

# National Textile University, Faisalabad



## Project Documentation

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<b>Section</b>	BSCS 5 <sup>th</sup> -A
<b>Subject</b>	Embedded IOT System
<b>Project</b>	Water Quality Monitoring
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## IoT-Based Water Quality Monitoring System Using ThingSpeak and Blynk

### 2. Problem Statement and Objectives

## Problem Statement

Monitoring water quality is essential to ensure safe water for daily use. Conventional methods are mostly manual and do not provide continuous or real-time monitoring. Due to this limitation, changes in water quality parameters such as turbidity and Total Dissolved Solids (TDS) may not be detected in time.

This project aims to develop a simple, reliable, and real-time IoT-based water quality monitoring system using cloud platforms.

## Objectives

- To design a basic IoT-based water quality monitoring system.
- To measure **Turbidity** and **TDS** using appropriate sensors.
- To upload real-time sensor data to **ThingSpeak** for cloud storage and visualization.
- To display live sensor values on the **Blynk mobile application**.
- To provide a clear and user-friendly monitoring interface.

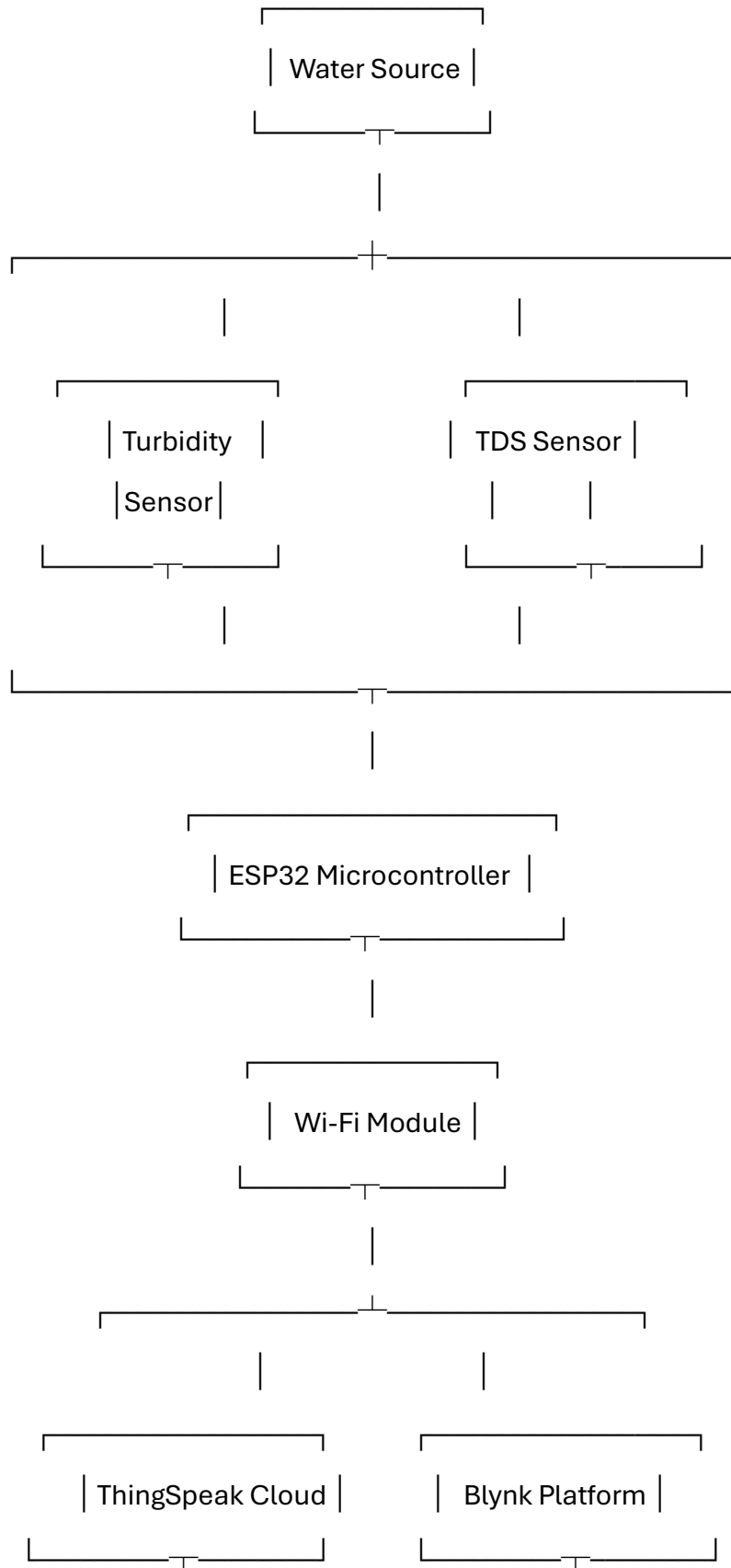
## 3. System Architecture / Block Diagram

