

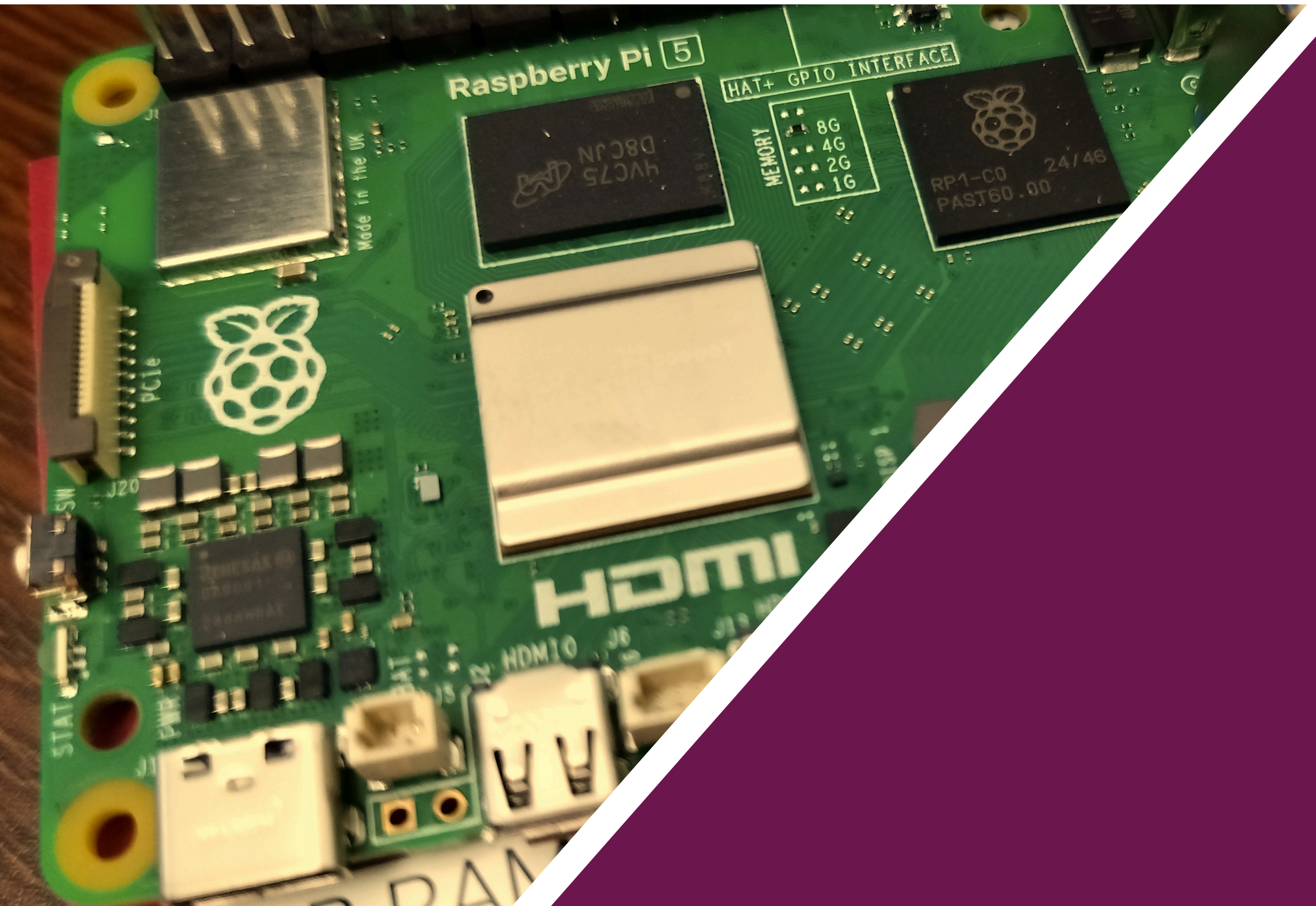


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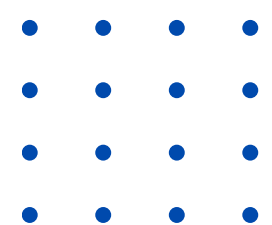
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10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

VOLUME 1



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JOHOR BRANCH
PASIR GUDANG CAMPUS



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FOREWORD BY THE PROGRAM CHAIR



Greetings from the Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025).

