# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590014.

Internship Project Report

On

# "SMART INDOOR GARDEN ECOSYSTEM"

*Submitted in partial fulfillment of the requirement for the award of 7th SEM*

*of*

**BACHELOR OF ENGINEERING**

In

**INFORMATION SCIENCE & ENGINEERING**

&

**COMPUTER SCIENCE & ENGINEERING**

By


| | |
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**2023 - 2024**


**DEPARTMENT OF**

**INFORMATION SCIENCE AND ENGINEERING**

**&**

**COMPUTER SCIENCE AND ENGENERRING**

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# Project Completion Certificate

I, **VAIBHAV KARANTH K** (Roll No: 1AP21IS041), hereby declare that the material presented in the Project Report titled **" SMART INDOOR GARDEN ECOSYSTEM"** represents original work carried out by me in the **Department ISE** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

- I have not manipulated any of the data or results.
- I have not committed any plagiarism of intellectual property and have clearly indicated and referenced the contributions of others.
- I have explicitly acknowledged all collaborative research and discussions.
- I understand that any false claim will result in severe disciplinary action.
- I understand that the work may be screened for any form of academic misconduct.

**Date**: **Student Signature**:

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In my capacity as the supervisor of the above-mentioned work, I certify that the work presented in this report was carried out under my supervision and is worthy of consideration for the requirements of the B.Tech. Internship Work.

**Advisor's Name**: **Guide Name:**

**Advisor's Signature** **Guide Signature**

# Project Completion Certificate

I, **SREYAS C (Roll No: 1AP21IS033)**, hereby declare that the material presented in the Project Report titled **" SMART INDOOR GARDEN ECOSYSTEM"** represents original work carried out by me in the **Department ISE** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

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**Advisor's Name**: **Guide Name:**

**Advisor's Signature** **Guide Signature**

# Project Completion Certificate

I, **M MOHAMMED (Roll No: 1AP21CS024),** hereby declare that the material presented in the Project Report titled **" SMART INDOOR GARDEN ECOSYSTEM"** represents original work carried out by me in the **Department of CSE** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

- I have not manipulated any of the data or results.
- I have not committed any plagiarism of intellectual property and have clearly indicated and referenced the contributions of others.
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**Advisor's Name**: **Guide Name:**

**Advisor's Signature** **Guide Signature**

# Evaluation Sheet

**Title of the Project:** SMART INDOOR GARDEN ECOSYSTEM

**Name of the Students:**

**VAIBHAV KARANTH K**

**SREYAS C**

**MOHAMMED M**

**External Supervisor:**

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**Internal Supervisor:**

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**Date:**

**Place:**

# SMART INDOOR GARDEDN ECOSYSTEM

## 1.ABSTRACT

The Smart Indoor Garden Ecosystem is a comprehensive IoT-based solution designed to tackle the challenges associated with indoor gardening. Indoor plants often require precise environmental conditions to thrive, including adequate temperature, humidity, soil moisture, and light. Monitoring and maintaining these conditions manually can be tedious and inconsistent, often resulting in suboptimal plant health.

This system automates plant care by integrating multiple sensors and actuators with a central controller powered by a Raspberry Pi. The sensors continuously monitor environmental parameters, while actuators such as stepper motors and LEDs take corrective actions, like watering plants or adjusting lighting. A Flask-based web interface enables real-time monitoring and manual control, providing users with an interactive platform to manage their indoor gardens effortlessly.

This project underscores the importance of IoT in modern-day automation. By combining environmental sensors with actuators and a web interface, the Smart Indoor Garden Ecosystem delivers a scalable, user-friendly, and efficient gardening solution. Future enhancements could include AI-driven predictive analytics, mobile application integration, and renewable energy options to further improve sustainability.

# 2. INTRODUCTION

Indoor gardening requires maintaining specific environmental conditions such as temperature, humidity, soil moisture, and light. Achieving these conditions manually is time-consuming and error-prone. The Smart Indoor Garden Ecosystem addresses these challenges by automating plant care tasks using IoT technology.

