# UTTARA UNIVERSITY

**Department of Electrical & Electronic Engineering**

# IoT Based Rain Alert with Weather Monitoring & Pump Control System

B.Sc. Project

By


| | |
|---|---|
| Md. Milon Hossain | ID: 2221171005 |
| Md. Belal Hossain | ID: 2221171015 |
| Md. Akash Hossain | ID: 2221171035 |
| Arjun Chandra Das | ID: 2221171009 |


In Partial Fulfillment of the Requirements for the Degree of BSc. in Electrical & Electronic Engineering

**January 2025**

# Declaration

We hereby declare that this thesis is based on the results found by ourselves. Materials of work found by other researcher are mentioned by reference. This thesis, neither in whole nor in part, has been previously submitted for any degree.

| Signature of Supervisor | Signature of Authors |
|---|---|
| ----------------------------- | ---------------------------- |
| | ---------------------------- |
| | ---------------------------- |
| | ---------------------------- |

# Acknowledgement

First, we would like to pay my sincerest gratitude to the almighty Allah for keeping us in sound mind and health during the work and giving me the ability to work hard successfully. Specially, we would like to thanks our honorable supervisor Md. Moiful Alam, Assistant Professor, Department of EEE Uttara University, for allowing us to do the projects. His constant supervision, constructive criticism, valuable advice, Scholarly guidance and encouragement at all stage of our work have made it possible to complete this project. We would like to give thanks to all the teachers of the department of Electrical and Electronic Engineering for their constructive criticism and valuable advices and cordial co-operation during study in the University. Specially thank to my family members who gave us huge support and inspiration during our whole B.Sc. Course in EEE.

In this connection, we also thank to the officers and staffs to the university of their co-operation and to all others not stated here for their help and co-operation. Science & Engineering, Uttara University who is supported us in any case with his kind and all the time during our project.

Finally, we would like to give thanks to our course mates, friends and well-wishers who gave us huge support inspiration and their friendly and lovely company during our project.

# Abstract

The IoT-Based Rain Alert & Pump Control System is an innovative solution that leverages Internet of Things (IoT) technology to monitor rainfall, provide real-time alerts, and automate water pump operations. Designed to address challenges in water management, agriculture, and urban infrastructure, this system ensures efficient water utilization while reducing manual intervention.

# Contents

# List of Figures



# List of Tables

# Chapter- 1

# Introduction

## 1.1 Introduction

The "IoT-Based Rain Alert with Weather Monitoring & Pump Control System" is an innovative project designed to provide a smart, efficient, and automated solution for managing agricultural and domestic water needs. This system integrates modern Internet of Things (IoT) technology with environmental sensors and automation to monitor weather conditions, provide rain alerts, and control water pumps effectively.

The project aims to address challenges such as inefficient water usage, delayed responses to changing weather conditions, and manual labor associated with water management. By leveraging IoT, the system offers real-time monitoring and control, ensuring optimal water utilization, reducing wastage, and increasing convenience for users.

## 1.2 Historical Background

The "IoT-Based Rain Alert with Weather Monitoring & Pump Control System" project is rooted in the need for efficient water management and weather monitoring, driven by advancements in technology and the challenges posed by climate change. Its development is influenced by the historical evolution of weather monitoring systems, automation technologies, and the emergence of the Internet of Things (IoT).

A. Early Weather Monitoring and Alerts:

19th Century Weather Instruments: Early weather monitoring relied on manual instruments like barometers, thermometers, and rain gauges to collect data. These tools required human effort to record and analyze weather patterns, often leading to delays in decision-making.

Development of Automated Weather Stations (AWS): By the mid-20th century, automated weather stations began to replace manual systems, enabling continuous and real-time data collection of weather parameters such as temperature, humidity, and rainfall.

B. Emergence of Automation in Pump Control:

Traditional Pump Systems: Water pumps were traditionally operated manually, which was labor-intensive and often resulted in inefficiencies like over-irrigation or under-irrigation.

First Automated Systems: In the late 20th century, basic automation systems using electrical timers or soil moisture sensors started to control pumps. However, these systems lacked flexibility and real-time adaptability to changing weather conditions.

C. Rise of IoT in the 21st Century:

Introduction of IoT: The Internet of Things (IoT) revolution began in the early 2000s, enabling devices to connect and communicate over the internet. This development allowed real-time data collection, remote monitoring, and automation.

Smart Sensors and Actuators: With IoT, smart sensors capable of measuring rainfall, temperature, humidity, and soil moisture became widely available. These sensors could transmit data wirelessly to cloud platforms, making it easier to analyze and act on the information.

Integration of IoT in Agriculture: IoT solutions started to address agricultural challenges like water scarcity and crop health monitoring. The ability to remotely control irrigation systems and receive weather alerts became a game-changer for farmers.

D. Development of Integrated Systems:

Smart Weather Stations: By the 2010s, integrated systems combining weather monitoring with IoT platforms were introduced. These systems provided users with real-time data on environmental conditions and allowed them to automate responses like pump control or irrigation scheduling.

Energy-Efficient Solutions: The integration of renewable energy sources like solar panels with IoT systems further enhanced their sustainability and usability in remote areas.

Machine Learning and Predictive Analytics: Modern IoT systems also began incorporating artificial intelligence to analyze historical weather and usage data, offering predictive insights and further optimizing resource management.

E. Current State and Applications: Today, IoT-based systems are widely used in smart agriculture, urban landscaping, and industrial water management. These systems offer precision, scalability, and accessibility, making them essential tools in addressing water and climate-related challenges.

## 1.3 IoT System

The Internet of Things (IoT) is an interconnected computing device, mechanical and digital machine, object, animal or human being that is provided with a unique identifier (UID) and gives people the ability to transfer data from network to network without need or communication from computer to human.The definition of the Internet of Things has evolved due to the integration of multiple technologies, real-timeanalytics, machine learning, product sensors and embedded systems.

Fig- 1.1: IoT System

The embedded systems, wireless sensor networks, control systems, automation (including home and building automation) and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is most synonymous with products related to the "agricultural system" concept, covering devices and applications (such as lighting, thermostats, home security systems and cameras and other home appliances) that support one or more common ecosystems, and smarter. Device ecosystems like phones and smart speakers Ira can be controlled through.

