PROJECT IDEA SUBMISSION FORM [with Modification]

INTEGRATED ENGINEERING TEAM PROJECT (IETP4115)

Project Title:

AI-Powered Water Distribution Optimization and Leak Detection System

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Project concept and SDG mapping:

This project aims to develop an AI-assisted water management system that not only monitors reservoir levels but also predicts water demand and detects pipeline leaks using real-time sensor data. The system integrates IoT sensors, machine learning models, and data analytics to optimize water distribution and minimize waste. It contributes directly to:
- SDG 6: Clean Water and Sanitation (ensuring sustainable water management)
- SDG 9: Industry, Innovation, and Infrastructure (using intelligent technology for resource efficiency).

- SDG 12**:** Responsible Consumption and Production; reducing water waste.

Objectives:

• To design a smart water management system capable of detecting leaks and predicting usage patterns.

• To implement real-time data collection and analytics for efficient water distribution.

• To demonstrate an energy- and cost-efficient prototype that minimizes water loss.

Short summary of the project (not more than 200 words):

This project focuses on developing an AI-powered smart water distribution and leak detection system that enhances water resource management. The proposed prototype integrates IoT-based sensors to monitor water flow, pressure, and reservoir levels. Data from these sensors will be analyzed using machine learning algorithms to detect anomalies such as hidden leaks and unusual consumption patterns. The system will automatically control valves and pumps to maintain optimal water flow, and prevent wastage. A cloud dashboard will provide real-time visualization, alerts, and predictive insights for maintenance scheduling. This innovative approach not only improves water efficiency and reduces operational costs but also supports sustainable urban and agricultural water use, setting the foundation for intelligent, scalable water networks.

Materials, Tools, Equipment/Instruments Required:

- Microcontroller: ESP32 / Arduino
- Sensors: Flow sensor, Pressure sensor, Ultrasonic level sensor
- Actuators: Solenoid valves, Relay modules, Mini water pump
- Display & Communication: LCD module, Wi-Fi module, IoT dashboard
- Other Components: Power supply, Breadboard, Tubing, Demonstration tank, Jumper wires
- Software: Python (for AI model), Arduino IDE, Cloud database