sponsor provided budget:** N/A
- **Materials already provided by the sponsor:**
  - Yamaha KT100 I.C. engine
  - Wilwood hydraulic disc calipers
  - Shiftec ZM022-3 clutch control unit (CCU)
  - Shiftec electronic shift paddles
  - DHE VR-09 RPM sensor

Component	Product Name	Qty	Est. Cost
Power Supply	LRS-150-12	2	$21.69
Microcontroller	ESP32-C3-DevKitM-1	2	$21.98
Microcontroller	dsPIC33F	2	$8.40
THP Sensor	BME280	2	$15.90
Servo Motor	ROBOTIS	2	$119.90
CAN BUS Shield	MCP25xx CAN-Bus Shield	2	$33.99
Proto-Board	32 Piece Double Sided PCB Board	1	$9.99
Total			$453.71

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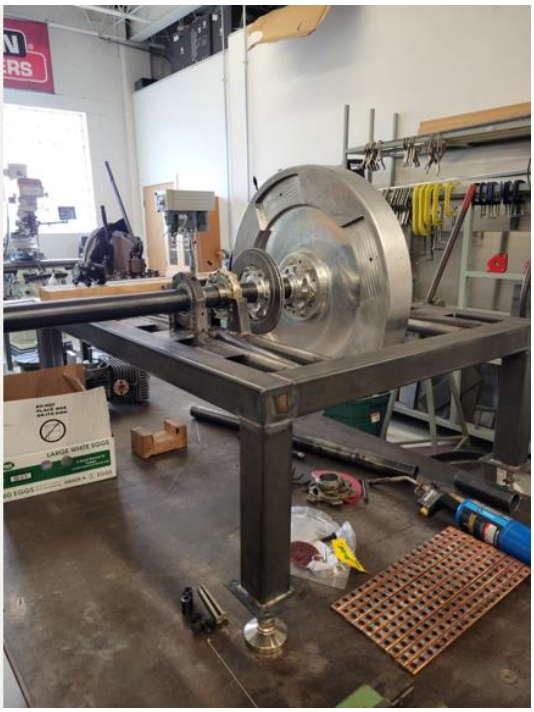
Mechanical Interfaces (out of scope)

- IC Engine mount & mounting hardware
- Engine clutch and gear reduction
- Sensor & component mounting
- Servo attachment for throttle control
- CCU mounting & additional hardware (e.g., 150psi compressor)
- Shock & vibration reduction



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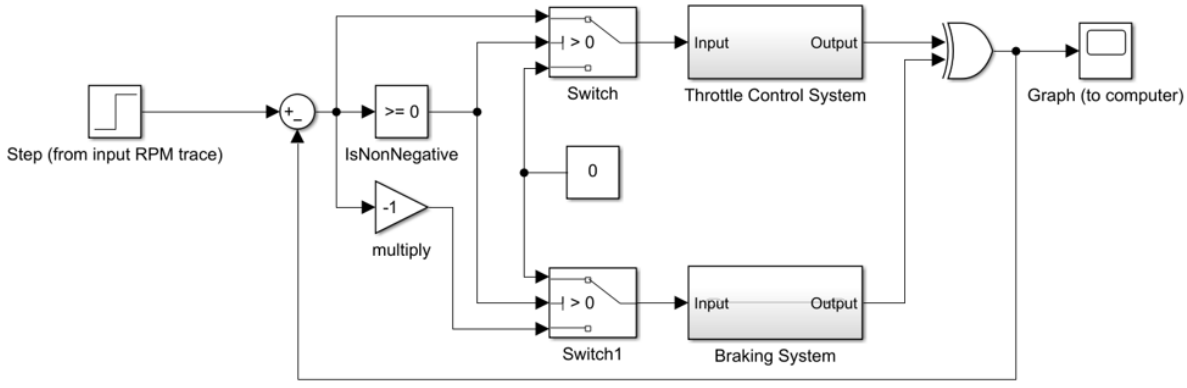
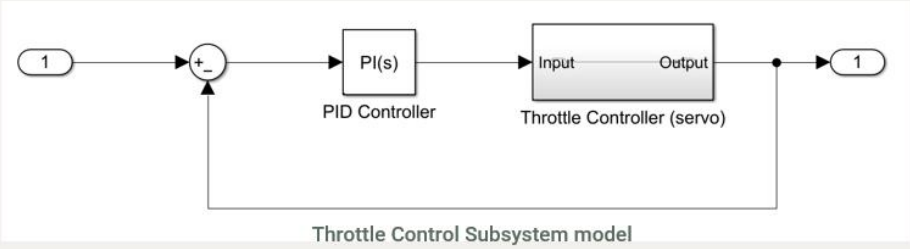
Control System (Main System)

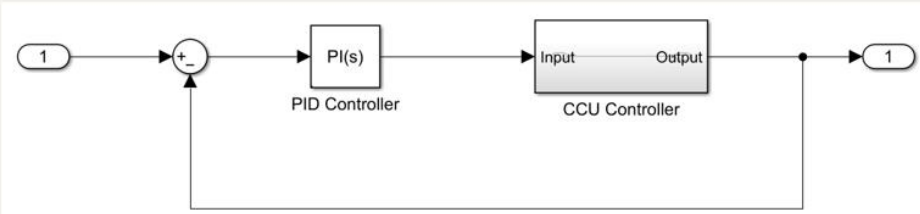


Main state feedback loop model

Control System Cont'd



Throttle Control Subsystem model



Braking Subsystem model

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Test Plan

Item to be tested	Test Criteria	Testing Method	Acceptance Criteria
CCU	Validate operation and control, CAN control, check for leaks	Visual inspection, pressure testing	No visible leaks, brakes can be (dis)engaged by MCU
Brake pressure modulation	Evaluate pressure modulation as a valid control strategy	Real-world dynamometer simulation, Record deceleration	brakes can be (dis)engaged quickly
Servo	Verify servo response to control signals	Input control signals, monitor servo movement and limits	Quick and accurate response

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Test Plan Cont'd

Item to be tested	Test Criteria	Testing Method	Acceptance Criteria
Engine throttle control	Verify throttle can be opened and closed with the servo	Simulate throttle opening and closing	Throttle can be opened and closed reliably
Inductive pickup & other sensors	Validate operation	Real-world testing with the MCU	MCU can reliably read sensor data
Serial communication	Verify data transmission and reception	Send and receive test packets, assess error handling	Data transmitted Error free at 115200 baud
RPM measurement (Hall-Effect Sensor)	Validate accuracy of axle RPM	Record RPM readings and compare with known values	RPM readings are accurate to 1%

Closing Statement

- ✓ Identified specifications & customer need
- ✓ Control system design
- ✓ Low level hardware & software design
- ✓ Test plan
- ✓ Tradeoff analysis
- ✓ Ordering components

References

Ahmad, Fauzi, et al. *Modeling and PID Control of Antilock Brake System with Wheel Slip Reduction to Improve Braking Performance*, Jan. 2013.

Schmidt, Ethan. *Inertia Dyno Design and Table Manufacturing, Butler University, Indiana University Purdue University*, 2007.

Todd, Darren. "Inertia Dyno Design Guide." *DTec*, www.dtec.net.au/. Accessed 6 Dec. 2023.

Wang, Yu, and Kim Stelson. "IEEE: Modeling, Control, and Experimental Validation of a Transient Hydrostatic Dynamometer." *Modeling, Control, and Experimental Validation of a Transient Hydrostatic Dynamometer*, Dec. 2021.

Zhai, Yao. "Design of Switching for Adaptive Cruise Control under String Stability Constraints." *Purdue University*, 2010.

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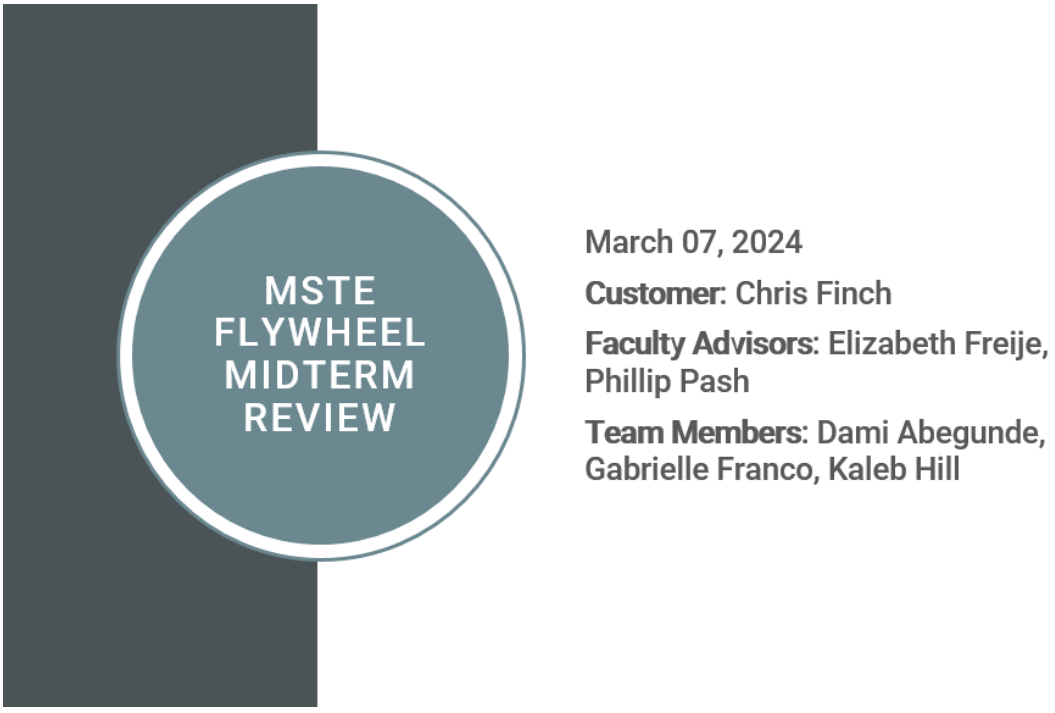
Midterm Presentation Slides:



PROJECT OVERVIEW

- Objective
  - Design and develop a control system to convert a steady state dynamometer to a transient dynamometer.
- Goals
  - Control acceleration/deceleration inputs
  - Output simulated traces
  - Emulate comparison RPM traces
- Deliverables
  - GUI interface – control system
  - Control system hardware design and implementation

REQUIREMENTS

- Must accurately emulate real-world RPM trace profiles of an internal combustion engine.
- Intuitive web-based user interface for data visualization.
  - Controls and buttons for adjusting configuration.
  - Graphs for torque, horsepower and rpm.
- RPM trace data import and export.
- Safety and emergency stop features to prevent damage and accidents.

