University of Waterloo

Co-operative Work Terms

Ahmed Osman

21081596

1B Electrical Engineering, Honours, Co-operative Program

Work Term	Employer	Evaluation
Jan - Apr 2025	Student Design Teams - University of Waterloo Battery Workforce Challenge Waterloo Ontario Canada Electrical Engineering Assistant - Battery Workforce Challenge (unpaid)	VERY GOOD

Planned Future Work Term(s)

Sep - Dec 2025

May - Aug 2026

Jan - Apr 2027

Jan - Apr 2028

Sep - Dec 2028

Email: aasaosma@uwaterloo.ca
Phone: +1 639-318-6936

July 6, 2025

Hiring Team
Kiwi Charge Inc
44 Gerrard Street East
Toronto, ON M5B 1G3

Hello Kiwi Charge Team,

I'm really excited to apply for the Electrical Engineering Intern role. As an Electrical Engineering student at the University of Waterloo, I've gained solid hands-on experience with motor control systems, embedded hardware design (STM32 and ESP32), and testing with oscilloscopes, multimeters, and power supplies — all skills you highlighted in the job description.

I'm especially eager to work on motor driver configuration, sensor integration, and PCB testing alongside your experienced engineers. The chance to contribute directly to autonomous system development and help solve real-world robotics challenges really motivates me.

I'm comfortable working both independently and as part of a team, and I enjoy diving into technical problems while learning from others. I'm confident I can bring value to your fast-paced, innovative environment and grow as an engineer through this internship.

Thank you for considering my application — I'd love the chance to chat and learn more about how I can support Kiwi Charge's exciting projects.

Best regards,
Ahmed Osman

Ahmed Osman

aasaosma@uwaterloo.ca | www.linkedin.com/in/ao2005/ | **+1 639-318-6936**

Skills

Hardware Development: PCB design and schematic capture using Altium, Eagle, KiCAD, BOM management, layout optimization, hardware revision control, embedded hardware debugging, test point documentation.

Embedded Systems: STM32 and ESP32 microcontrollers, real-time motor control firmware, timer-driven PWM, ADC sampling, SPI, UART, sensor and actuator interfacing, and telemetry communications.

Power Electronics & Motor Control: BLDC driver design, gate driving, dead-time optimization, switching loss measurements, ripple and thermal testing, protection circuits, and high-current PCB layout techniques.

Lab Instrumentation & Testing: Oscilloscopes (200–500 MHz), logic analyzers, current clamps, differential probes, multimeters, insulation testers, power supplies, IR thermal imaging, and transient capture.

Experience

Electrical Design Intern Jan 2025 – May 2025

BWC *Waterloo, ON*

- Designed and revised mixed-signal schematics in Altium for STM32 sensor and power boards; managed BOMs, test points, and documentation to support DFM and compliance.
- Bench-tested SPI, CAN, and PWM interfaces with 200–500 MHz oscilloscopes and logic analyzers; logged timing, jitter, and voltage margins across hardware revisions.
- Characterized switching regulators and analog filters using IR imaging and transient capture; validated output ripple (<40 mV) and thermal headroom (<60°C) under load.
- Used multimeters, clamp meters, and insulation testers for fault isolation, voltage drop checks, and continuity during hardware bring-up.
- Maintained detailed bring-up logs linking schematic versions and failure modes to speed debugging and firmware handoff.
- Collaborated with engineers on design reviews and compliance; resolved 80% of first-pass hardware issues independently.
- Implemented STM32 HAL firmware features including PWM control, GPIO sequencing, and SPI communication; verified via scope captures and loopback testing.

Electrical Project Manager Jan 2025 – Present

Waterloo Aerial Robotics Group (WARG) *Waterloo, ON*

- Led design of 3-phase BLDC driver boards in Altium; selected gate drivers, MOSFETs, and shunt amps for sensorless startup and current control. Added protection and filtering for avionics power bus.
- Bench-tested startup, commutation, and zero-crossing with Rogowski coils and oscilloscopes. Captured BEMF phase jitter and noise margins under simulated in-flight switching conditions.
- Integrated STM32 with ESP32 for flight and telemetry; managed SPI traffic, PWM prioritization, and debug throughput. Verified task jitter and end-to-end timing under max concurrent load.
- Ran thermal soak and load-step tests on drive subsystems. Logged throttle tracking and switching losses at 24 V/8 A; tuned control loop to suppress oscillation and improve tracking.
- Reduced EMI and ringing by reworking high di/dt loops, adjusting stitching, and cleaning return paths. Confirmed overshoot and ripple improvements with near-field probes and clamp diagnostics.

Electrical Engineer & Embedded Flight Software Developer Sep 2024 – Dec 2024

Waterloo Aerial Robotics Group (WARG) *Waterloo, ON*

- Designed motor controller PCBs in Altium with STM32F4 and ESP32; routed Hall inputs, isolated ADCs, and bulk capacitors for brownout protection. Verified signal quality with scope probes and thermal data.
- Captured motor behavior during brake, stall, and overcurrent using current clamps, diff probes, and scripted faults. Measured heating and timing response over repeated test cycles.
- Developed firmware for PWM drive, BEMF sampling, and braking logic in STM32 HAL and ESP-IDF. Verified loop timing, debounce, and ISR execution via scope captures and logic analyzer.

