Nager Yuwak Shikshan Sanstha's

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING

(An Autonomous Institution affiliated To Rashtrasant Tukadoji Maharaja Nagpur University)

TOPIC:-

IOT BASED WATER IRRIGATION SYSTEM USING ESP-8266.

SUBMITTED BY :-

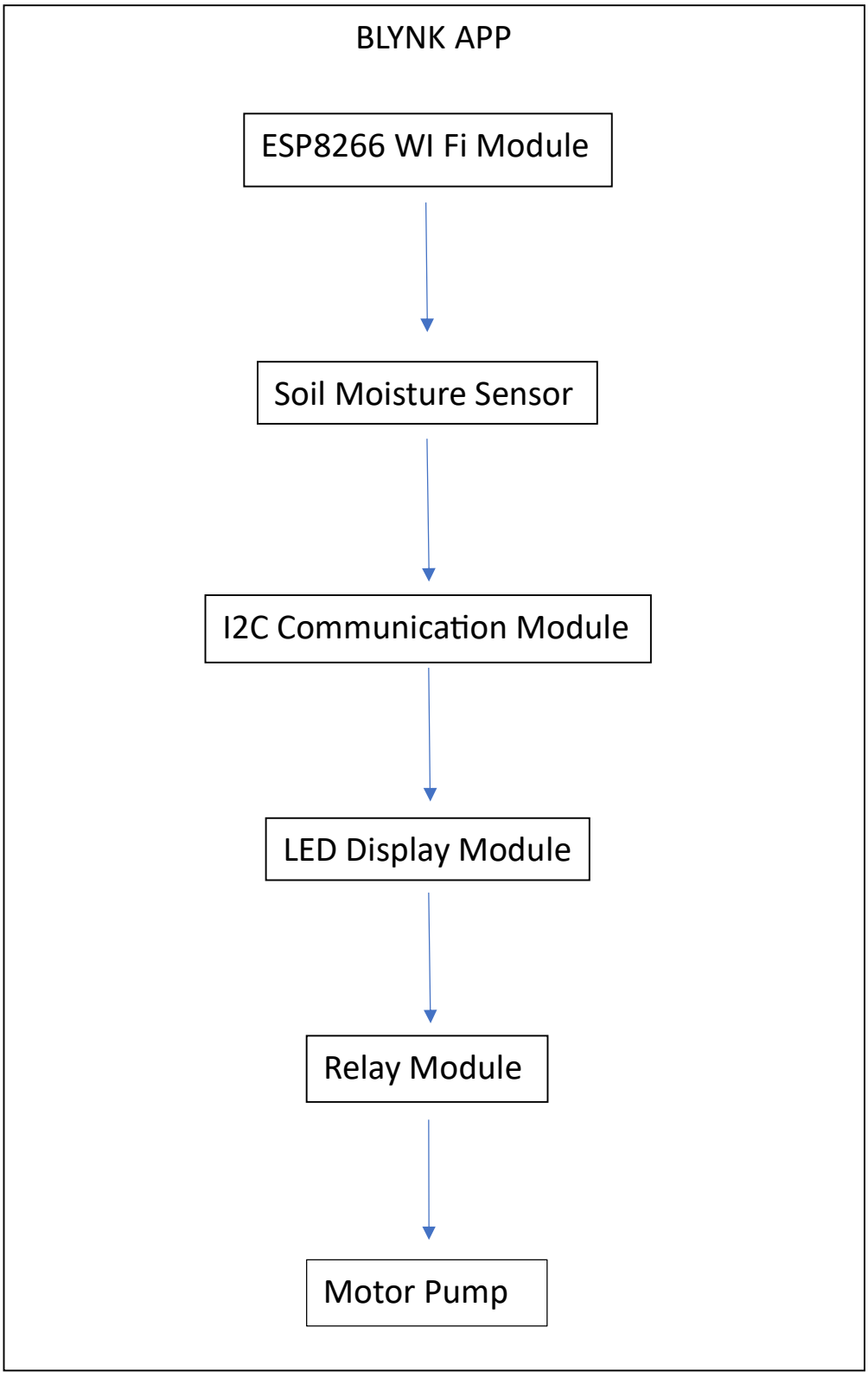
(A-32) Aman Dudhpachare

Department of Electronics Engineering

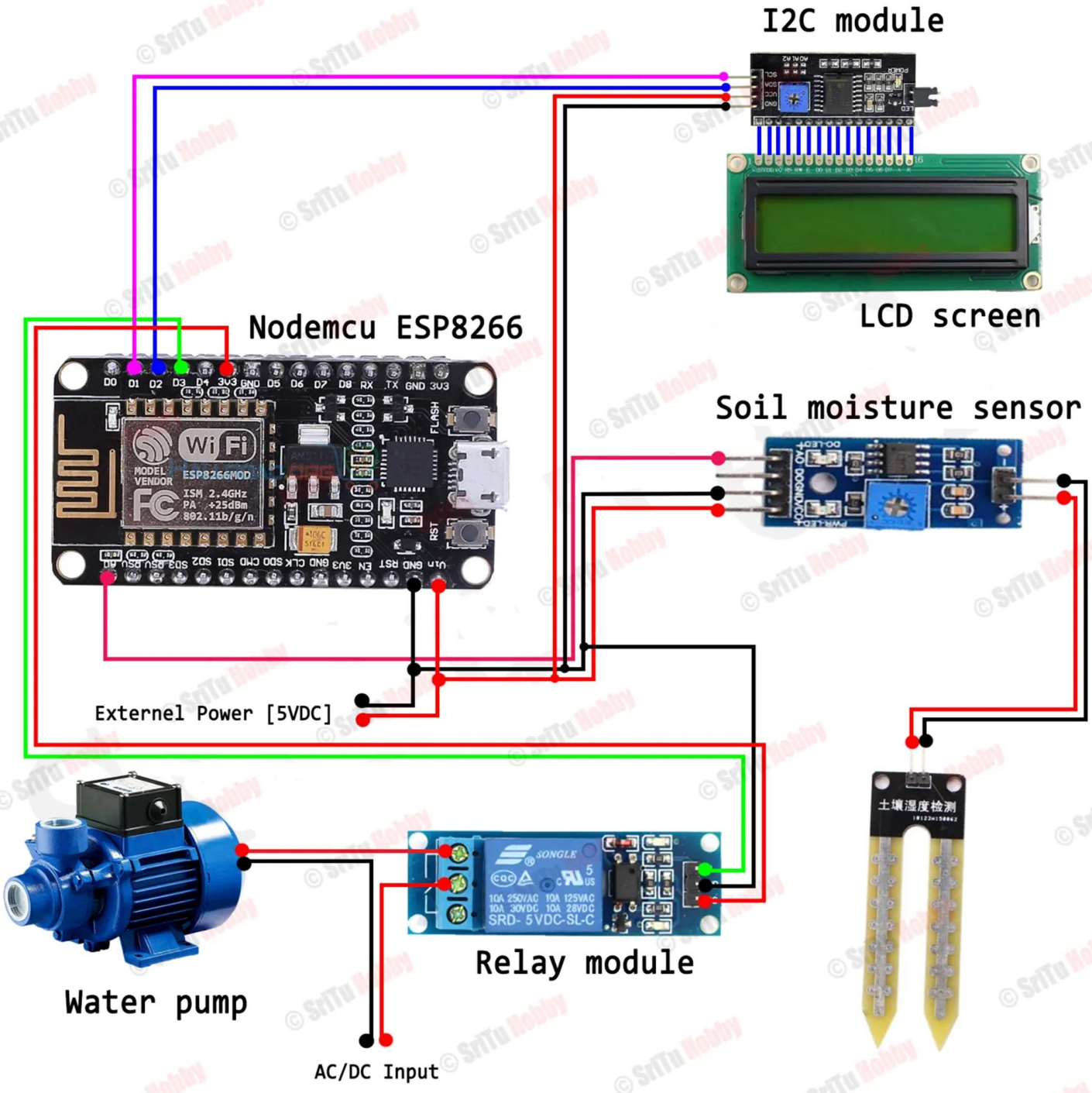
BRANCH (IIOT)