SPECIFICATIONS

- Braking System
  - Brake calipers engaged by CCU.
  - Pressure modulation at 5-10hz.
  - 150 psi compressor for engaging brake calipers.
  - Communicates with the microcontroller over Controller Area Network (CAN).
- Throttle Control system
  - Engine RPM is controlled by the carburetor (throttle angle).
  - Servo arm controls the engine throttle angle.
  - Servo can fully actuate throttle angle in under 1s.

SPECIFICATIONS CONT'D

VR-09 RPM Sensor
- RPM >2000
- Frequency >267 HZ

Stringray-3 Servo
- Torque >1388 Oz-In (9.8N-M)
- Degrees ≤180 (1/2 turn)
- Voltage 5V

ESP32
- I2C & CAN module, 2 Serial modules,

BME280 Temp. Sensor
- Voltage 5V
- Temp. rating -40 to 85° C
- 0.02% accuracy

DECISIONS & COMPONENT SELECTIONS

- **Microcontroller**
  - ESP32-C3 (ESP32–C3-devkitM development board)
- **Sensors**
  - BME280 pressure, humidity, temperature sensor
  - Onboard 12v inductive pickup for engine RPM
  - Onboard analog differential engine temp sensor
  - DHE-VR-09 Wheel Speed Sensor (hall-effect)
- **Control system and strategy**
  - State Feedback loop (Main system)
  - Proportional-Integral (PI) feedback loop (throttle & brake control)
- **User Interface**
  - Locally hosted webpage
  - USB serial for communication with microcontroller
- **Power Supply**
  - LRS-150-12 12v 150W switch mode power supply
  - LM7805 5V Regulator
- **Braking system**
  - Shiftec ZM022-3 clutch control unit (CCU)
  - CAN module for communication
- **Throttle control (carburetor)**
  - Stingray-3 servo

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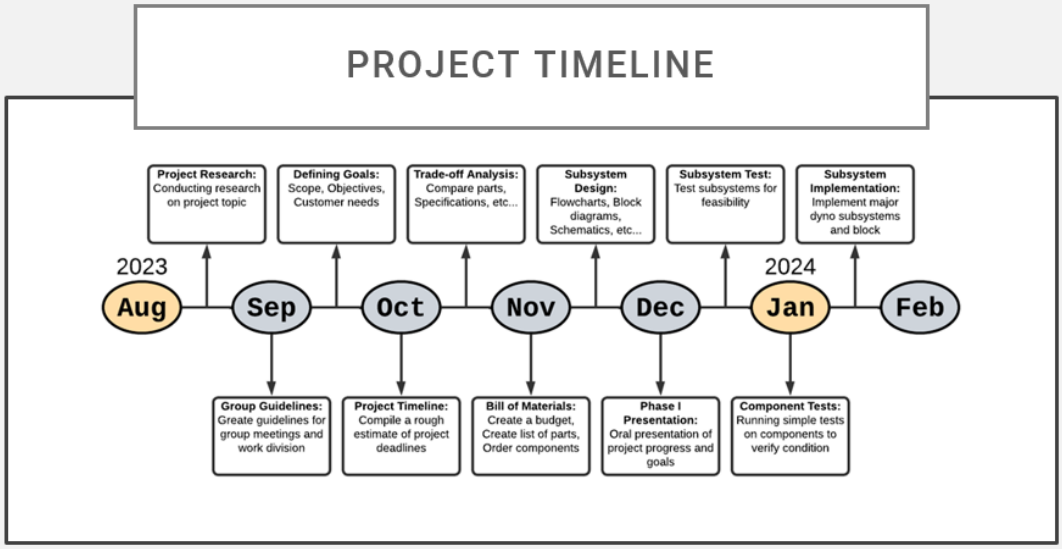
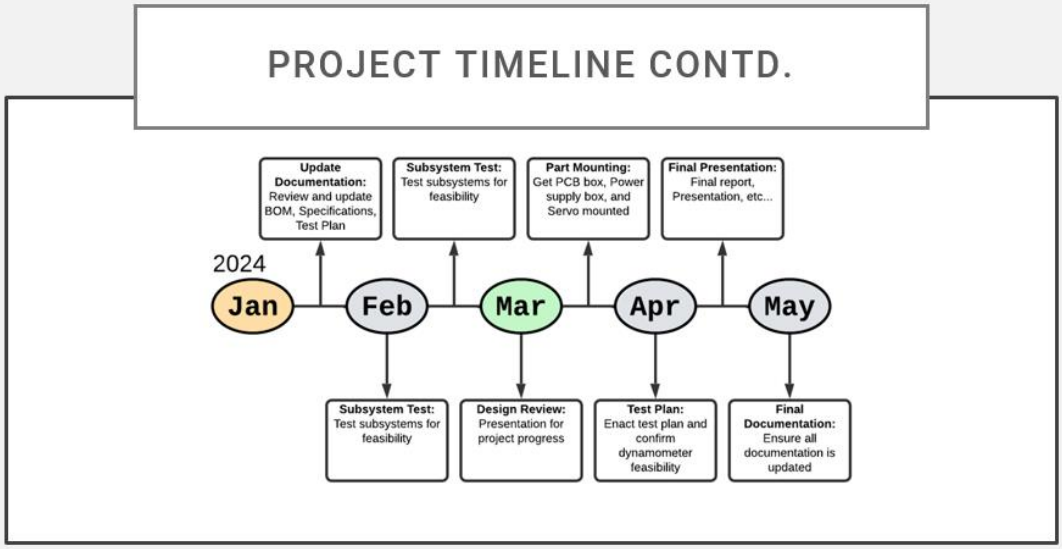
UPDATES & PROGRESS

- Replaced Robotis with Stringray-3 servo due to control issues and to reduce complexity.
- Removed dsPIC33 microcontroller from design plan for simplicity.
- Removed separate 5v/3.3v power supply for ESP32 for simplicity.
- Added k-type amplifier for engine temperature readings.
- Quality-of-life (QOL) updates and additions to the user interface

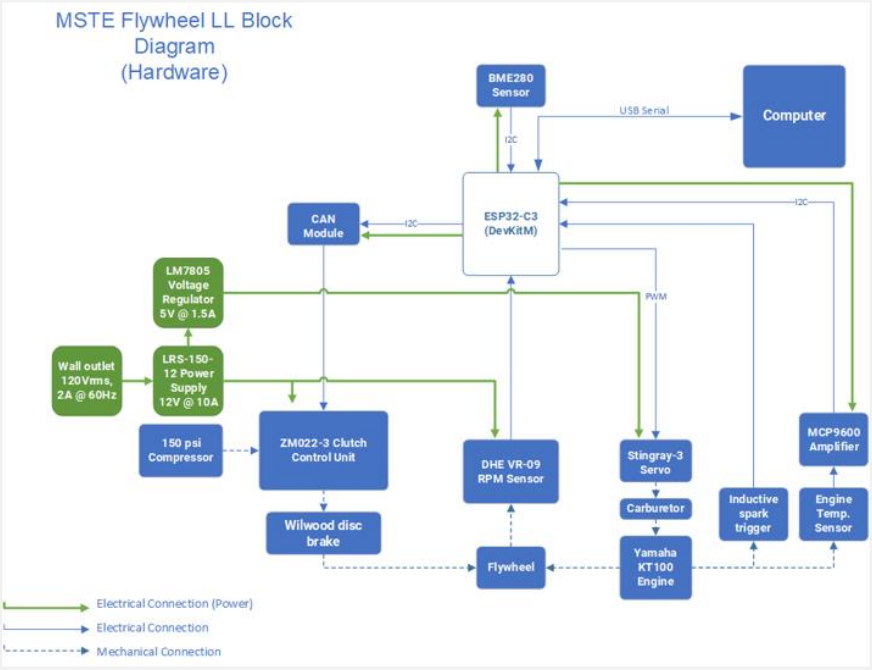

PROJECT TIMELINE
Project Research: Conducting research on project topic
Defining Goals: Scope, Objectives, Customer needs
Trade-off Analysis: Compare parts, Specifications, etc...
Subsystem Design: Flowcharts, Block diagrams, Schematics, etc...
Subsystem Test: Test subsystems for feasibility
Subsystem Implementation: Implement major dyno subsystems and block
2023
2024
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Group Guidelines: Greate guidelines for group meetings and work division
Project Timeline: Compile a rough estimate of project deadlines
Bill of Materials: Create a budget, Create list of parts, Order components
Phase I Presentation: Oral presentation of project progress and goals
Component Tests: Running simple tests on components to verify condition


PROJECT TIMELINE CONTD.
Update Documentation: Review and update BOM, Specifications, Test Plan
Subsystem Test: Test subsystems for feasibility
Part Mounting: Get PCB box, Power supply box, and Servo mounted
Final Presentation: Final report, Presentation, etc...
2024
Jan
Feb
Mar
Apr
May
Subsystem Test: Test subsystems for feasibility
Design Review: Presentation for project progress
Test Plan: Enact test plan and confirm dynamometer feasibility
Final Documentation: Ensure all documentation is updated

