SMART WATER QUALITY MONITORING AND MANAGEMENT SYSTEM FOR SHRIMP HATCHERY

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A Final Year Design Project (FYDP) submitted to the Department of Electrical and Electronics Engineering in partial fulfillment of the requirements for the degree of BSEEE

Electrical and Electronics Engineering
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Electrical and Electronics Engineering
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May 2025

Declaration

It is hereby declared that

1. The Final Year Design Project (FYDP) submitted is our own original work while completing a degree at Brac University.
2. The Final Year Design Project (FYDP) does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The Final Year Design Project (FYDP) does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

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Ethics Statement

We hereby confirm that this project “Smart Water Quality Monitoring and Management System for Shrimp Hatchery” has met the requirements of the Final Year Design Project (FYDP). This project has been developed by collective effort of the group members. The supportive materials, literature review and collected data have been cited properly. According to the library of Brac University this report consists of a similarity score of 12%. Through proper guidance and support from our supervisors and university we have implemented our project contents.

Abstract/ Executive Summary

Shrimp farming is one of the most important aquaculture in Bangladesh. By exporting this product, we earn millions in foreign revenue. One of the main aspects of shrimp farming is water quality management. In ideal temperature, pH, salinity, and dissolved oxygen levels, shrimp production thrives. However, maintaining the water quality is still manual labor-based. It is estimated that 50% of larvae die before growing to full adults because of manual water quality management. We developed a system where different sensors will collect data, and it can be shown in real time. By using microcontrollers and actuator motors , whenever any changes occur in the quality of the water , they will be resolved. As such, it helps to decrease the shrimp mortality rate.

Keywords:

pH, Salinity, Dissolved Oxygen, Temperature, Water level, Shrimp, IoT, ThingSpeak etc

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Chapter 1: Introduction

1.1 Introduction

Shrimp aquaculture still serves as a pillar of the blue-economy in Bangladesh, providing 348 million USD in exported value in the 2019-20 fiscal period. On the other hand, the national harvests have seen a drop from 250 000 t in 2016-17 to 240 000 t two seasons later, a decline that indicates troubling underlying issues in the industry that still represents 2.1 % of the global market [1].

The main reason for this change is increasing pond environment volatility. Escalating temperatures along with random salinity and oxygen shocks—made worse by pollution and climate change—undermine shrimp immunity and survivability, pushing average farm mortality above 50 percent [2]. Because growers discover these deviations hours after irreversible damage has begun, intermittent manual testing offers little protection [3].

For that reason, this work develops a smart water quality monitoring and management system that uses reliable sensors in conjunction with Arduino-ESP32 IoT frameworks. By providing temperature, pH, salinity, turbidity, and dissolved-oxygen levels to a cloud API, along with immediate access to pump and valve control, the system promises lower mortality and improved yields, paving the way for increased sustainable expansion [4].

1.1.1 problem statement

One of the most vulnerable sectors in Bangladesh is shrimp aquaculture as it remains profitable. The industrial productivity, which is a strong contributor to the economy, has been gradually declining. In the year of 2016-17, shrimp production was around 250,000 metric tons but dropped at an alarming rate of 240,000 metric tons in 2018-19. The export revenue also followed the same declining trend, going from 365.44 million USD to 348 million USD between 2018-19 and 2019-20 [1]. Bangladesh is ranked ninth globally in the industry as they produce 2.1% of the market shrimp, which constitutes them as the 9th highest producer of shrimp. However, the alarming decline in sustainability and efficiency calls these statistics into question which requires a good explanation. The most vital aspect is the management of water quality in hatcheries that is getting worse and is impacted by pollution, salinity fluctuations, temperature changes, and oxygen depletion [3], [4].

The inability of the environment to provide the required basic essentials results in the decline in immunity of shrimp, which leads to blooms of disease that increases fatality rates— which costs the majority of the farms around 55-65% unidentified mortality [6]. Compounding these issues, the manual techniques for monitoring relied on by the industry are not real-time and require consistent continuous checking. Major damage that could potentially spell trouble for the highly inefficient industry laden with timid workers and low profit margins, could already have happened by the time the water condition irregularities are figured out. A

lack of responsiveness paired with no automation makes the industry face an endless cycle of challenges where they suffer from unending losses yet somehow find themselves propped up.

1.1.2 Background Study

Bangladesh, by nature, is blessed with dependencies necessary for shrimp farming like the climatic conditions of the region, abundant water resources, and cheap labor. These benefits have, in the past, fueled growth in the aquaculture industry. However, remaining shrimp farms are highly dependent on the environmental conditions of the area, most importantly the water quality in shrimp ponds. Several parameters like the range of temperature, pH, the amount of oxygen available, turbidity, and salt concentration have to be maintained within set levels to guarantee shrimp health, reduce stress, and promote optimal growth [3]. Variability in these factors combined with international climate change and pollution is detrimental to shrimp farms in Bangladesh [4].

IoT devices have provided innovative solutions for extra freshwater monitoring in shrimp farming expansion. IoT-enabled equipment can constantly measure and monitor water quality using remote sensors, microcontrollers, and wireless communication [5], [8]. Besides simple farmers notifications, these systems could allow automatic corrective actions such as pump activation or chemical dispensers [2], [7]. Increased automation allows these improvements to be easily integrated without sacrificing operational standards, avoiding negative impact on ecosystem-friendly ranching practices, and lowering program costs. Because of such systems, operational effectiveness is bound to increase.

1.1.3 Literature Gap

Despite the increasing enthusiasm towards the technological offerings in aquaculture, there is still a significant gap concerning development and application of fully automated, real-time water quality monitoring and control systems specific for shrimp hatcheries in Bangladesh. Most systems continue to operate on a manual basis or with the help of semi-automated tools, which rely on the provision of disconnected data devoid of alerts. In essence, farmers tend to discover detrimental changes in water parameters after it is too late thus causing undue suffering for shrimp in terms of mortality, and dips in yield.

Although there has been some work incorporating IoT frameworks towards monitoring water quality, many of which are limited to data gathering only, or apply to general aquaculture and not the more environmentally sensitive shrimp farming. In addition, most solutions do not offer any form of integrated automation, such as active engagement of propellers and chemical dispensers for prompt command response farming. Oftentimes, practical aspects such as pricing, the possibility of rural adaption, and user-friendliness are disregarded as well.

These circumstances bring forth the need for a system that is easy to adapt to, cheap, and chiefly able to manage and monitor water quality without any help. With this gap filled, hand-carrying leads to better shrimp health and promotes labor independence.

1.1.4 Relevance to current and future Industry

Bangladesh's economy depends heavily on shrimp farming, which creates jobs in rural areas and boosts export revenue. However, disease outbreaks, ineffective water management, and environmental instability are currently posing serious challenges to the industry. Modernization of shrimp aquaculture at all levels is urgently needed due to the growing demand for premium, sustainably farmed shrimp worldwide. This need is directly met by the suggested smart water quality monitoring and management system, which automates hatchery operations and adds accuracy and real-time responsiveness.

Digital transformation and IoT integration are quickly becoming commonplace methods in aquaculture and agriculture across the globe in the current industry landscape. This project supports that trend by providing hatchery owners, particularly those operating in rural areas with limited resources, with a scalable, affordable, and user-friendly solution.

1.2 Objectives, Requirements, Specification and constant

1.2.1. Objective

- Develop real-time water monitoring systems for shrimp aquaculturists.
- Integrate advanced technologies in shrimp farming.
- Enhance production efficiency.
- Promote sustainable shrimp farming practices.
- Increase Global Competitiveness.

1.2.2 Functional and Nonfunctional Requirements

Functional requirements:

The functional requirements (must-do) are centered around the core operations of the system. As we are designing a smart water quality monitoring and management system of a shrimp hatchery, the sensors must accurately measure the water parameters such as temperature,salinity, pH, etc. Then we need a data processing unit which will process the collected raw data from the sensors. After that these processed data has to be stored in a cloud storage system.Again we will also need a user interface where all the water parameters will be shown. Lastly there must be a control system to take actions regarding the water parameters, containing a servo motor,water pump and several adjustors connected with an actuator controller which will be controlled by the processing unit.

Non Functional requirements:

The non-functional requirements (shall-do) focus on the performance, reliability, and usability of the system. We can add solar cells to maintain uninterrupted electricity. The project design should have scope for addition of components in future for ensuring better water quality for shrimp. Maintenance of the system should be simple. Overall, these requirements will contribute to a system that is not only functional but also reliable, secure, and user-friendly.

1.2.2 Specifications

The proposed smart water quality monitoring and management system is designed to ensure continuous, accurate, and real-time assessment of critical water parameters in shrimp hatcheries. The system aims to improve shrimp survival rates and support sustainable aquaculture practices through the integration of advanced electronics, IoT, and automation.

- **Monitoring Parameters**:
    - Temperature
    - pH level
    - Dissolved Oxygen (DO)
    - Salinity
    - Turbidity
    - Water Level
- **Sensor Suite**:
    - DS18B20 (Temperature)
    - SEN0161 (pH)
    - Gravity TOL-00316 (DO)
    - RK500-13 RIKA (Salinity)
    - RKI-2350 (Water Level)

- **Data Processing and Transmission**:
    - Microcontroller: Arduino Uno R3
    - Microprocessor: Raspberry Pi 3 B+
    - Real-time data acquisition and transmission via Wi-Fi to cloud/server

- **User Interface**:
    - Mobile application (Android) for real-time data access
    - Dashboard for visualization and historical data tracking
- **Automated Control System**:
    - Servo motors, pumps, and actuators to adjust environmental conditions based on sensor data
    - Threshold-based response system with alert generation
- **Power and Connectivity**:
    - Backup power (solar-compatible)
    - Wireless connectivity (Wi-Fi, optionally GSM)
- **Scalability and Maintenance**:
    - Modular design for easy expansion
    - Components selected for durability and minimal maintenance

1.2.3 Technical and Non-technical consideration and constraint in design process

Constraints:

One of the key challenges in developing a smart water quality monitoring and management system for a shrimp hatchery is balancing full automation with the need for manual intervention during emergencies. While the fully automated approach (Design Approach-2) aims to reduce human involvement, it's crucial to allow for manual overrides in case of system failures to protect the shrimp and maintain operations. Another major constraint we face is budget—high-precision sensors and equipment are essential for accurately monitoring

water parameters, but these often come with a high price tag. This makes it important to strike the right balance between cost and accuracy to ensure both reliability and affordability.

Technical Considerations

Sensor Accuracy and Reliability:
Low-cost sensors (e.g., pH, DO, salinity) can have limited precision, require frequent calibration, and may degrade over time, affecting data quality.