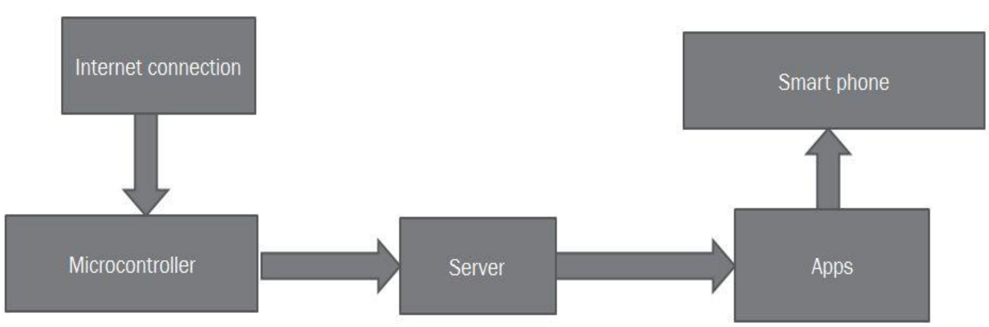


Fig- 1.2: Block Diagram of IoT

There are several serious concerns about the dangers of IoT growth, especially in terms of privacy and security; and as a result industry and government initiatives begin to address them.

## 1.4 Proposed Methodology

The methodology for the "IoT-Based Rain Alert with Weather Monitoring & Pump Control System" project involves a structured approach to integrating IoT technology, sensors, and automation to achieve the desired functionality. This methodology can be divided into distinct stages as follows:

1. System Design and Architecture:

Objective Definition: Clearly define the goals of the project, such as detecting rainfall, monitoring weather parameters, and automating pump control.

System Architecture Development:

Design a system architecture that includes: Sensors for data collection (rain sensor, temperature sensor, humidity sensor, soil moisture sensor).

Microcontroller or microprocessor (e.g., Arduino, ESP8266, or Raspberry Pi) to process data.

Communication modules (e.g., Wi-Fi or GSM) for IoT connectivity.

Actuators for controlling the water pump.

Cloud platform or IoT dashboard for data visualization and remote control.

2. Hardware Selection and Setup:

Sensor Selection:

Choose appropriate sensors to monitor environmental parameters: Rain Sensor: To detect rainfall.

DHT11/DHT22 Sensor: For temperature and humidity monitoring.

Soil Moisture Sensor: To measure soil moisture levels.

Microcontroller/Processor: Select a microcontroller like ESP8266 or ESP32 for IoT capabilities or Arduino for standalone systems.

Communication Modules:

Include modules like: Wi-Fi Module (ESP8266/ESP32): For real-time data transmission to a cloud platform.

GSM Module (SIM800): For SMS-based alerts if required.

Pump Control Mechanism: Use a relay module to interface the microcontroller with the water pump for automated on/off control.

3. Software Development:

Sensor Integration and Data Collection: Develop code to read data from the sensors and process it using the microcontroller. Programming languages like C++ (for Arduino) or Python (for Raspberry Pi) can be used.

IoT Integration: Use MQTT, HTTP, or REST APIs to transmit data to a cloud platform such as:

ThingSpeak

Blynk

Google Firebase

Node-RED

Control Logic Development:

Write algorithms to automate pump operation based on:

Rain detection.

Soil moisture threshold.

User-defined weather parameters.

User Interface Development: Create a mobile or web dashboard for real-time monitoring and control. This can include: Graphical representation of weather data.

Alerts for rainfall and pump status.

Remote pump activation/deactivation.

4. Cloud Integration and Data Visualization:

Cloud Platform Setup:

Configure a cloud platform to: Store sensor data.

Generate alerts and notifications.

Provide a user-friendly interface for monitoring and controlling the system.

Data Visualization: Create visual dashboards showing trends in weather conditions, rainfall, and pump operation status using tools like Blynk, Grafana, or custom dashboards.

5. Testing and Calibration:

Sensor Calibration: Test and calibrate sensors for accuracy and reliability.

System Testing: Test the system under various scenarios, such as:

Rainy weather.

Varying soil moisture levels.

Manual control of the pump through the IoT interface.

Error Handling: Identify and resolve issues such as data transmission failures, sensor malfunctions, or pump control errors.

6. Deployment and Implementation:

Install the system in the desired location (e.g., agricultural field, garden, or industrial site).

Connect the system to a stable power source and internet connection.

Ensure proper placement of sensors for optimal data collection.

7. Maintenance and Upgrades:

Regularly check sensor functionality and recalibrate if necessary.

Monitor system logs for performance issues.

Update software to include new features or improve efficiency.

Workflow Diagram:

Input: Sensors collect real-time environmental data (rainfall, temperature, humidity, and soil moisture).

Processing: The microcontroller processes the sensor data and applies control logic.

Communication: Data is sent to the cloud platform for visualization and alerts.

Output: Alerts are sent to the user via a mobile app or web dashboard.

The water pump is activated or deactivated automatically based on the predefined conditions.

## 1.5 Future Scope of This Study

The "IoT-Based Rain Alert with Weather Monitoring & Pump Control System" project has immense potential for future advancements and broader applications. As technology evolves and challenges such as water scarcity, climate change, and agricultural productivity become more pressing, the project can be expanded and refined to address these issues effectively.

## 1.6 Objective of this Work

The primary objective of the IoT-Based Rain Alert with Weather Monitoring & Pump Control System project is to design and implement a smart, automated system that optimizes water usage, improves environmental monitoring, and enhances user convenience by integrating IoT technology, sensors, and automation. The project addresses critical challenges in water management, resource conservation, and timely weather-based decisions.

- Rain Detection and Alert System.
- Weather Monitoring and Data Collection.
- Automated Pump Control.
- Remote Monitoring and Control.
- Water Conservation.
- Data Logging and Analytics.

- Cost-Effective and Scalable Solution.
- Sustainability and Energy Efficiency.
- User Awareness and Decision Support.

## 1.7 Summary

The IoT-Based Rain Alert with Weather Monitoring & Pump Control System is an innovative solution designed to address challenges related to water management, environmental monitoring, and automation in agriculture and domestic settings. The system leverages IoT technology to integrate sensors, microcontrollers, and cloud-based platforms for efficient, real-time data collection, processing, and decision-making.

- Rain Alert System.
- Weather Monitoring.
- Automated Pump Control.
- IoT Integration.
- Data Logging and Analytics.
- Water Conservation.
- Cost Efficiency.