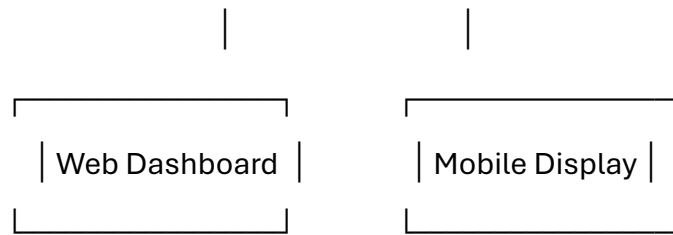
### System Architecture Description

The system consists of water quality sensors connected to a microcontroller with Wi-Fi capability. The microcontroller collects sensor data, processes it, and sends the data to cloud platforms. ThingSpeak is used for data logging and graphical visualization, while Blynk is used for real-time mobile monitoring.

### Block Diagram (Textual Representation)

The block diagram represents the overall system structure. The turbidity sensor and TDS sensor are connected to the ESP32 microcontroller. The ESP32 processes the sensor data and sends it through Wi-Fi to cloud platforms. ThingSpeak is used for data logging and graphical visualization, while Blynk is used to display real-time values on a mobile application.





## 4. Hardware and Software Description

### Hardware Components

#### 1. Microcontroller (ESP32 with Wi-Fi):

- Reads sensor values
- Communicates with cloud platforms

#### 2. Turbidity Sensor:

- Measures water clarity
- Provides analog output

#### 3. TDS Sensor

- Measures of total dissolved solids in water
- Indicates water quality level

#### 4. Power Supply:

- Supplies required voltage to the system

### 5. Connecting Wires and Breadboard

### Software Components

#### 1. ThingSpeak:

- Used for cloud data storage and graphical analysis