Component Durability:
Exposure to harsh aquatic environments (e.g., saltwater, humidity) can reduce the lifespan of sensors and electronic components.

Power Supply:
Continuous operation requires stable power. In rural areas, frequent outages can disrupt functionality unless a backup system (e.g., battery or solar) is used.

Internet Connectivity:
Real-time data transmission and remote control depend on consistent network access, which may be unreliable in coastal or rural locations.

Non-Technical Considerations

1. **Financial Constraints:** Initial Setup Cost: Although components are relatively low-cost, the total expense (including sensors, controllers, motors, and protective enclosures) can still be significant for small-scale farmers.

   Maintenance Cost: Periodic sensor replacement, motor servicing, and potential repairs add to operational costs.

2. **Human Resource Constraints:** Technical Skills Gap: Farmers or hatchery operators may lack the technical knowledge to operate, calibrate, or troubleshoot the system without training.

   System Dependency: Over-reliance on automation without understanding core principles of aquaculture management may lead to misuse or complacency.

3. **Environmental Constraints**
   Climate Sensitivity: Sudden environmental changes (e.g., heavy rainfall, storms, tidal fluctuations) can affect sensor readings and motor performance.

   Corrosive Environment: Saltwater environments can accelerate corrosion of exposed hardware, requiring specialized waterproofing or protective housing.

4. **Regulatory and Legal Constraints**

Compliance Requirements: If data logging is used for regulatory purposes, the system must meet local aquaculture monitoring standards.

Import Restrictions: Some components may be difficult to source locally due to import regulations or supply issues.

1.2.4 Applicable compliance, standards, and codes

Department of Fisheries of Government of Bangladesh and Bangladesh shrimp and Fish foundation jointly prepared and revised a code of conduct for shrimp hatchery in Bangladesh in accordance with US Food and Drug Administration food safety regulations EU food and feed safety regulations and international buyers demand.the codes are published in the following article

CODE OF CONDUCT For Selected 10 Segments of the Shrimp Aquaculture Industry in Bangladesh originally prepared by Department of fisheries Government of Bangladesh and further revised by Bangladesh Shrimp and Fish foundation [8]

General Codes

- Legal ownership and right to the use of the hatchery land and infrastructure
- Registration with and license from an appropriate organization.
- Harmony with the local community.
- Labour standard compliance.
- Workers health and hygiene issues.
- Environment protection and sustainability.
- Broodstock management like hatcheries shall only use local species and shall not Import non-native species.
- Broodstock Health as hatcheries shall test all broodstock for viruses, pathogens and contaminants and preserve records on all tests conducted.
- Storage and Disposal of hatchery supplies as fuel, lubricants and chemicals should be stored and discharged in a responsible manner.
- Food safety precautions should be taken to ensure the shrimps are safe for consumption like nationally and internationally approved medicine shall be used.
- Hatchery shall not sell not sell PL younger than Pl-10 to farmers.
- Hatchery shall maintain all conditions which will not alter PL's health status.
- It is imperative that hatcheries should implement robust biosecurity measures to prevent inadvertent contamination of the facility.
- Hatchery should maintain all the traceability records.

1.3 Systematic Overview/summary of the proposed project

1.3.1 Design Approach 1

The first design approach for a water quality monitoring system designed to measure and display various environmental parameters using multiple sensors and a microcontroller-based processing unit. The sensor systems include a Temperature Detector for monitoring water temperature, crucial for assessing aquatic health, and a pH Detector to measure water acidity or alkalinity, ensuring the environment is safe for aquatic life. The Dissolved Oxygen (DO) Detector monitors oxygen levels, vital for organism survival, while the Salinity Detector measures salt concentration, important for estuaries and marine ecosystems. Additionally, the Water Level Detector tracks water levels to prevent flooding or ensure sufficient water availability.

The system continuously monitors various water quality parameters using a range of sensors, such as the DS18B20 temperature sensor, SEN0161 pH sensor, Gravity TOL-00316 dissolved oxygen (DO) sensor, RK500-13 RIKA salinity sensor, and the RKI-2350 water level sensor. These sensors send real-time data to a central processing unit, typically a microcontroller,which collects and interprets the raw data, performing necessary computations to convert it into meaningful information. The processed data is then displayed on a system, such as an OLED screen, providing a real-time visualization of the water quality parameters. This allows users to easily monitor the environment and recognize any anomalies or changes. Based on the displayed information, users can take manual actions if needed, such as adjusting pH levels, salinity, or water levels to maintain optimal water quality.

1.3.2 Design Approach 2

In our second design approach, we propose a comprehensive water quality monitoring and control system that integrates sensors, a processing unit, and a controller unit to maintain optimal environmental conditions. This system is designed to automatically monitor and manage critical water parameters such as temperature, pH, dissolved oxygen (DO), salinity, and water levels. Various detector systems are employed to continuously collect real-time data: a temperature detector monitors water temperature, a pH detector gauges acidity or alkalinity, a DO detector ensures sufficient oxygen levels for aquatic life, a salinity detector tracks salt concentration, and a water level detector monitors the water volume. All sensor data is transmitted to the processing unit for analysis and evaluation.

The processing unit acts as the system’s core, receiving and analyzing sensor data to detect any deviations from predefined thresholds. If a parameter exceeds acceptable limits, the system performs two key actions: it alerts the user through an app notification, and it sends corrective commands to the controller unit. The controller unit then activates the appropriate actuators to restore balance, including a temperature controller, pH level adjustor, salinity adjustor, and water pump. These actuators automatically intervene to adjust conditions back to safe levels, ensuring a stable water environment. This closed-loop feedback system allows for proactive, real-time management of water quality, essential for maintaining the health of aquatic ecosystems or the efficiency of water-based operations.

1.4 Conclusion

Effective water quality monitoring is now more important than ever due to growing concerns about water pollution and its effects on the environment and human health. In order to facilitate early contamination detection and aid in the endeavors to guarantee sustainable and safe water use, this project seeks to create a dependable and effective system for evaluating important water parameters. This project advances the larger objective of safeguarding water resources for present and future generations by fusing environmental science with contemporary technology.

Chapter 2: Project Design Approach

2.1 Introduction

Two different design approaches were developed to compare and analyze which design has the most potential and benefits for the consumers. Both design approaches had some minimal changes in the component level and since the project is based on fire detection some minimal changes to the algorithm have also been made. Furthermore, while comparing the designs some key features were prioritized which are higher accuracy, faster response time and user friendliness as well as ease of maintenance. For both the designs we prioritized having components that are durable and cost effective. Through both designs we successfully achieved our objective to create a reliable, cost-effective and easily adopted by consumers fire detection system.