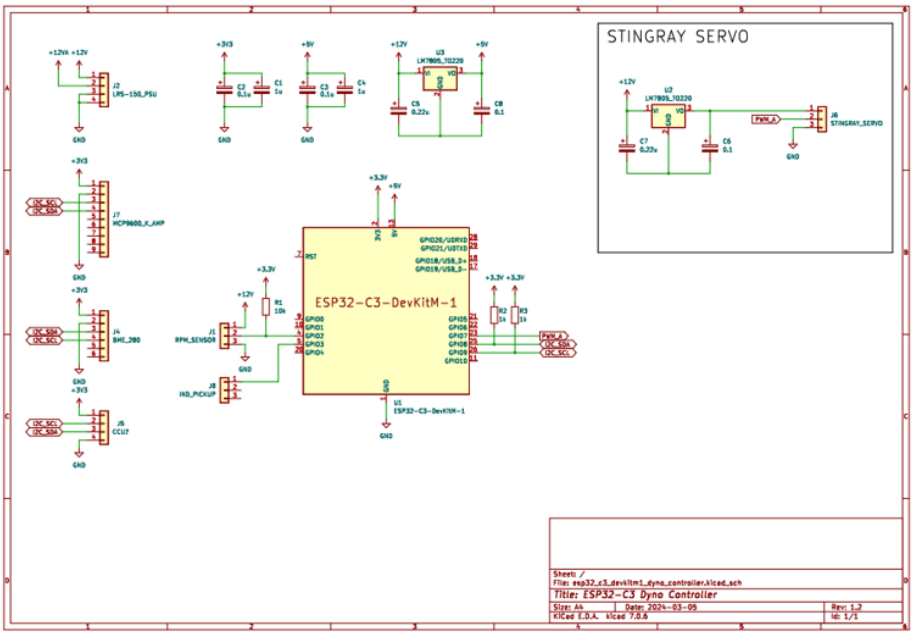
BUDGETING & MATERIALS

- Estimated Cost: $600.00
- Sponsor Provided Budget: $1000
- Parts provided by school:
  - Yamaha KT100 I.C. Engine
  - Wilwood Hydraulic Disc Calipers
  - Shiftec ZM022-3 Clutch Control Unit (CCU)
  - Shiftec Electronic Paddles
  - DHE VR-09 RPM Sensor
  - Thermocouple
  - Printed Circuit Board (PCB)

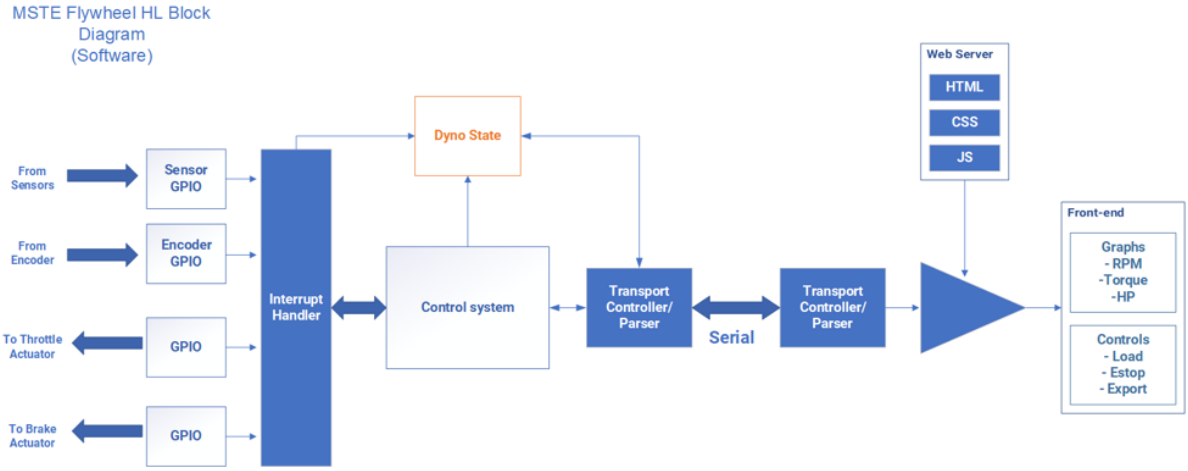
Part Name	Part Number	Qty	Price
CAN-BUS Shield	B076DSQFXH	2	$33.99
CCU Connector & Pins	3-1437290-7	2	$11.25
ESP32 Microcontroller	B09F5XRK12	2	$21.98
Power Supply	LRS-150-12	2	$22.00
Stingray-3 Servo Motor	3215-0001-0003	1	$119.99
Environmental THP Sensor	BME280	2	$15.90
Thermocouple Amplifier	3263	1	$17.50
LM7805 5V 1.5A regulator	296-47192-ND	10	16.84
			Total: $259.45



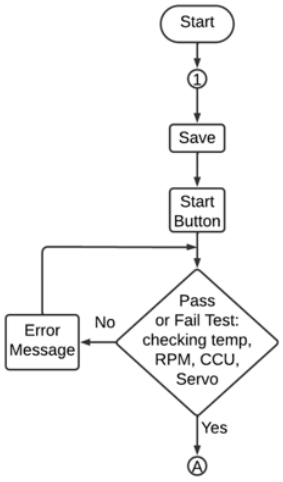
PROJECT SCHEMATIC

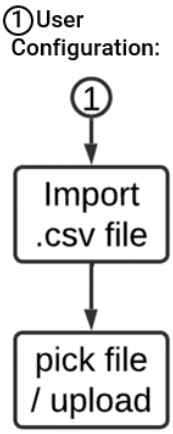


SOFTWARE BLOCK DIAGRAM

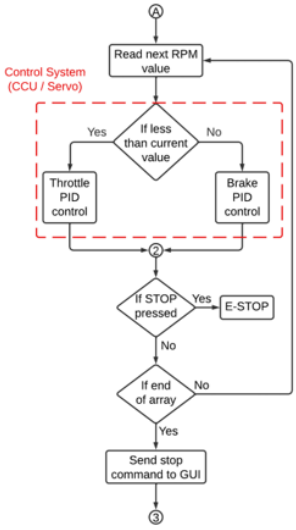


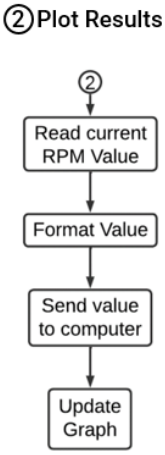
OPERATION FLOWCHART

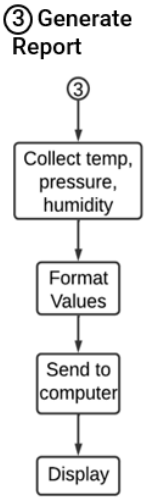




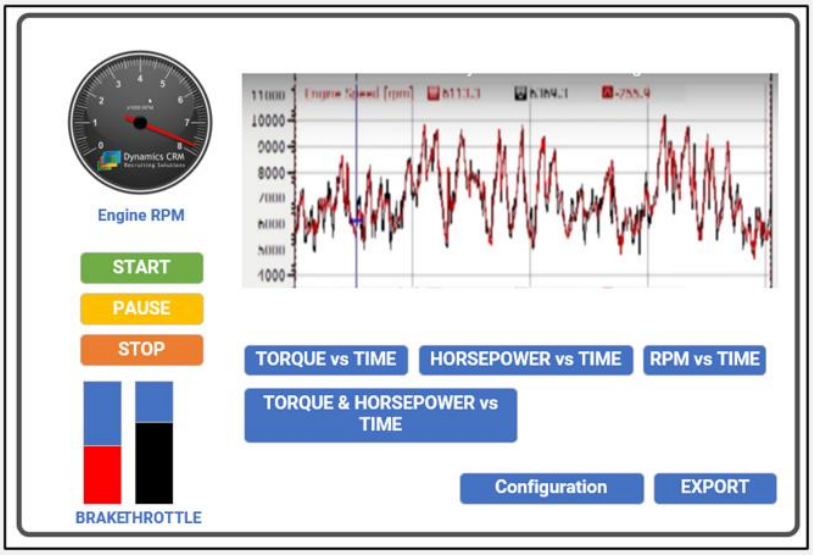
OPERATION FLOWCHART CONT'D



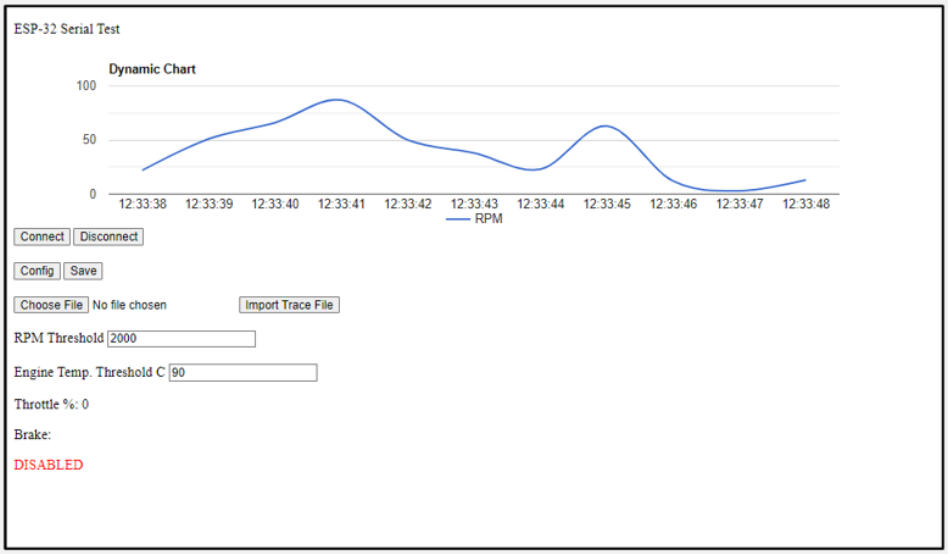




USER INTERFACE CONCEPT



USER INTERFACE CURRENT PROGRESS



TEST PLAN

Item to be tested	Test Criteria	Testing Method	Acceptance Criteria
Engine throttle control	Verify throttle can be opened and closed with the servo	Simulate throttle opening and closing	Throttle can be opened and closed reliably
Inductive pickup & other sensors	Validate operation	Real-world testing with the MCU	MCU can reliably read sensor data
Serial communication	Verify data transmission and reception	Send and receive test packets, assess error handling	Data transmitted Error free at 115200 baud
RPM measurement (Hall-Effect Sensor)	Validate accuracy of axle RPM	Record RPM readings and compare with known values	RPM readings are accurate to 1%

TEST PLAN CONT'D

Item to be tested	Test Criteria	Testing Method	Acceptance Criteria
CCU	Validate operation and control, CAN control, check for leaks	Visual inspection, pressure testing	No visible leaks, brakes can be (dis)engaged by MCU
Brake pressure modulation	Evaluate pressure modulation as a valid control strategy	Real-world dynamometer simulation, Record deceleration	brakes can be (dis)engaged quickly
Servo	Verify servo response to control signals	Input control signals, monitor servo movement and limits	Quick and accurate response

CONCLUSION

- The current design satisfies all the previously identified customer requirements.
- Based on our current progress and timeline, the project will reach completion before the deadline of April 26, 2024.