#### 2. Blynk Mobile Application:

- Used for real-time monitoring on a smartphone

#### 3. Embedded Programming Language C++

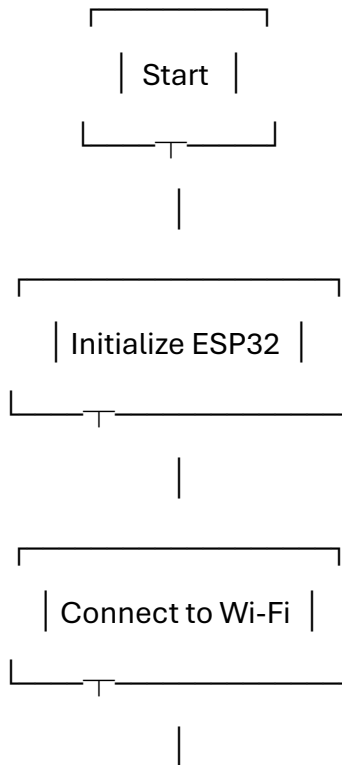
## 5. Methodology and Flowchart

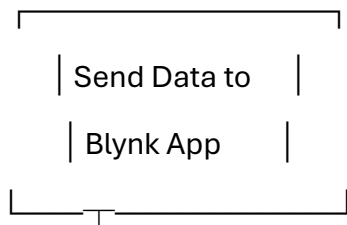
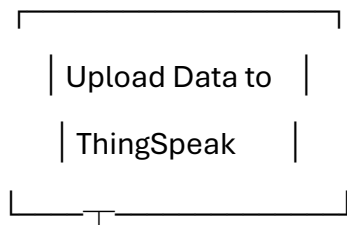
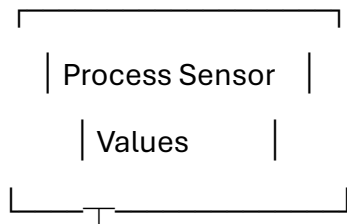
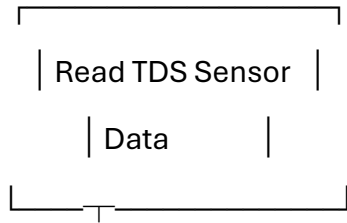
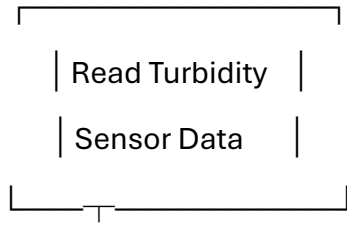
## Methodology

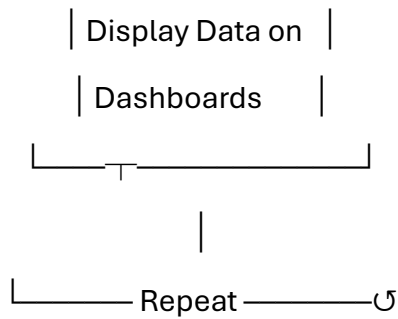
1. Power on the system and initialize the microcontroller.
2. Establish Wi-Fi connection.
3. Read analog data from turbidity and TDS sensors.
4. Convert sensor data into readable values.
5. Upload data to ThingSpeak for logging and visualization.
6. Send live data to the Blynk application.
7. Display real-time values on dashboards.
8. Repeat the process at regular intervals.

## Flowchart (Textual Representation)

The flowchart illustrates the step-by-step working of the system. It starts with system initialization, followed by Wi-Fi connection setup. The ESP32 then reads data from turbidity and TDS sensors, processes the values, and uploads the data to ThingSpeak and Blynk platforms. The values are displayed on dashboards, and the process repeats continuously.







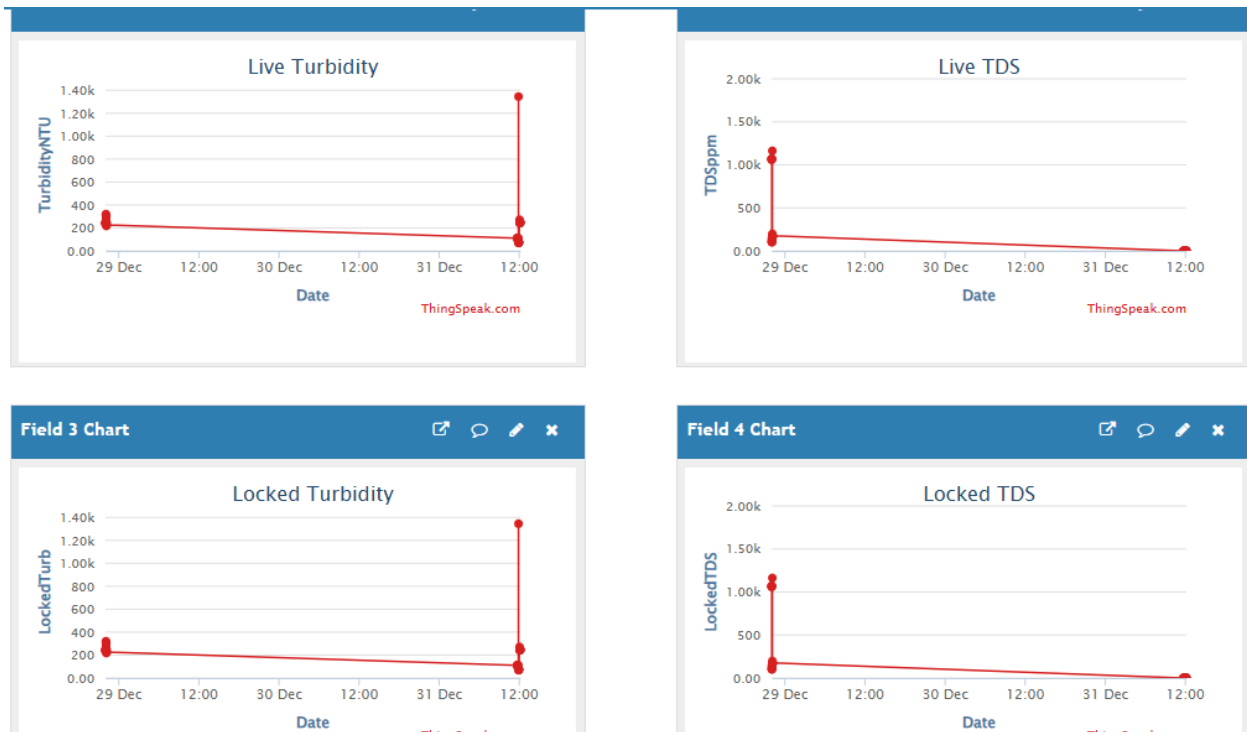
## 6. Screenshots of Output and Dashboards