2.2 Identify Multiple Design Approach

2.2.1 Design Approach 1:

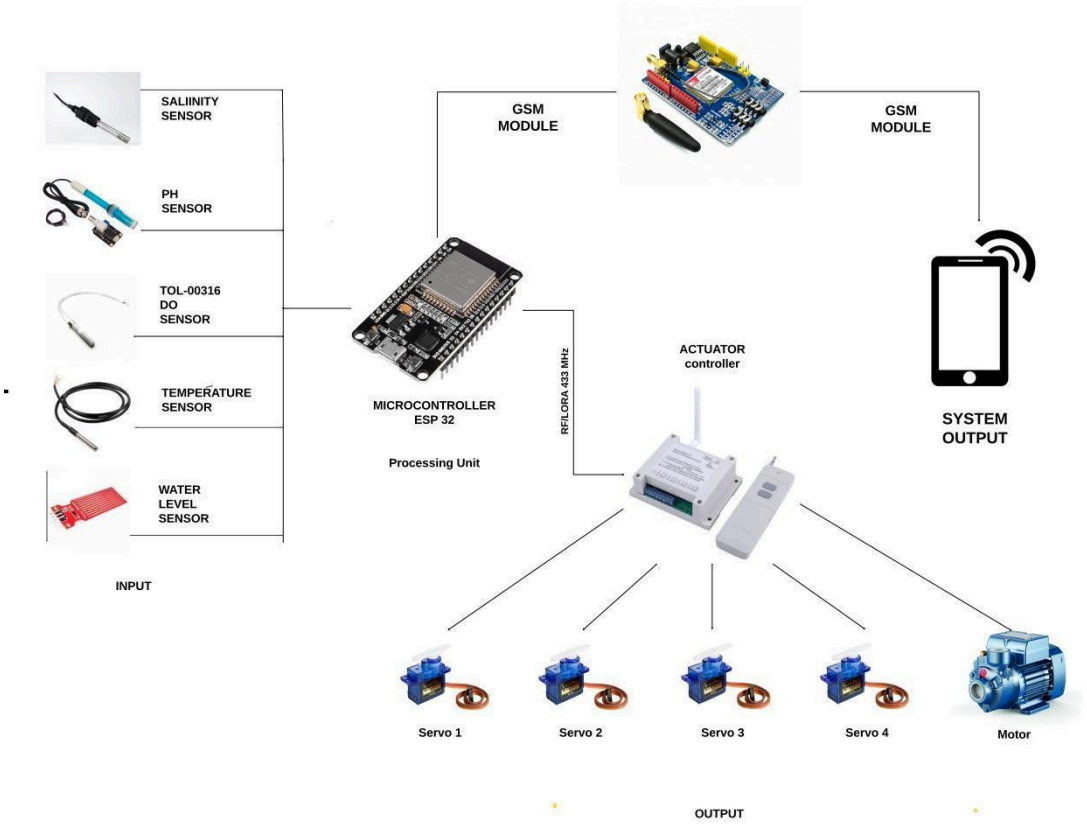

Figure 1 : System Block Diagram of Design Approach 1

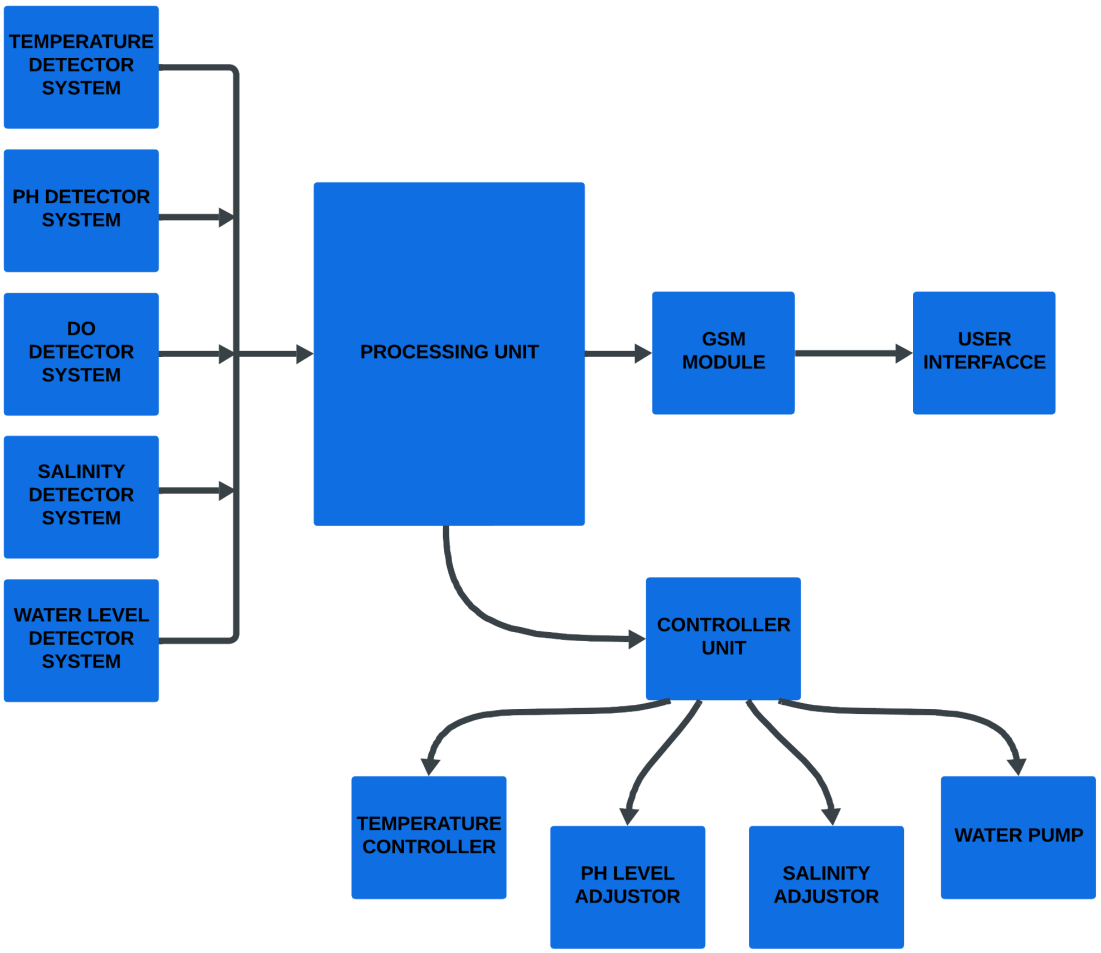

Figure 2 : Block Diagram of Design Approach 1

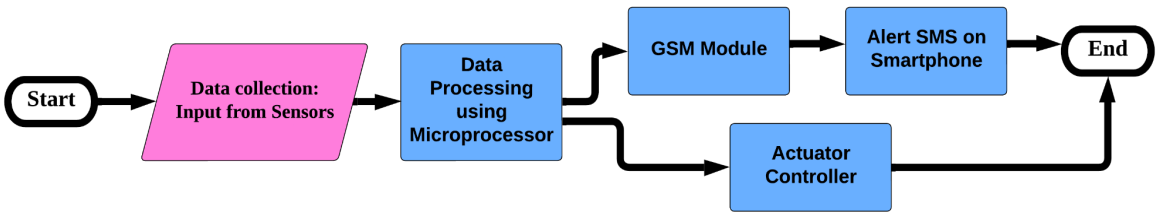

Figure 3 : Flowchart of Design Approach 1

2.2.2 Design Approach 2:

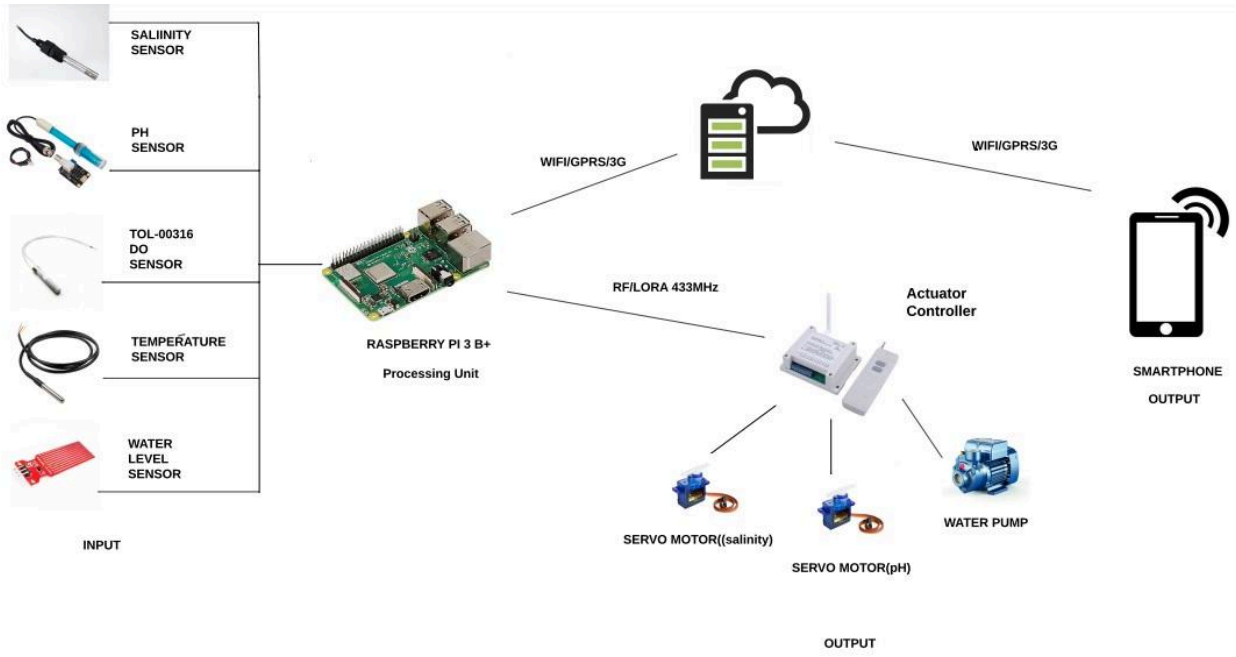

Figure 4 : System Block Diagram of Design Approach 2

Here sensors will be connected to a microcontroller, and if any data goes outside of threshold, it will send a command to the actuator motor, which will then send a command to the relevant servo motor or water pump to take action.

In this approach, data will be sent to an IoT dashboard (e.g., Thingspeak) through a Wi-Fi module. The Wi-Fi module will keep sending the data to the dashboard.

