IoT-Based Underground Cable Fault Detection

Underground power distribution eliminates the visual clutter and weather vulnerability of overhead lines, but creates a severe maintenance problem: locating a cable fault currently requires excavating long road stretches. This project implements an IoT-based underground cable fault detection system that computes fault distance electrically. Built around an ESP32, the unit injects a low-voltage test signal into the cable through relay-switched circuitry, measures loop resistance via ADC, and applies the calibrated resistance-per-kilometer constant to derive the fault distance — implementing the classical Murray/Varley loop principle in modern embedded form. Three-phase support identifies the faulted phase (R/Y/B) by sequential testing.

Results are displayed instantly on a 16x2 LCD and simultaneously pushed to a ThingSpeak/Blynk cloud dashboard with an SMS/push alert carrying phase and distance, enabling repair crews to excavate at a single point. A resistor-ladder cable model with fault-injection switches allows repeatable demonstration and calibration at known distances, and the report documents measurement accuracy against injected faults. Compared with legacy Arduino+GSM designs still sold by competitors, the ESP32 + cloud architecture adds remote logging, history analytics, and lower cost. Built-to-order with firmware source code, circuit diagrams, calibration procedure, full project report, presentation PPT, and viva Q&A; support, this project covers embedded systems, electrical measurement theory, and IoT cloud integration — a proven high-demand EEE final-year topic, rebuilt for 2026.