This section includes:

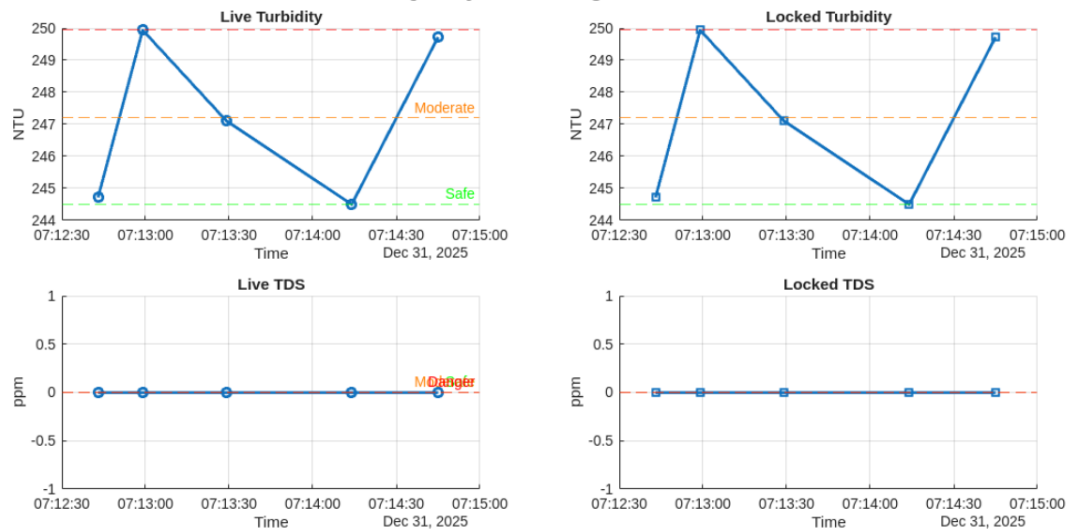
**ThingSpeak channel dashboard** showing turbidity and TDS graphs.

The screenshot shows the 'My Channels' page on the ThingSpeak website. At the top is a blue navigation bar with the ThingSpeak logo and links for Channels, Apps, Devices, and Support. Below the navigation bar, the page title 'My Channels' is displayed. A green 'New Channel' button is on the left, and a search bar with the placeholder 'Search by tag' is on the right. The main content area features a table with the following data:

Name	Created	Updated
<div><div><div>Private</div><div>Public</div><div>Settings</div><div>Sharing</div><div>API Keys</div><div>Data Import / Export</div></div><div>Water Quality Monitoring</div></div>	2025-12-28	2025-12-31 07:14

