**MEMORANDUM**  A yellow and green logo

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**To:** Prof. Charlie Refvem - crefvem@calpoly.edu

Prof. Eric Espinoza-Wade - erwade@calpoly.edu

Department of Mechanical Engineering, Cal Poly SLO

**From:** Jonathan Lam – [jlam94@calpoly.edu](mailto:jlam94@calpoly.edu)

Vinh T. Vo – [vvo11@calpoly.edu](mailto:vvo11@calpoly.edu)

Department of Mechanical Engineering, Cal Poly SLO

**Course:** ME 507 - Mechanical Control System Design

**Group:** MECHA08

**Date:** 5/10/2024

**RE:** Term Project Memo – Basketball Laucher

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# ABSTRACT

Mention what we do after the proposal:

After the getting approval from Prof Charlie Refvem, we move on to build hardware, etc……

# OBJECTIVE

## OVERVIEW

Mention project requirements

Look for Charlie docs for reference

You are to design, build, program, test, and document an intelligent machine as outlined in this  
and future documents. Your device must follow the Design Requirements and Manufacturing  
Restrictions and Safety Requirements indicated in this document.  
Your bot must have the following components:  
• A custom PCB designed around an STM32F411 MCU (or similar) programmed in either C,  
C++ (or Rust, with permission).  
• Two or more actuators, such as motors, driving the machine, actuated by suitable electronics,  
such as motor drivers.  
• Two or more unique sensors.  
• Some sort of closed-loop control loop or similarly complex algorithm.  
• A wireless controller allowing you to command the bot hands-free or to be used as a wireless  
e-stop. The controller and receiver will be provided to students for use during ME 507.  
Your machine must be safe for builders, operators and bystanders and conform to the ME 507  
lab safety rules. It must have good construction quality. Component and material choices will be  
restricted to a curated set of options to even the playing field between teams; therefore, the quality  
of construction and programming will set teams apart from one another

## IDEATION

Describe the picture below basically

A diagram of a machine

Description automatically generated

# MECHANICAL DESIGN

## CONTROLLER

Describe the picture below:

A person holding a blue device

Description automatically generated

Mentioned and screenshot all 3Dprinted brackets and button, etc not the pcb and coding part

Show the whole assembly in CAD model and note for each part name

Mentioned the hinge connection between 2 pieces for convenient access from user

## LAUNCHER

# PCBA DESIGN

## CONTROLLER

## LAUNCHER

# SOFTWARE IMPLEMENTATION

## CONTROLLER

## LAUNCHER

The first part of the project selection was understanding the rules and procedures of project and how we achieved each requirement. As stated in the manual

The next procedure to design the ball launcher was to propose and design an electric schematic. For our group the electric looks like figure 1. In this figure shows the microcontroller the STM32411CEU6 “Black Pill” with our custom printed circuit board (PCB) the PCB need to conect to two  NEMA 17 stepper motors using the motor DRV8825 and connect 1 motor to a Brushless DC motor using an ESC (BLDC). Then it is wire into multiple voltage sources in the basic electric schematic.  Then the  microcontroller is attach to to bluetooth using UART which communicates to Figure 2 for a gloved that has attach to an inertial measurement units to send the message into the master MCU then it is attach to a killer switch incase it doesn’t work.

This project introduces a 5” basketball launcher equipped with a 12V power supply regulated to 5V and 3.3V. Two NEMA 17 stepper motors, controlled wirelessly via Bluetooth using HC-05 modules, facilitate angular movement (Yaw) and lateral motion (Theta). The slave STM32 F411 Black Pill interfaces with an Inertia Measurement Unit (IMU) for motion control and incorporates a switch for ball launching. High-speed Brushless motors with ESCs propel the basketball upon activation of a radio transmitter signal, implemented with safety measures via limit switches to prevent motor damage. The master controller, utilizing a custom PCB designed with Fusion 360 ECAD, employs a STM32 F411 Black Pill to receive IMU data and orchestrate motor actions through collaborative multitasking.