SESSION 2022-23

• BLOCK DIAGRAM:



• CIRCUIT DIAGRAM :



• COMPONENTS/SOFTWARE REQUIRED :

1.Components:

- **ESP8266**: This is a Wi-Fi-enabled microcontroller board used for connecting the irrigation system to the internet.
- **Soil Moisture Sensor**: Measures the moisture level in the soil.
- **I2C Module**: Enables communication between the ESP8266 and other I2C-compatible devices.
- **Relay Module**: Controls the water pump or valve.
- **LCD**: Provides visual feedback on the system's status.
- **Blynk App**: A mobile app that allows remote monitoring and control of IoT devices.
- **Motor**: Motor is used to watering the soil.

2.Hardware Setup:

- Connect the ESP8266 board to the I2C module using the appropriate pins.
- Connect the soil moisture sensor to the I2C module.
- Connect the relay module to the ESP8266 board to control the water pump or valve.
- Connect the LCD to the ESP8266 board to indicate the system's status.

3. Software Setup:

- Program the ESP8266 using an Arduino-compatible IDE or another suitable development environment.
- Configure the ESP8266 to connect to a Wi-Fi network.
- Set up communication with the I2C module and configure its address.
- Implement code to read data from the soil moisture sensor through the I2C module.
- Analyze the moisture data and determine the watering requirements.
- Control the relay module to turn the water pump or valve on or off based on the moisture readings.
- Integrate the Blynk library into your code to establish communication between the ESP8266 and the Blynk app.
- Create a user interface in the Blynk app to monitor the system's status, display moisture readings, and control the irrigation process.

• **WORKING** :

4. System Workflow:

- The ESP8266 connects to the Wi-Fi network, allowing the system to be remotely monitored and controlled via the Blynk app.
- The soil moisture sensor measures the moisture level in the soil.
- The ESP8266 reads the moisture data from the sensor through the I2C module.

- The system analyzes the moisture data and determines if watering is necessary.
- If the moisture level is below a certain threshold, indicating the need for watering, the ESP8266 activates the relay module.
- The relay module turns on the water pump or opens the valve to supply water to the irrigation system.
- The LCD provides visual feedback, indicating the system's status (e.g., watering in progress, watering completed).
- The Blynk app displays the moisture readings, system status, and allows manual control of the irrigation process.
- The user can remotely monitor the irrigation system, and adjust the irrigation settings through the Blynk app.
- The system continues this cycle, periodically monitoring and adjusting the irrigation based on the soil moisture readings, and responding to commands received from the Blynk app and watering the soil using motor.

By integrating these components and following this workflow, you can create an IoT-based water irrigation system that automates the watering process based on soil moisture levels, while also providing remote monitoring and control through the Blynk app.

• BRIEF DESCRIPTION OF COMPONENTS :

*** LCD (Liquid Crystal Display):** A display module commonly used to provide visual feedback and information. It consists of a grid of tiny liquid crystal cells that can change their opacity when an electric current is applied. In an IoT-based water irrigation system, an LCD can be used to show real-time data, such as soil moisture readings, system status, or user prompts.

*** I2C (Inter-Integrated Circuit) Module**: A communication module that allows devices to exchange data over short distances using the I2C protocol. It facilitates communication between different components in the system, such as the microcontroller (e.g., ESP8266) and the soil moisture sensor, or the microcontroller and the LCD display.