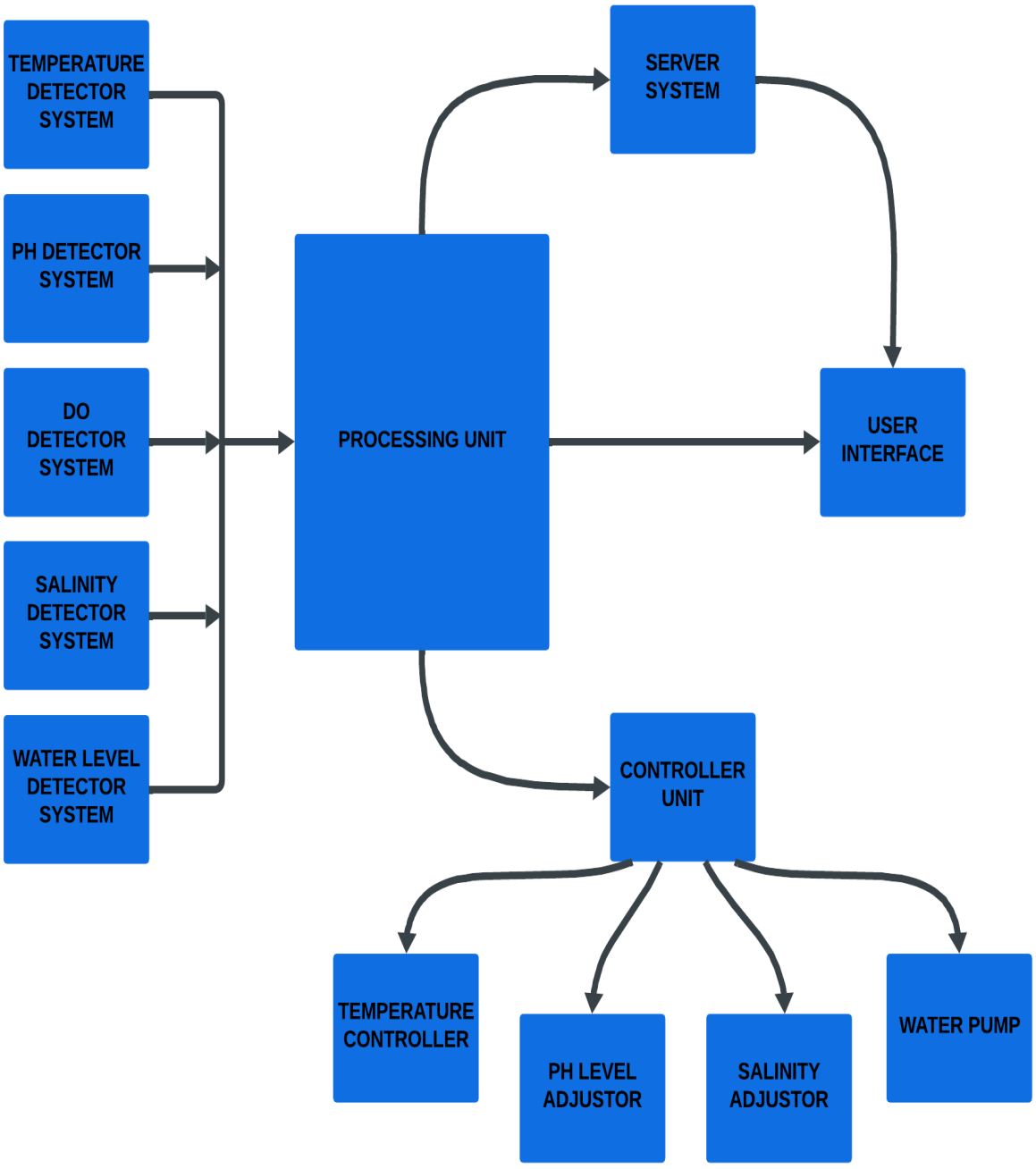

Figure 5 : Block Diagram of Design Approach 2

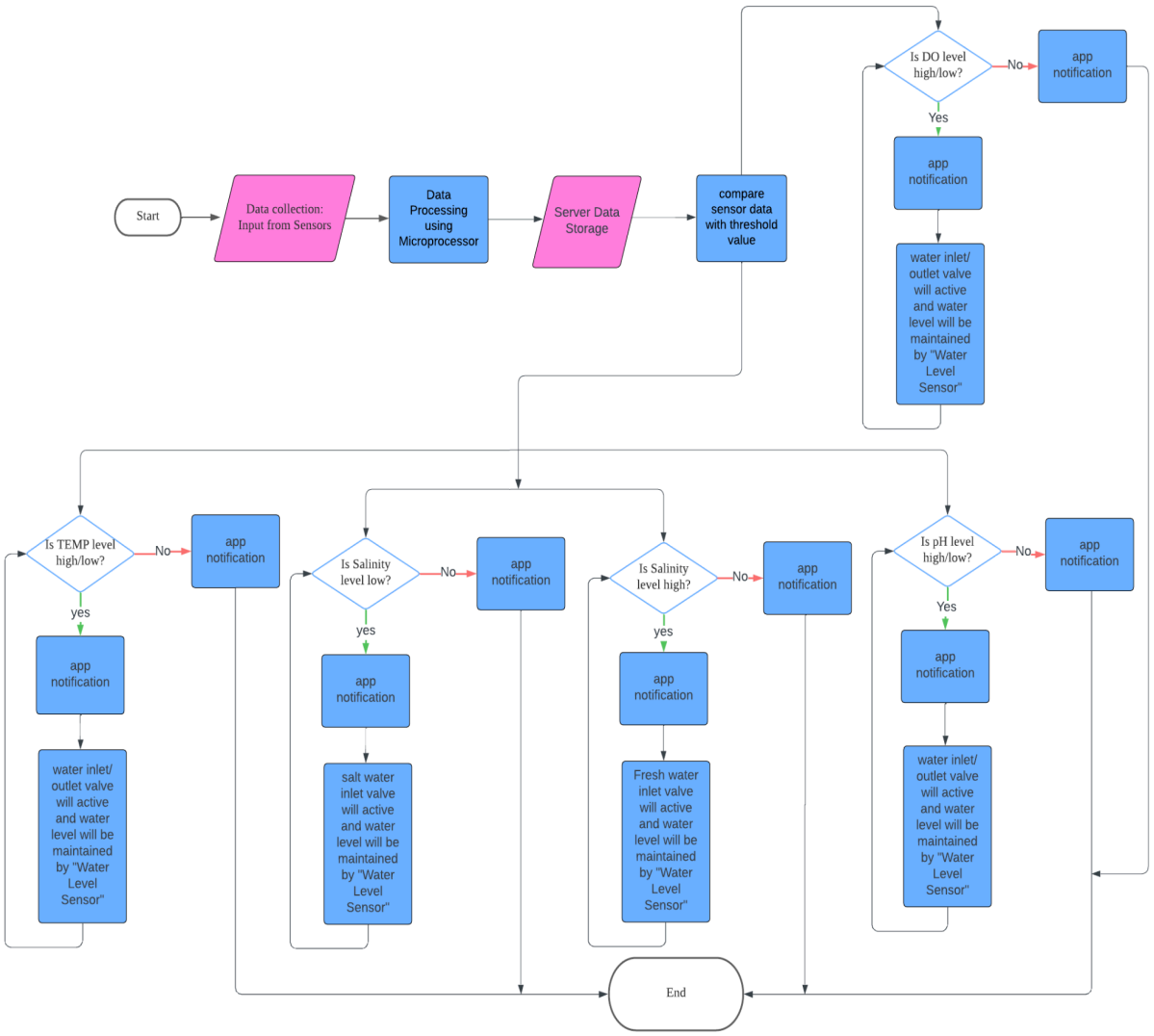

Figure 6 : Flowchart of Design Approach 2

2.3 Describe multiple design approach

2.3.1 Design Approach 1:

The water quality monitoring system incorporates a range of sensors and modules to continuously measure environmental parameters, transmit data, and enable real-time response. The following steps outline the methodology for the design:

1. **Sensor Integration**

    - Multiple sensors are employed to monitor essential water quality parameters:
        i. DS18B20 Temperature Sensor: Measures the water temperature to assess aquatic health.

ii. SEN0161 pH Sensor: Monitors the acidity or alkalinity of water.
iii. Gravity TOL-00316 Dissolved Oxygen (DO) Sensor: Tracks oxygen levels, crucial for organism survival.
iv. RK500-13 Salinity Sensor: Measures the salt concentration in the water.
v. RKI-2350 Water Level Sensor: Detects water levels to prevent flooding or ensure sufficient water availability.

- The sensors are connected to the ESP32 microcontroller, which acts as the central processing unit.

2. **Data Processing:**
   - The ESP32 microcontroller collects raw data from the sensors.
   - The microcontroller processes the data, performing necessary computations to convert raw readings into meaningful information.
   - The ESP32 ensures seamless integration and handles data storage, communication, and real-time computation.

3. **Data Transmission via GSM Module:**
   - A GSM module is integrated with the ESP32 to facilitate wireless communication.
   - The module enables the transmission of processed data to a remote server or mobile device in real-time.
   - Users can monitor water quality parameters remotely through GSM-enabled notifications or messages, enhancing accessibility.

4. **Output and Actuation:**
   - SMARTPHONE: Provides a real-time local visualization of the water quality parameters for on-site monitoring.
   - Actuator Controller with RF/LoRa Communication:
     i. Based on the processed data, the actuator controller can trigger corrective actions.
     ii. Actuators, including servo motors and pumps, adjust environmental conditions, such as regulating water flow or maintaining optimal salinity levels.
   - The system's output actuators are designed for dynamic responses, ensuring timely intervention when critical thresholds are breached.

By integrating multiple sensors, the ESP32 microcontroller, and GSM communication, the system provides a robust, real-time solution for water quality monitoring and control, ensuring sustainability and environmental safety.

The ESP32 microcontroller serves as the processing unit in this design, which shows an automated water quality monitoring and control system. Five essential sensors—a salinity sensor, pH sensor, DO (dissolved oxygen) sensor, temperature sensor, and water level sensor—provide real-time data to the system. The ESP32 receives data from these sensors,

which continuously check the water's conditions, and compares the readings to preset thresholds.

A water pump motor and several servo motors are operated by the actuator controller in response to a response from the ESP32 if any of the parameters depart from the ideal range. To ensure remote monitoring and control, a GSM module is also utilized to transmit data or alerts to a user's mobile device. Water quality is efficiently maintained by this closed-loop system, which also provides real-time.

2.3.2 Design Approach 2:

For our second design approach, we aim to achieve a water quality monitoring and control system that integrates sensors, a processing unit, and a controller unit to maintain optimal environmental conditions. The system is designed to automatically manage key water parameters such as temperature, pH, dissolved oxygen (DO), salinity, and water levels.

1. Sensors and Data Collection

The system incorporates various Detector Systems:

- Temperature Detector System: Monitors water temperature.
- pH Detector System: Measures the acidity or alkalinity of the water.
- DO (Dissolved Oxygen) Detector System: Ensures adequate oxygen levels in the water for aquatic life.
- Salinity Detector System: Tracks the salt concentration in the water.
- Water Level Detector System: Keeps track of the water volume.

These detectors constantly monitor their respective parameters and send real-time data to the “Processing Unit” for analysis.

2. Processing Unit

The Processing Unit serves as the central hub of the system. It gathers data from the detectors, processes it, and checks whether any of the measured parameters exceed pre-set threshold values. If the system identifies a parameter that deviates from the acceptable range, it performs two main tasks:

1. Alerts the user: The system sends notification to the user through the app, warning them of the abnormal condition, ensuring they are aware of potential issues even if they are not physically present.

2. Activates automatic control mechanisms: The processing unit issues commands to the “Controller Unit” to adjust environmental conditions and bring the parameter back within the desired range.

3. Controller Unit and Actuators

The “Controller Unit” interfaces between the processing unit and the various actuators responsible for maintaining water quality. Upon receiving commands from the processing unit, it directs specific actuators to take corrective action. These actuators include:

- Temperature Controller: Adjusts the water temperature to maintain it within a safe range.
- pH Level Adjustor: Adds chemicals or adjusts the water system to maintain optimal pH levels.
- Salinity Adjustor: Modulates salt concentration in the water to maintain a proper balance, although this may be done indirectly through controls on water flow or salinity sensors.
- Water Pump: Regulates water flow, particularly to maintain water level, or to ensure proper mixing of chemicals in the water for balance.

This closed-loop system ensures that the water environment remains stable and safe for any processes or organisms depending on it.

4. User Interface and Server System

The system includes a “User Interface” and a “Server System”. The user interface allows remote access to the system's data and provides an interactive platform for manual adjustments or monitoring. Through the server system, users can view historical data, track trends, and intervene in the system if necessary. This capability is particularly useful for long-term monitoring and in-depth analysis of water quality data.

The “Server System" also ensures that all relevant data, such as sensor readings, system actions, and alerts, are stored and backed up. It may provide access via web or mobile applications, giving users flexibility to manage and monitor their water systems from anywhere.

5. System Alerts and Automation

A key feature of this system is its ability to send “automated alerts” to the user when the system detects critical deviations in water parameters. The alert system is based on threshold values pre-set in the processing unit. For instance, if the water temperature rises beyond the acceptable limit, the processing unit will trigger notification to notify the user. This alert mechanism allows for quick responses to issues, minimizing potential damage or disruptions.

The automation within the system reduces the need for constant manual oversight, making it highly efficient and reducing the workload on human operators. The actuators (temperature

controllers, pH adjusters, etc.) respond almost instantly to commands from the controller unit, ensuring prompt corrective measures.

With a Raspberry Pi 3 B+ as the central processing unit, this design offers an intelligent water quality monitoring and control system. To collect environmental data in real time from the water source, the system incorporates five essential sensors: salinity, pH, dissolved oxygen (DO), temperature, and water level sensors. The data is processed locally by the Raspberry Pi, which also determines whether any parameters are over safe bounds.

Both RF (433 MHz) signals and Wi-Fi/GPRS/3G/5G connectivity are used for communication and control. The system can alert the user through a smartphone interface and send data to the cloud for remote monitoring. When anomalies are detected, the Raspberry Pi instructs a actuator controller, which in turn triggers the appropriate actuators: A water pump to control water levels and servo motors to modify pH and salinity.

2.4 Analysis of multiple design approach

Comparative Analysis of Designs

Table 1: Comparison table for different approaches.

