

ABSTRAK

Rancang Bangun Alat Sistem Monitoring Kualitas Udara pada Ruang Laboratorium sebagai Sistem Pemantauan Dini Kondisi Lingkungan Berbasis Blynk

(2026: xiv + 63 Halaman + 43 Gambar + 7 Tabel + Daftar Pustaka + Lampiran)

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Monitoring kualitas udara di ruang laboratorium secara manual menyebabkan perubahan kondisi lingkungan sulit diketahui secara cepat sehingga berpotensi meningkatkan risiko kecelakaan kerja. Penelitian ini merancang dan membangun sistem monitoring kualitas udara sebagai sistem pemantauan dini kondisi lingkungan berbasis Internet of Things (IoT) menggunakan sensor MQ-135, sensor DHT22, dan mikrokontroler ESP32. Sensor MQ-135 digunakan untuk mendeteksi perubahan kualitas udara melalui nilai ADC, sedangkan sensor DHT22 mengukur suhu dan kelembapan ruangan. Data hasil pengukuran ditampilkan pada LCD 16×2 I2C serta dikirim ke aplikasi Blynk melalui jaringan Wi-Fi sehingga dapat dipantau secara real-time menggunakan smartphone. Sistem juga dilengkapi LED sebagai indikator kondisi udara dan buzzer sebagai alarm ketika nilai yang terukur melebihi batas yang telah ditentukan. Hasil pengujian selama tujuh hari menunjukkan bahwa sistem mampu bekerja dengan baik dalam memantau kualitas udara, suhu, dan kelembapan laboratorium. Sensor MQ-135 berhasil mendeteksi perubahan kualitas udara sesuai aktivitas di laboratorium, sedangkan sensor DHT22 memberikan hasil pengukuran yang stabil. Dengan demikian, alat yang dirancang mampu berfungsi sebagai sistem pemantauan dini (early warning system) untuk meningkatkan keselamatan kerja serta membantu petugas laboratorium dalam memantau kondisi lingkungan secara efektif dan real-time.

Kata Kunci: Monitoring kualitas udara, ESP32, MQ-135, DHT22, Blynk, Internet of Things (IoT), Sistem Pemantauan Dini.

ABSTRACT

Design and Construction of an Air Quality Monitoring System in a Laboratory as a Blynk-Based Early Environmental Monitoring System
(2026: xiv + 63 Pages + 43 Figures + 7 Tables + Bibliography + Appendices)

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Manual monitoring of air quality in laboratory rooms makes it difficult to detect environmental changes at an early stage, thereby increasing the risk of workplace accidents. This study designed and developed an air quality monitoring system as an early environmental condition monitoring system based on the Internet of Things (IoT) using an MQ-135 gas sensor, a DHT22 temperature and humidity sensor, and an ESP32 microcontroller. The MQ-135 sensor was used to detect changes in air quality through ADC values, while the DHT22 sensor measured room temperature and humidity. The measured data were displayed on a 16×2 I2C LCD and transmitted to the Blynk application via a Wi-Fi network, allowing real-time monitoring through smartphones. The system was also equipped with LED indicators to display air quality status and a buzzer to provide an alarm when the measured values exceeded the predetermined threshold. The seven-day testing results showed that the system performed well in monitoring laboratory air quality, temperature, and humidity. The MQ-135 sensor successfully detected changes in air quality according to laboratory activities, while the DHT22 sensor provided stable temperature and humidity measurements. Therefore, the developed system can serve as an effective early warning system to improve laboratory safety and assist personnel in monitoring environmental conditions accurately and in real time.

Keywords: Air Quality Monitoring, ESP32, MQ-135, DHT22, Blynk, Internet of Things (IoT), Early Warning System.