

# ELECTRICAL ENGINEERING INNOVATION COMPETITION & EXHIBITION 2025

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### FOREWORD BY IR DR. ILHAM BIN RUSTAM KPP FKE UITMCTKD

All praise be to Allah for the successful culmination of this collaborative endeavor between Politeknik Sultan Mizan Zainal Abidin and Universiti Teknologi MARA (UiTM) Terengganu, which has led to the publication of this compilation of Extended Abstracts. The field of Electrical Engineering continues to evolve at a remarkable pace, driven by rapid technological advancements and the increasing demand for smarter, more sustainable, and efficient systems. This publication presents a curated collection of extended abstracts derived from final year projects undertaken by students of the Electrical Engineering programs at both institutions. These projects not only reflect the students' technical capabilities but also their creativity, critical thinking, and commitment to addressing real-world engineering challenges. I would like to express my heartfelt appreciation to all contributors, particularly the editorial teams, for their dedication and hard work in bringing this publication to life. May the knowledge, methodologies, and outcomes shared within these pages serve as a source of inspiration and a foundation for future advancements in the field of Electrical Engineering. More importantly, may it continue to embody the spirit of discovery and lifelong learning that lies at the core of engineering education. Thank you.

### FOREWORD BY HAJI MOHD DASRI BIN CHE MOK @ ADNAN KJ JKE PSMZA

All praise be to Allah for the successful publication of this collection of Extended Abstracts for Final Year Projects, a collaborative effort between the Electrical Engineering Department of UiTM Terengganu and the Department of Electrical Engineering (JKE), Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu. I extend my heartfelt congratulations to the editorial teams from both UiTM Terengganu and JKE PSMZA, as well as everyone involved in making this publication possible. This compilation showcases the work of diploma students in electrical engineering and is intended to serve as a valuable reference for students, especially those currently undertaking their final year projects. Thank you.



## **Extended Abstracts of Final Year Projects**

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# SMART MEDICINE BOX (S.M.B)

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**Abstract:** The IoT-enabled Smart Medicine Box project is designed to assist patients in taking their medication on time. By integrating IoT technology with automated scheduling and tracking, the system provides users with timely reminders, real-time dose monitoring, and remote access—especially useful for caregivers at a distance. The smart medicine box features an automatic timer that activates when medication needs to be taken. Notifications are sent to a remote smartphone as reminders for medication intake. Timing can be set according to the patient's specific requirements. These features are beneficial for patients who are forgetful, busy, or on frequent dosing schedules. This device is designed to be portable, user-friendly, and accessible for people of all ages. It also includes a notifier when the medication box is empty and needs a refill. It offers great convenience for both patients and caregivers

**Keywords:** IoT, smart medicine box, remote monitoring

## INTRODUCTION

Medication intake is an important aspect of effective healthcare. However, many patients fail to follow prescribed medication schedules consistently. This is due to various reasons, such as busy lifestyles or simply forgetting to do so. Missed doses can lead to poor health outcomes, making it essential to have solutions that support timely medication intake. This paper presents the development of an IoT-enabled Smart Medicine Box [4], designed to simplify medication management by providing reminders and ensuring the availability of medicine in the box itself.

Previous research on medication management includes various reminder applications and electronic pillboxes with basic timer functions. However, many existing solutions lack integration with current technology, particularly the Internet of Things (IoT). IoT enables real-time tracking and remote accessibility. This project, the Smart Medicine Box, addresses this by combining IoT-powered automation with a user-friendly interface, making medication management easier for a broad range of users.

The Smart Medicine Box is built using the NodeMCU [1] microcontroller, which provides wireless connectivity and automation. Some of its key features include an automatic timer that activates when medication is taken, reminders sent to users' smartphones at the exact dosage time, and an automated notification to refill the medicine box. This device is portable, user-friendly, and customizable to suit individual needs.