Criteria	Design 1	Design 2
Cost	Data will be sent by SMS. Every time an SMS is sent, it will add up to the cost. Depending on the data, the cost might become exponentially higher.	A one time monthly broadband bill will suffice..
Power Consumption	GSM consumes more power because of continuous communication with cellular towers.	Generally consumes less power than GSM .
Data Transmission Speed	Speed depends on network availability. In rural areas , the GSM network may not support high speed data transmission.	Transmits higher and more consistent speed. Specially for transmitting real time data.
Ease of Setup	Comparatively easier to set up. Can be powered by a mobile power bank.	Will need a constant electric source..
Coverage	Wide coverage with cellular networks.	Limited wifi ranger

Criteria	Design 1	Design 2
Reliability	It will depend on the cellular strength which is in our rural areas.	Stable with a good wifi network.
Data Storage & Visualization	It needs an additional server set up.	Real time data visualization is possible with thingspeak.
Scalability	Multiple sims needed for scaling.	Easier to connect multiple devices.
Latency	Higher delay in cellular network.	Low latency in wifi
Security	Security depends on sim based security.	Security depends on data encryption.

When Design 1 (GSM-based) and Design 2 (Wi-Fi/IoT-based) are compared, a number of significant differences are found that affect the system's scalability, cost, and performance for shrimp hatchery monitoring. Since each reading sent raises the overall cost, Design 1's reliance on SMS for data transmission results in continuous expenses. Design 2 is much more affordable for continuous, high-volume data transfer because it uses a fixed monthly broadband connection. Wi-Fi modules used in Design 2 are typically more power-efficient, making them perfect for systems with limited energy resources, whereas GSM modules use more energy because they are constantly in communication with cellular towers. In terms of data transfer velocity, GSM

2.5 Conclusion

In order to handle the increasing difficulties facing Bangladesh's aquaculture sector, this project sought to create an efficient, real-time water quality monitoring and management system for shrimp hatcheries. Two design strategies—Design 1, which makes use of GSM-based communication, and Design 2, which combines Wi-Fi connectivity with Internet of Things technology—were assessed. The comparative analysis unequivocally demonstrates that Design 2 is more effective, scalable, and in line with the long-term requirements of sustainable shrimp farming, even though both strategies provide worthwhile solutions.

Cost-effectiveness, power efficiency, transmission speed, scalability, and system reliability are all significantly improved by Design 2. Its centralized cloud integration, low latency communication, and real-time data visualization capabilities guarantee more accurate and responsive water parameter management. Additionally, Design 2 offers improved security and simpler multi-device connectivity.

Chapter 3: Use of Modern Engineering and IT Tool. [CO9]

3.1 Introduction

In the development of our shrimp hatchery water quality monitoring and management system, several key engineering tools were utilized to ensure efficient design, simulation, programming, and cloud integration. These tools include the **Arduino Uno R3** microcontroller for real-time control, **Proteus** for circuit simulation, the **Arduino IDE** for code development, **ThingSpeak** for IoT-based data visualization, and **WokWi** for online simulation and collaborative testing. Together, these tools streamline the development process, enhance system reliability, and support early validation of the project before physical implementation.

3.2 Select appropriate engineering and IT tools

Engineering & IT Tools	
Hardware Tools	**Software Tools**
Arduino Mega	Proteus
ESP 32	Arduino IDE
Actuator Motors	ThingSpeak
Keypad	WokWi Simulator
Connecting Wires , pipes	
Water Tanks	

Table 2: Engineering and tools table

3.3 Use of modern engineering and IT tools

- **Arduino Mega (Microcontroller):** The Arduino Mega was selected as the core microcontroller for the project due to its compatibility with a wide range of sensors, its robust and user-friendly ecosystem, and its suitability for real-time monitoring and control applications. Its support for modern engineering tools such as the Arduino IDE simplifies programming and debugging, while the availability of numerous libraries and community resources accelerates development. Furthermore, its digital and analog I/O capabilities, combined with efficient power management, make it ideal for integrating water quality sensors and control modules required for the shrimp hatchery system.

- **Proteus Software:** Proteus was selected as a key simulation tool for its ability to emulate electronic circuits and microcontroller-based systems with precision. In this project, it allows for the virtual testing of Arduino Uno R3 functionality and interactions with sensors and actuators before physical implementation. Proteus provides a realistic environment to debug and validate the circuit design, ensuring that the water quality monitoring and management system performs as intended. This reduces development time, minimizes hardware errors, and enhances the reliability of the shrimp hatchery project.

- **Arduino IDE** : The Arduino IDE was chosen as the primary development tool for its simplicity, versatility, and widespread support for the Arduino ecosystem. This open-source platform provides an intuitive interface for writing, compiling, and uploading code to the Arduino Uno R3. With its extensive library support and built-in examples, the IDE enables seamless integration of sensors and modules required for water quality monitoring and management. Additionally, its compatibility with multiple operating systems and strong community backing ensures efficient debugging, troubleshooting, and project scalability.

- **ThingSpeak :** ThingSpeak, combined with virtual circuit simulation tools, provides an efficient platform for testing and validating IoT-based water quality monitoring systems. Simulation software ensures accurate emulation of Arduino Uno R3 functionality and sensor interactions, while ThingSpeak facilitates real-time data visualization and analysis. This approach ensures seamless cloud integration and early performance validation, streamlining the development of the shrimp hatchery monitoring project.

- **WokWi :** WokWi is an online simulator for testing Arduino, ESP32, and other microcontroller projects. It allows users to design circuits with virtual components

like LEDs, sensors, and displays in an interactive interface. The built-in code editor supports Arduino IDE syntax for seamless coding and testing. With real-time simulation, users can observe how their code interacts with the circuit, making debugging easier. Being cloud-based, it's accessible from anywhere and eliminates the need for physical hardware, making it ideal for beginners and students. Advanced users can simulate complex systems and test designs efficiently. Wokwi also supports collaboration by allowing users to share projects, making it perfect for teamwork and remote learning.

3.4 Conclusion

All the modern IT tools used to simulate and process for prototype installation are recommended by the Institute of Electrical and Electronics Engineers (IEEE). The user-friendly interface and high processing capability make this system more optimized. This chapter presents an overview of the modern IT tools we have used during the project timeline.

Chapter 4: Optimization of Multiple Design and Finding the Optimal Solution. [CO7]

4.1 Introduction

Design optimization is a systematic engineering approach to finding the best solution among multiple design alternatives while meeting specific constraints and objectives. The process involves analyzing design variables, objective functions, and constraints through problem definition, design space exploration, rigorous analysis, and optimization techniques. This methodology has become crucial in modern engineering due to increasing system complexity and the need to balance competing factors like cost, performance, and sustainability, ultimately leading to more efficient designs.