REFERENCES

- Ahmad, Fauzi, et al. *Modeling and PID Control of Antilock Brake System with Wheel Slip Reduction to Improve Braking Performance*, Jan. 2013.
- Schmidt, Ethan. *Inertia Dyno Design and Table Manufacturing, Butler University, Indiana University Purdue University*, 2007.
- Todd, Darren. "Inertia Dyno Design Guide." *DTec*, www.dtec.net.au/. Accessed 6 Dec. 2023.
- Wang, Yu, and Kim Stelson. "IEEE: Modeling, Control, and Experimental Validation of a Transient Hydrostatic Dynamometer." *Modeling, Control, and Experimental Validation of a Transient Hydrostatic Dynamometer*, Dec. 2021.
- Zhai, Yao. "Design of Switching for Adaptive Cruise Control under String Stability Constraints." *Purdue University*, 2010.

Final Presentation Slides:

Weekly Progress Reports:

Dami Abegunde Reports:

Name: __Dami Abegunde____

Today's date: __10/06/23___

Week Number: __5__

Total Hours for Week: __6___

Expected Tasks to be Accomplished This Past Week

Our team has met a total of 4 times since the start of the project. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Meet with project sponsor professor Chris Finch to go over project details, requirements, and specifications.
- Set up Microsoft project to create a Gantt chart for following the team's progress.
- Start researching concepts related to the topic including Antilock Braking systems and Chassis dynamometers.
- Complete and turn in the project charter, Voice of the customer and Specifications documents.
- Meet at Stutz to observe the dyno

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the five tasks we identified, three were completed successfully. Research for dynamometer concepts is still ongoing as it would need to span multiple weeks. The meeting at Stutz has already been scheduled for next week.

Problems Encountered This Past Week and Impact on Project

- Our team had a few issues setting up MS Project for the gantt chart, but this was resolved with UITS.
- Some details in the specifications document were left empty or unfilled because we did not have the information but the meeting with the project sponsor cleared this up.

Expectations for Next Week

- We expect to have received the RPM and throttle trace from Chris by next week so we can start analyzing the data.
- We plan to meet at Stutz to observe the dyno
- We plan to have a proposal and mid-high level block diagram of the project based on the requirements.
- We plan to update our requirements and charter documents and fill in missing info.

Name: __Dami Abegunde____

Today's date: __10/13/23___

Week Number: __6__

Total Hours for Week: __6___

Expected Tasks to be Accomplished This Past Week

Our team has met a total of 6 times since the start of the project. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- We expected to have received the RPM and throttle trace from Chris by next week so we can start analyzing the data.
- We plan to meet at Stutz to observe the dyno.
- We plan to have a proposal and mid-high level block diagram of the project based on the requirements.
- We plan to update our requirements and charter documents and fill in missing info.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the five tasks we identified, two were completed successfully. Research for dynamometer concepts is still ongoing as it would need to span multiple weeks. The team met with the project sponsors at the Stutz engineering building where we were able to see the dyno and ask questions.

We also had issues setting up the Gantt chart in teams, but I was able to get those resolved.

Problems Encountered This Past Week and Impact on Project

- Most of the issues we had this week were very minor, mostly having to do with splitting up the workload between team members, but those were resolved.
- There are still some missing details/information related to the project that makes it difficult to finish the specifications. We might need a few more meetings to account

Expectations for Next Week

- We plan to complete the specifications for the project and have it signed by the project sponsor.
- We plan to draw up decision matrices for the different sensors and MCUs that will be used in the project and present them to the project sponsor.
- We plan to have at least a High-level block diagram for the project that we can present to the faculty advisors and sponsor

Name: __Dami Abegunde____

Today's date: __10/20/23___

Week Number: __9__

Total Hours for Week: __6___

Expected Tasks to be Accomplished This Past Week

Our team met a total of 2 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- We planned to complete the specifications for the project and have it signed by the project sponsor.
- We plan to draw up decision matrices for the different sensors and MCUs that will be used in the project and present them to the project sponsor.
- We plan to have at least a High-level block diagram for the project that we can present to the faculty advisors and sponsor.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the three tasks we identified, two were completed successfully. Research for dynamometer concepts is still ongoing as it would need to span multiple weeks. The team met with ben, the engineer in charge of building the dynamometer to discuss the race studio software, engine specifications and have them answer any other questions we had.

Later in the week, the team met with the faculty advisor Ms. Freije to discuss the high-level block diagram of the project along with some control strategies we were considering using for the project

Problems Encountered This Past Week and Impact on Project

- Most of the issues we had this week were very minor, mostly having to do with splitting up the workload between team members, but those were resolved.
- Work is still ongoing with part selection and decision matrixes however, most of the details were ironed out in our discussion with the faculty advisor

Expectations for Next Week

Next week, our team plans to:

- Create decision matrixes for the rotary sensor, microcontroller, and control system.
- Meet with the project sponsor Chris Finch to discuss some more specifics and go over functional requirements for the project.
- Have the project sponsor sign off on the functional specifications, making sure to ask clarifying questions about the use-case of the project.
- Create block-diagrams for software portion of the project and design a rough sketch of the frontend.
- Complete functional requirements and update the Gantt chart.

Name: __Dami Abegunde____

Today's date: __10/27/23___

Week Number: __10__

Total Hours for Week: __2___

Expected Tasks to be Accomplished This Past Week

Our team met once this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Create decision matrixes for the rotary sensor, microcontroller, and control system.
- Meet with the project sponsor Chris Finch to discuss some more specifics and go over functional requirements for the project.
- Have the project sponsor sign off on the functional specifications, making sure to ask clarifying questions about the use-case of the project.
- Create block-diagrams for software portion of the project and design a rough sketch of the frontend.
- Complete functional requirements and update the Gantt chart.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the five tasks we identified, two were completed successfully. Research for dynamometer concepts is still ongoing as it would need to span multiple weeks. The team met with the project sponsor, Chris Finch, to discuss and provide more details about the project. At the end of the meeting, we felt a lot more confident about our ideas for the project.

I was able to complete the block diagrams for the software portion of the project and generate decision matrices for the rotary encoder/rpm sensor

Problems Encountered This Past Week and Impact on Project

- Most of the issues we had this week were very minor, mostly having to do with splitting up the workload between team members, but those were resolved.
- The team raised good points about appropriately sharing tasks and the need for more consistency when creating documentation and reports

Expectations for Next Week

Next week, our team plans to:

- Create decision matrixes for the servo, RPM sensor, temp and other sensors brake actuators and so on
- The team plans to turn in all outstanding documents and update the gantt chart with any other additions that need to be made.

Name: __Dami Abegunde____

Today's date: __11/03/23___

Week Number: __11__

Total Hours for Week: __3___

Expected Tasks to be Accomplished This Past Week

Our team met once this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Create decision matrixes for the servo, RPM sensor, temp and other sensors brake actuators and so on
- The team plans to turn in all outstanding documents and update the Gantt chart with any other additions that need to be made.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the two tasks we identified neither was fully completed. Research for dynamometer concepts is still ongoing as it would need to span multiple weeks. Our team had a lot of documents missing so we need a few weeks to catch up. The team met with the project sponsor and faculty advisors to discuss the carburetor and the brake actuator which have been selected.

Problems Encountered This Past Week and Impact on Project

- Most of the issues we had this week were very minor, mostly having to do with splitting up the workload between team members, but those were resolved.
- The team raised good points about appropriately sharing tasks and the need for more consistency when creating documentation and reports

Expectations for Next Week

Next week, our team plans to:

- The team plans to turn in all outstanding documents and update the gantt chart with any other additions that need to be made.

- Update gantt charts with missing actions and activities
- Meet with the contact at xtrac to discuss feasible control methodologies for the selected brakes.
- Create an accurate test plan for the project.
- Discuss ways of modelling the braking and acceleration curves in MATLAB

Name: __Dami Abegunde____

Today's date: __11/10/23___

Week Number: __11__

Total Hours for Week: __6___

Expected Tasks to be Accomplished This Past Week

Our team met once this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- The team plans to turn in all outstanding documents and update the gantt chart with any other additions that need to be made.
- Update gantt charts with missing actions and activities
- Meet with the contact at xtrac to discuss feasible control methodologies for the selected brakes.
- Create an accurate test plan for the project.
- Discuss ways of modelling the braking and acceleration curves in MATLAB

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the two tasks we identified two were fully completed (see below).

- Update gantt charts with missing actions and activities
- Discuss ways of modelling the braking and acceleration curves in MATLAB

Research for dynamometer concepts is still ongoing as it would need to span multiple weeks. Our team still has a lot of documents missing so we need a few weeks to catch up. The team met with the project sponsor and faculty advisors to discuss the carburetor and the brake actuator which have been selected.