As the Program Chairs, it is our great pleasure to present this compilation of extended abstracts, showcasing the remarkable projects developed by our final-semester students from the Diploma in Electrical Engineering (Power) and Diploma in Electrical Engineering (Electronics) programs at Universiti Teknologi MARA, Cawangan Johor, Pasir Gudang Campus.

This exhibition marks a significant milestone in our students' academic journey, representing the culmination of years of dedication, perseverance, and learning. It also serves as an essential step toward the successful completion of their diploma studies. The projects featured this year are centered on the theme *Engineering Excellence: Bridging Technology and Life*, reflecting current trends and innovations in the engineering field.

This extended abstract book highlights not only the students' technical expertise but also their creativity, problem-solving skills, and ability to engage meaningfully with peers and industry professionals. Within these pages, you will find a diverse range of projects that embody a unique blend of knowledge, innovation, and practical application.

We warmly invite you to explore this collection, which celebrates the achievements of our aspiring engineers. Welcome once again to the Electrical, Electronics, and Systems Engineering Exhibition 2025. May the insights shared here inspire and pave the way for the next generation of innovative engineers.

Warm regards,

Dr. Fatimah Khairiah binti Abd Hamid

Dr. Atiqah Hamizah binti Mohd Nordin

Program Chairs

Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025)



RFID-Enabled Electromagnetic Door Lock System Powered by Solar Panel

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ABSTRACT

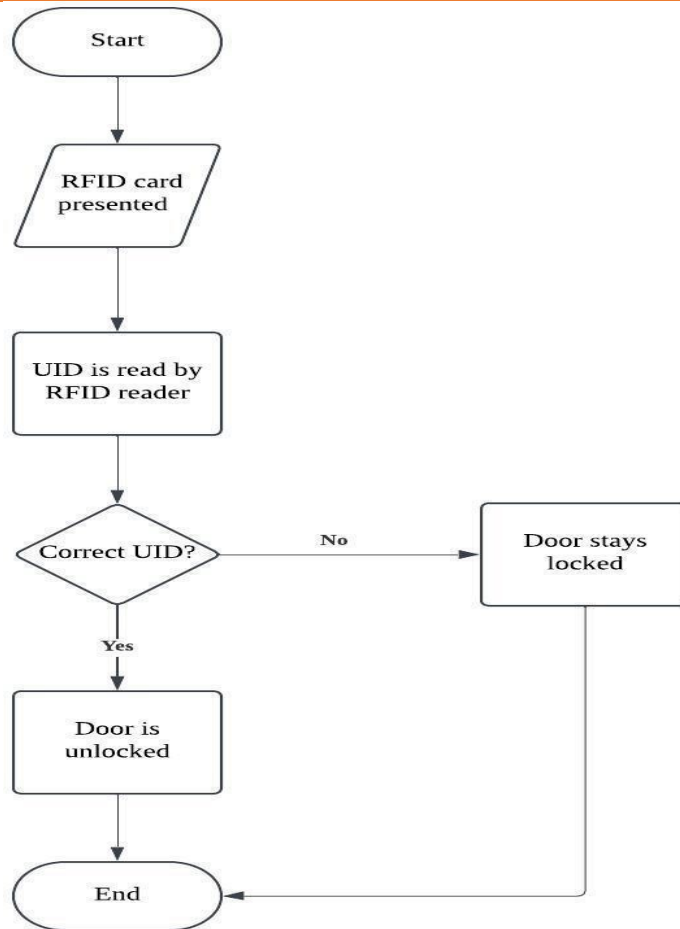
Most doors that use traditional lock systems, which utilize mechanical locks, are being replaced by electrical and control-based lock systems that offer more capabilities and features compared to traditional lock systems. One of the most important features of these lock systems is their high efficiency. In this project, an electromagnetic lock system was constructed by combining mechanical and electronic components into a functional device. A microcontroller ESP32 was used to control every function, process information, and relay signals to all the other components in the device. The inputs for this device include an RFID module, a push button, and a mobile app. The RFID module reads the UID of the RFID tag or card presented by the user. The push button functions as a way of opening the lock from the inside, while the mobile app serves as a remote control to open the lock without presenting an RFID tag or card. An electromagnetic lock secures the door during the lock state. The main system performances include a read range of approximately 20 mm and the ability to detect RFID tags or cards through thin materials like paper, plastic, glass, and cloth. However, materials like aluminum and iron interfere with the RFID reader, preventing it from reading the RFID UID.