Education

University of Waterloo (Excellent Academic Standing) Waterloo, ON

Bachelor of Applied Science, Electrical Engineering

UNIVERSITY OF WATERLOO
UNOFFICIAL GRADE REPORT

Ahmed Osman
21081596

1B Electrical Engineering, Honours, Co-operative Program

Fall 2025

PD	20		Strategies for Career Success	
Term Average:	N/A		Decision:	

Spring 2025

GENE	120		First-Year Eng Seminar	
ECE	140		Linear Circuits	
ECE	192		Eng Economics & Society Impact	
ECE	106		Electricity & Magnetism	
ECE	108		Discrete Math & Logic 1	
ECE	102		Information Session	
ECE	124		Digital Circuits & Systems	
MATH	119		Calculus 2 (Eng)	
Term Average:	N/A		Decision:	

Winter 2025

PD	19		Tactics for Workplace Success	CR
COOP	1		Co-operative Work Term	CR
Term Average:	N/A		Decision:	

Fall 2024

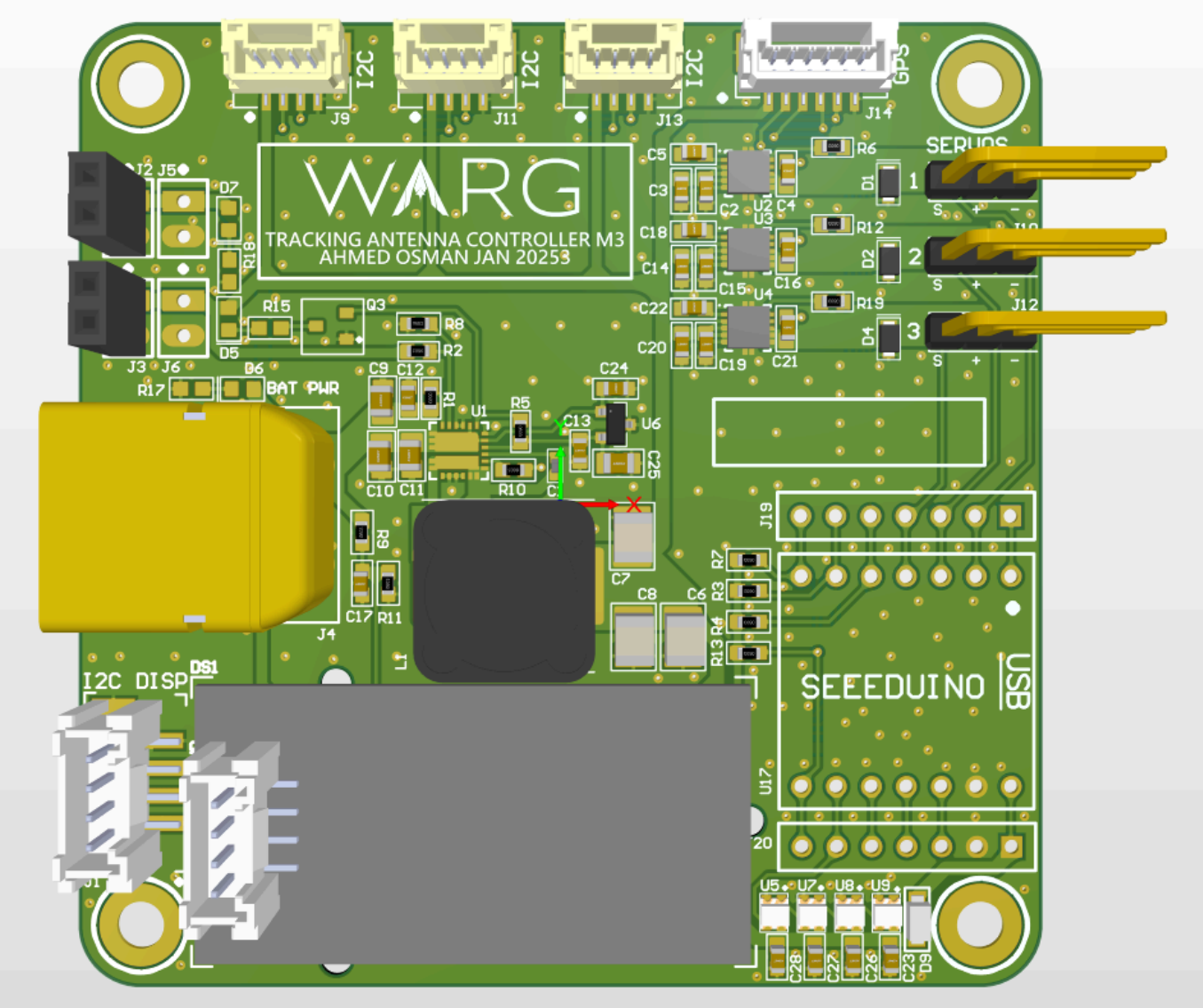
MATH	117		Calculus 1 (Eng)	89
ECE	105		Classical Mechanics	82
ECE	150		Fundamentals of Programming	81
MATH	115		Linear Algebra (Eng)	90
COMMST	192		Eng Comm (COMPE/ELE/MGTE)	80
GENE	119		First-Year Engineering Seminar	
ECE	190		Eng Profession & Practice	80
ECE	198		Project Studio	57
MTHEL	99		First-Year Math Readiness	CR
Term Average:	81.75		Decision:	Excellent Standing