Problems Encountered This Past Week and Impact on Project

- There weren't any major issues this week other than minor concerns regarding documents that need to be completed.
- The brake test plan was put on hold because we didn't have a lot of details

Expectations for Next Week

Next week, our team plans to:

- Meet with the contact at xtrac to discuss feasible control methodologies for the selected brakes.
- Complete decision matrices and complete any other documents that be filled.
- Find more details about the brake like actuation time and speed to generate a test plan

Name: __Dami Abegunde____

Today's date: __11/17/23___

Week Number: __11__

Total Hours for Week: __6.5___

Expected Tasks to be Accomplished This Past Week

Our team met 3 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Meet with the contact at xtrac to discuss feasible control methodologies for the selected brakes.
- Complete decision matrices and complete any other documents that be filled.
- Find more details about the brake like actuation time and speed to generate a test plan

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the two tasks we identified two were fully completed (see below).

- Meet with the contact at xtrac to discuss feasible control methodologies for the selected brakes.
- Complete decision matrices and complete any other documents that be filled.

Research for dynamometer concepts is still ongoing as it would need to span multiple weeks.

The team still has a lot of documents missing so we need a few weeks to catch up.

The team met with the project sponsor and faculty advisors to discuss the carburetor and the brake actuator which have been selected. During our meeting we constructed a crude test plan for testing the brakes which we plan to start sourcing ASAP

The team was able to meet with the xtrac representative, but he wasn't able to provide a lot of info/specifics about the break. However, he was able to provide insights and recommendations about our control strategy.

Problems Encountered This Past Week and Impact on Project

- There weren't any major issues this week other than minor concerns regarding documents that need to be completed.

Expectations for Next Week

Next week, our team plans to:

- Source any components in the brake test plan,
- Email Brake CCU supplier to see if they can provide any more information or specifics about the brake.

- Complete any outstanding documents over the break

Name: __Dami Abegunde____

Today's date: __11/17/23___

Week Number: __11__

Total Hours for Week: __0.5___

Expected Tasks to be Accomplished This Past Week

Our team didn't meet officially this week as a result of the thanksgiving break but we all agreed we should use the time to work on any outstanding documents that need to be turned in. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Complete any outstanding documents over the break

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the two tasks we identified one is still in progress as we gear up towards the final presentation.

Problems Encountered This Past Week and Impact on Project

- There weren't any major issues this week other than minor concerns regarding documents that need to be completed.

Expectations for Next Week

Next week, our team plans to:

- Complete and finalize our presentation

Name: __Dami Abegunde____

Today's date: __01/19/24___

Week Number: __2__

Total Hours for Week: __2___

Expected Tasks to be Accomplished This Past Week

Our team met once this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Visit Stutz to assess the state and completion of the main dyno.
- Plan and adjust our schedules for the semester.
- Delegate tasks to group members and create a gantt chart for the 2nd half of the project.
- Create a GitHub to start working on the code portion
- Get started testing and working on getting the individual components and subsystems working

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 5 tasks we identified, 4 were completed successfully. We were able to visit Stutz where we met with Jess to discuss which items had been completed, what was left to do and when we could expect to receive the dynamometer. We created a gantt chart for the semester and agreed on a meeting schedule that would work for us. I have started testing some components for the dyno (e.g the servo), however this task would likely span multiple weeks.

Problems Encountered This Past Week and Impact on Project

- Our team has had difficulties obtaining documentation for the CAN standard for the Clutch control unit. Jess has suggested we contact a racing team or other means to get the information.
- I had some concerns because some deliverables (assignments for the senior design class) have yet to be submitted.

Expectations for Next Week

- We expect to meet to discuss & flowchart some of the coding portion for the project since we do not have the hardware yet.
- We plan to meet with the project sponsor and faculty advisors.
- We plan to email contacts and work on getting documentation for the CCU.
- We expect to continue working on getting the getting the individual components and subsystems working.

Name: __Dami Abegunde____

Today's date: __01/26/24___

Week Number: __3__

Total Hours for Week: __5___

Expected Tasks to be Accomplished This Past Week

Our team met 3 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- We expect to meet to discuss & flowchart some of the coding portion for the project since we do not have the hardware yet.
- We plan to meet with the project sponsor and faculty advisors.
- We plan to email contacts and work on getting documentation for the CCU.
- We expect to continue working on getting the individual components and subsystems working.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 5 tasks we identified, 2 were completed successfully. The team met on Thursday to flowchart the code for our program and plan out the GUI for our project. I was able to get in contact with one of the team leads at Shiftec who provided CAN documentation for the CCU. They also offered to help with connecting the CCU by providing connection instructions. We agreed to try to schedule a meeting with the project sponsor to make sure our design and tools align with the requirements, but they have a busy schedule. In the background, Kaleb and I have been working on getting the individual components with the goal of getting a test fixture that simulates all the inputs into our controller.

Problems Encountered This Past Week and Impact on Project

- There were no major issues this week other than the fact that working on getting the individual components and subsystems talking to each other is taking longer than expected.
- I had some concerns because some deliverables (assignments for the senior design class) have yet to be submitted.

Expectations for Next Week

- Set up a “test fixture” that simulates all the inputs into our controller
- Start working on the GUI and code for the project
- We expect to continue working on getting the individual components and subsystems working.
- We plan to meet with the project sponsor and faculty advisors.

Name: __Dami Abegunde____

Today's date: __02/02/24___

Week Number: __04__

Total Hours for Week: __3___

Expected Tasks to be Accomplished This Past Week

Our team met 2 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Set up a "test fixture" that simulates all the inputs into our controller.
- Start working on the GUI and code for the project.
- We expect to continue working on getting the individual components and subsystems working.
- We plan to meet with the project sponsor and faculty advisors.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 5 tasks we identified, 2 were completed successfully. The team met on Monday to discuss the code for our program. We also met with the professors and identified some additional hardware needed to get the project testing started.

I wrote some code for each of the individual subsystems so we can start working on testing them immediately.

We also identified some questions we may want to ask the sponsor and plan to schedule a meeting with them to clarify.

Problems Encountered This Past Week and Impact on Project

- I had some concerns because some deliverables (assignments for the senior design class) have yet to be submitted.
-

Expectations for Next Week

- Meet with team to discuss code progress.
- We plan to meet with the project sponsor and faculty advisors.
- We expect to continue working on getting the individual components and subsystems working.
- Test individual subsystems once components have arrived.

Name: __Dami Abegunde____

Today's date: __02/09/24___

Week Number: __05__

Total Hours for Week: __4___

Expected Tasks to be Accomplished This Past Week

Our team met 2 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Meet with team to discuss code progress.
- We plan to meet with the project sponsor and faculty advisors.
- We expect to continue working on getting the individual components and subsystems working.
- Test individual subsystems once components have arrived.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 5 tasks we identified, 2 were completed successfully. The team met on Monday to discuss the code for our program. We also met with the professors to discuss our progress. They also identified some concerns our customer had about the project.

I made a lot of progress with the user interface for the project, and the other team members started working on the schematics and code for the main microcontroller.

The dyno was finally delivered to the ET building and the team began testing the individual subsystems.

Problems Encountered This Past Week and Impact on Project

- I had some concerns because some deliverables (assignments for the senior design class) have yet to be submitted.

Expectations for Next Week

- Tested and validated all the major components and subsystems of the dynamometer.
- Tested and validated the control strategy for rpm and brake control of the dyno.
- Completed a major portion of the UI code and main code for the microcontroller.
- Drawn up a schematic for our board

Name: __Dami Abegunde____

Today's date: __02/23/24___

Week Number: __07__

Total Hours for Week: __4___

Expected Tasks to be Accomplished This Past Week

Our team met 2 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Tested and validated all the major components and subsystems of the dynamometer.
- Tested and validated the control strategy for rpm and brake control of the dyno.
- Completed a major portion of the UI code and main code for the microcontroller.
- Drawn up a schematic for our board

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 5 tasks we identified, 1 was completed successfully. The team met on Monday to discuss our progress and one of the faculty advisors raised some concerns over some missing documentation and flow charts. The previous week I met with the project sponsor to see if he had any thoughts about the mock UI we had developed. He identified some missing elements like engine temperature and brake and throttle indicators e.t.c

I made a lot of progress with the user interface for the project, and the other team members are still working on the schematics and code for the main microcontroller.

The dyno has been fitted with the new engine and is ready for testing

Problems Encountered This Past Week and Impact on Project

- I had some concerns because some deliverables (assignments for the senior design class) have yet to be submitted.

Expectations for Next Week

- Turn in flow charts and documentation for code
- Tested and validated all the major components and subsystems of the dynamometer.
- Drawn up a schematic for our board

Name: __Dami Abegunde____

Today's date: __03/01/24___

Week Number: __08__

Total Hours for Week: __6___

Expected Tasks to be Accomplished This Past Week

Our team met 2 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Turn in flow charts and documentation for code.
- Tested and validated all the major components and subsystems of the dynamometer.
- Drawn up a schematic for our board

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 5 tasks we identified, 1 was completed successfully. The team met on Monday to discuss our progress and spent a lot of time diagnosing hardware issues we were having. We completed the schematic for the project and submitted it to the faculty advisors for review.

I made a lot of progress with the user interface for the project, and the other team members are still working on the schematics and code for the main microcontroller.

The engine was taken off the dynamometer again for rebuilding.

Problems Encountered This Past Week and Impact on Project

- I've had a lot of issues interfacing with the CCU and dynamometer. I spent some time in the past week talking to the faculty advisor and contact at Shiftec for help.
- We were able to solve the issue for the CCU but ultimately decided to go with a different servo due to issues with the current part requiring a proprietary board.

