# ABSTRAK

**RANCANG BANGUN SISTEM *TRACKING* ALAT LAB TEKNIK TELEKOMUNIKASI MENGGUNAKAN RFID BERBASIS *INTERNET OF THINGS* (IoT)**

**(2026: xii +58 Halaman + 32 Gambar + 10 Tabel + 25 Daftar Pustaka)**

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Perkembangan teknologi *Internet of things* (IoT) dan *Radio Frequency Identification* (RFID) membuka peluang dalam meningkatkan efisiensi pengolahan alat laboratorium. Pengelolaan alat laboratorium secara manual sering kali menimbulkan berbagai permasalahan, seperti kesulitan dalam proses identifikasi, pencatatan peminjaman, serta pemantauan lokasi alat secara *real-time*. Oleh karena itu, pada perancangan ini dirancang dan dibangun sistem *tracking* alat Laboratorium Teknik Telekomunikasi menggunakan teknologi RFID berbasis IoT yang terintegrasi dengan mikrokontroler ESP32 sebagai pusat pengendali sistem. Sistem ini memungkinkan identifikasi otomatis alat laboratorium, pemantauan lokasi, serta pencatatan peminjaman secara *real time* melalui platfrom berbasis *cloud* yaitu *google sheet*. Pengujian sistem meliputi akurasi pembacaan RFID dengan akurasi 100%, jarak maksimum pembacaan dengan jarak baca maksimum 3 cm, waktu respon dengan rata-rata terespon pada 04:99 (detik), pembacaan kartu berikunya biasanya di sekitar 05:45-07:32 (detik), serta sinkronisasi ke database. Hasil pengujian menunjukkan sistem mampu membaca tag RFID dengan akurasi tinggi, mampu memonitor lokasi alat secara *real time*, sehinggga mampu meningkatkan efisiensi dan transparansi pengolaaan inventaris laboratorium.

**Kata kunci** : *Internet of things* (IoT), *Radio Frequency Identification* (RFID), ESP32, *tracking* alat Laboratorium, *google sheet*.

## *ABSTRACT*

***DESIGN AND DEVELOPMENT OF A TELECOMMUNICATION ENGINEERING LABORATORY EQUIPMENT TRACKING SYSTEM USING RFID BASED ON THE INTERNET OF THINGS (IoT)***

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*The development of Internet of Things (IoT) and Radio Frequency Identification (RFID) technologies has created opportunities to improve the efficiency of laboratory equipment management. Manual management of laboratory equipment often leads to various problems, such as difficulties in equipment identification, loan recording, and real-time location monitoring. Therefore, this project designed and developed a Telecommunication Engineering Laboratory equipment tracking system using RFID technology based on IoT, integrated with an ESP32 microcontroller as the main system controller. The system enables automatic identification of laboratory equipment, location monitoring, and real-time loan recording through a cloud-based platform, namely Google Sheets. System testing included RFID reading accuracy, maximum reading distance, response time, and database synchronization. The test results showed that the system achieved an RFID reading accuracy of 100%, a maximum reading distance of 3 cm, and an average response time of 4.99 seconds. The subsequent card reading process required approximately 5.45 to 7.32 seconds. In addition, the system successfully synchronized data to the database in real time. These results indicate that the proposed system is capable of monitoring equipment locations effectively and can improve the efficiency and transparency of laboratory inventory management.*



**Keywords :** *Internet of Things (IoT), Radio Frequency Identification (RFID), ESP32, laboratory equipment tracking, Google Sheets.*