This system integrates sensors to monitor environmental parameters and actuators for corrective actions, such as watering plants or adjusting lighting. A Raspberry Pi serves as the central controller, while a Flask-based web interface enables real-time monitoring and remote control.

## 2.1 Objective

- Automating routine plant care tasks, such as watering and lighting adjustments.
- Reducing human error by implementing sensor-driven monitoring and control mechanisms.
- Enabling remote management of indoor gardens through a user-friendly web interface.
- Providing a scalable solution adaptable to various garden sizes and plant types.

## 2.2 Problem Statement

Indoor gardening has gained popularity due to urbanization and limited outdoor space. However, maintaining indoor plants can be challenging, as they rely on controlled conditions to thrive. Common issues include:

1. Inconsistent Watering: Overwatering or underwatering due to manual interventions leads to root damage or dehydration.
2. Environmental Monitoring: Regularly checking temperature, humidity, and light levels is time-consuming and error-prone.
3. Scalability Issues: Many existing solutions are rigid, making it difficult to adapt to different setups or larger gardens.

To address these challenges, the Smart Indoor Garden Ecosystem provides an intelligent, automated, and flexible solution for optimal plant care.

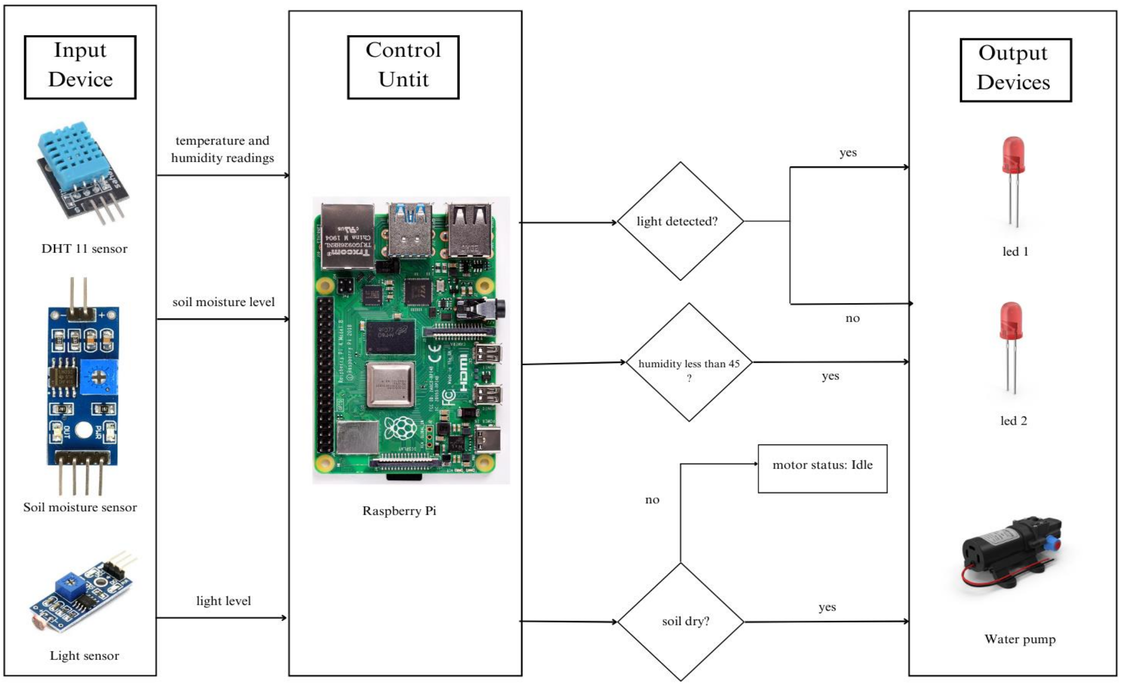
# 3.APPLICATIONS

1. **Home Gardening**:
   Automates routine plant care for hobbyists, ensuring healthier plants with minimal effort.
2. **Commercial Agriculture**:
   Optimizes greenhouse and vertical farm operations by reducing labor costs and improving crop yield.
3. **Research**:
   Provides data logging and controlled environments for studying plant growth and behavior.
4. **Education**:
   Demonstrates IoT, automation, and sensor integration, serving as a practical project for students.
5. **Urban Farming**:
   Supports vertical and rooftop farming in smart cities, maximizing productivity in limited spaces.
6. **Multi-User Environments**:
   Useful for shared gardens or co-working spaces, enabling controlled access and shared responsibilities.

