

## **ABSTRACT**

*This study developed an automatic monitoring system based on Internet of Things (IoT) using the ESP32 microcontroller to monitor environmental conditions in melon cultivation inside a greenhouse. The system uses the AHT10 sensor for temperature and humidity measurement, and the BH1750 sensor for light intensity detection. Sensor data is transmitted in real-time to the Firebase Realtime Database and visualized through an LCD and a remote-accessible web interface.*

*The system applies Mamdani fuzzy logic to control three main actuators: exhaust fan, water pump, and grow light, aiming to maintain optimal growing conditions of 25–30°C temperature, 60–70% humidity, and at least 3000 lux light intensity. The fuzzy logic engine enables adaptive control decisions using defuzzification output and PWM signals to ensure smooth and intelligent response to environmental changes.*

*Testing results showed average measurement errors of  $\pm 0.5^{\circ}\text{C}$  for temperature,  $\pm 2\%$  for humidity, and  $\pm 10$  lux for light intensity. Data was successfully transmitted with a 98% success rate and an average delay of 5 seconds. The system effectively maintained optimal conditions and provided remote access, offering significant potential to enhance the efficiency, accuracy, and productivity of tech-driven agriculture.*

*Keywords : Internet of Things, ESP32, fuzzy logic, greenhouse, AHT10, BH1750, Firebase, monitoring system.*