Portfolio

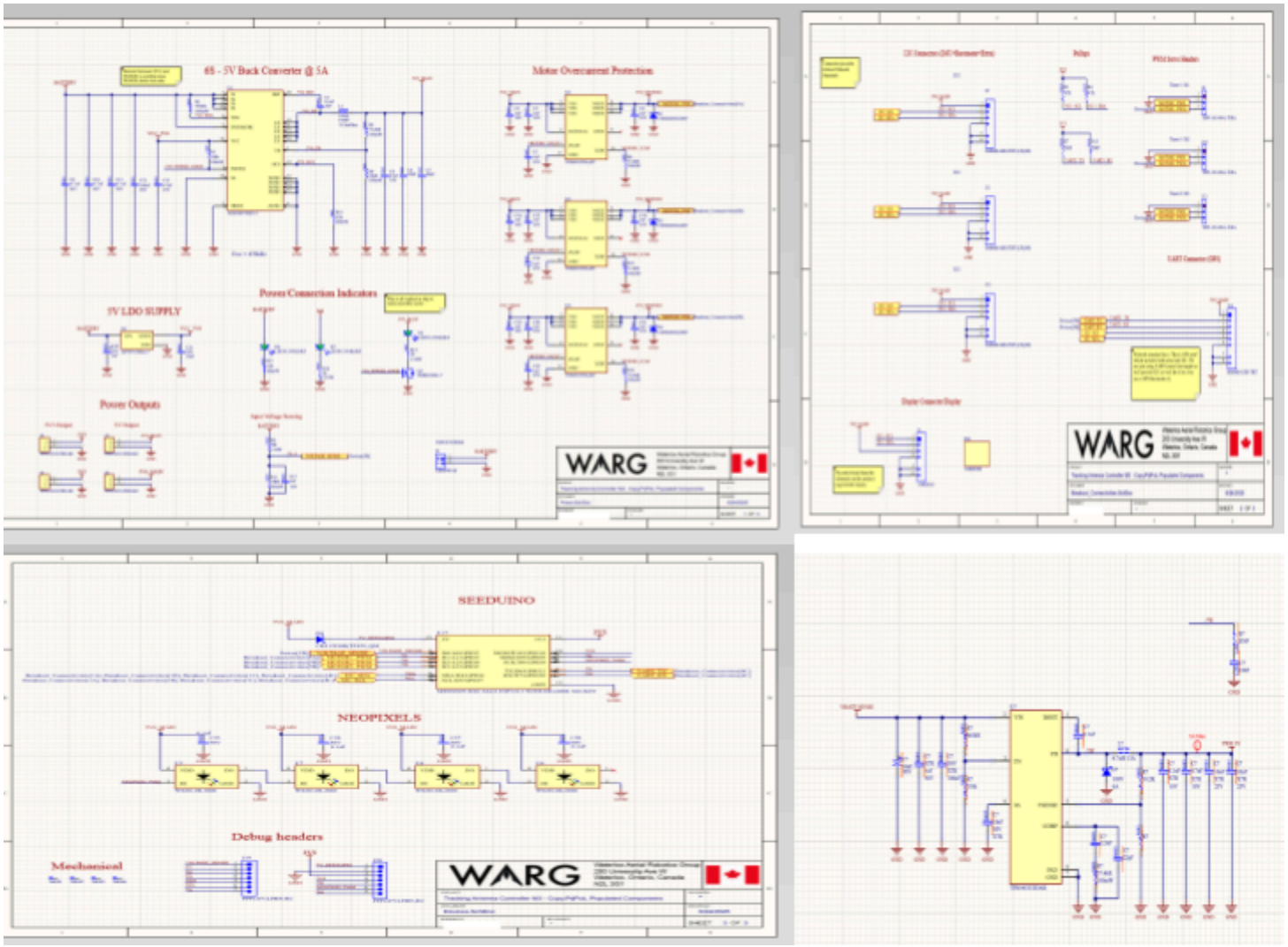
aasaosma@uwaterloo.ca

Telemetry (Tracking Antenna) Controller

- **Designed** power management PCB for tracking antenna system, bucking 3S–6S LiPo input to regulated 12V/5V rails; integrated voltage sensing for battery health monitoring.
- **Implemented** motor control via PWM outputs for yaw/pitch tracking; Seeeduino Xiao-based MCU firmware enabled real-time antenna orientation.
- **Developed** modular test board architecture with UART, I²C, and NEOPIXEL control, supporting multi-servo loads up to 6A peak.
- **Enabled** integration with MAVLink over Wi-Fi and GPS for autonomous RF tracking; transitioned architecture to support directional + omni antenna arrays.
- **Iterated** toward a multi-revision system with goals including dynamic heading resolution, integrated SD logging, and ELRS airside tracking capability.



Schematic:

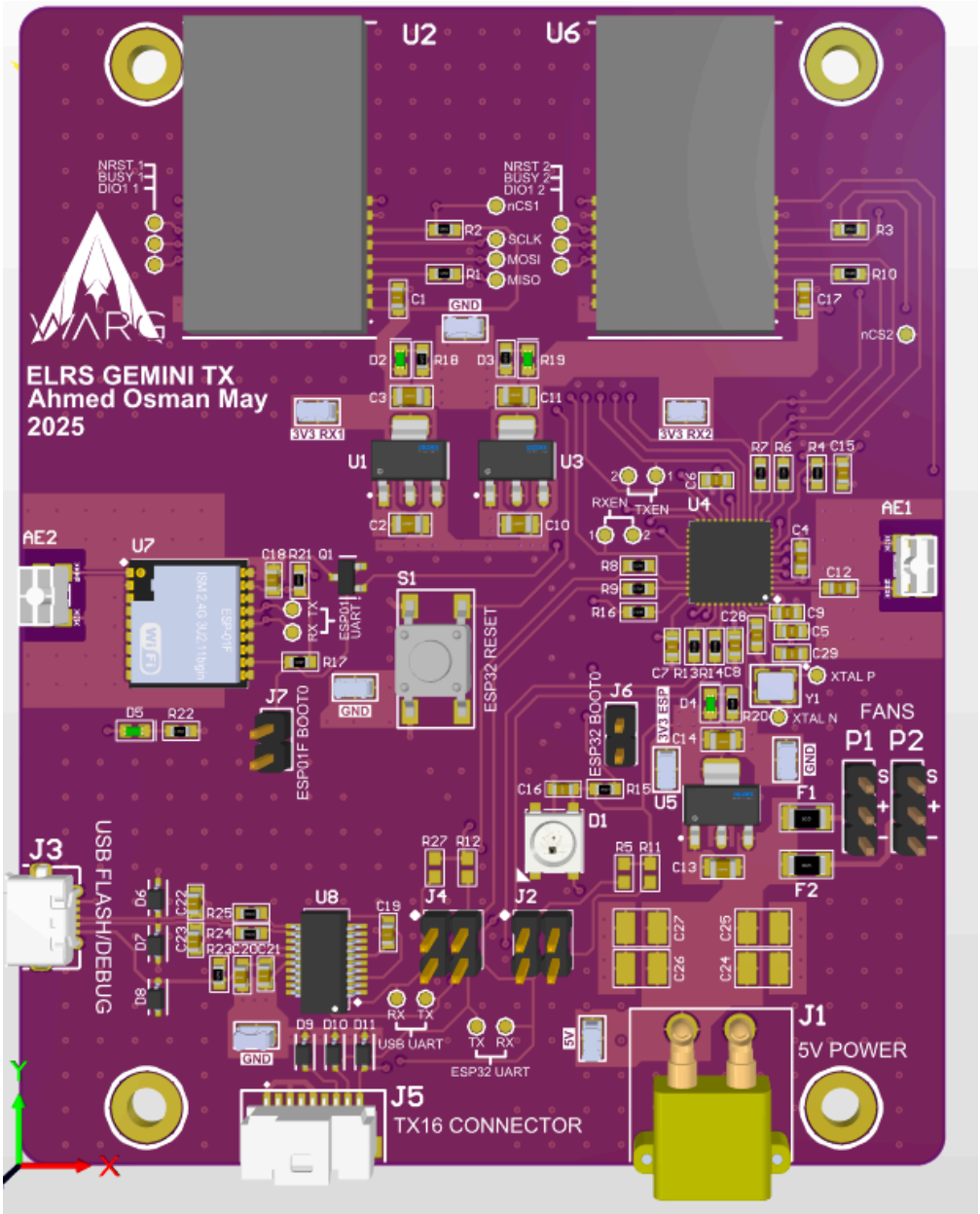

6S - 5V Buck Converter @ 5A
Motor Overcurrent Protection
Power Connection Indicators
5V LDO SUPPLY
Power Outputs
WARG
SEEDUINO
NEOPIXELS
Debug headers
Mechanical
WARG