# Chapter- 2

# Theoretical Review

## 2.1 Introduction

The IoT-Based Rain Alert with Weather Monitoring & Pump Control System is a cutting-edge solution that integrates Internet of Things (IoT) technology with environmental sensors and automation to address challenges in water management, irrigation efficiency, and weather monitoring. This project aims to provide a smart, sustainable, and user-friendly system for individuals and industries to optimize resource usage and respond effectively to weather changes.

Water scarcity, unpredictable weather patterns, and inefficient irrigation methods are critical challenges faced in agriculture, urban development, and industrial operations. Traditional methods of weather monitoring and water management often involve manual efforts, leading to resource wastage and inefficiency. This project seeks to overcome these limitations by leveraging IoT to enable automated, real-time monitoring and control.

## 2.2 Android Apps

For visualization and authentication, in this research work, the team has an Android App. The Android Application does not restrict itself to Thing Speak but also has a Firebase login system. Firebase is a Google-provided API to create a database and fetch from it in real time. It also provides enhanced security for the developed App. Also, it is used for backend support and other functionalities like data storage, user authentication and hosting. Real-time data variations are recorded automatically and updates are sent to clients. The HTTP protocol works on a simple request and response system but firebase is different as its real-time database uses data synchronization. It can be used for user authentication purposes as the user credentials are securely stored using crypt. Firebase authentication to the android studio is added using Firebase Android Studio tool. Whenever someone authenticates during the sign-in process either using an Email or Google, it handovers a firebase user object that represents that the authentication is successfully done by the user. This object contains the basic information about the user. Once the firebase API is included in Android or IOS App, firebase features like Analytics, Authentication, Storage, Messaging, Hosting, Crash reporting, Real-time Database etc.

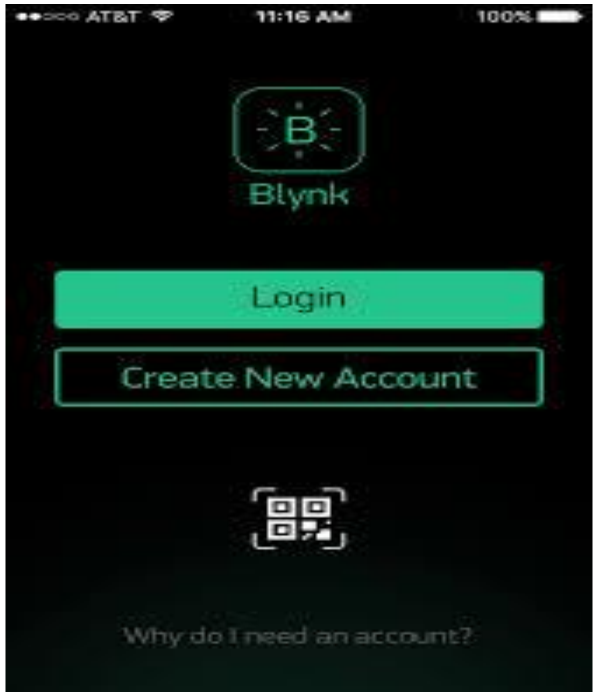


Fig-2.1: Android Apps

## 2.3 System

Our project operates through the Internet, in the project we can monitor the data of various sensors used which can be monitored from anywhere on the Internet.

## 2.4 Motivation for Project

The motivation for developing the IoT-Based Rain Alert with Weather Monitoring & Pump Control System stems from the need to address critical challenges in resource management, environmental sustainability, and automation in agriculture and other water-dependent activities. The motivation for this project lies in its potential to revolutionize water management practices, mitigate the impacts of climate change, and support sustainable development goals. By leveraging IoT technology, this project aims to create a smart, efficient, and user-friendly system that meets the growing demand for automation, precision, and sustainability in water-dependent activities.

# Chapter- 3

# Hardware Development

## 3.1 Introduction

The IoT-Based Rain Alert with Weather Monitoring & Pump Control System is an innovative project aimed at addressing the challenges of efficient water management, real-time weather monitoring, and automation in agriculture and other water-dependent sectors. By leveraging the power of the Internet of Things (IoT), this system integrates sensors, automation, and cloud connectivity to provide a smart, user-friendly solution for managing water resources effectively.

Water scarcity, unpredictable weather patterns, and the increasing need for sustainable practices have made it essential to adopt advanced technologies in daily life. Traditional methods of irrigation and weather monitoring are not only labor-intensive but also often inefficient, leading to resource wastage. This project is designed to overcome these limitations by providing an intelligent system that can monitor environmental conditions, alert users to rainfall, and control water pumps automatically.