Expectations for Next Week

- Mid semester design review.
- CCU CAN connection to MCU
- Finish UI code.
- Document new servo and integrate with our system

Name: __Dami Abegunde____

Today's date: __03/08/24___

Week Number: __09__

Total Hours for Week: __8___

Expected Tasks to be Accomplished This Past Week

Our team met 4 times this week. In our previous meeting, we identified a few tasks that would need to be completed. These tasks are as follows:

- Mid semester design review.
- CCU CAN connection to MCU
- Finish UI code.
- Document new servo and integrate with our system

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Of the 4 tasks we identified, 2 were completed successfully. The team met on Monday to discuss our progress and spent a lot of time diagnosing hardware issues we were

having. We completed the schematic for the project and submitted it to the faculty advisors for review.

This week we completed our mid-semester design review and created a presentation for our customer. After lots of questions and a few concerns, we identified all we needed to do for the spring break to ensure we were back on track to complete.

Problems Encountered This Past Week and Impact on Project

- Weissbach had a few concerns about our progress and asked to sit in on a meeting in two weeks.
- I still haven't been able to get the CCU working yet but I'm still talking to our contact at shiftec for help

Expectations for Next Week

- Things to do: This weekend (3/9 - 3/10)
- -Mia: Create dyno test strategy
- Email craig about double sided copper and if he can do double sided PCB
- -Kaleb: Low level flow chart for control strategy of throttle and brake (decompose PID)
- Email Chris about pressure sensor for brake.
- -Dami: creating hardware prototype
- Send shiftec software to phil.

Gabrielle Franco Reports

Name: Mia Franco

Today's date: 10/16/23

Week Number: 08

Total Hours for Week: 6

Expected Tasks to be Accomplished This Past Week

Physically look at the dyno in person (visit Stutz).

Create Gantt chart.

Finalize specification sheet prior to signature from customer.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

We visited the dyno at Stutz on Wednesday October 11th. This helped us to better determine missing specifications needed for project.

Additionally, we met as a team after the dyno visit to create our Gantt chart and a plan of action for the upcoming week (Fall break).

Problems Encountered This Past Week and Impact on Project

We could not meet with Ben this week to discuss the data provided by him. Additionally, we learned that Ben is in charge of the construction of the dyno so further communication needs to be precedent with him in order to gather additional specifications.

Expectations for Next Week

Next week, we each have assigned work to create our given matrix decision prompts and create a flow char with them. This work we plan to present to the customer the

following week before proceeding further. Additionally, we are adding new information gathered to the specification sheet.

Name: Gabrielle Mia Franco

Today's date: 10.20.23

Week Number: 09

Total Hours for Week: 7

Expected Tasks to be Accomplished This Past Week

-Finalize Gantt chart

-Create decision matrixes for microcontroller, control system, and sensors to present for next week's meeting with customer

-Design a rough draft of GUI interface

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-Gantt chart was completed (second semester was also incorporated in the schedule)

-We are still in the process of finalizing the matrix decisions for the microcontroller and sensors

-GUI interface was roughly designed with team during weekly Thursday meeting. Next step is to draw the design on visio or some other software for documentation and future usage.

Problems Encountered This Past Week and Impact on Project

Work overload was discussed due to the Gantt chart schedule not matching the realistic timeline of project. The team discussed this further and was able to divide and conquer work to accommodate the schedule of Gantt chart as well as individual schedules.

Expectations for Next Week

Meet with customer and propose matrix finalized decision. From there we will adapt to any changes requested by the customer or move along if no accommodation is needed.

Additionally, we need to create flow charts that correspond to chosen hardware with retrospect to control's strategy and physical connections.

Name: Gabrielle Mia Franco

Today's date: 10.26.23

Week Number: 10

Total Hours for Week: 8

Expected Tasks to be Accomplished This Past Week

-Meet with customer to give updates as well as collect additional specifications

-Continue research on transient dyno and create a control strategy

-Research ABS

-Finalize Decision matrices on hardware sensors

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-We did meet with out customer on 10/25/23. We were able to get additional insight on the type of braking mechanisms we should be focusing on : ABS and from there apply that ideology to our control plan for deacceleration.

-After the meeting with the customer, we continued to create a to do list as a team and dissect who was going to work on what.

-I have continued to do research on ABS and need to find the data sheet for the current brake that will be attached to the dyno to compare data.

Problems Encountered This Past Week and Impact on Project

There hasn't been any problems this week.

Expectations for Next Week

-We are planning to visit Stutz garage again to gather additional information regarding the brake system and motor that will be attached to the dyno.

-I need to create a flow chart of the control strategy once I have completed my research.

-Additional block diagrams will need to be made to display the hardware connections of the motor to the control box and braking system.

-A schematic drawing should be started so that as we gather our chosen hardware, we can add them to the design to move further along to a permanent design.

Name: Gabrielle Mia Franco

Today's date: 11/06/23 (Due Date: 11/03/23)

Week Number: 11

Total Hours for Week: 4 1/2

Expected Tasks to be Accomplished This Past Week

Continue working on control strategy for brakes and translate that information into block diagrams / flow charts.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Made progress with control strategy and met with the team to discuss what I have gathered. I have began to create block diagrams and document my gathered research. Gathered research was uploaded to the Microsoft team's site.

Problems Encountered This Past Week and Impact on Project

I was not able to physically be in person for the faculty advisor meeting. As a result, I missed demonstration of throttle actuator.

Expectations for Next Week

We are planning an in-person team workday on Wednesday to power through documents that need to be finished ASAP.

Name: Gabrielle Mia Franco

Today's date: November 9th, 2023

Week Number: 12

Total Hours for Week: 9

Expected Tasks to be Accomplished This Past Week

-Team workday on Wednesday

-Divide tasks within team

-Finish up matrix decision documents

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-We did meet as a team on Wednesday and worked for a decent number of hours and determined who should cover what documents are missing from submission (within canvas)

-We decided as a team that our decision matrixes should be finalized by Sunday, Monday max.

Problems Encountered This Past Week and Impact on Project

-Additional components that we need to make decision matrices on.

Expectations for Next Week

-Finalize control plan

-Create subsystem block diagrams

-Meet with carburetor expert to discuss Carburetor Control Unit

-Discuss testing plan and additional documents that need to be created

Name: Gabrielle Mia Franco

Today's date: 11/27/23

Week Number: 13

Total Hours for Week: 10

Expected Tasks to be Accomplished This Past Week

-We need all matrices completed

-Subsystem draft needs completion

-Begin BOM

-Begin low level design

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-I am close to finalizing the subsystem and I did begin creating the BOM. The subsystem is on halt due to the power supply matrix and microcontroller not being finalized in decision.

Problems Encountered This Past Week and Impact on Project

-I have not been able to complete the power supply matrices because I need additional information from undecided components.

Expectations for Next Week

-Meet at the Stutz garage to determine CCU brake testing. Additionally, we need to talk with Devin in regards to how we want things mounted.

Name: Gabrielle Mia Franco

Today's date: 12/06/23

Week Number: 14 &15

Total Hours for Week: 4

Expected Tasks to be Accomplished This Past Week

The expectation is to complete the senior design presentation and practice presenting. Additionally, we need to submit all final reports/documents. Moreover, we need to submit the BOM and get the process of ordering components done before winter break.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

We have all steadily been adding to the presentation and completing final reviews of documents.

Problems Encountered This Past Week and Impact on Project

I personally have been quite sick for the past week and was not able to accomplish as much as I would have liked. Luckily, my team really stepped up and was able to support the areas in which I could not complete.

Expectations for Next Week

Present presentation and submit all final documents. Order BOM components.

Name: Gabrielle Mia Franco

Today's date: 02/02/24

Week Number: 04

Total Hours for Week: 7

Expected Tasks to be Accomplished This Past Week

-Submit application to Cooney Scholarship foundation.

-Order additional needed parts.

-Update any design documents that are missing information.

-Get dyno prototype update from Jess.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

We met up for a team workshop day after our advisor meeting. We spent a decent amount of hours flow charting and walking through our programming design. We were able to determine additional details regarding our control strategy. All items that were discussed and organized were documented and saved to our team page.

Problems Encountered This Past Week and Impact on Project

The dyno is taking longer than expected to be constructed. We will need to continue to visit Stutz to perform testing on the hydraulics system. Additionally, the Cooney foundation appears to have already closed for submissions.

Expectations for Next Week

Next week (if our ordered parts are delivered) we would like to begin wiring up the hardware so that we can check that it is functioning as needed. Additionally, we need to decide whether we are going to need to create a PCB board for our control box or if we will be hard wiring.

Name: Gabrielle Mia Franco

Today's date: 09 Feb 2024

Week Number: 05

Total Hours for Week: 7 hours

Expected Tasks to be Accomplished This Past Week

-Submit Cooney foundation form

-Create schematic for controls-hardware components

-Communicate with jess in regards to mounting servo motor

-Still waiting on digikey parts

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-I began working on the schematic design for all the hardware control-components. This may take me up until next week to finish, due to the fact that I have to manually create the footprints of each component (since they are specific and not on the library database of Multisim). However, once I complete that, it looks like there is an option that instantly converts my schematic into utiliboard. Which I can then send over to Craig to print out as a PCB single layer board. NOTE: I will need to send my final design for review to both my teammates and professor Pash.

Additional news: the dyno has officially been delivered to the IUPUI engineering building (which will make for testing a lot easier).

Problems Encountered This Past Week and Impact on Project

No obvious problems other than time running out to complete this project!

Expectations for Next Week

-Finish schematic design and send for peer review.

-Undergo dyno tests with our servo and CCU.

-Continue the master program with gathered data from servo and sensors.

Name: Gabrielle Mia Franco

Today's date: 2/16/23

Week Number: 06

Total Hours for Week: 6

Expected Tasks to be Accomplished This Past Week

-Begin test on CCU and servo motor

-Continue programming master code and GUI interface

-Finalize schematic footprint for PCB board

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-Manually created schematic footprints for specific components in our control strategy

Problems Encountered This Past Week and Impact on Project

-I had to miss this week's meeting with the team but we will be establishing a wokshop day this upcoming Monday.