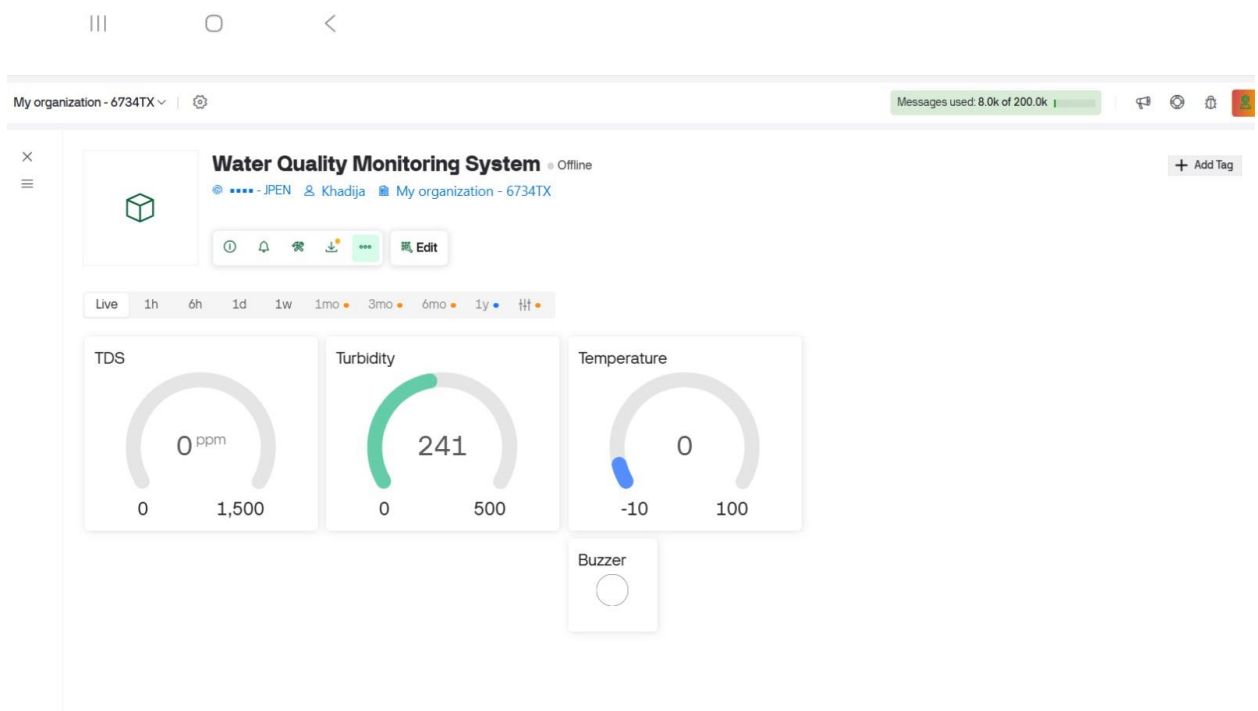
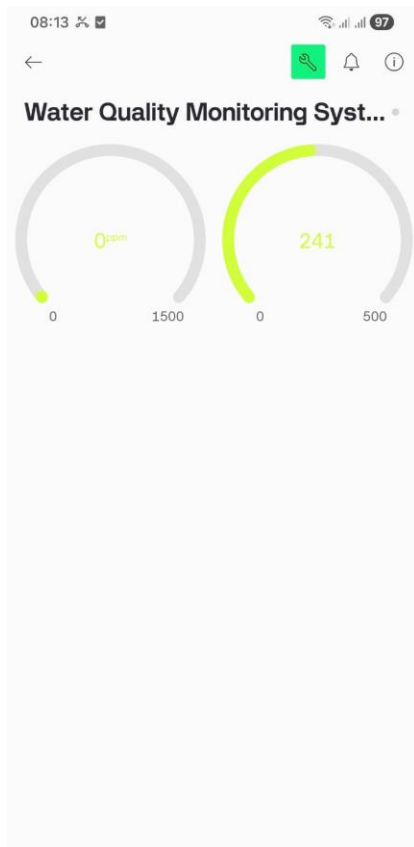


### Water Quality Monitoring Dashboard



**Blynk mobile application** displaying live sensor values.





## 7. Results, Conclusion, and Future Scope

## **Results**

The system successfully measures water turbidity and TDS values and uploads the data to ThingSpeak in real time. The cloud dashboard provides clear graphical visualization of water quality parameters, enabling remote monitoring.

## **Conclusion**

This project presents a simple and effective IoT-based water quality monitoring system. The integration of ThingSpeak and Blynk provides both cloud-based data analysis and real-time mobile monitoring. The system is easy to understand, reliable, and suitable for academic implementation.

## **Future Scope**

- Addition of more sensors such as pH and temperature sensors.
- Mobile application integration for alerts and notifications.
- Data analytics and threshold-based warning system.
- Deployment in real-world water distribution systems.