KONERU LAKSHMAIAH EDUCATION FOUNDATION

AZIZ NAGAR, HYDERABAD

DEPARTMENT OF ECE

Project Proposal

1.0	**Details of Candidates:**	(i) D. Lahari (2310040036) (ii) M. Sravya(2310040032) (iii) A.Kavyanjali(2310040033) (iv) Bala Sai Ram(2310040044)
	Course of Study:	B.TECH/ECE
	Year:	II
	Semester:	EVEN
2.0	**Course Details:**	23SDEC02A EMBEDDED SYSTEM AUTOMATION
3.0	**Name of Supervisor:**	Dr. Mrs Kosaraju Madhavi Associate Professor, KLEF/ECE
4.0	**Proposed Title:**	Smart Trash Can

FEB,2025

5.0 Introduction

5.1 **Objective**: The objective of a smart trash bin is to make waste management easier, cleaner, and more efficient. Key goals include:

- **Sorting Waste**: Automatically separating recyclables, compost, and trash to help the environment.
- **Monitoring Fill Levels**: Sensing when the bin is full and alerting for pickup, reducing unnecessary collections.
- **Encouraging Recycling**: Promoting eco-friendly waste disposal through better sorting.
- **User-Friendly**: Offering features like hands-free opening and odor control for convenience.
- **Saving Energy**: Reducing trips for trash collection and minimizing environmental impact.

5.2 **Sensors**:

- **Ultrasonic Sensor**: Measures the distance to trash, determining when the bin is full.
- **Servo Motor**: Opens and closes the bin lid automatically based on motion detection.
- **Motion Sensor**: Detects nearby movement to trigger automatic lid opening.
- **Weight Sensor**: Measures the bin's weight to determine when it needs to be emptied.

5.3 **Data Collection**: Sensors collect real-time data on smart trash bin parameters.

5.4 **Microcontroller Integration**: The ESP32 microcontroller connects sensors and servo motor, processes data, and automates lid control, fill detection, and weight monitoring efficiently.

5.5 **Data Transmission**: The ESP32 sends sensor data to the **Blynk IoT app** via Wi-Fi, enabling real-time monitoring of fill level, weight, and status.

5.6 **Analysis**: The **Blynk IoT app** collects real-time data from the ESP32, analyzing fill level, weight, and usage patterns. This helps optimize waste management, send alerts, and improve efficiency for smarter disposal

5.7 **Applications**: Smart trash bins using **Blynk IoT app** and **ESP32** are used in homes, offices, streets, and public spaces for real-time monitoring, automated waste management, optimized collection, and reduced environmental impact.

5.8 **Impact**: Smart trash bins using **Blynk IoT app** and **ESP32** improve waste management, reduce overflow, optimize collection, promote recycling, and enhance cleanliness, leading to a healthier environment and smarter urban waste disposal systems.

5.9 Problem Statement

Here are a few variations of the problem statement for your smart trash bin using ESP32 and Blynk IoT app:

- Inefficient waste management leads to overflowing bins, bad odors, and irregular disposal schedules. A smart trash bin with ESP32 and Blynk IoT provides real-time monitoring, automated alerts, and optimized collection to improve hygiene and efficiency.

- Manual waste monitoring results in delayed collection, unhygienic conditions, and increased pollution. A smart bin using ESP32 and Blynk IoT ensures real-time tracking, reducing overflow and enhancing waste disposal efficiency.

- Traditional bins do not provide waste level updates, causing inefficient collection and environmental hazards. A smart trash bin integrated with ESP32 and Blynk IoT enables automated tracking, reducing unnecessary pickups and improving waste management.

- Unmonitored waste bins lead to littering and health risks. A smart trash bin with ESP32 and Blynk IoT enables remote waste tracking, optimizing collection schedules, and promoting a cleaner environment.

5.10 Objectives of the study

The smart trash bin using **ESP32** and **Blynk IoT app** aims to:

1. Monitor Waste Levels – Detect how full the bin is in real-time.
2. Automate Lid Opening – Open the bin automatically using motion sensors for a hands-free experience.
3. Track Weight – Measure the trash weight to know when the bin is too full.
4. Send Alerts – Notify users via the Blynk app when the bin needs to be emptied.
5. Optimize Waste Collection – Help reduce unnecessary trash pickups and improve waste management.
6. Promote Cleanliness – Prevent overflowing bins, bad odors, and littering.
7. Improve Efficiency – Reduce manual checking and make waste disposal smarter and easier.

5.11 Scope of the Project

The smart trash bin using ESP32 and Blynk IoT app focuses on:

1. Real-Time Waste Monitoring – Detects trash levels using sensors and updates data on the Blynk app.
2. Automatic Lid Operation – Uses motion sensors and a servo motor to open and close the lid hands-free.
3. Weight Measurement – Tracks the bin's weight to prevent overloading.
4. Instant Notifications – Sends alerts via the Blynk app when the bin is full or needs attention.
5. Optimized Waste Collection – Helps reduce unnecessary trash pickups, saving time and resources.
6. User-Friendly Interface – Provides easy access to waste data through the Blynk IoT app.
7. Environmental Benefits – Promotes cleanliness, reduces waste overflow, and supports smart waste management.