Portfolio

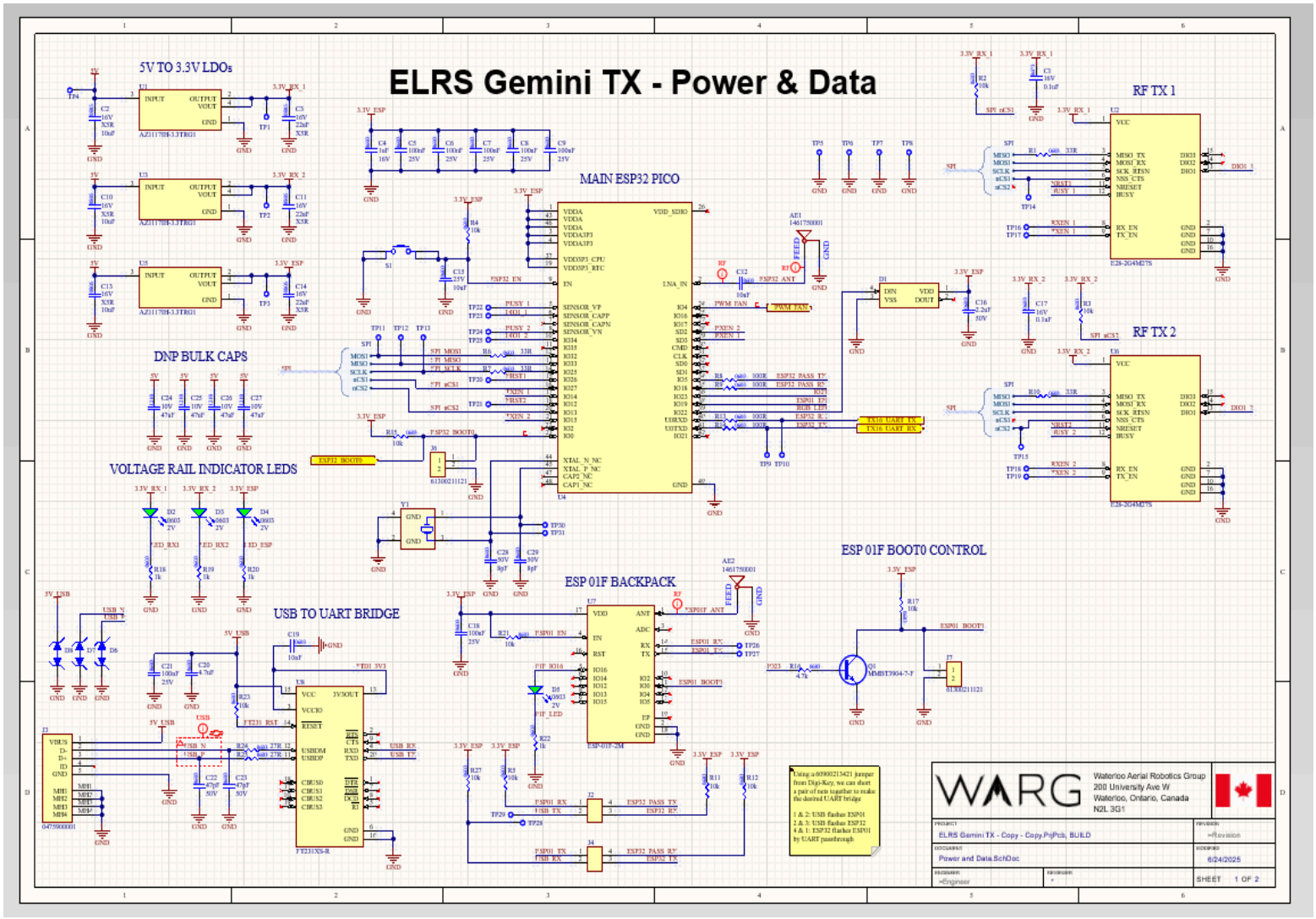
aasaosma@uwaterloo.ca

Transmitter Gemini Board

- **Designed** custom ELRS Gemini TX PCB enabling dual 27dBm RF modules with frequency diversity for ~8km drone link reliability.
- **Integrated** ESP32-PICO for SPI-based RF control, UART multiplexing, and PWM fan regulation..
- **Implemented** 3-rail LDO power system (3×3.3V) for isolated TX and logic domains.
- **Enabled** dual firmware flashing via USB and Wi-Fi; onboard jumper-selectable UART routing.
- **Developed** ESP-01F “backpack” module interface for remote RF parameter updates.
- **Optimized** RF layout using dense via stitching per Infineon AN91445 guidelines; minimized inductance.
- **Verified** thermal and electrical integrity under max-load conditions using dropout curve analysis.



Schematic:

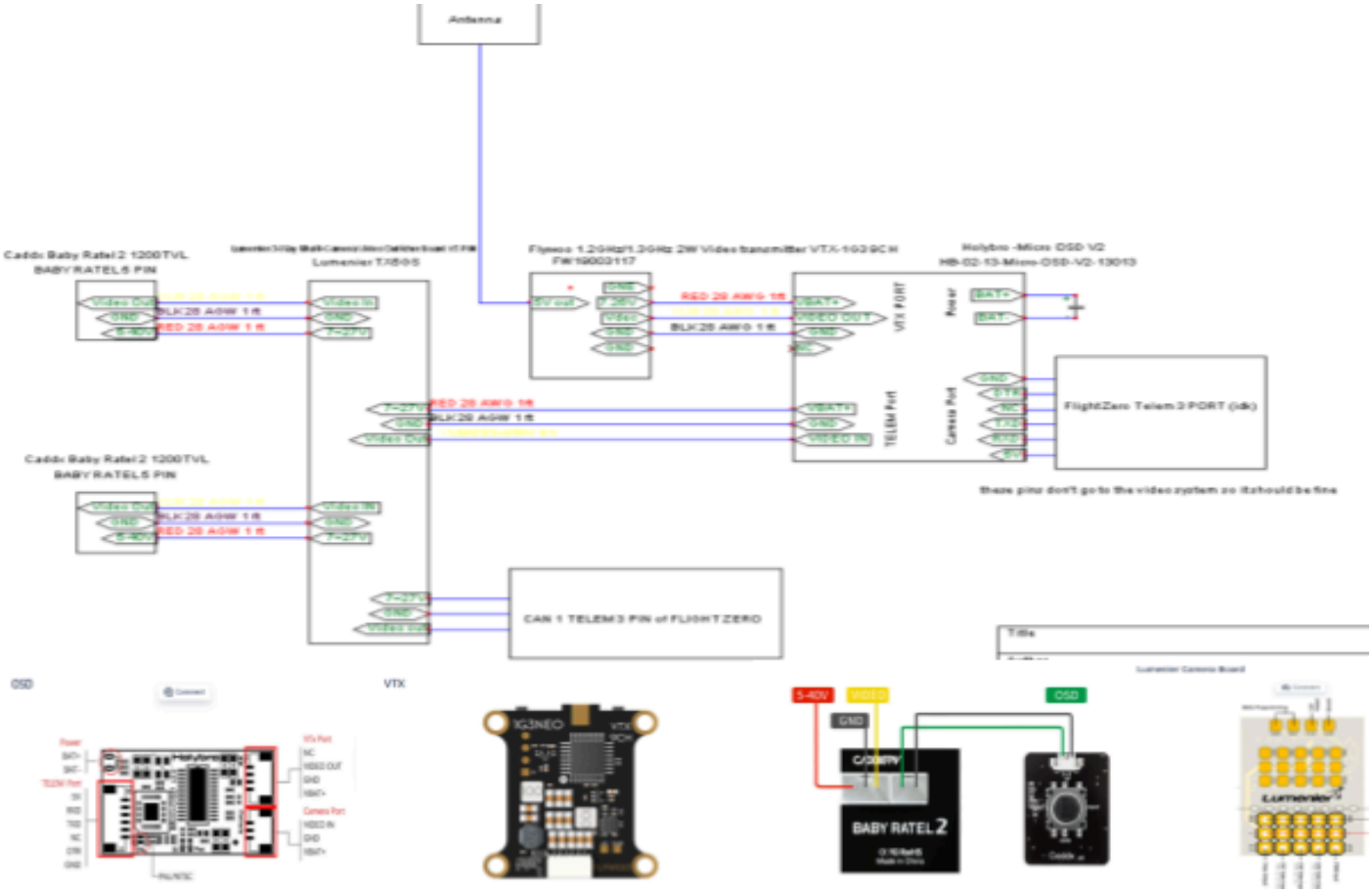

ELRS Gemini TX - Power & Data
5V TO 3.3V LDOs
MAIN ESP32 PICO
RF TX 1
RF TX 2
DNP BULK CAPS
VOLTAGE RAIL INDICATOR LEDS
USB TO UART BRIDGE
ESP 01F BACKPACK
ESP 01F BOOT0 CONTROL
WARG
Waterloo Aerial Robotics Group
200 University Ave W
Waterloo, Ontario, Canada
N2L 3G1
ELRS Gemini TX - Copy - Copy.PrjPcb, BUILD
Power and Data.SchDoc
6/24/2025
SHEET 1 OF 2

Portfolio

aasaosma@uwaterloo.ca

Video System Harness

- **Developed** a dual-camera configuration using a camera multiplexer (mux), achieving seamless switching between outputs and enhancing flexibility in video capture during drone operations.
- **Designed** the mux output routing to an on-screen display (OSD) for overlaying critical flight data, improving real-time situational awareness and operator decision-making.
- **Engineered** stable wireless video transmission via a video transmitter (VTX) with dedicated power and ground lines, reducing signal interference and ensuring consistent video feeds during high-interference flights.
- **Standardized** the wiring harness with correct wire gauges, color coding, and labeled connectors, simplifying installation and reducing troubleshooting time by 20%.