4.2 Optimization of multiple design approach

4.2.1 Design Approach 1:

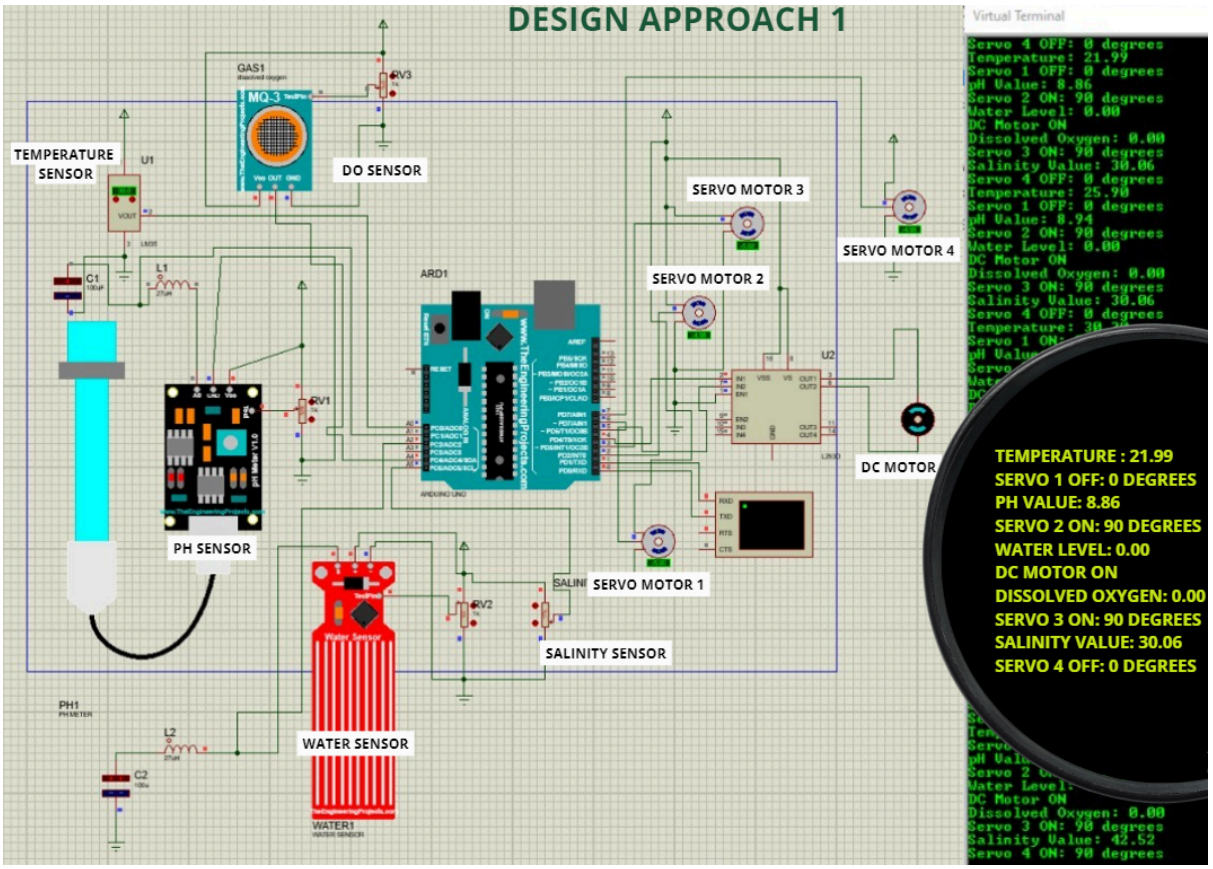

Figure 7 : Proteus Simulation of Design Approach 1

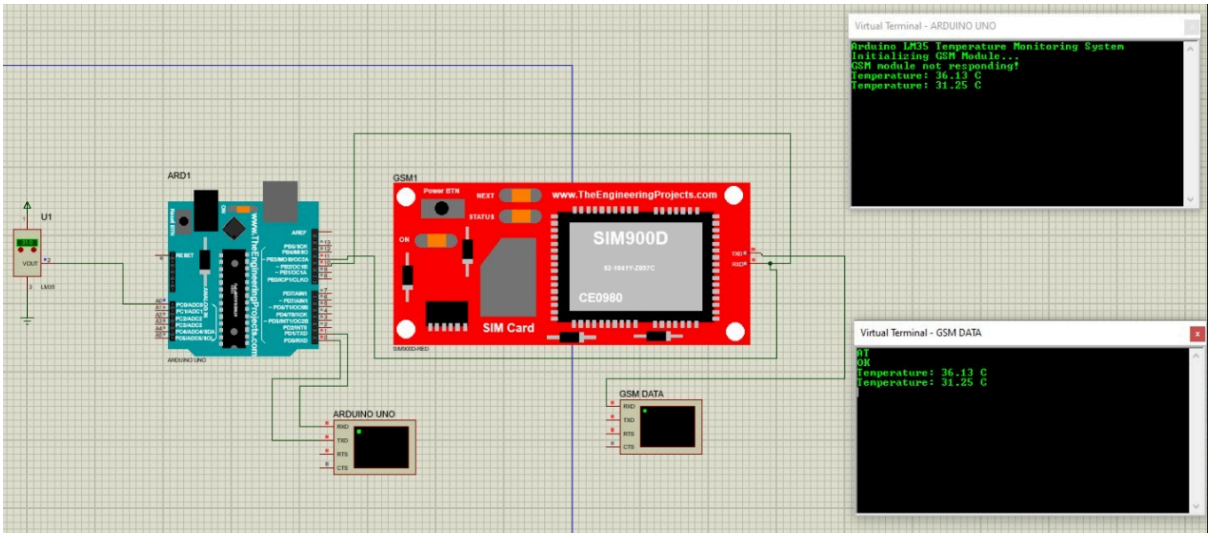

Figure 8 : GSM MODULE simulation of Design Approach 1

Technical Details:

Hardware: The hardware details for the smart water quality monitoring system project include the following components:

1. Water Level Sensor
   - Capable of detecting multiple levels (LOW, MEDIUM, HIGH)
   - Likely uses ultrasonic or float switch technology

2. pH Sensor
   - Measures the acidity or alkalinity of the water
   - Typically uses a glass electrode method

3. Temperature Sensor
   - Monitors water temperature
   - Likely uses a thermistor or digital temperature probe

4. Salinity Sensor
   - Measures the salt content in the water
   - Typically uses conductivity measurement principles

While specific technical details are not provided in the available information, a typical smart water quality monitoring system would also include:

5. Microcontroller or Single-Board Computer
   - Acts as the brain of the system, processing sensor data

- Examples include Arduino, ESP32

6. Power Supply
   - Provides electricity to the system
   - Could be battery-powered or use a solar panel for remote locations

7. Data Transmission Module
   - Sends collected data to a central system or cloud platform
   - May use Wi-Fi, cellular (GSM/GPRS), or LoRa for long-range communication

8. Enclosure
   - Waterproof housing to protect the electronic components
   - Usually made of durable, corrosion-resistant materials

9. Data Storage
   - Local storage (SD card or built-in memory) for data logging

10. GSM Module
    - send data to an IOT device for real time monitoring.

These components work together to collect, process, and transmit water quality data. The system monitors various parameters such as water level, pH, temperature, and salinity, which are crucial for assessing and maintaining water quality in different environments

Output : The smart water quality monitoring system processes and presents data from various sensors to provide comprehensive information about water quality. Here's a detailed explanation of the system output:

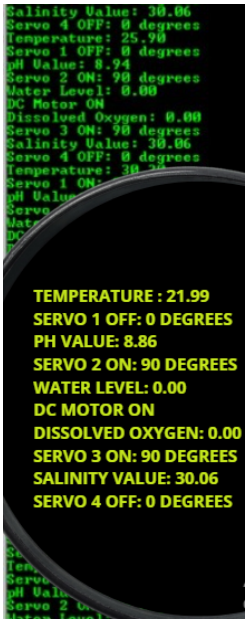

Figure 09 : Sensor Output

Figure 10 : GSM Module Output

1. Water Level Sensor:

- The system interprets data from the water level sensor and categorizes it into three states: LOW, MEDIUM, and HIGH.
- This information is crucial for monitoring water bodies, reservoirs, or tanks to prevent overflow or drought conditions.
- The output may be displayed as a numerical value (e.g., depth in meters) or as a categorical status.

2. pH Sensor:

- The pH sensor measures the acidity or alkalinity of the water on a scale of 0 to 14.
- The system processes this data and typically presents it as a numerical value with one or two decimal places (e.g., 7.2).

3. Temperature Sensor:

- Water temperature data is processed and displayed in Celsius scale .
- The output is usually presented as a numerical value with one decimal place (e.g., 25.3°C).
- The system might also include temperature trend analysis, showing changes over time.

4. Salinity Sensor:

- Salinity measurements are typically processed and presented in parts per thousand (ppt) or practical salinity units (PSU).
- The output is displayed as a numerical value, often with two decimal places (e.g., 35.05 ppt).
- For freshwater systems, the system might use a different scale or convert the readings to total dissolved solids (TDS).

Additional System Output Features:

5. Data Visualization:

- The system likely generates performance plots and graphs to visualize trends and patterns in water quality parameters over time.
- These plots help in identifying correlations between different parameters and detecting anomalies.

6. Real-time Monitoring:
- The system provides real-time updates of all measured parameters, allowing for immediate detection of any changes in water quality.

7. Notifications:
- When any parameter exceeds predefined thresholds, the system generates notifications.
- These can be displayed on-screen.

8. Data Logging:
- All sensor readings are typically logged with timestamps for historical analysis and compliance reporting.
- The system may offer options to export this data in various formats (CSV, Excel, etc.) for further analysis.

9. User Interface:
- The processed data is likely presented through a user-friendly interface, possibly web-based.
- This interface would display current readings, historical trends, and system status at a glance.

10. Integration with Other Systems:
- The output may be designed to integrate with larger water management systems, providing data for broader environmental monitoring or smart city initiatives.

11. Customizable Reports:
- The system might offer the ability to generate customized reports, summarizing water quality data over specific periods or focusing on particular parameters of interest.

This comprehensive output system ensures that water quality is monitored effectively, allowing for quick responses to any changes and informed decision-making in water management.

Circuit Connection

Here is the connection table between sensors, microcontroller and the motors.

Sensors	**Arduino Uno pin**
DS1B20 Temperature Sensor	A0
PH sensor	A1
Water Level Sensor	A2
Dissolved Oxygen Sensor	A4
Salinity Sensor	A5

Table 3: Input Connection between Sensors and Arduino Uno

Output Parts	**Arduino Uno Pin**
Temperature Servo Motor	PD2
PH Servo Motor	PD3
DC Motor for Water Level	Digital pin 4, Digital Pin 5
Dissolved Oxygen Servo Motor	Digital pin 6
Salinity Servo Motor	Digital Pin 7
L239D driver for DC motor	PD4,PD5
Virtual Terminal	PD0, PD1

Table 4: Output Connections between Motors and Microcontrollers

Simulation

We have set the parameters of the sensors according to data of shrimp hatcheries. If any data reaches outside the parameters then consequent servo motors or DC motors will start. Here servo motors are indicated as the consequent water or chemical which would be used to tackle the change of water condition .

Sensors	Threshold
Temperature	26-32 C
PH	7.5-8.5
Salinity	15-25 ppt
Dissolved Oxygen	>4 ppm
Water Level	0.9-1 m

Table 5: Ideal parameters for shrimp hatchery

GSM Module

To simulate the GSM module, we have simplified the circuit. We have taken only a temperature sensor, Arduino Uno, GSM module, and virtual monitor. In Proteus we are showing the data sent through the GSM module in a virtual terminal.

Circuit Connection

Terminals/sensors	Arduino Uno Pin
LM35 (Temperature Sensor)	A0
GSM Module	Pin 10, Pin 11
Virtual Terminal 1	Pin 0. Pin 1
Virtual Terminal (GSM Data)	PIn 10

Table 6: Input Connection of GSM Module

Simulation

The system is designed to transmit sensor data through the microcontroller and GSM module, ensuring effective data visualization on designated virtual terminals. The LM35 temperature sensor collects temperature readings and sends the data to the microcontroller, an Arduino Uno R3 in this case. The microcontroller processes the analog signals received from the sensor, converts them into digital temperature values, and prepares the data for transmission. This processed data is displayed on Virtual Terminal 1, which is connected to the microcontroller via a serial communication interface. Virtual Terminal 1 can be accessed using software tools like the Arduino IDE Serial Monitor, Tera Term, or CoolTerm, allowing for real-time monitoring of the sensor's data locally.

In addition to local data display, the system integrates a GSM module for remote communication. The microcontroller sends the temperature data to the GSM module using UART communication, which is then transmitted to a virtual terminal associated with the GSM module. This terminal could represent a remote device or system capable of receiving the data through SMS or other wireless means. The separation of local and remote data presentation ensures redundancy and flexibility in monitoring. Local data provides immediate access for nearby operators, while the GSM-enabled remote terminal allows for monitoring from distant locations, making the system highly versatile and reliable for applications like shrimp hatchery water quality management.