Initial usage showed that the Smart Medicine Box effectively supports users in maintaining consistent medication routines. Therefore, it can reduce missed doses and enable caregivers to remotely monitor medication intake. This solution is a practical and affordable tool for promoting better health outcomes among patients.

## METHODOLOGY

This section details the framework adopted for the design and development of the Smart Medicine Box. It incorporates both hardware and software components, with the aim of providing an affordable, user-friendly solution to improve medication intakes.

### A. Project Framework

The framework is supported by a block diagram and a project flowchart.

- The **project block diagram** provides a simplified overview of the Smart Medicine Box system architecture. It consists of three main stages that are input (sensor and timer), process(NodeMCU) and output (LED, phone)
- The **project flowchart** illustrates in Figure 1 shows how the Smart Medicine Box functions during runtime, starting from the moment the system is powered on, checking for the availability of medicine, monitoring the timer, and sending notifications to the patient and caregiver. Figure 2 shows the final product of this project.

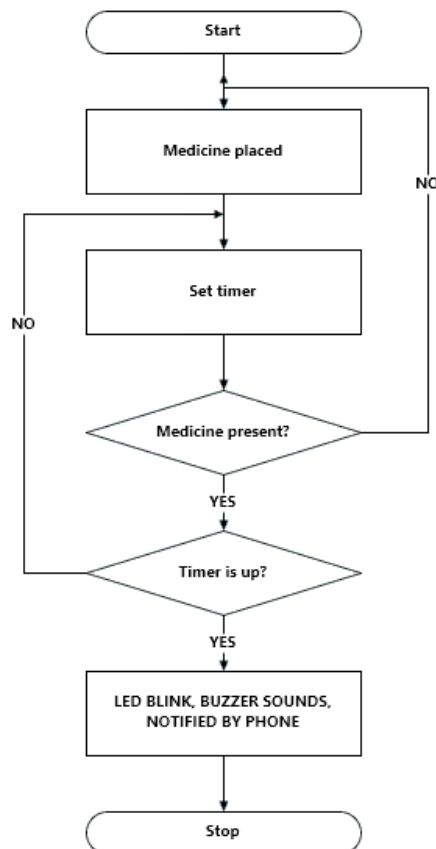


Figure 1. Project flowchart



Figure 2. Final product

### B. System Architecture

The overall architecture of the system integrates both hardware and software components with a focus on Internet of Things (IoT) functionality. The hardware includes IR sensors [2] to detect the availability of medicine in the compartment and LEDs to provide real-time visual feedback to the user. Through IoT connectivity, the system can send timely notifications to the user's smartphone and caregivers, ensuring medication adherence. This architecture allows remote monitoring, real-time interaction, and enhances the overall efficiency of medication management.

### C. Software and IoT Integration

Software development was conducted using NodeMCU and is programmed to trigger reminders at scheduled times, monitor whether medicine box is empty and notify the patient/caregiver via the Blynk [3] mobile application. Integration with the Blynk platform enables real-time alerts to be sent to a smartphone, ensuring that users and caregivers remain informed. Wi-Fi is configured for cloud communication, enabling remote monitoring.

## RESULT AND DISCUSSION

The Smart Medicine Box project works well, with all components functioning as planned. A NodeMCU microcontroller is connected to an IR sensor and two LEDs. The system continuously checks if the medicine box is empty or not. One LED blinks when the box is empty, reminding the user to refill it. The other LED blinks at scheduled times to remind the user to take their medicine, helping prevent missed doses. The system was tested using the Blynk app, confirming that the LEDs blink correctly. Caregivers can also monitor the box remotely through the app, providing extra support. In summary, this simple yet effective system helps users manage their medication and allows remote monitoring by caregivers, improving health and safety.