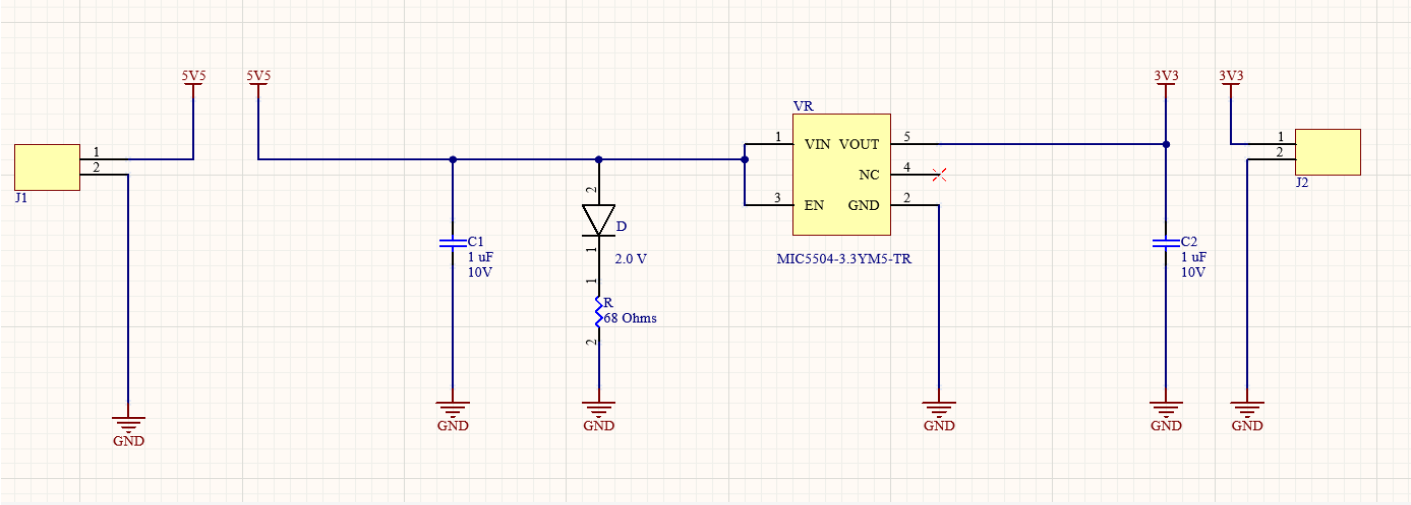


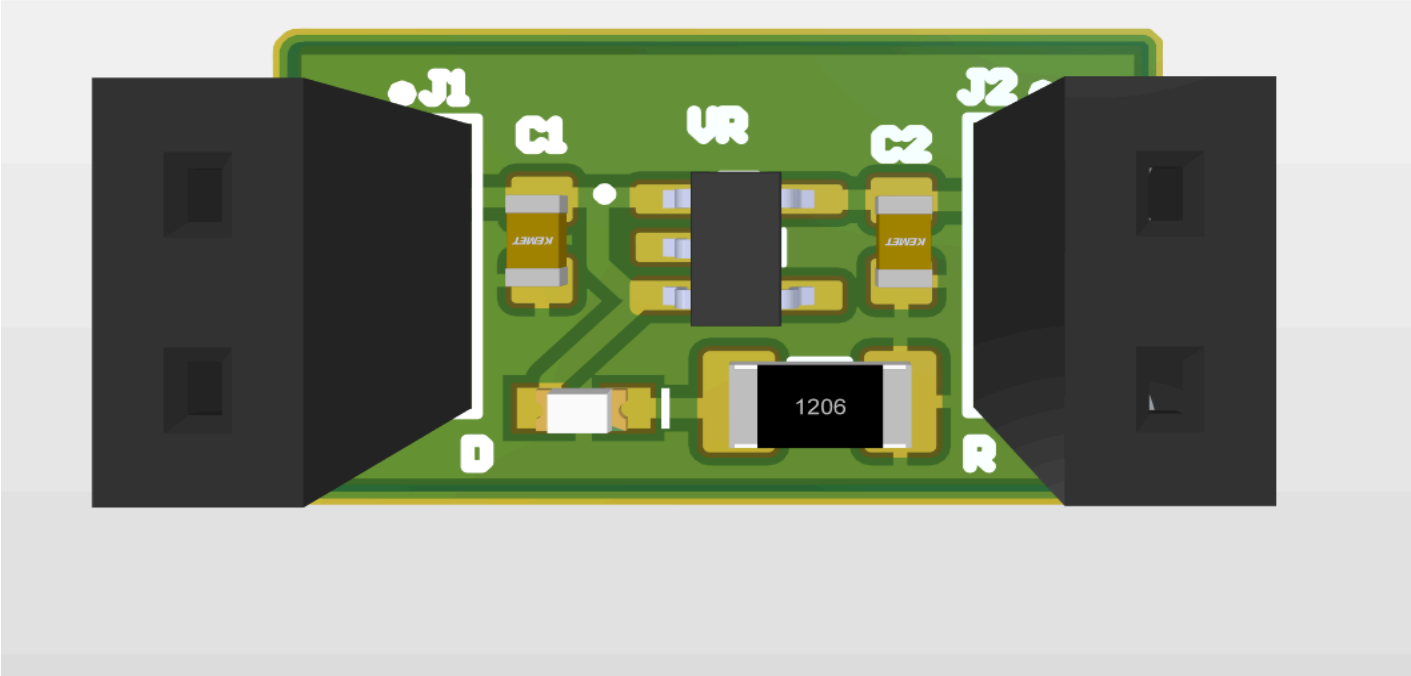
Portfolio

aasaosma@uwaterloo.ca

LDO circuit

- **Constructed** the circuit to accept a 5.5V input while delivering a stable 3.3V output, ensuring reliable device operation and enhancing the drone's performance in various conditions.
- **Utilized** two 1 µF capacitors to minimize voltage fluctuations and noise, significantly improving the stability of sensitive electronics and increasing flight control accuracy.
- **Devised** an LED indicator with a 68Ω resistor for visual power status feedback, enabling operators to quickly assess system health during missions and improve operational efficiency.