## 3.2 Block Diagram

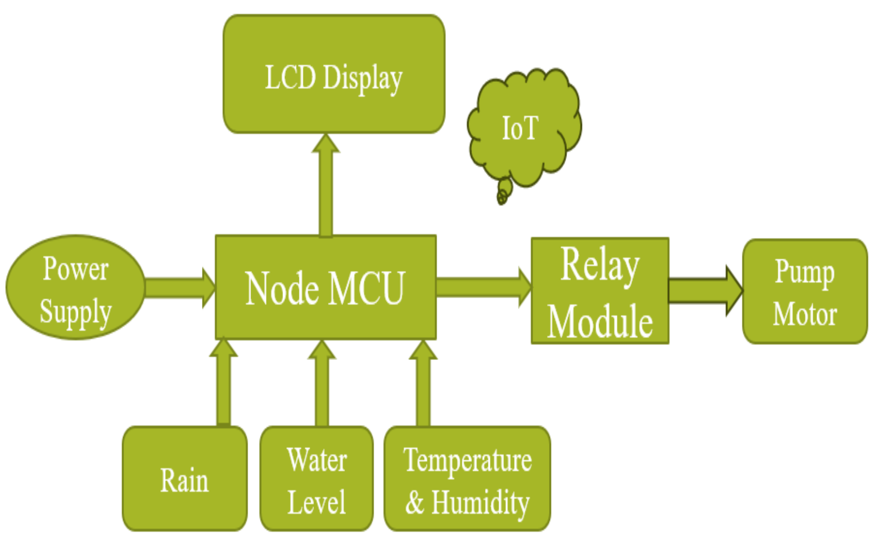


Fig-3.1: Block Diagram of the Overall System

## 3.3 Circuit Diagram

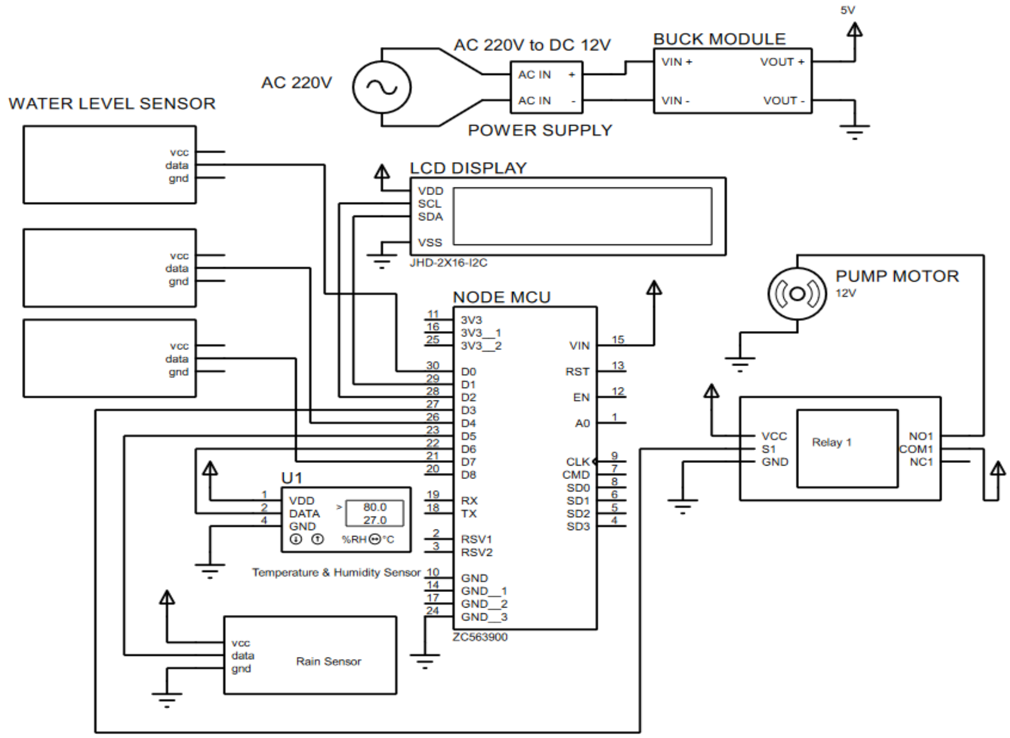


Fig-3.2: Circuit Diagram

The systems used in our project are shown above, our project we have created a IoT Based Rain Alert with Weather Monitoring & Pump Control System Project  that can be controlled with anywhere. We'll get to use all of these systems as we need to, while we use whatever we need, just getting instructions from a internet will start working.

## 3.4 The list of devices used in the project is given below

- Node MCU.
- Buck Converter.
- SMPS.
- LCD Display.
- Float sensor.
- Rain Sensor.
- Temperature & Humidity Sensor.
- Relay Module.
- Pump Motor.

## 3.5 Node MCU

NodeMCU is an open source IoT platform.It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266.The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core,[citation needed] widely used in IoT applications (see related projects). NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub.Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9.

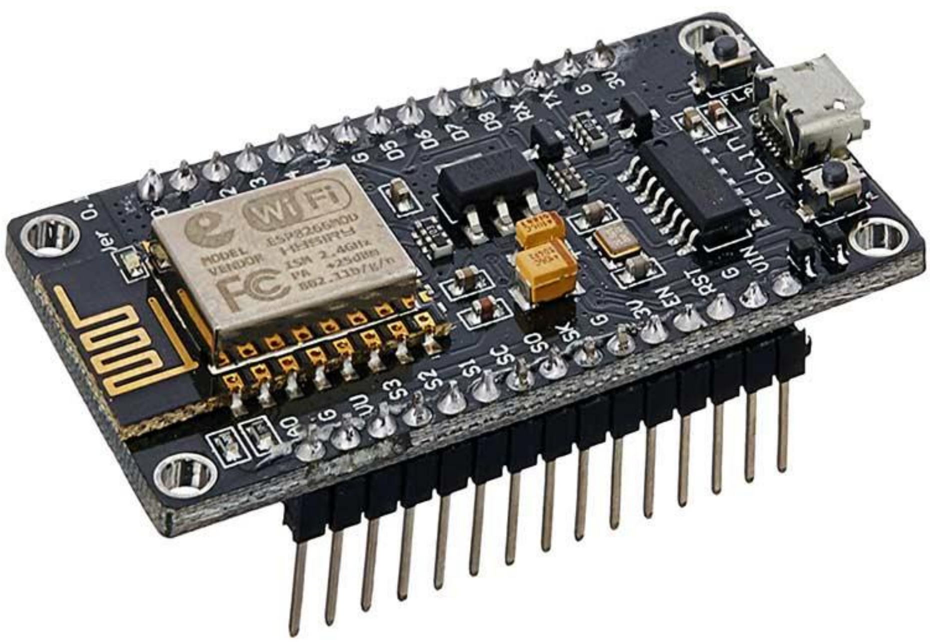

Fig- 3.3: Node MCU

### 3.5.1 Technical Specifications

- Power input: 4.5V ~ 9V (10VMAX), USB-powered
- Transfer rate: 110-460800bps
- Support UART / GPIO data communication interface
- Support Smart Link Smart Networking

- Working temperature: -40°C ~ + 125°C
- Drive Type: Dual high-power H-bridge
- Don't need to download resetting
- A great set of tools to develop ESP8266
- Flash size: 4MByte

## 3.6 LM2596 Voltage Converter

LM2596 Buck DC-DC Adjustable Step Down Power Supply Module Converter.

- Module Property: Non-detached money
- Correction mode: Non-synchronous correction
- Size: About 48 * 23 * 14mm (Length * Width * Height)
- Type: LM2596 adjustable power supply module
- Input voltage: DC 4V-35V
- Output voltage: DC 1.23V-30V
- Output Current: 3A (maximum)
- Conversion efficiency: 92% (maximum)
- Output ripple: 30 mV (maximum)
- Switching frequency: 150KHz
- Load control: 0.5%
- Voltage control: 2.5%
- Working temperature: -40? - +85?

Fig-3.4: LM2596 Voltage Converter

## 3.7 SMPS

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power, see AC adapter) to DC loads, such as a personal computer, while converting voltage and current characteristics. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. A hypothetical ideal switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of on-to-off time (also known as duty cycles). In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor. The switched-mode power supply's higher electrical efficiency is an important advantage.