4.2.2 Design Approach 2:

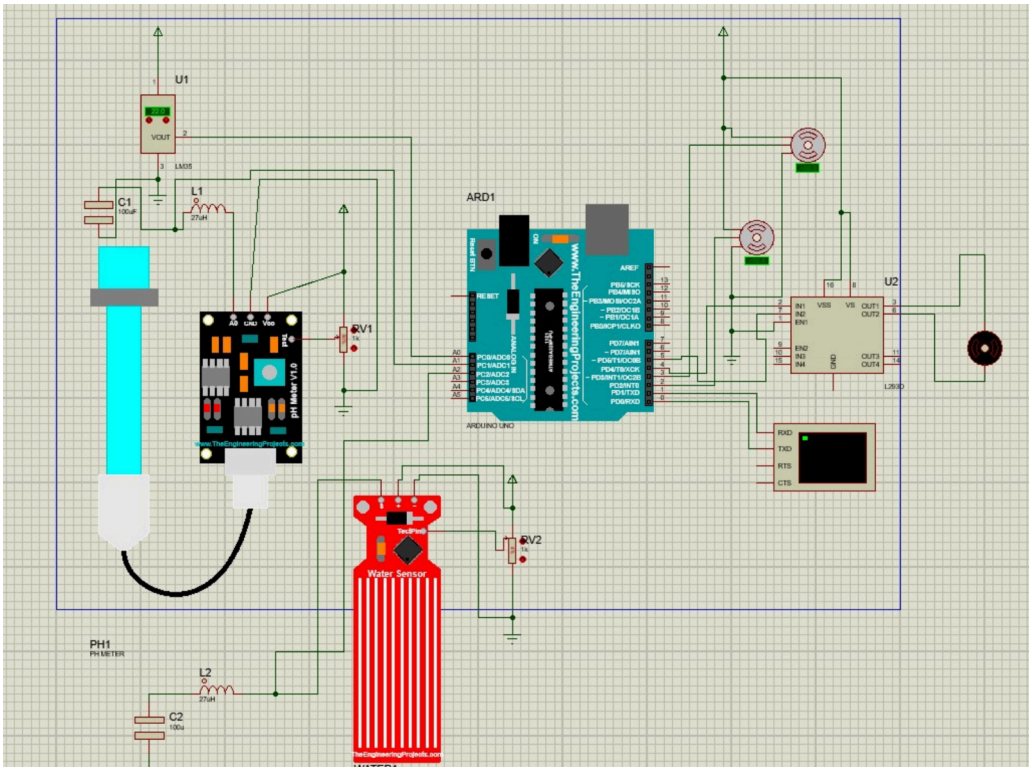

Figure 11 : Combined Circuit of Design Approach 2

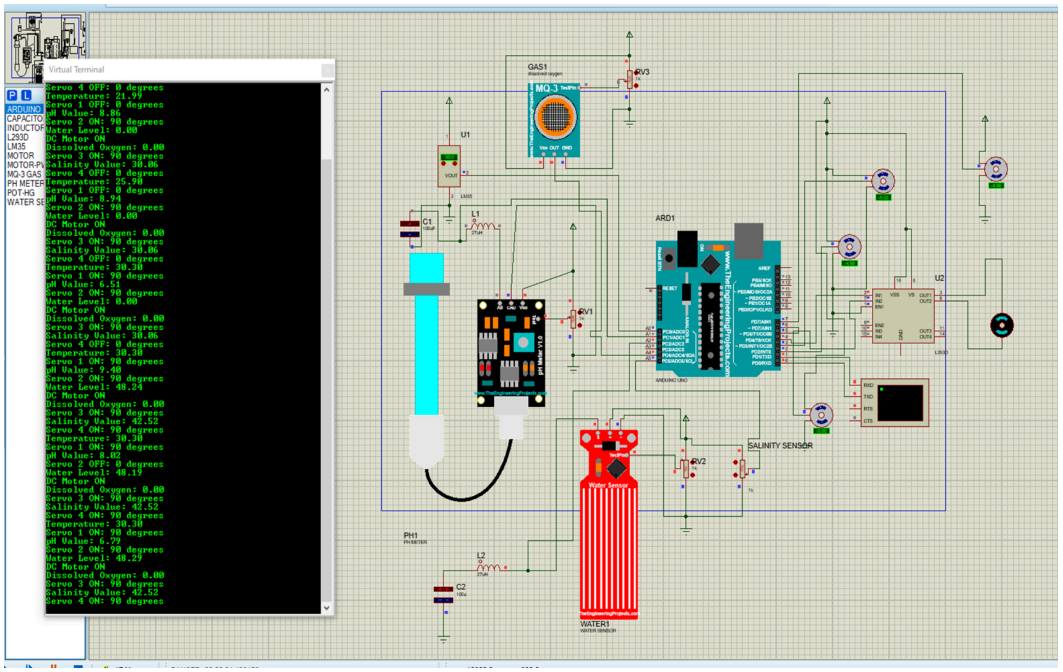

Figure 12: Simulation of Design Approach 2

In design approach 2, we have divided the simulation into 2 parts. One part is for automation and the other part is for the IoT. For automation, we have used Proteus to show the simulation, which is the same as the first half of design approach 1. Which sensors will continue to take data, and when the data output goes beyond the previously set threshold, it will send a signal to the connected servo motor or water pump?

In the IOT part, we have used the WOKWI simulator. Here, as a microcontroller, the ESP32 has been used, which, through a Wi-Fi module, will send the data to the IoT dashboard. Here we have used 'Thingspeak' for real-time data.

Hardware

We have used LM35 as a temperature sensor in proteus. For Ph,Salinity, Water level and Dissolved Oxygen sensor there were no built in libraries in proteus so we had to import ph, water level sensors. For dissolved oxygen sensor we have used MQ-3 gas sensors as substitute and for salinity sensor we have used potentiometer.

To show the output we have used Servo motor and DC motor.
We have used Arduino Uno as the microcontroller asd ESP 32 Wifi module to transfer Data Connection to IoT devices.

Circuit Connection

Here is the connection table between sensors, microcontroller and the motors.

Sensors	**Arduino Uno pin**
LM35 Temperature Sensor	A0
PH sensor	A1
Water Level Sensor	A2
Dissolved Oxygen Sensor	A4
Salinity Sensor	A5

Table 7: Input Connection between Sensors and Arduino Uno

Output Parts	Arduino Uno Pin
Temperature Servo Motor	PD2
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DC Motor for Water Level	Digital pin 4, Digital Pin 5
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Salinity Servo Motor	Digital Pin 7
L239D driver for DC motor	PD4,PD5
Virtual Terminal	PD0, PD1

Table 8: Output Connections between Motors and Microcontrollers

Simulation

We have set the parameters of the sensors according to data of shrimp hatcheries. If any data reaches outside the parameters then consequent servo motors or DC motors will start. Here servo motors are indicated as the consequent water or chemical which would be used to tackle the change of water condition .

Sensors	Threshold
Temperature	26-32 C
PH	7.5-8.5
Salinity	15-25 ppt
Dissolved Oxygen	>4 ppm
Water Level	0.9-1 m

Table 9: Ideal parameters for shrimp hatchery

IOT Dashboard

We have used Thingspeak as a dashboard to show the real time data from the sensors .

Simulation: This simulation uses an ESP32 DevKit-C V4 to create a simple IoT system. It has a DHT22 sensor for temperature and humidity and 4 potentiometers to act like different sensors (for salinity, DO, pH, etc.). There are 6 LEDs to show if values are too high or low. A serial monitor helps display the data in real-time.

The ESP32 processes all the data and can send it to ThingSpeak for storage and viewing online. This setup shows how to monitor multiple things easily in real-time.

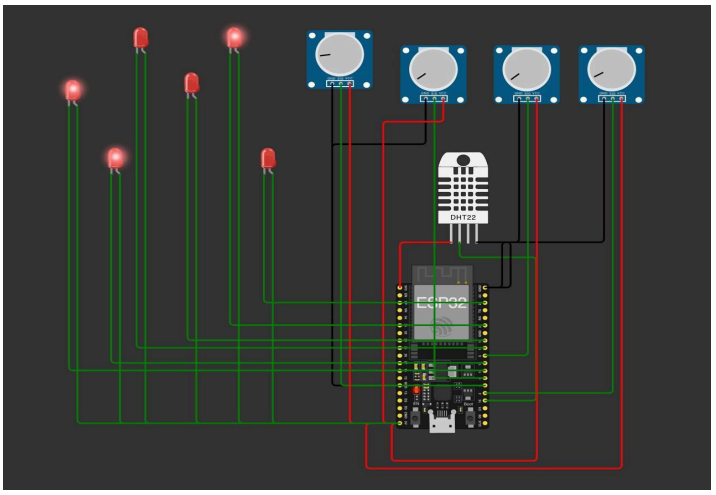


Figure 13: Wokwi Simulation

```
ets Jul 29 2019 12:21:46

rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
configsip: 0, SPIWP:0xee
clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
mode:DIO, clock div:2
load:0x3fff0030,len:1156
load:0x40078000,len:11456
ho 0 tail 12 room 4
load:0x40080400,len:2972
entry 0x400805dc

DHT sensor initialized.
Connecting to WiFi..
WiFi connected!
Local IP: 33557002
Temperature: 67.40 °C
Humidity: 91.5 %
DO Sensor Value: 6.00 mg/L
Salinity Sensor Value: 13.00 ppt
pH Sensor Value: 7.00
Water Level Sensor Value: 33.00 %
Data sent successfully to ThingSpeak.
Temperature: 67.40 °C
Humidity: 91.5 %
DO Sensor Value: 5.00 mg/L
Salinity Sensor Value: 13.00 ppt
pH Sensor Value: 7.00
Water Level Sensor Value: 34.00 %
Data sent successfully to ThingSpeak.
```

Figure 14: Output in Wokwi

Dashboard:

Figure 15: IOT Dashboard

4.3 Identify optimal design approach

We chose the **WiFi-based approach** for our water quality monitoring system because it works better in many important ways. This system sends data faster, responds quicker, and is more reliable in places with good WiFi networks, like cities or towns. It also connects to a central server, which helps store data, show trends, and make long-term monitoring easier. The WiFi system can handle more devices on one network, making it easier to use and less costly for big setups. While the GSM-based system is good for remote areas, it uses more power, is slower, and doesn't store or analyze data as well. The WiFi-based system is also better at automating and fixing problems quickly. These features make it the best choice for our project, as we want a system that is easy to use, efficient, and reliable.

SWOT Analysis

Strengths

- **Real-Time Monitoring**: Continuous tracking of key water parameters (temperature, pH, salinity, DO, and water level) increases responsiveness to water quality issues.
- **Automation**: Automatic motor activation when thresholds are breached improves efficiency and reduces human error.
- **Cost-Effective**: Utilizes affordable and readily available components like Arduino/ESP32 and standard sensors.
- **Improved Yield**: Enhanced water management leads to healthier shrimp, lower mortality rates, and higher productivity.
- **Data Logging**: Provides historical data for analysis, predictive maintenance, and regulatory compliance.

Weaknesses

- **Sensor Calibration and Maintenance**: Sensors require regular calibration and can degrade over time, affecting accuracy.
- **Initial Learning Curve**: Farmers with limited technical skills may struggle with system setup or troubleshooting.
- **Power Dependency**: The system's reliability depends on continuous power supply; rural areas may face outages.
- **Internet Connectivity**: Real-time data upload or remote monitoring may be hindered in areas with poor internet infrastructure.

Opportunities

- **Scalability**: The system can be expanded to cover larger hatcheries or integrated multi-pond operations.
- **Integration with AI**: Predictive analytics and machine learning could further optimize water quality management.
- **Commercialization**: Can be packaged and sold as a smart aquaculture kit for small and medium shrimp farms.
- **Support from Government/NGOs**: Opportunities to collaborate with agencies promoting sustainable aquaculture or rural technology adoption.