# 4.COMPONENTS

1. **DHT11 Sensor**: Measures ambient temperature and humidity. This ensures the environment is suitable for plant growth.
2. **Soil Moisture Sensor**: Measures soil water content through an ADC (MCP3008). Helps determine if plants need watering.
3. **Light Sensor**: Detects ambient light levels to decide if supplemental lighting is required.
4. **Stepper Motor**: Drives the watering system (e.g., operates a valve or pump).
5. **LEDs**: Provide supplemental lighting or indicate system states, such as low water levels.
6. **Raspberry Pi**: The main controller that integrates sensor inputs and actuates outputs based on predefined conditions.
7. **Power Supply**: Ensures reliable operation of the Raspberry Pi and connected peripherals..
8. **Python Programming**: Used for implementing facial recognition, password authentication, and system logic.
9. **Flask Framework**: Creates a lightweight server for handling facial recognition and API requests.
10. **GPIO Library**: Interfaces the Raspberry Pi with hardware components like relays, switches, and buzzer.
11. **Adafruit Libraries**: Facilitate communication with sensors and the ADC.

# 5.FLOWCHART




The flowchart illustrates the functionality of a Smart Indoor Garden System, designed to automate plant care using input sensors, a central control unit, and output devices. The system starts by collecting data from input devices, including a DHT11 sensor to monitor temperature and humidity, a soil moisture sensor to detect soil dryness, and a light sensor to measure ambient light levels.

The collected data is processed by a Raspberry Pi, which serves as the central control unit. Based on the data, the system evaluates the environmental conditions and makes decisions. If light is detected, LED 1 is activated to indicate adequate lighting. If the humidity level falls below 45%, LED 2 is turned on to signal low humidity. Additionally, if the soil is detected as dry, the water pump is activated to irrigate the plants. If all conditions are within optimal ranges, the system remains idle.

The output devices, including LEDs and the water pump, provide real-time feedback and perform necessary actions to maintain the plants' health. This system ensures efficient and automated plant care, reducing manual intervention and maintaining optimal growing conditions for indoor gardens.

# 6.CONCLUSION

The Smart Indoor Garden Ecosystem is a robust IoT solution that automates plant care by integrating sensors, actuators, and a user-friendly web interface. It addresses common challenges such as inconsistent watering and manual monitoring, making plant maintenance more efficient and reliable.

The modular design and scalability of the system make it suitable for a wide range of applications, from home gardening to commercial agriculture and research. By leveraging modern technology, the system enhances productivity and ensures optimal plant health with minimal human intervention.

This project demonstrates the potential of IoT in revolutionizing everyday tasks and highlights opportunities for further innovation, such as AI-based decision-making and sustainable energy integration.

# 7. FUTURE WORK

1. **AI Integration**:
   Implement machine learning algorithms to predict plant needs, such as watering schedules or light adjustments, based on historical data.
2. **Mobile Application**:
   Develop a companion app to provide users with remote access, notifications, and manual control from their smartphones.
3. **Renewable Energy Sources**:
   Incorporate solar panels or other sustainable power sources to reduce energy consumption and support eco-friendly operations.
4. **Expanded Scalability**:
   Enhance the system's adaptability for larger-scale setups, including commercial greenhouses and outdoor farming environments.
5. **Weatherproofing**:
   Adapt the system for outdoor use by adding protective enclosures and components resilient to weather conditions.
6. **Advanced Logging and Analytics**:
   Integrate cloud-based data storage and analytics for long-term environmental tracking and insight generation.
7. **Enhanced Actuators**:
   Include additional actuators like mist sprayers or temperature control units to expand functionality.

# 8.APPENDIX

## 8.1 PSEUDO CODE