Switched-mode power supplies can also be substantially smaller and lighter than a linear supply because the transformer can be much smaller. This is because it operates at a high switching frequency which ranges from several hundred kHz to several MHz in contrast to the 50 or 60 Hz mains frequency. Despite the reduced transformer size, the power supply topology and the requirement for electromagnetic interference (EMI) suppression in commercial designs result in a usually much greater component count and corresponding circuit complexity.


Fig-3.5: Switched Mode Power

Switching regulators are used as replacements for linear regulators when higher efficiency, smaller size or lighter weight is required. They are, however, more complicated; switching currents can cause electrical noise problems if not carefully suppressed, and simple designs may have a poor power factor.

### 3.7.1 Technical Specifications

- Input Voltage: AC 85-265V
- Output Voltage: DC 12V
- Current: 10A
- Size:128mm*98mm*40mm
- Shell Material: Metal case / Aluminum base
- Protection: Shortage Protection, Overload Protection, Over Voltage Protection
- Widely used in Industrial automation, LED display, communications, etc.
- Safety Compliance: CCC/ FCC / CE
- Working Temperature: 0~40℃
- Storage Temperature: -20~60℃
- Ambient Humidity: 0~95% Non-Condensation

## 3.8 LCD

It is a 16-character X2-line blue background super-twisted nematic (STN) LCD with built-in HD44780 equivalent controller (also known as alphabetical display).Interfacing is facilitated by 4 bits or 8 bits, and the programming code is widely available for many different controllers and systems.

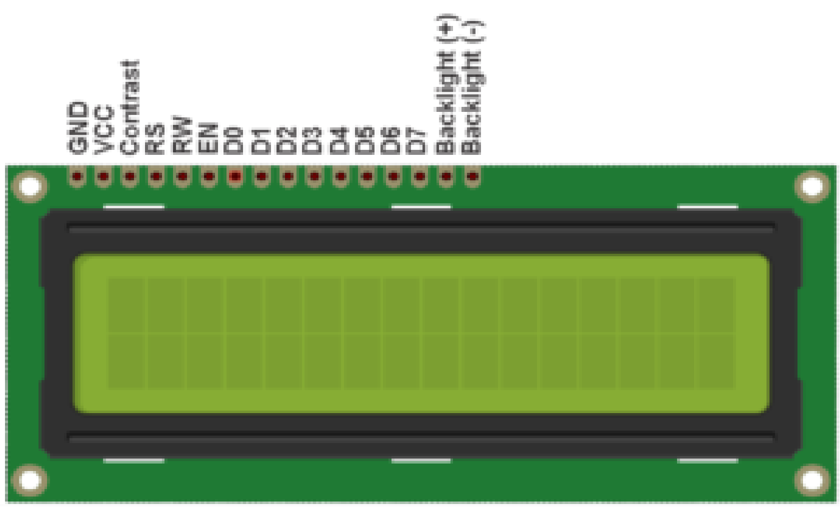


Fig-3.6: LCD Display

| Pin | Function |
|---|---|
| VSS | connected to ground |
| VDD | connected to a +5V power supply |
| VO | to adjust the contrast |
| RS | A register select pin that controls where in the LCD's memory you are writing data to. You can select either the data register, which holds what goes on the screen, or an instruction register, which is where the LCD's controller looks for instructions on what to do next. |
| R/W | A Read/Write pin to select between reading and writing mode |
| E | An enabling pin that reads the information when High level (1) is received. The instructions are run when the signal changes from High level to Low level. |
| D0-D7 | to read and write data |
| A | Pins that control the LCD backlight. Connect A to 3.3v. |
| K | Pins that control the LCD backlight. Connect K to GND. |

Tabel-01: LCD display outline

## 3.9 Float sensor

A float sensor is a device used to detect the level of liquid within a tank or container. It operates by using a floating element that rises or falls with the liquid level, triggering a sensor mechanism. These sensors are commonly used in applications like water tanks, sump pumps, and industrial fluid systems. If you're integrating a float sensor with an IoT-enabled door system or any other internet-based control system, let me know. I can guide you through selecting or interfacing the sensor with your project.

Fig-3.7: Float sensor

### 3.9.1 Technical Specifications

- Item Type: BERM Float Switch
- Brand: BERM
- Optional Style: 2Meter,3Meter,4Meter,5Meter
- Size: Approx.2meter / 6.6ft, 3meter / 9.8ft, 4meter / 13.1ft, 5meter / 16.4ft
- Water Temperature Range: 0~70℃
- Working Flow: 4A-8A
- Use Power: 500W
- Working Voltage: 220V~380V
- Control Range: >0.3Meter

## 3.10 Rain Sensor

A rain sensor is a device used to detect the presence and intensity of rainfall. It’s widely used in automation systems, particularly for irrigation control, automotive windshield wipers, and weather monitoring. Detects rain based on changes in resistance when water droplets form on the sensor's surface. Commonly used in hobbyist projects and small-scale applications. Measures the capacitance change caused by water on the sensor surface. A rain sensor could signal the system to automatically close outdoor-facing doors or shutters during rainfall. Data from the sensor can be logged or analyzed remotely to predict patterns or integrate with other smart systems.

Fig-3.8: Rain Sensor

### 3.10.1 Technical Specifications

- Small board PCB size: 3.2cm x 1.4cm
- Operating voltage: 3.3V-5V
- Voltage: 5V
- VCC: positive power supply (3-5V)

- GND: negative
- DO: TTL switching signal output
- AO: Analog signal output

## 3.11 Temperature & Humidity Sensor

DHT-11 is a composite digital temperature and humidity sensor that outputs calibrated digital signals. Thanks to the dedicated digital module acquisition technology and the application of temperature and humidity sensing technology to the module, DHT-11 brings very high reliability and excellent long-term durability. The DHT-11 has a capacitive moisture sensor and an NTC temperature measuring element that is connected to a high-performance 8-bit microcontroller, resulting in a great quality, super-fast response time, powerful anti-interference capability and highly cost effective.