Expectations for Next Week

-Finalizing schematic design and transitioning design to PCB board design for print.

-Mounting control hardware to dyno

Name: Gabrielle Mia Franco

Today's date: 3/1/24

Week Number: 08

Total Hours for Week: 6

Expected Tasks to be Accomplished This Past Week

-Review Multisim drawing and submit to get printed as a PCB board

-Review low level flowchart designs

-Work on presentation

-Update design documents with removed/added components

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

-Multisim schematic has been created and we are waiting to hear back on any edits that need to be made

-We are working on our presentation Sunday

-Testing of CCU and servo was completed this week

Problems Encountered This Past Week and Impact on Project

-For myself personally, time management has been a struggle. I need to work on setting aside more time for this project and my team. This will require me to better organize myself.

Expectations for Next Week

-Finalize presentation and practice with team

-Get schematic submitted for PCB board print

-Interface with new hardware that was ordered (the updated servo)

Kaleb Hill Reports

Name: ____Kaleb Hill_____

Today's date: ___10/5/2023_____

Week Number: ___Week 7_____

Total Hours for Week: __5_____

Expected Tasks to be Accomplished This Past Week

1. Complete VOC and Scope. Understanding what the customer is looking for in this project.
2. Complete Project Charter. A layout of our project, this will help us write out our understanding of the project goals.
3. Complete Project Specifications. The specifications are our official document for all current project information.
4. Meet with customer. This will help us gain a better understanding of what the customer desires and how we can accomplish this.
5. Meet with sponsors. This meeting will enforce our goals and understanding of where we want to go.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Completed VOC and Scope

2. Started Project Charter
3. Started Project Specifications
4. Met with our customer
5. Met with our sponsor
6. Got a valuable Project report for the dyno we are working on

Problems Encountered This Past Week and Impact on Project

While doing project specifications, we realized how much information we were still missing for our project. This halted our charter and specifications being fully complete for the time being, but these documents can now be updated.

Expectations for Next Week

1. Update project charter and specifications
2. Create Gantt chart
3. Talk with Ben from MSTE for data
4. Meet at stutz to get a view of our Dyno
5. Meeting with project sponsors

Name: ____Kaleb Hill_____

Today's date: ___10/13/2023_____

Week Number: ___Week 8_____

Total Hours for Week: __12_____

Expected Tasks to be Accomplished This Past Week

1. Update project charter and specifications.

2. Create a Gantt chart and layout all of our tasks for the rest of the semester so that we can better assign and complete tasks as a team.

3. Talk with Ben from MSTE for track data.

4. Meet at Stutz to get a view of our Dyno. This will help us get a better understanding of the project.

5. Meeting with project sponsors. Talk about upcoming and current deadlines, as well as any updates on the project.

6. Touch up the SIPOC

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. We spent around an hour each updating our specifications after our meeting at Stutz.

2. We met as a group and spent about an hour and a half creating our Gantt chart. This process helped us get a much better look at what we still need to get done for this project in the upcoming weeks.

3. We got in contact with Ben from MSTE and have gotten out data for the project. We also have a meeting with him on Wednesday to learn more about his side of the project and how it can help us achieve our goal.

4. We met at Stutz with our sponsors for around an hour and got a good look at our Flywheel and the engine we'll be working with. This meeting also replaced our sponsor meeting for the week, so we got to ask questions about some more of the specifications and pieces we need to complete the project.

5. We realized we had never created a SIPOC so I started up an excel and got a baseline of our customers wants and needs as well as any inputs I could think of.

Problems Encountered This Past Week and Impact on Project

We were all hit with the realization this week that we are more than halfway through the semester and still have so much to do. We have delegated tasks and completed our Gantt chart so we have an idea of how we can achieve what we need to.

Expectations for Next Week

1. Teaming Assessment
2. Block Diagram
3. Signed Functional Specifications
4. Microprocessor Decision Matrix
5. Program Decision Matrix
6. Meet with Ben from MSTE to learn more about our project
7. Meet with sponsors

Name: ____Kaleb Hill_____

Today's date: ___10/20/2023_____

Week Number: ___Week 9_____

Total Hours for Week: __7.15_____

Expected Tasks to be Accomplished This Past Week

1. Teaming Assessment
2. Block Diagram
3. Signed Functional Specifications
4. Microprocessor Decision Matrix
5. Program Decision Matrix
6. Meet with Ben from MSTE to learn more about our project
7. Meet with project sponsors

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Teaming Assessment only took about a minute to complete.
2. Block Diagram was not done by me, but I spent about 30 minutes reviewing the diagram.
3. Signed Project Specs. This can't be finished until our meeting with the customer this Wednesday.
4. Microprocessor Decision Matrix was started but has not been finished. I spent about three hours researching different Microcontrollers.
5. Program Decision Matrix is not something I can currently do until the microcontroller has been picked.
6. Meet with Ben from MSTE to learn more about our project. Our meeting lasted about an hour.
7. Meet with project sponsors. This meeting lasted an hour and a half and provided crucial insight into how we can choose the components we need.
8. Full Project Timeline. This is a rough estimate of what we'll be doing next semester, and it took about 45 minutes to complete.

Problems Encountered This Past Week and Impact on Project

A personal problem I encountered was coming up with a good plan on searching for a microcontroller. Our weekly meeting helped put into perspective what I would need to understand to find a microcontroller that will fit our project needs.

Expectations for Next Week

1. Design/Tradeoff Analysis
2. Draft for Review
3. Microcontroller Decision Matrix
4. Meeting is project Customer
5. Signed Project Specs
6. Meeting with project Sponsors

Name: ____Kaleb Hill_____

Today's date: ___10/28/2023_____

Week Number: ___Week 10_____

Total Hours for Week: __8_____

Expected Tasks to be Accomplished This Past Week

1. Design/Tradeoff Analysis
2. Draft for Review
3. Microcontroller Decision Matrix
4. Meeting is project Customer
5. Signed Project Specs
6. Meeting with project Sponsors

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Design/Tradeoff Analysis has been started, but we are at the point in our project where we must complete a few more processes before we can finalize our decision matrices.
2. Microcontroller Decision Matrix has been started, but it still needs some other details that have yet to be decided for its completion.
3. Meeting with project Customer and Sponsors. This meeting was effective in helping us define some of our specs we still need to determine to start implementing our design.
4. Signed Project Specs was sent to the sponsors and completed
5. Updating Gantt chart to align with some changes that were made with our process

Problems Encountered This Past Week and Impact on Project

No major problems were encountered, although we realized we need to do better as a team in dividing and conquering our tasks. We had a small meeting after our sponsor meeting to determine who could do what tasks for the week.

Expectations for Next Week

1. Motor RPM
2. Flywheel RPM
3. Axle RPM
4. Servo Motor
5. Other Components

Name: ____Kaleb Hill_____

Today's date: ___11/3/2023_____

Week Number: ___Week 11_____

Total Hours for Week: __7_____

Expected Tasks to be Accomplished This Past Week

1. Motor RPM
2. Flywheel RPM
3. Axle RPM
4. Servo Motor
5. Other Components

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. THP Sensor: I spent about 3 hours looking into potential sensors we could use in our design.

2. Brake: I spent about 30 minutes searching for the part sheet for our brake calipers. Thanks to the pictures we took at our visit to stutz, I was able to determine what brakes we had and located the sheet.

3. Meeting with sponsors: the meeting this week was a little over 1 hour, where we discussed our lab visit as well as the master cylinder. We were able to obtain plenty of documents for out master cylinder and get a better understanding of the way the engine, brakes, and other components are set up.

4. TCM Work: I spent about 2 hours gathering documents that we have made and adding some stuff we have learned since then to finalize our Charter and Contract for TCM.

5. Emails: I spent about 30 minutes this week sending out emails to set up presentation dates and to get in contact with third parties.

Problems Encountered This Past Week and Impact on Project

This week we went down to the engineering labs and got to see in person how our go-kart is set up. I was finally able to grasp how the motor brake system is set up.

Expectations for Next Week

1. Servo Motor

2. Schedule Design

3. RPM Data

Name: ____Kaleb Hill_____

Today's date: ___11/10/2023_____

Week Number: ___Week 12_____

Total Hours for Week: __9_____

Expected Tasks to be Accomplished This Past Week

1. Servo Motor
2. Schedule Design
3. RPM Data

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Servo Motor: I spent about an hour and a half looking into Servo Motors and how they function. I was able to use some information from the electrical machines course as well to find some information.

2. Schedule Design: I spent about thirty minutes discussing possible meeting dates for our presentation. We have agreed on Thursday, December 7th at 11:30 to 12:30.

3. Wednesday Meeting: Our group met Wednesday for about two hours. This meeting was very useful as I was able to continue adding to my THP sensor matrix and we also took a second trip to the MSTE garage to look at the GoKart components.

4. Thursday Meeting: We met with project sponsors for an hour to talk about where we are at in the project. This meeting helped us understand how our twostroke engine works, which was personally helpful to me because I did not know there was a difference.

5. THP Sensor Matrix: I spent about an extra hour finishing up my document for the THP Sensor matrix.

6. Microcontroller Matrix: I spent about an hour and a half looking into the micro controllers that Dami had found and comparing them, as well as creating a document for our Matrix.

7. Spent about 30 minutes touching up our functional specifications document.

8. Spent about an hour updating our Gantt Chart.

Problems Encountered This Past Week and Impact on Project

This week was not bad, we met as a group an got a good idea of what assignments we need to get done in these upcoming weeks before our presentation.

