PROJECT REPORT

- **Project Title -** IoT-Based Smart Agricultural Monitoring System
- **Department -** Electronics and Communication Engineering
- **Mentor -** Dr. Dinesh Kumar Kothari
- **Submission Date -** 5 November 2025
- **Students-**

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Introduction:

The project is designed to automate and monitor essential agricultural parameters like soil moisture, temperature, humidity, water level, and fire detection using ESP32 and Blynk IoT platform. It provides real-time monitoring and control through the Blynk mobile app. The system can automatically activate a water pump when soil moisture levels are low, detect fire incidents and trigger safety actions, and alert the user through IoT notifications. The goal is to improve farming efficiency and reduce manual supervision by leveraging IoT automation.

Objectives:

- To monitor real-time soil moisture, temperature, humidity, water level, and flame detection.
- To control the water pump automatically or manually via the Blynk app.
- To send alerts and data to a cloud dashboard for remote observation.
- To develop a cost-effective smart farming prototype using ESP32.

Components and Tools Used:

- ESP32 Microcontroller
- Blynk IoT Platform (Cloud + Mobile App)
- Soil Moisture Sensor
- Water Level Sensor
- Ultrasonic Sensor (HC-SR04) for distance and motion detection
- Flame Sensor for fire detection
- DHT Sensor (Temperature and Humidity reading)
- DC Motor (Water Pump)
- Buzzer and LED for alerts
- Wi-Fi Connectivity for IoT communication

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Working Principle / Methodology:

- The ESP32 reads data from soil moisture, flame, DHT, water level, and ultrasonic sensors.
- It sends this data to the Blynk cloud using WiFi, where it can be viewed in real time on the mobile dashboard.
- When soil moisture drops below a threshold, the pump activates automatically to irrigate the soil.
- If fire is detected, the system triggers the LED, buzzer, and pump for emergency cooling.
- Ultrasonic sensor detects nearby motion or obstacles, activating a buzzer for safety alerts.
- Users can manually control the pump through the Blynk app as well.

Output:

- The system successfully monitored and transmitted environmental parameters in real time to Blynk.
- Automatic irrigation triggered correctly when soil was dry.
- Flame detection and safety measures operated as expected.
- The Blynk dashboard accurately displayed live sensor data and allowed manual control of the water pump.

Conclusion:

The project demonstrates the integration of IoT with agriculture for smart farming. It minimizes human effort, conserves water, and enhances crop monitoring. Using ESP32 and Blynk, it provides an accessible and low-cost way to digitize farm management.

Future Scope:

- Integration of AI for predictive irrigation based on weather and soil trends.
- Solar-powered system deployment for rural use.
- Expansion to include pH and nutrient monitoring for better crop management.

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