## CONCLUSIONS

The Smart Medicine Box project shows how simple technology can help users remember to take their medicine and know when it's running out. Using a NodeMCU, IR sensor, and three LEDs, the system continuously monitors the medicine box. One LED blinks when the box is empty, another reminds users to take their medicine, and a third shows the system is online. This setup supports regular medication and helps users avoid missed doses. However, there are some limitations. The system relies on blinking lights and a smartphone app, which may not be suitable for users with poor vision. Reminder times are fixed and difficult to change, especially for elderly users. Also, the Blynk app depends on a stable internet connection for remote monitoring. Despite these issues, the project offers practical benefits for both users and caregivers. It supports consistent medication habits and allows remote monitoring, showing how affordable technology can improve healthcare. Future improvements could include sound or vibration alerts and an easier way to set reminder times. The system could also be expanded to support various medicine storage needs.

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# MOBILE PHONE CHARGING KIOSK WITH SAFETY SYSTEM

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**Abstract:** Mobile Phone Charging Kiosk with Safety System project was developed to tackle a common issue that everyone faces which is phone batteries dying, especially during out in the city or busy shopping while waiting for friends. So, the primary goal is to set up these charging stations in convenient public areas. It's also designed to be a real help during emergencies when a dead phone is the last thing needed. For security, each charging spot uses a door lock system that works with a PIN. To use it, users need to make a payment at the kiosk counter and receive a PIN to unlock the secure locker. As an added feature, the system using a servo motor to open or close the locker door which is controlled by PIN. The power supply will be cut off immediately once the designated charging period expires, regardless of whether the phone has been fully charged. So, the main benefit is making daily life more convenient for everyone. It also removes the worry about phones getting stolen while charging. This project will allow users to easily charge their phones at nearby kiosks as they go about their day. On the technical side, the project involves components like door locks which is operated with a keypad lock, relays, Arduino UNO which is to control and operate the system. The locker also equipped with an LCD display that shows on-screen prompts such as PIN entry instructions, PIN validation messages, and the status of the door and charging

**Keywords:** Mobile Phone Charging Kiosk, PIN, secure locker, keypad lock, relay. Solar-powered roof cooling, Arduino control, roof sprinkler system.

## INRODUCTION

This charging kiosk project aims to solve the problem of running out of phone batteries while outside. It introduces a secure charging kiosk designed for public areas, such as shopping malls, to address the common issue of depleted mobile phone batteries, a concept aligned with the development of smart city components [1]. The kiosk operates on a PIN-based security system, which is a recognized method within the broader field of modern door lock security systems [2]. Users first obtain a unique PIN from the service counter, which is then entered using an integrated keypad. Upon correct PIN validation, a servo motor unlocks and opens a secure locker, where the user can place their phone for charging. Once the locker is closed, the phone is secured, allowing the user to leave it unattended. The entire operation of the system is managed by an Arduino UNO microcontroller, a common and effective interface for developing smart charging devices [3]. It is responsible for validating the PIN to control the servo-operated door lock and monitoring the locker's status. To enhance security, the system will activate a warning indicator if the door is not fully closed. Furthermore, the Arduino manages a pre-set charging timer, automatically cutting off the charger's power supply once the charging expires. This function not only regulates the use of the kiosk but also acts as a critical safety feature to prevent overcharging and potential fire hazards [4].

## METHODOLOGY

Figure 1 shows the flowchart of the Mobile Phone Charging Kiosk with Safety System. To use the charging locker, the user first obtains a unique PIN from the service counter. The PIN then entered using an integrated keypad. A correct PIN will unlock the locker door. A warning indicator activates while the door opens. The timer starts counting the charging time as soon as the phone is connected to the charger. When the charging time expires, the relay will cut off the charger's power supply. The user re-enters the same PIN to unlock the door locker again to retrieve the phone.