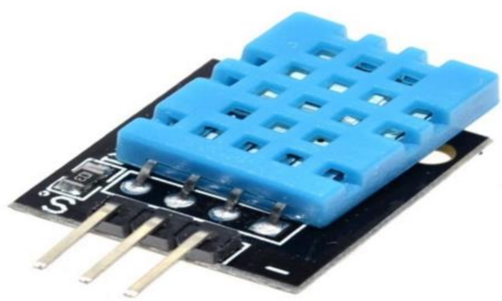

Fig-3.9: DHT-11 Sensor

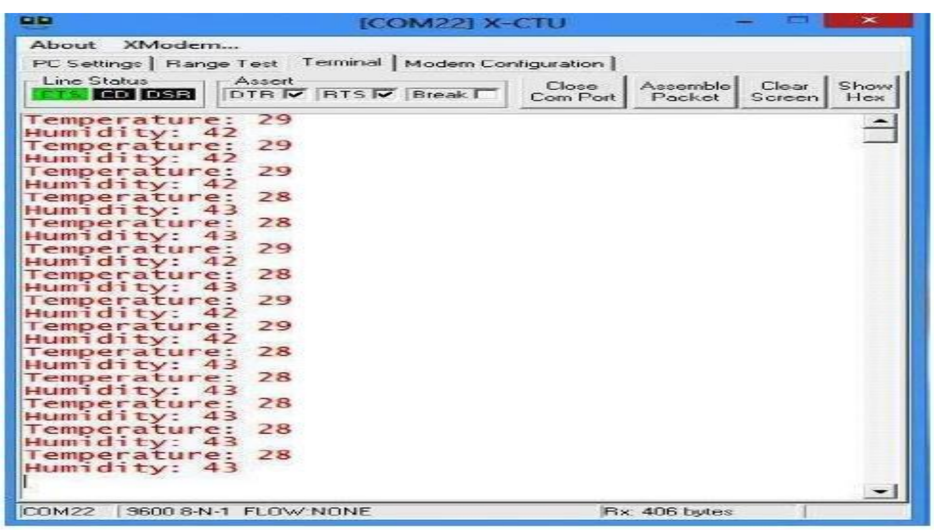


Fig-3.10: DHT-11 Sensor Data

### 3.11.1 Specification

- 32 KiB instruction RAM
- 32 KiB instruction cache RAM
- 80 KiB user-data RAM
- Supply voltage: 5V
- Temperature Range: -40-80 resolution / resolution 0.1 ℃ / error <± 0.5 ℃
- Humidity Range: 0-100% RH / Resolution 0.1% RH / Error ± 2% RH
- Temperature response time: Condition: 1 / E (63%) Minimum 6s maximum 20s
- Humidity Response Rhyme: Condition: 1 / e (63%) 25 ℃, 1 m / s in air <5 s
- Interface Sequence: VCC, GND, SS
- Size: 38 x 20 mm

## 3.12 Relay Module

A relay is an electrically operated device. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output cont. actor). It is frequently used in automatic control circuit. To put it simply, it is an automatic switch to controlling a high-current circuit with a low-current signal.


Fig- 3.11: Relay Module

The advantages of a relay lie in its lower inertia of the moving, stability, long-term reliability and small volume. It is widely adopted in devices of power protection, automation technology, sport, remote control, reconnaissance and communication, as well as in devices of electro mechanics and power electronics. Generally speaking, a relay contains an induction part which can reflect input variable like current, voltage, power, resistance, frequency, temperature, pressure, speed and light etc. It also contains an actuator module

(output) which can energize or de-energize the connection of controlled circuit. There is an intermediary part between input part and output part that is used to coupling and isolate input current, as well as actuate the output. When the rated value of input (voltage, current and temperature etc.) is above the critical value, the controlled output circuit of relay will be energized or de-energized.
NB: input into a relay can be divided into two categories: electrical quantities (including current, voltage, frequency, power etc.) and non- electrical quantities(including temperature, pressure, speed, etc.)

### 3.12.1 Features

The features of 1-Channel Relay module are as follow:

- Good in safety. In power system and high voltage system, the lower current can control the higher one.
- 1-channel high voltage system output, meeting the needs of single channel control
- Wide range of controllable voltage.
- Being able to control high load current, which can reach 240V, 10A
- With a normally-open (NO) contact and a normally-closed (NC) contacts

## 3.13 Pump Motor

Micro DC 12V Pump Mini water pump For Fountain Garden Mini water circulation System.

Fig-3.12: Pump Motor

### 3.13.1 Features

- Maximum lift: 40-110 cm / 15.75 "-43.4"
- Flow rate: 80-120L / h
- Outside diameter of water outlet: 7.45mm / 0.3 "(our 7mm internal diameter tube is right for this pump).
- Internal diameter of water outlet: 4.7 mm / 0.18 "
- Diameter: Approx. 24mm / 0.95 "
- Length: approx. 45mm / 1.8 "
- Height: Approx. 33mm / 1.30 "
- Material: engineering plastic
- Driving mode: Brushless DC design, magnetic driving
- DC voltage: 8-12V

# Chapter- 4

# Experimental Results

## 4.1 Introduction

The Internet of Things (IoT) has revolutionized how devices interact, making automation and remote monitoring more efficient. The IoT-Based Rain Alert with Weather Monitoring & Pump Control System is a comprehensive solution designed to integrate weather sensing, rain detection, and automated pump control for various applications, including agriculture, smart homes, and industrial systems. By leveraging IoT technology, this system enhances convenience, reduces resource wastage, and ensures a sustainable and automated solution for weather-dependent operations.