Expectations for Next Week

1. Finish Microcontroller Matrix
2. Submit Late Work
3. Meeting with Project Sponsors
4. Meeting with Xtract contact?
5. Research information on master cylinder

Name: ____Kaleb Hill_____

Today's date: ___11/17/2023_____

Week Number: ___Week 13_____

Total Hours for Week: __5_____

Expected Tasks to be Accomplished This Past Week

1. Finish Microcontroller Matrix
2. Submit Late Work
3. Meeting with Project Sponsors
4. Meeting with Xtract contact?
5. Research information on master cylinder

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Finish Microcontroller Matrix: This took about an hour, updating some information and saving some of the old references I used. The Matrix is currently a rough draft ready for review.

2. Submit Late Work: As a group we met on Sunday to discuss what late work we are ready to get done and we spent about 30 minutes compiling assignments such as our matrices.

3. Meeting with Project Sponsors: Our meeting lasted close to an hour and a half. The meeting was very helpful in determining what aspects of our decision matrices need to be fine-tuned.

4. Meeting with Xtract contact: This meeting was around an hour, sadly it left a lot to be desired as we were still left with a lot of questions. However, we did figure out that we will need to test our master cylinder to see if it works in our design.

5. Research information on master cylinder: Based on reading the documents available, meeting with Andrew, and our sponsor meeting, we have a general idea of how we can get started testing.

6. TCM: I spent about an hour working on our TCM assignment which was just formatting our PowerPoint for our upcoming presentation.

Problems Encountered This Past Week and Impact on Project

We now need to figure out where the paddles for the master cylinder are so that we can properly test it.

Expectations for Next Week

I will personally be busy most of Thanksgiving week, but I will work to make changes to our Gantt Chart and Matrices when I have time.

Name: ____Kaleb Hill_____

Today's date: ___11/27/2023_____

Week Number: ___Week 14_____

Total Hours for Week: __<1_____

Expected Tasks to be Accomplished This Past Week

As said, I was fairly busy all week due to Thanksgiving, so besides sending some emails, I did not do anything with the project this week.

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

Occasional email sent – approximately 15 min.

Problems Encountered This Past Week and Impact on Project

None

Expectations for Next Week

1. Final touch-ups on Gantt chart
2. Catch up on late work
3. Start PowerPoint for presentation
4. Meet with sponsors

Name: ____Kaleb Hill_____

Today's date: ___1/19/2024_____

Week Number: ___Week 2_____

Total Hours for Week: __7_____

Expected Tasks to be Accomplished This Past Week

1. Gantt Chart
2. Specifications
3. Stutz Visit
4. GUI Testing
5. Servo Testing

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Gantt Chart (30 min)
2. Specifications (30 min)
3. Stutz Visit (1 hour)
4. GUI Testing (3 hours)
5. Servo Testing (1 hour)
6. Document review (1 hour)

Problems Encountered This Past Week and Impact on Project

Our Stutz visit was enlightening as to where we need to go with the next few weeks

Expectations for Next Week

1. Further Servo Testing 2. GUI Testing 3. Test Specification 4. Final Specifications 5. First Advisor Meeting 6. Team Meeting

Name: ____Kaleb Hill_____

Today's date: ___1/26/2024_____

Week Number: ___Week 3_____

Total Hours for Week: __11.5_____

Expected Tasks to be Accomplished This Past Week

1. Further Servo Testing
2. GUI Testing
3. Test Specification
4. Final Specifications
5. First Advisor Meeting
6. Team Meeting

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Further Servo Testing (4 hours)
2. Test Specification (3 hours)
3. Final Specifications (2 hours)
4. First Advisor Meeting (30 Minutes)
5. Team Meeting (2 hours)

Problems Encountered This Past Week and Impact on Project

Our group discussed how we will go about tackling the code. We still must get it in a testable state, but it seems that we have a solid plan so far.

Expectations for Next Week

1. Finish Servo Code
2. Update Gantt Chart
3. Team Meeting

4. Advisor Meeting
5. Start System Code Testing

Name: ____Kaleb Hill_____

Today's date: ___2/2/2024_____

Week Number: ___Week 4_____

Total Hours for Week: __10.25_____

Expected Tasks to be Accomplished This Past Week

1. Finish Servo Code
2. Update Gantt Chart
3. Team Meeting
4. Advisor Meeting
5. Start System Code Testing

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Task Scheduler (Spent about 4 hours putting together a task scheduler, still needs some work)
2. Team Meeting (Spent about 2 hours going over flowcharts for our system)
3. Flowchart Update (Spent 1 hour updating flowcharts)
4. Advisor Meeting (Spent about 45 minutes discussing new parts needed and other project updates)
5. Emails (Spent about 30 minutes sending emails this week, getting updates on the flywheel from Stutz)
6. Research (Spent around 2 hours reading into information on some libraries we might need to use for our system)

Problems Encountered This Past Week and Impact on Project

We figured out some additional pieces needed to communicate with our CCU and Servo motor. They have been ordered; we will currently work on code while we wait.

Expectations for Next Week

1. Get Task Scheduler in a working state
2. Advisor Meeting
3. Group Work Session?
4. Update Gantt Chart

Name: ____Kaleb Hill_____

Today's date: ___2/9/2024_____

Week Number: ___Week 5_____

Total Hours for Week: __5.25_____

Expected Tasks to be Accomplished This Past Week

1. Task Scheduler
2. Advisor Meeting
3. Group Work Session
4. Update Gantt Chart

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Spent about an hour compiling the task Scheduler.
2. Advisor meeting ran for almost an hour; we were able to get some good information.
3. Group Work Session ran for about an hour covering schematic design 4. Took about 30 minutes to update the Gantt Chart.
5. Spent an hour on CAN BUS communication.
6. Spent 45 minutes testing RPM Sensor and viewing Flywheel.

Problems Encountered This Past Week and Impact on Project

The Flywheel has finally been moved so our group is ready to get some testing done!

Expectations for Next Week

1. Get CAN BUS talking
2. Group Work Session
3. Advisor Meeting

Name: ____Kaleb Hill_____

Today's date: ___2/16/2024_____

Week Number: ___Week 6_____

Total Hours for Week: __10.5_____

Expected Tasks to be Accomplished This Past Week

1. Get CAN BUS talking
2. Group Work Session
3. Advisor Meeting

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Spent 6 hours during the weekend working on CAN BUS research and communication protocols

2. Spent 1 hour designing a state machine for our ABS

3. Spent 1 hour on THP sensor

4. Spent 2 hours working in lab confirming RPM sensor and other component work 5. The Advisor meeting ran for 30 minutes.

Problems Encountered This Past Week and Impact on Project

CCU Connector was missing the pins needed to get connected to our circuit, parts have been ordered.

Expectations for Next Week

1. Get task scheduler working with all our inputs and outputs

2. Update Gantt Chart

3. Advisor Meeting

4. Group Work Session

5. Testing as needed

Name: ____Kaleb Hill_____

Today's date: ___2/23/2024_____

Week Number: ___Week 7_____

Total Hours for Week: __13.25_____

Expected Tasks to be Accomplished This Past Week

1. Get task scheduler working with all our inputs and outputs
2. Update Gantt Chart
3. Advisor Meeting
4. Group Work Session
5. Testing as needed

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Spent an hour in advisor meeting
2. Spent an hour updating the Gantt chart with percentages
3. Spent 2 hours working on THP sensor data
4. Spent 3 hours creating flowcharts for the THP sensor
5. Started compiling the inputs for the task scheduler (About 5 hours)
6. Spent 30 minutes on updates for the Dyno
7. Started on PowerPoint for presentation (about 45 minutes)

Problems Encountered This Past Week and Impact on Project

Connector pins are here and confirmed to be sized correctly. The schematic is almost done so the measurements for the circuit box will be ready soon.

Expectations for Next Week

1. Updates to PowerPoint presentation
2. Group Meeting
3. Advisor Meeting
4. Task Scheduler
5. Flowchart Task scheduler

Name: ____Kaleb Hill_____

Today's date: ___3/1/2024_____

Week Number: ___Week 8_____

Total Hours for Week: __11_____

Expected Tasks to be Accomplished This Past Week

1. Updates to PowerPoint presentation
2. Group Meeting
3. Advisor Meeting
4. Task Scheduler
5. Flowchart Task scheduler

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Updates to PowerPoint (About 5 hours)
2. Advisor Meeting (Met for about 45 minutes)
3. Group Meeting (Multiple work sessions, about 3 hours)
4. Updated Gantt Chart (About 15 minutes, might work on it more)
5. Task Scheduler Flow Chart (2 hours)

Problems Encountered This Past Week and Impact on Project

Schematic data was lost so we had to rework it

Expectations for Next Week

1. Presentation Prep
2. Advisor Meeting
3. Group Meetings

Name: ____Kaleb Hill_____

Today's date: ___3/11/2024_____

Week Number: ___Week 9_____

Total Hours for Week: __12.75_____

Expected Tasks to be Accomplished This Past Week

1. Presentation Prep
2. Advisor Meeting
3. Group Meetings

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Presentation Prep (about 8 hours)
2. Advisor meeting (about 45 min)

3. Group meeting (about 1 hour)

4. PID control loop (3 hours)

Problems Encountered This Past Week and Impact on Project

Presentation went well; however, we have learned that we are behind and need to do extra work to get caught up.

Expectations for Next Week

1. Lots of lab work

Name: ____Kaleb Hill_____

Today's date: ___3/22/2024_____

Week Number: ___Week 11_____

Total Hours for Week: __18.5_____

Expected Tasks to be Accomplished This Past Week

1. Advisor Meeting
2. Lab work
3. Update documentation
4. Operators Manual
5. Report Draft

Actual Tasks Accomplished This Past Week and Number of Hours Spent on Each Task

1. Advisor Meeting (meeting ran for about 30 min)
2. Finalized PID control Flowcharts (about 1 hour)
3. Proof of concept (about 6 hours)
4. Lab time (about 2 hours)
5. Update Documentation (about 3 hours)

7. Report Draft (about 6 hours)

Problems Encountered This Past Week and Impact on Project

Busy busy busy with all the part testing and getting the correct tray size

Expectations for Next Week

1. Finish Report Draft
2. Lab Time
3. Advisor Meeting