Flowchart of the Mobile Phone Charging Kiosk with Safety System

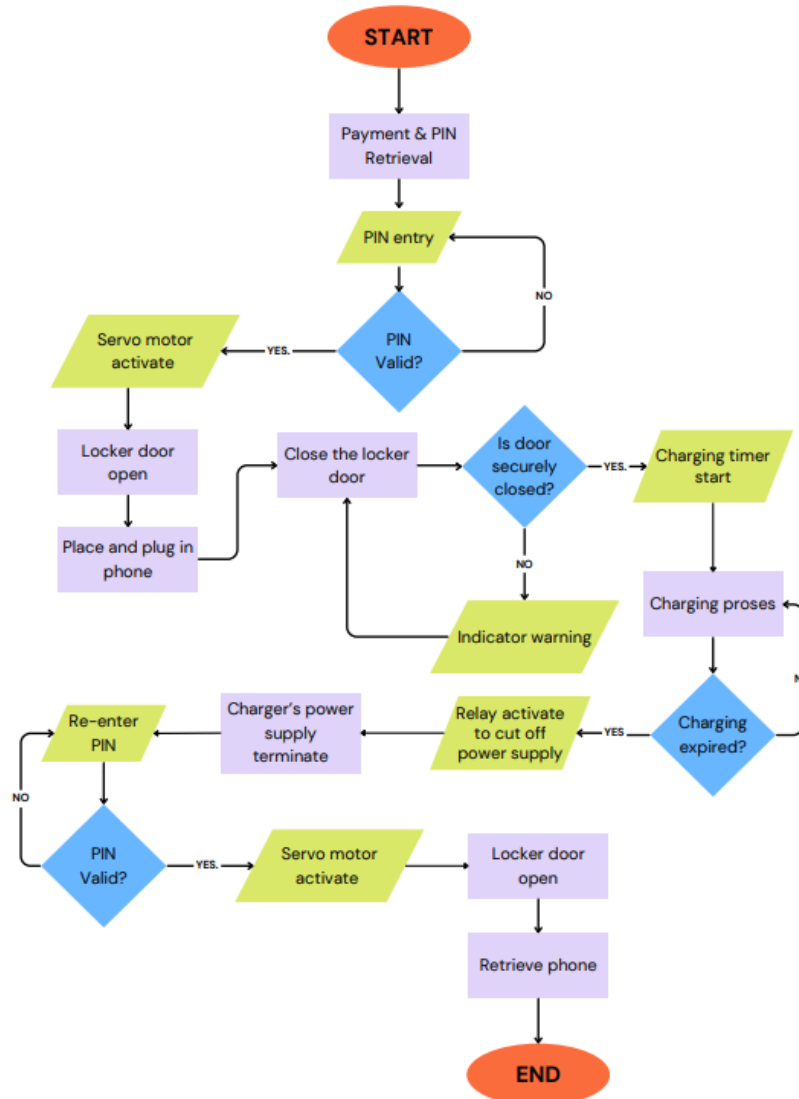


Figure 1. Flowchart of the Mobile Phone Charging Kiosk with Safety System

## RESULT AND DISCUSSION

Figure 2 shows the prototype model of Mobile Phone Charging locker and Table 1 presents the operational results for the Mobile Phone Charging Kiosk. The system's performance is assessed based on two key inputs that govern three distinct outputs. The first input, the PIN entry system, controls the actuation of the servo motor and the activation of the warning indicator. The second input, the pre-set timer, is responsible for automatically cut-off the charger's power supply.



Figure 2. Prototype model of Mobile Phone Charging locker

Table 1. Operational results for the Mobile Phone Charging locker

Input	Output	Status	Action	Description
PIN Entry system	Servo motor	ON	Release the door lock	Correct PIN entry
	Warning indicator	ON	Warning the door is open	Safety element for user attention
Pre-set timer	Relay	ON	Cut-off the charger's power supply	Charging time expired

## CONCLUSIONS

In conclusion, this project has successfully developed a functional prototype of a secure mobile phone charging kiosk, with providing a convenient and safe charging solution for public spaces. The integration of an Arduino UNO controller with a PIN-based keypad, a servo-operated lock, and an automated timer has proven to be an effective approach. The final system demonstrates a practical and reliable solution to the prevalent issue of depleted mobile phone batteries. Future enhancements could include the integration of a cashless payment gateway, the addition of wireless charging capabilities, or the development of an IoT-based notification system to further improve the user experience and commercial potential of the kiosk.