KEYWORDS: RFID, Electromagnetic Lock, ESP32, Button, IoT, Mobile App

PRODUCT DESCRIPTION

The RFID Electromagnetic Lock System is a simple, fast, and reliable lock system that uses an electromagnetic lock integrated with RFID for control of the lock and unlock state. It utilizes renewable energy by drawing power from a solar-charged battery [1]. The system's key feature is its reliability, ensuring security even during power outages. Even in the case of a blackout, the lock system remains fully operational [2]. Another significant feature is the ability to operate the lock remotely, enabled by integrating a mobile app. This feature proves beneficial in scenarios where users cannot access their RFID tag or card but still need to unlock the door. Additionally, it allows users to authorize access remotely in situations where they cannot be physically present but need someone to retrieve items.

FLOW CHART AND TABLE



RFID Detection Range Test Results (mm)						
Range	05	10	15	20	25	30
Functioning	Yes	Yes	Yes	Yes	No	No

NOVELTY AND UNIQUENESS

The RFID-Enabled Electromagnetic Access Control System with solar power integration is a novel and sustainable solution for modern security needs [2]. It offers a unique combination of energy efficiency, user interaction, and scalability. By employing a solar panel and battery backup, the system ensures eco-friendly operation and reliability, even in off-grid locations [1]. Robust security mechanisms, including relay-controlled electromagnetic locks, are complemented by visual (LCD and LEDs) and auditory (buzzer) feedback, enhancing user interaction [4]. The use of commonly available components such as the ESP32 and MFRC522 ensures cost-effectiveness and adaptability [4]. Its customizable authentication system supports dynamic updates to authorized RFID credentials, making it versatile for various applications, from smart homes to rural setups [6]. This project bridges the gap between traditional access systems and advanced, sustainable, intelligent security solutions [5].

BENEFIT TO MANKIND

The RFID-Enabled Electromagnetic Access Control System powered by solar energy benefits humanity by enhancing security, sustainability, and accessibility [1]. Its use of renewable energy reduces dependence on conventional power sources, promoting environmental conservation. This makes it suitable for deployment in remote or underdeveloped regions [6]. Its user-friendly design meets the growing demand for efficient access control in diverse settings like homes, offices, and public facilities [5]. The system's affordability and scalability ensure accessibility for a wide audience, while its IoT integration potential supports smart living through remote monitoring and control [4]. This project demonstrates the potential of combining technology with sustainability to address modern security challenges effectively [3].

COMMERCIALIZATION POTENTIAL

This project demonstrates strong commercialization potential by merging security, sustainability, and affordability into a single solution [2]. Unlike traditional access control systems reliant on grid electricity, its solar-powered design ensures functionality in off-grid areas and regions with unreliable power supplies [6]. The integration of RFID technology addresses the growing need for smart, user-friendly security systems [5]. Compared to existing market products, it offers reduced operational costs while prioritizing environmental sustainability, positioning it as an eco-conscious and cost-effective alternative. Its modular and scalable design makes it adaptable for diverse applications, ranging from small households to large corporations [4]. Moreover, its compatibility with IoT devices enhances its market relevance, allowing for seamless integration into advanced smart home or industrial systems. By addressing the gaps in current access control solutions, this project stands out as a competitive and innovative option in the renewable energy and smart security markets [3].

CONCLUSION

In conclusion, the RFID-enabled electromagnetic access control system powered by a solar panel represents a step forward in sustainable and secure access management. By leveraging renewable energy and advanced RFID technology, it addresses energy efficiency, environmental impact, and robust security challenges. Its seamless integration of components, user-friendly interface, and modular design ensure adaptability for diverse applications. This project highlights the potential of modern technology combined with sustainability to address global security needs. It serves as a testament to how innovation can enhance quality of life while contributing to a greener and more secure future.

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