*** ESP8266**: A Wi-Fi-enabled microcontroller board commonly used in IoT applications. It provides wireless connectivity to the internet, allowing the irrigation system to connect to a Wi-Fi network. The ESP8266 can be programmed to gather data from sensors, control devices, and communicate with external applications.

*** Soil Moisture Sensor**: A sensor that measures the moisture level in the soil. It provides valuable data to determine the watering requirements of plants. The sensor is typically integrated into the irrigation system to monitor soil conditions and ensure optimal irrigation practices.

*** Relay Module**: A device that acts as an electrically controlled switch. It allows the microcontroller to control the operation of other electrical devices, such as a water pump

or valve. In an irrigation system, the relay module is used to activate or deactivate the water supply based on moisture readings or user commands.

* **Blynk App**: A mobile application used for remote monitoring and control of IoT devices. The Blynk app provides a user-friendly interface that allows users to view real-time data, receive notifications, and send commands to the IoT system. With the app, users can monitor the irrigation system, adjust settings, and receive updates on soil moisture levels or system status.

* **Motor**: A motor is an electrical device that converts electrical energy into mechanical energy. In the context of an irrigation system, a motor is typically used to drive the water pump or valve to supply water to the plants. The motor can be controlled by the relay module, which receives signals from the microcontroller to start or stop the water flow.

• SOCIETAL IMPACT :

- **Water Conservation**: IoT-based irrigation systems can improve water conservation by precisely monitoring soil moisture levels and delivering water only when necessary. This targeted approach reduces water wastage, promotes efficient water usage, and contributes to overall water conservation efforts. By conserving water, these systems help address water scarcity issues and promote sustainable irrigation practices.
- **Agricultural Efficiency**: IoT-based irrigation systems equipped with soil moisture sensors and automated control mechanisms optimize irrigation processes. This technology enables farmers to deliver the right amount of water to crops at the right time, ensuring optimal growth and yield. Improved agricultural efficiency supports food production, enhances crop quality, and contributes to food security.
- **Cost Savings**: By accurately monitoring soil moisture and automating irrigation, IoT-based systems help farmers reduce water and energy expenses. The precise control of water usage prevents overwatering, reducing water bills. Additionally, the automation of irrigation processes minimizes labor costs associated with manual monitoring and operation.
- **Environmental Impact**: The efficient use of water resources facilitated by IoT-based irrigation systems has positive environmental implications. By reducing water consumption, these systems help preserve natural water sources, such as

rivers and groundwater reserves. Additionally, the optimized irrigation practices promote healthier soil, prevent soil erosion, and minimize the risk of nutrient leaching into the environment.