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# AUTOMATIC WATERING PLANT

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**Abstract:** Automatic Watering Plant proposed the development of an automatic watering system that enable users to manage plant irrigation remotely via an application using a smartphone. The objective is to create an efficient and automated watering mechanism using Arduino Uno and ESP8266 microcontrollers, combine with a mobile interface. This system addresses the challenge of maintain large gardens, particularly when time or physical presence is limited. The model include a water pump and scheduled irrigation control via an internet connection. The project goes through several phases: literature review, system design, prototype development, testing and final documentation. Benefits of the system include time-saving, consistent watering for plant health and increase integration of technology in daily life.

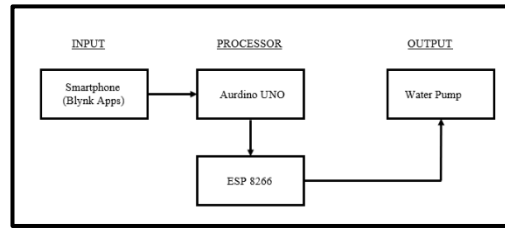
**Keywords:** Watering System, Smart Farming, Remote Plant Monitoring, Aurdino Uno, Mobile Control Watering System

## INTRODUCTION

In recent years, the integration of technology in small gardening and also agriculture has significantly improved the efficiency and effectiveness of crop management. Among the key innovations is the automation of irrigation systems, which allows for precise and scheduled watering without the need for constant human intervention. This is particularly beneficial for individuals who manage large gardens or are frequently away from their plants. This project introduces an *Automatic Watering System* designed to remotely control plant irrigation using a smartphone. The system utilizes microcontrollers such as the Arduino UNO and ESP8266 to receive commands and trigger the watering process based on a predefined schedule. The need for this project arises from common problems faced by gardeners, such as lack of time, inconsistent watering, and inefficient use of water resources. By developing a smart and automated solution, this project aims to reduce manual labor, promote plant health, and demonstrate the practical application of Internet of Things (IoT) technology in everyday life.

## METHODOLOGY

The development of the Automatic Watering System was carried out in four main phases. First, a literature review was conducted to study similar projects and understand the use of microcontrollers, soil moisture sensors, and IoT integration in smart irrigation. Based on this, the system was designed using Arduino UNO as the main controller, ESP8266 for Wi-Fi connectivity. A water pump was included to carry out irrigation. Next, the prototype was built by integrating all components according to the circuit design. Programming was done using the Arduino IDE, allowing the system to operate automatically or through commands sent from a smartphone. The third phase involved testing the prototype in different conditions to check its responsiveness and reliability. Necessary adjustments were made to improve performance. Finally, all processes were documented, and the final prototype was demonstrated, showing its ability to simplify plant watering and reduce the need for manual intervention.



**Figure 1 : Block Diagram**

## RESULT AND DISCUSSION

Prototype development faced several technical challenges despite successful attempts at wiring and basic programming. Firstly, the ESP8266 module encountered frequent Wi-Fi disconnections, limiting the system's ability to be controlled remotely in real-time. Lastly, the shared power supply was insufficient to sustain both the microcontroller and the water pump simultaneously, causing the system to shut down during operation. These issues suggest that improvements are needed in sensor calibration, using separate power sources for motor and control components, and potentially replacing the existing setup with more integrated and reliable hardware such as NodeMCU or ESP32 for better performance and stability.

## CONCLUSIONS

Although the prototype was incomplete, this project provided valuable insights into the challenges of developing a smart irrigation system. Lessons learned include the importance of dedicated power supplies for high-draw components, proper sensor calibration, and the limitations of using Arduino UNO with ESP8266 for full IoT functionality. Future versions of the system are expected to incorporate more integrated controllers like Node MCU or ESP32, along with improved wiring architecture and cloud-based control features.

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