

Project Proposal Template

Embedded IoT Systems Fall2025

Project Title:

VoltSense: Smart Home Energy Monitor

A dual-domain project integrating Embedded Systems and Web Technologies to monitor home energy usage.

Group Name:

Team CircuitSync

Group Members (IoT + Web Responsibilities):

1. Abdullah Tahir (23-Ntu-CS-1004)

- IoT Task: ESP32 Main Firmware Logic & Wi-Fi Client Handling.
- Web Task: Backend API Development (FastAPI) & Data Processing.

2. Raees UI Mujtaba (23-Ntu-CS-1276)

- IoT Task: Sensor Interfacing (ZMPT101B/ACS712) & Signal Calibration.
- Web Task: Database Architecture (SQL) & Data Logging Integration.

3. Talha Mehmood (23-Ntu-CS-1086)

- IoT Task: On-device Alert System Logic (Threshold Triggers).
- Web Task: Frontend Dashboard UI (React) & Real-time Charts.

Objectives:

- 1: Real-time measurement of AC Voltage and Current using ESP32.
- 2: Seamless transmission of sensor data to a cloud database via REST API.
- 3: Visualization of live energy patterns on a responsive Web Dashboard.
- 4: Automated alert generation for abnormal power consumption.

Hardware Components:

- ESP32 Development Board (Main Controller)
- ZMPT101B AC Voltage Sensor
- ACS712 Current Sensor (20A/30A module)
- Breadboard & Jumper Wires
- 5V Power Supply (USB/Battery)

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Software Stack:

- PlatformIO / VS Code (Firmware Development)
 - Arduino C++ (ESP32 Logic)
 - FastAPI (Python) / Node.js (Backend Server)
 - React.js / HTML5 (Frontend Visualization)
 - PostgreSQL / Supabase (Database)
 - HTTP / REST API (Communication Protocol)
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System Architecture / Block Diagram:

Sensors (Voltage/Current) -> ESP32 (Processing) -> WiFi (HTTP Request) -> Web Server (FastAPI) -> Database -> Frontend Dashboard (User View)