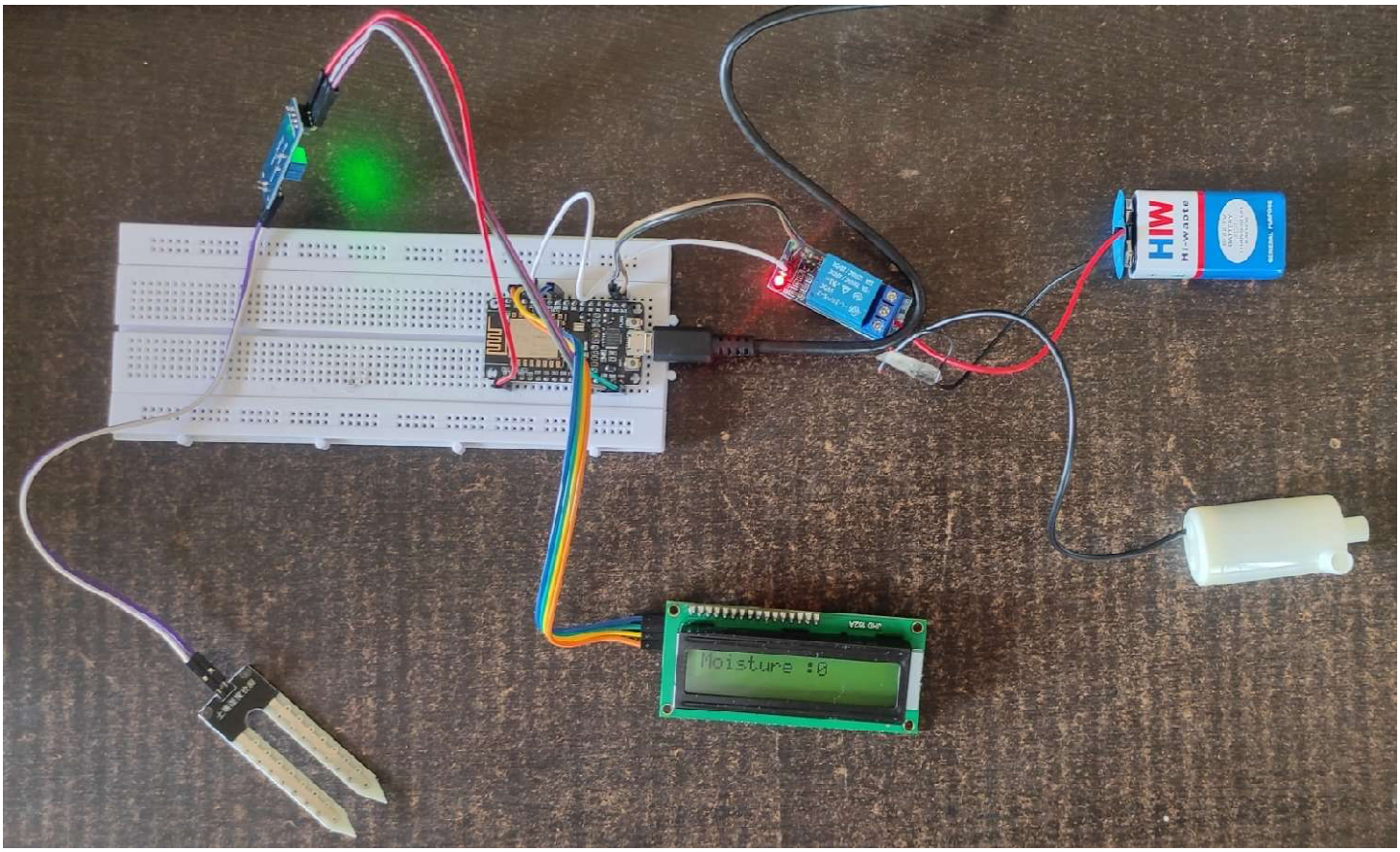
- **Accessibility and Remote Monitoring**: The integration of the Blynk app in the irrigation system enables remote monitoring and control. This feature benefits farmers by allowing them to monitor the system, receive real-time data, and control the irrigation process from any location. Remote accessibility improves convenience, saves time, and empowers farmers to make informed decisions regarding irrigation management.
- **Technology Adoption and Innovation**: The implementation of IoT-based irrigation systems encourages the adoption of advanced technologies in agriculture. Farmers and stakeholders become familiar with IoT concepts, sensors, connectivity, and data-driven decision-making processes. This increased technology adoption fosters innovation, encourages research and development, and drives the evolution of smart agricultural practices.

• APPLICATION/UTILITY:

- **Agriculture**: IoT-based water irrigation systems are widely used in agricultural settings, ranging from small-scale farms to large-scale plantations. By monitoring soil moisture levels and automating the irrigation process, these systems ensure that crops receive the optimal amount of water for their growth and development. Farmers can remotely monitor and control the irrigation system using the Blynk app, making it convenient to manage irrigation schedules and respond to changing weather conditions.
- **Smart Gardens and Greenhouses**: IoT-based irrigation systems find application in smart gardens and greenhouses, where precision watering is crucial. By integrating soil moisture sensors with the system, the irrigation process can be tailored to meet the specific needs of plants. The system can be programmed to deliver water at specific intervals, ensuring the ideal soil moisture conditions for plants' growth in controlled environments. The LCD display provides real-time information on soil moisture levels and system status.
- **Urban Gardening and Vertical Farms**: In urban environments with limited space, IoT-based water irrigation systems can be deployed in vertical farms or urban gardens. These systems enable efficient watering of plants in a compact setup. The ESP8266 board connects to the Blynk app, allowing users to monitor and control the irrigation system remotely. The motor and relay module control the water flow to ensure plants receive adequate hydration.