5.12 Literature Review

Traditional Waste Management Issues:

Traditional trash bins are often inefficient, leading to problems like overflowing and unscheduled waste collection. These issues can create unhygienic conditions and waste resources by requiring unnecessary pickups.

Role of ESP32 in Smart Bins:

The ESP32 microcontroller is a popular choice for IoT projects due to its low cost, built-in Wi-Fi and Bluetooth capabilities, and sufficient processing power. It connects sensors to monitor the bin's status and enables real-time data transfer.

Ultrasonic Sensors for Fill Level Monitoring:

Ultrasonic sensors are commonly used to measure the fill level of smart bins. These sensors detect the distance between the sensor and the trash, providing information about when the bin is full and needs to be emptied.

Weight Sensors for Load Monitoring:

Weight sensors are often integrated to measure the weight of the trash. This allows the bin to track when it's overloaded, ensuring it gets emptied before it becomes too heavy or overflows, optimizing the waste collection process.

Automation with Servo Motors:

Servo motors automate the opening and closing of the bin lid. When the motion sensor detects movement nearby, it triggers the servo motor to open the lid, allowing for a hands-free operation. This reduces human contact with the trash and improves hygiene.

Real-Time Monitoring and Data Transmission:

The ESP32 enables real-time monitoring by transmitting data from the sensors to a connected mobile app or cloud platform. This allows users to track the status of the bin remotely, making waste management more efficient and responsive.

Environmental Benefits:

Smart trash bins using ESP32 contribute to a cleaner environment by preventing waste overflow, optimizing collection schedules, and promoting recycling. This leads to reduced pollution and more efficient waste management practices**.**

6.0 Abstract:

This project focuses on creating a smart trash bin using the ESP32 microcontroller. The goal is to improve waste management by automating the process of monitoring and collecting trash. The system uses ultrasonic sensors to measure the fill level of the bin, ensuring that it alerts when the bin is full. Weight sensors are added to track the load of the trash and prevent overloading. A servo motor is used to open and close the bin lid automatically based on motion sensors, providing a hands-free experience. The ESP32 microcontroller connects all these sensors and transmits the data to a mobile app for real-time monitoring. This system helps in optimizing waste collection, preventing overflow, and promoting a cleaner environment by reducing unnecessary pickups. Overall, the project aims to make waste management more efficient, environmentally friendly, and user-convenient.

7.0 Methodology

1. **Components Used**: The project uses **ESP32**, **ultrasonic sensors** (for fill level), **weight sensors**, **motion sensors**, and a **servo motor** for automation.
2. **Sensor Integration**:
    - **Ultrasonic** measures bin fill level.
    - **Weight sensors** track trash weight.
    - **Motion sensors** detect nearby movement to open the bin lid automatically.
3. **Programming**: The **ESP32** controls sensors, the servo motor, and transmits data to the **Blynk IoT app**.
4. **Real-Time Monitoring**: The **Blynk app** receives data on the bin's fill level and weight, sending alerts when the bin is full.
5. **Automation**: The servo motor opens the lid based on motion sensor input and closes it automatically.
6. **Alerts**: The system sends notifications if the bin is full or overloaded.

This methodology simplifies waste management, automates bin usage, and improves efficiency using ESP32 and Blynk IoT.

8.0 Expected Output

The **expected output** of the smart trash bin using **ESP32** is a fully automated system that monitors the bin's fill level and weight in real-time, sending data to the **Blynk IoT app**. The **motion sensors** trigger the **servo motor** to open the bin lid when someone approaches, ensuring hands-free use. If the bin is full or overloaded, the system sends alerts to the user via the app. This setup optimizes waste collection by providing real-time updates, promoting cleaner and more efficient waste management while reducing human contact with the bin.

9.0 Other Relevant Information

The smart trash bin using ESP32 is powered by a battery or adapter. It transmits data via Wi-Fi to the Blynk app for remote monitoring. The system is cost-effective, scalable, and easy to maintain, with potential applications in homes, offices, and public spaces.

10.0 References

1. **Internet of Things (IoT) and ESP32**:
    - "ESP32: The ESP32 and IoT" by Random Nerd Tutorials.
    - "Getting Started with ESP32" by Rui Santos.
2. **Smart Waste Management Systems**:
    - Alabdulmohsin, I., & Alsadi, A. (2020). "IoT-based Smart Waste Management System for Efficient Collection and Disposal of Trash." *Journal of Environmental Management*.
3. **Blynk IoT Platform**:
    - "Getting Started with Blynk" by Blynk Documentation.
4. **Sensors Used in Smart Trash Bins**:
    - "Ultrasonic Sensors in Smart Bins" by D. R. Sahu et al. (2021). *International Journal of Waste Resources*.

CANDIDATES

Name: D. Lahari Reg. No.2310040036

Signature: …… Date: ……

Name: M. Sravya Reg. No 2310040032

Signature: …… Date: ……

Name: A. Kavyanjali Reg. No. 2310040033

Signature: …… Date: ……

Name: Bala Sai Ram Reg. No. 2310040044

Signature: …… Date: ……

SUPERVISOR

1. Comments by Supervisor:

Date: ……..... Name: ……...…….……..

Signature: …….....