- **Facilitated** dual input/output connectors for seamless system integration, simplifying maintenance and allowing for rapid deployment in diverse operational scenarios.



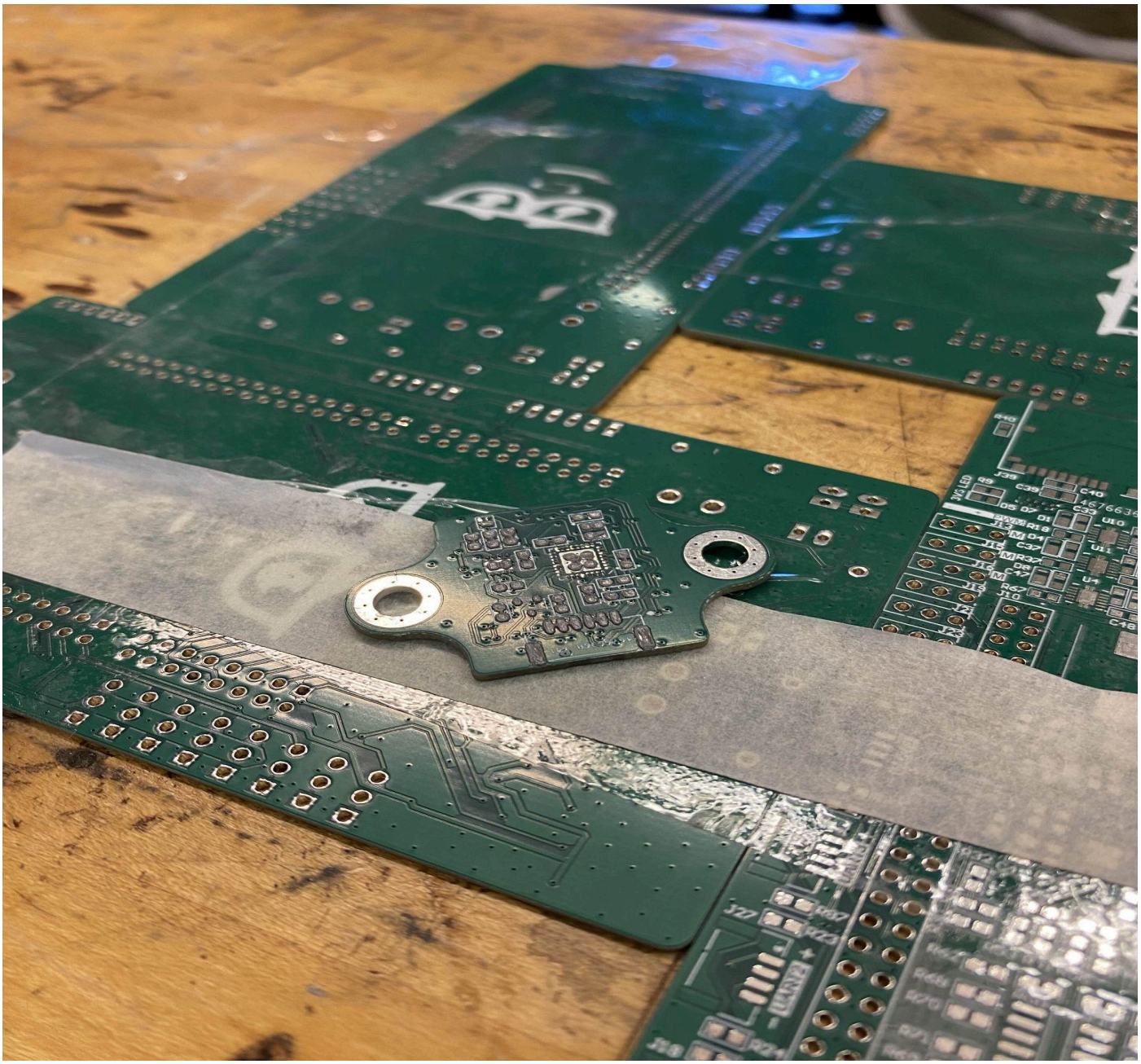


Portfolio

aasaosma@uwaterloo.ca

LED Board

- **Assembled** a 5.5V to 3.3V regulated circuit with 1 µF capacitors, ensuring reliable operation and improved drone performance.
- **Integrated** an LED indicator with a 68Ω resistor, providing clear visual feedback of power status, allowing for quick system diagnostics and reducing mission downtime.
- **Created** 3D component footprints, streamlining PCB fabrication and ensuring precise part placement, which enhanced production efficiency and reduced assembly errors.



