

Team 13 Practicum Project Proposal Document

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Project 1: Tilt-Timer Cube with OLED Display

The Tilt-Timer Cube is a portable embedded system that detects its orientation using an accelerometer or IMU sensor and displays information on a small OLED screen. Depending on which face is facing upwards, the cube activates a pre-defined timer duration (1, 5, 10, or 15 minutes). The OLED automatically rotates its display to stay upright, showing the current timer and countdown animation. When the timer completes, the cube provides audiovisual feedback through an LED and buzzer. This project demonstrates sensor fusion, real-time display control, and embedded timing.

Components List:

- 1× LIS3DH or MPU-6050 accelerometer module
- 1× RP2040 or ATSAMD21 microcontroller
- 1× SSD1306 0.96" OLED display (128×64, I²C)
- 1× Piezo buzzer
- 1× Status LED
- 1× 150–300 mAh LiPo battery + TP4056 charger module
- Misc. resistors, capacitors, headers, and power switch

Project 2: Pocket UV-Dosimeter Badge

The Pocket UV-Dosimeter Badge is a small wearable device that measures UV intensity and cumulative exposure throughout the day. When exposure surpasses a threshold, it alerts the user using an LED or buzzer, helping promote sun safety. The project showcases sensor interfacing, threshold logic, and low-power embedded design.

Components List:

- 1× VEML6075 or GUVA-S12SD analog UV sensor
- 1× ATtiny1616 or RP2040/ATSAMD21 microcontroller
- 1× RGB LED + piezo buzzer
- 1× CR2032 coin cell or 150 mAh LiPo + charger
- Misc. resistors, capacitors, and switch

Project 3: Micro Quadcopter

A simplified micro drone project that demonstrates multi-motor control and attitude stabilization without full flight autonomy. It uses an IMU for angle detection and an embedded PID controller to control four brushed motors, simulating drone control systems.

Components List:

- 1× MPU-6050 IMU
- 1× ATmega32U4 or STM32F103 microcontroller
- 4× Brushed DC motors + props
- 4× N-MOSFETs (AO3400)
- 1× LiPo 500 mAh battery + TP4056 charger
- Optional: NRF24L01 receiver + handheld TX
- Misc. connectors, resistors, and switch

Final Choice:

After looking at all three choices, we decided to choose the tilt-timer cube. We believe that the difficulty of this project as well as its concept would be perfect for the practicum project. The UV-Dosimeter is nice, but we think that it may be too simple for the practicum. Then, the quadcopter might be too dangerous to implement as well as take too much time to debug. Whereas the time cube is in the middle ground with regards to simplicity and time to develop, making it the most practical project for our team.