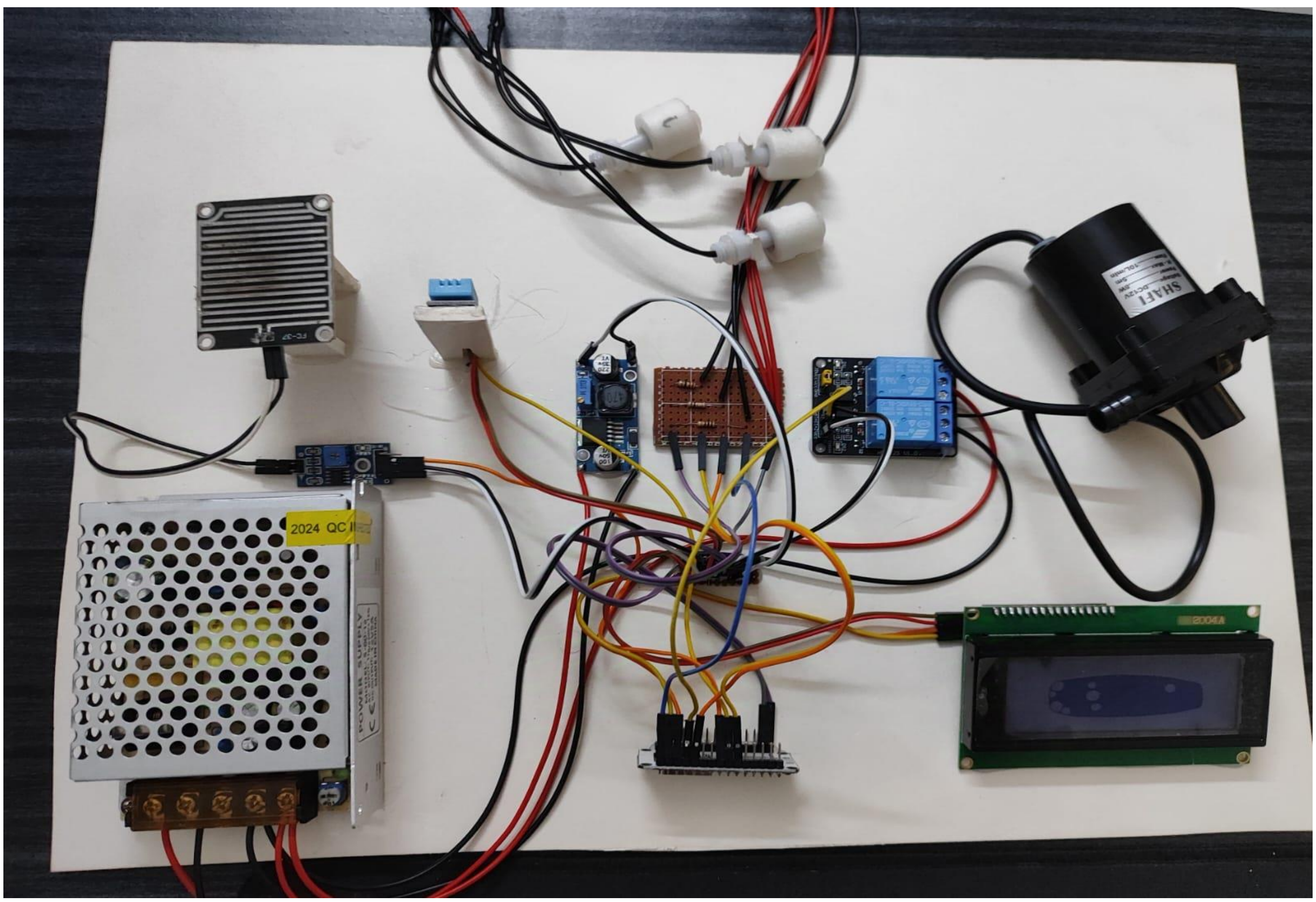


Fig-4.1: Project Picture

## 4.2 Result

The implementation of the IoT-Based Rain Alert with Weather Monitoring & Pump Control System has yielded several promising outcomes, showcasing its efficiency, reliability, and practical application in real-world scenarios. The project successfully demonstrated how IoT technology can integrate weather monitoring, rain detection, and pump control into a cohesive, automated system. The results validated the practicality of the solution, emphasizing its potential to save resources, improve efficiency, and promote sustainable practices. This system has significant potential for broader implementation in agriculture, urban infrastructure, and industrial operations, paving the way for smarter and more sustainable environmental management solutions. The integration of IoT technology into this domain introduces real-time monitoring, automation, and remote accessibility, offering a smarter and more sustainable alternative.

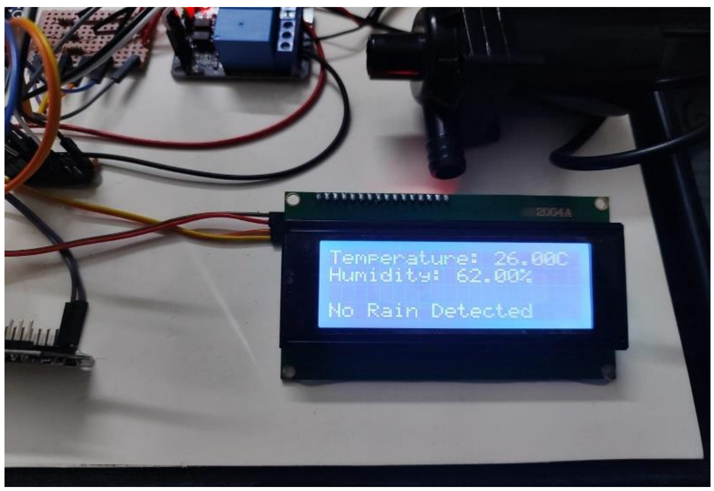


Fig-4.2: Experimental Results-01

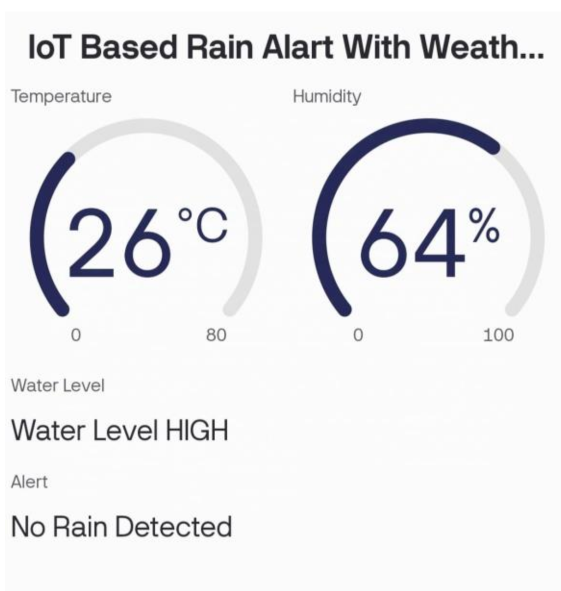


Fig-4.3: Experimental Results-02

# Chapter- 5

# Conclusion & Future Scope

## 5.1 Introduction

The IoT-Based Rain Alert & Pump Control System is a transformative innovation that addresses critical challenges in water management, irrigation, and flood prevention. By integrating sensors, automation, and IoT connectivity, the system enhances operational efficiency and resource conservation.

## 5.2Advantage

Advantages of IoT-Based Rain Alert & Pump Control System Real-Time Monitoring and Alerts. Provides immediate notifications about rainfall intensity and pump status, enabling users to respond quickly to changing conditions.