Portfolio

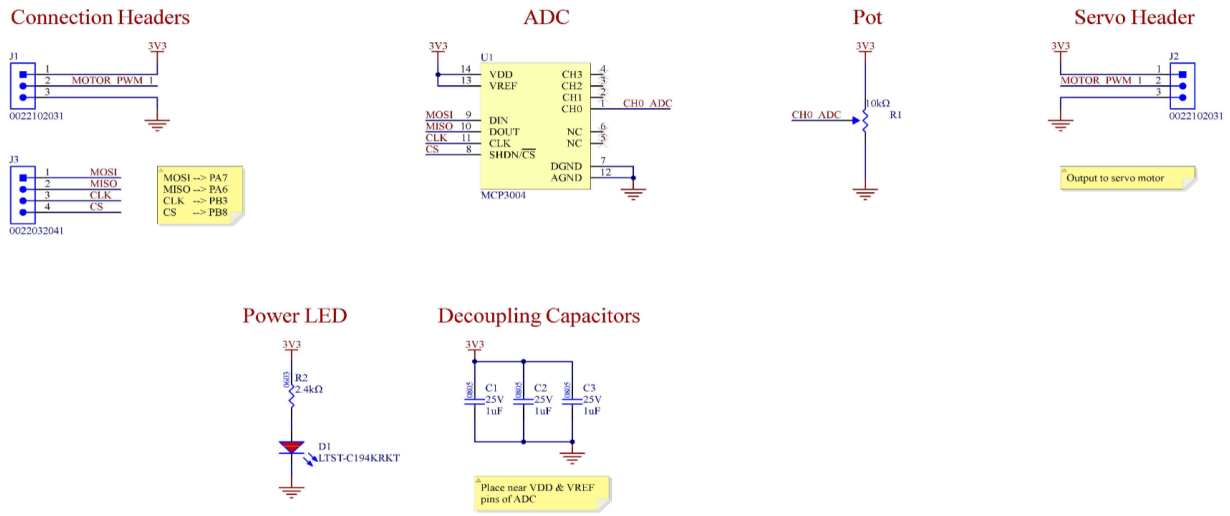
aasaosma@uwaterloo.ca

Embedded: Potentiometer to Servo Motor

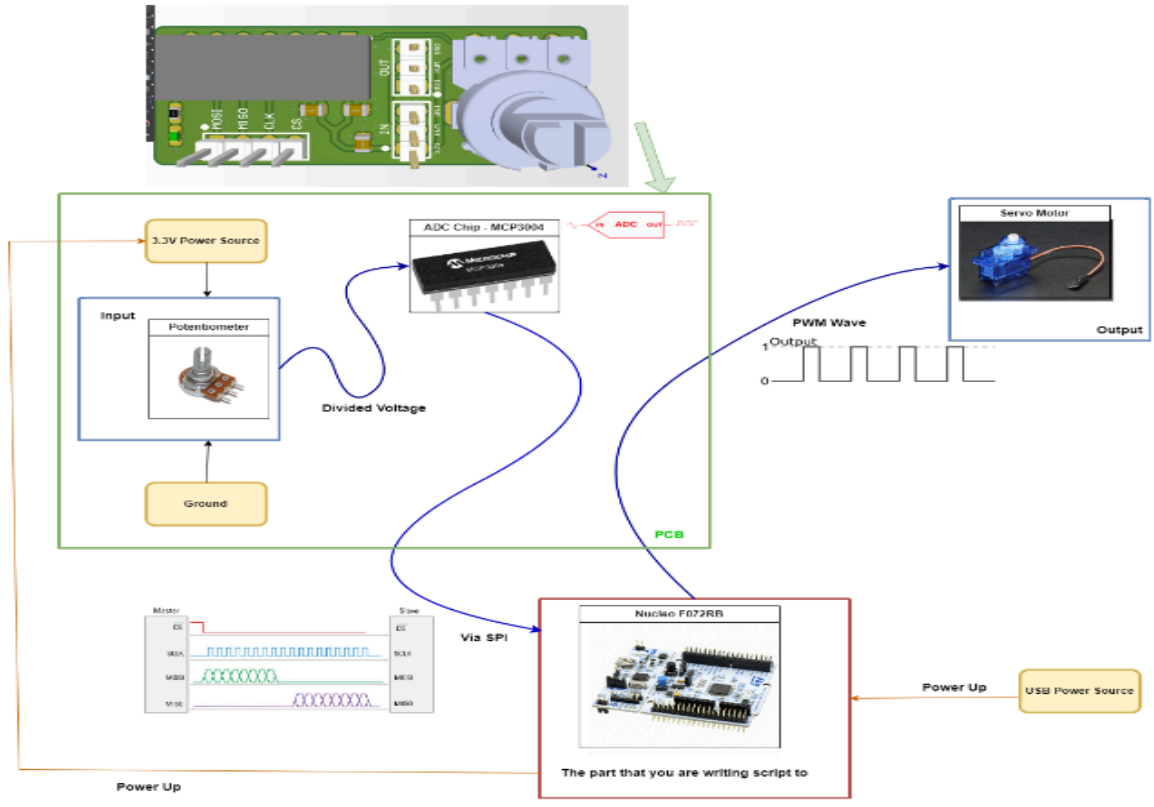
https://github.com/ahmed27037/stm32-bootcamp

- **Executed** a project using the STM32 microcontroller to control motor speed and direction via PWM from a potentiometer input.
- **Combined** a potentiometer with an external ADC and established an SPI connection with the STM32 for accurate data communication.
- **Crafted** software routines to configure SPI and generate a PWM signal, enabling precise motor control based on potentiometer readings.

.



and centering servos.



Ahmed Osman

21081596

1B Electrical Engineering, Honours, Co-operative Program

This job is funded by the Government of Canada as advertised in the job posting. To be eligible you must be a Canadian citizen, permanent resident or a protected person defined by the Immigration and Refugee Protection Act. Do you meet this requirement?	Yes
Are you open to an 8 months co-op?	Yes