

# Project Proposal Template

Embedded IoT Systems Fall2025

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**Project Title:**

*VoltSense: Smart Home Energy Monitor*

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

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**Group Name:**

Team CircuitSync

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**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.
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**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.
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**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)*