- Automation
- Efficient Irrigation
- Flood Prevention
- Remote Accessibility
- Cost Savings

## 5.3 Application

- Urban Drainage Systems
- Rainwater Harvesting Systems
- Flood Control
- Industrial Water Management
- Greenhouse and Indoor Farming
- Water Supply and Conservation
- Construction Sites

## 5.4Future Scope

- Advanced Sensor Technology.
- Integration with Artificial Intelligence (AI).
- Enhanced Connectivity Options.
- Improved User Interfaces.

## 5.5 Conclusion

The IoT-Based Rain Alert & Pump Control System represents a significant step forward in automating and optimizing water management processes. By combining rainfall monitoring with smart automation and IoT connectivity, the system addresses critical challenges in agriculture, flood control, and sustainable resource utilization. Its ability to provide real-time alerts, automate pump operations, and offer remote accessibility empowers users to efficiently manage water resources while reducing manual intervention.

# References


[1] E. Welbourne, L. Battle, G. Cole, K. Gould, K. Rector, S. Raymer et al., Building the internet of things using RFID: The RFID experience, IEEE internet comput., vol. 13, no. 3, pp.48- 55, MayJun. 2009.

[2] Shifeng Fang; Li Da Xu; Yunqiang Zhu; JiaerhengAhati; Huan Pei; Jianwu Yan; Zhihui Liu., An integrated system for regional environmental monitoring and management based on internet of things, IEEE Transactions on Industrial Informatics,vol.10, no. 2,pp.1596-1605, May-Jun. 2014.

[3] J. A. Stankovic, Research directions for the Internet ofThings

[4] IEEE Internet ThingsJ., vol. 1, no. 1, pp. 39, Feb. 2014

[5] Shanzhi Chen; HuiXu; Dake Liu; Bo Hu; Hucheng Wang.

[6] P Bellavista, G. Cardone, A. Corradi, and L. Foschini,Convergence of MANET and WSN in IoT urban scenarios,IEEE Sens. J., vol. 13, no. 10, pp. 35583567, Oct. 2013.

[7] International Journal of Advanced Research in Computer and Communication Engineering ISO 3297:2007 Certified Vol. 5, Issue 9, September 2016

[8] International Journal of Engineering Trends and Technology (IJETT) – Volume 32 Number 2- February 2016

[9] International Journal of Engineering Science and Computing, May 2017

[10] Sagar J. S. T. , M. S. Balamurugan and J. A. Vivek, “A wireless framework for automotive monitoring systems,” in Indian Journal of Science and Technology, Vol 8(19), IPL0146, August 2015

# Appendix:

## Program for Node MCU:

```
#define BLYNK_PRINT Serial
#define BLYNK_TEMPLATE_ID "TMPL6wcfCty99"
#define BLYNK_TEMPLATE_NAME "IoT Based Rain Alart with Weather Monitoring"
#define BLYNK_AUTH_TOKEN "TY6tDUGTiYNjqwBzsgT3GLPeLOhI-w3J"
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <LiquidCrystal_I2C.h>
#include "DHT.h"
#define DHTPIN D6      // what digital pin we're connected to
#define DHTTYPE DHT11  // DHT 22  (AM2302), AM2321
DHT dht(DHTPIN, DHTTYPE);
LiquidCrystal_I2C lcd(0x27, 20, 4);
int pos = 0;
char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "student";
char pass[] = "iotstudent";
int rain = D5;
int raindata;
int pump = D3;

int flag = 0;
int pinValue;
int wt1 = D0;
int wt2 = D7;
int wt3 = D4;
int wt_lev1;
int wt_lev2;
int wt_lev3;
```

```
void setup() {

  // Debug console
  Serial.begin(9600);
  pinMode(pump, OUTPUT);
  pinMode(wt1, INPUT);
  pinMode(wt2, INPUT);
  pinMode(wt3, INPUT);
  // pinMode(wt1, INPUT);
  digitalWrite(pump, HIGH);
  dht.begin();
  lcd.init();
  lcd.backlight();
  Blynk.begin(auth, ssid, pass);
  //timer.setInterval(1000L, myTimerEvent);
}

void loop() {
  Blynk.run();

  float h = dht.readHumidity();
  // Read temperature as Celsius (the default)
  float t = dht.readTemperature();

  //timer.run(); // Initiates BlynkTimer
  raindata = digitalRead(rain);

  wt_lev1 = digitalRead(wt1);
  wt_lev2 = digitalRead(wt2);
  wt_lev3 = digitalRead(wt3);
```

```
Serial.println(wt_lev1);
Serial.println(wt_lev2);
Serial.println(wt_lev3);
Serial.println("..........................");
Blynk.virtualWrite(V1, h);  //virtual pin V0
Blynk.virtualWrite(V0, t);  //virtual pin V0

delay(1000);
lcd.clear();

lcd.setCursor(0, 0);
lcd.print("Temperature: ");
lcd.print(t);
lcd.print("C");

lcd.setCursor(0, 1);
lcd.print("Humidity: ");
lcd.print(h);
lcd.print("%");

if (wt_lev1 == 0 && wt_lev2 == 1 && wt_lev3 == 0) {
  lcd.setCursor(0, 2);
  lcd.print("Water Level LOW");
  Blynk.virtualWrite(V2, "Water Level LOW");  //virtual pin V0
  digitalWrite(pump, LOW);
}

if (wt_lev1 == 0 && wt_lev2 == 0 && wt_lev3 == 0) {
  lcd.setCursor(0, 2);
  lcd.print("Water Level LOW");
  Blynk.virtualWrite(V2, "Water Level Low");  //virtual pin V0
```

```
  }

  if (wt_lev1 == 1 && wt_lev2 == 1 && wt_lev3 == 0) {
    lcd.setCursor(0, 2);
    lcd.print("Water Level Medium");
    Blynk.virtualWrite(V2, "Water Level Medium");  //virtual pin V0
  }

  if (wt_lev1 == 1 && wt_lev2 == 1 && wt_lev3 == 1) {
    lcd.setCursor(0, 2);
    lcd.print("Water Level HIGH");
    Blynk.virtualWrite(V2, "Water Level HIGH");  //virtual pin V0
    digitalWrite(pump, HIGH);
  }

  if (raindata == 0) {
    Blynk.virtualWrite(V3, "Rain Detected!");
    lcd.setCursor(0, 3);
    lcd.print("Rain Detected!");
  }

  if (raindata == 1) {
    Blynk.virtualWrite(V3, "No Rain Detected");
    lcd.setCursor(0, 3);
    lcd.print("No Rain Detected");
  }
}
```