- **Smart Landscaping and Parks**: Municipalities and landscape designers can benefit from IoT-based irrigation systems in maintaining parks and green spaces. By using soil moisture sensors and the Blynk app, the system can adjust watering schedules based on real-time data. The LCD display can provide visual feedback on soil moisture levels and system status, making it easier to identify potential issues or optimize watering patterns.
- **Residential Gardens and Home Automation**: IoT-based irrigation systems can be installed in residential gardens, allowing homeowners to automate the watering process. By integrating the Blynk app, users can remotely control the system and receive notifications about soil moisture levels or system operation. The LCD display provides local feedback and information, making it easier for users to monitor their garden's irrigation status.

• RESULTS:


Moisture :0


11:42 PM
Watering System
Now go to your computer.
Check your inbox for the code and instructions on how to get your device online.
Moisture level
0
0
100
Water Pump
ON

• FUTURE SCOPE:

- **Integration with Artificial Intelligence (AI) and Machine Learning (ML):** The combination of IoT and AI/ML can enable more advanced and intelligent irrigation systems. By analyzing historical data, weather patterns, and crop-specific requirements, AI algorithms can optimize irrigation schedules, predict watering needs, and dynamically adjust watering parameters for enhanced efficiency and water conservation.
- **Data Analytics and Insights**: IoT-based irrigation systems generate vast amounts of data. Future advancements may focus on developing advanced analytics tools that process and analyze this data to provide valuable insights. These insights can help farmers and stakeholders make informed decisions, identify trends, optimize irrigation practices, and further enhance crop yield and resource management.
- **Enhanced Sensor Technologies**: As sensor technologies continue to evolve, future iterations may introduce more advanced soil moisture sensors that offer higher accuracy, better durability, and improved power efficiency. These advancements will contribute to more reliable and precise monitoring of soil moisture levels, ensuring optimized irrigation strategies.
- **Integration with Weather Forecasting**: Future systems may integrate real-time weather forecasting data to adjust irrigation schedules based on predicted rainfall, humidity levels, or other relevant weather conditions. This integration would enhance the system's ability to adapt and optimize irrigation processes in response to changing environmental factors.
- **Water Quality Monitoring**: Beyond soil moisture monitoring, future systems could incorporate sensors to monitor water quality. This would enable farmers to assess the quality of the water used for irrigation, detecting any potential contaminants or imbalances that may impact plant health and crop productivity.
- **Wireless Mesh Networks**: IoT-based irrigation systems can benefit from the implementation of wireless mesh networks. This technology allows devices to communicate with each other, forming a network without relying solely on a centralized hub. Wireless mesh networks provide better coverage, improved scalability, and increased reliability, ensuring seamless communication between the components of the irrigation system.
- **Integration with Other IoT Applications**: IoT-based water irrigation systems can integrate with other IoT applications and platforms to create more

comprehensive and interconnected solutions. For example, integration with smart farming platforms can enable farmers to access additional data, such as crop growth patterns, pest management information, or market insights, facilitating more informed decision-making and precision agriculture practices.

- **Water Management and Regulatory Compliance**: IoT-based irrigation systems have the potential to assist in water management and regulatory compliance. By accurately monitoring water usage and providing detailed records, these systems can help farmers comply with water regulations, track water consumption, and optimize irrigation practices to meet sustainability goals.

• REFERANCE:

https://srituhobby.com/how-to-make-a-plant-watering-system-with-the-nodemcu-esp8266-board-and-the-new-blynk-update/