Threats

- **Harsh Environmental Conditions**: Sensors and electronics may be damaged by saltwater exposure, humidity, or extreme temperatures.
- **Resistance to Change**: Traditional farmers may be skeptical of adopting automated systems.
- **Component Availability**: Supply chain issues or hardware unavailability could delay implementation or maintenance.
- **Cybersecurity Risks**: As an IoT solution, the system could be vulnerable to data breaches or unauthorized control if not properly secured.

4.4 Performance evaluation of developed solution

First, we had to calibrate all the sensors. While the other sensor was not difficult pH sensor seems to be a challenge. We have calibrated the sensor with regular water, saline water, and carbonated drinks. However, in time of system testing, the sensor's value went negative, which is false. So we had to recalibrate with the optimum pH 4 and pH 6.9 solutions. Still, in our research, we have found it's hard to get the accurate result by the lab-grade sensor.

We have tested our system in the fresh water. To increase the salinity, we have used saltwater (artificially made with salt). To decrease salinity, fresh water is used. To increase pH, we have used baking soda form of an alkaline, and to decrease we have used vinegar in the form of acidic water.

In the project, we have created a system where you can set your own threshold. Whenever the sensor's output goes beyond the threshold, the relevant motor starts to pump the solution. The increase of pH manually or naturally is very slow. So it takes a significant amount of time to

increase the value to the applied threshold. When the value comes back in the threshold, the motor stops pumping.

4.5 Conclusion

After reaching various aspects, we have come to the conclusion that design approach 1 will be appropriate for our project. The main automation system is the same, but sending the data through wifi is cheaper and can be monitored constantly.

Chapter 5: Completion of Final Design and Validation. [CO8]

5.1 Introduction

This chapter presents the finalized design and validation of the IoT-based smart water quality monitoring and control system tailored for shrimp hatcheries. After thorough analysis of multiple design approaches, the selected system prioritizes energy efficiency, real-time monitoring, and automation. The finalized setup incorporates essential water quality sensors, microcontrollers, wireless communication, and actuator components powered by a sustainable hybrid power system including DC battery and solar panel backup.

5.2 Completion of Final Design

Overview of the Final Design

The system was built around **Arduino Uno** for sensor data acquisition and **ESP32** for Wi-Fi-based communication and control logic. This setup ensures low power consumption and reliable performance. The design incorporates:

- **Arduino Uno** – Main controller for analog and digital sensors.
- **ESP32** – Wi-Fi enabled microcontroller for data transmission to cloud services and for automation control.
- **DC Battery Power Source** – Supplies stable energy in hatchery environments.
- **Solar Panel Backup** – Provides sustainable power during outages.

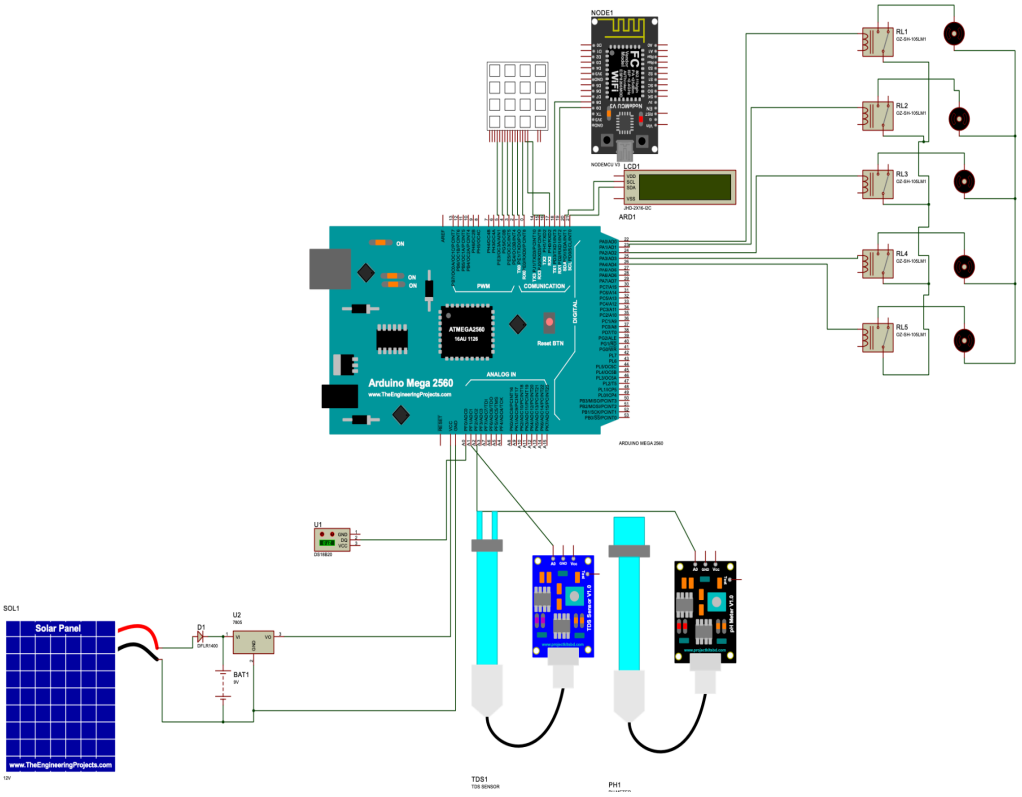


Figure 16: System Layout

Sensor and Actuator Integration

Sensor Components

- **pH Sensor** – Measures acidity of the water. Calibrated between pH 6.5 to 8.5.
- **Water Level Sensor** – Detects minimum and overflow conditions.
- **Salinity Sensor (TDS)** – Monitors salt concentration to maintain optimal levels (20–32 ppt).
- **DO Sensor** – Measures dissolved oxygen content to ensure aerobic balance.
- **Temperature Sensor** – Detects water temperature, especially relevant during hot pre-monsoon periods.

Actuator Components

- **Servo Motors** – Used to circulate water by rotating paddles to maintain uniform temperature and distribute nutrients.
- **Wind Blower** – Operated automatically to enhance aeration and oxygenation in water when DO drops.
- **Relay-Controlled System** – Handles actuator triggering based on sensor thresholds.

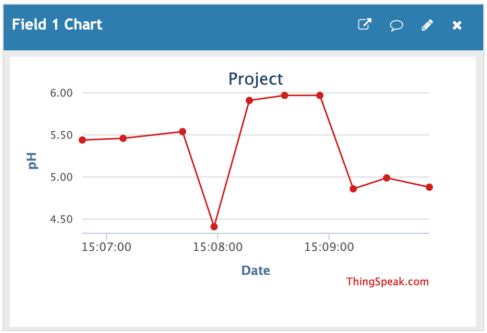
Human-Machine Interface

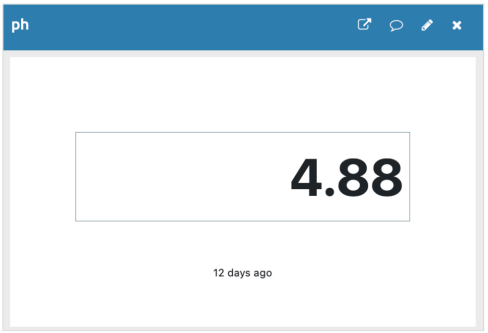
- **Monitor with Keypad** – Allows manual input of set-points and threshold values for pH, salinity, temperature, and DO.
- Users can manually adjust values, reset the system, or override automation in emergency conditions.

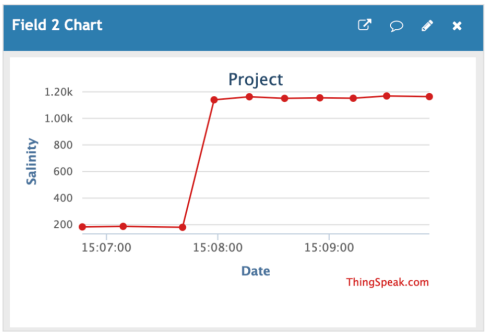
Figure 17: Display

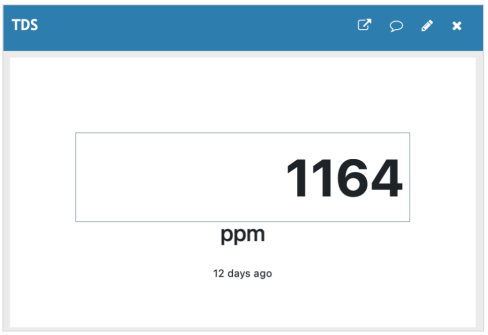
Communication and Cloud Integration

- **ESP32** sends real-time sensor data to the **ThingSpeak** cloud platform.
- Alerts and data visualizations are available remotely via mobile or web applications.
- Data is uploaded every 30 seconds and includes trend graphs and threshold-based alerts.


Field 1 Chart
Project
6.00
5.50
5.00
4.50
pH
15:07:00
15:08:00
15:09:00
Date
ThingSpeak.com


ph
4.88
12 days ago


Field 2 Chart
Project
1.20k
1.00k
800
600
400
200
Salinity
15:07:00
15:08:00
15:09:00
Date
ThingSpeak.com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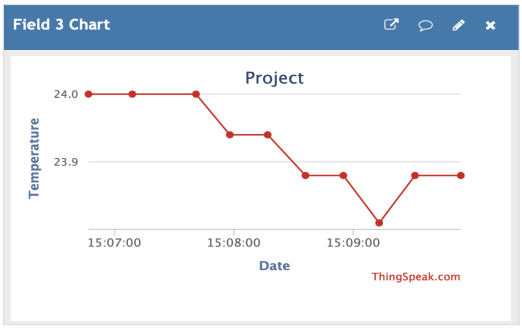
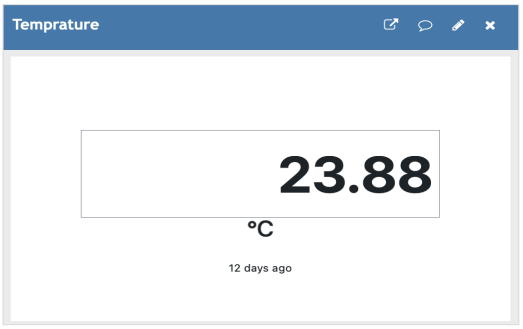
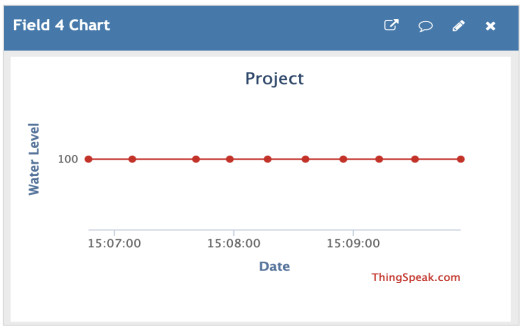
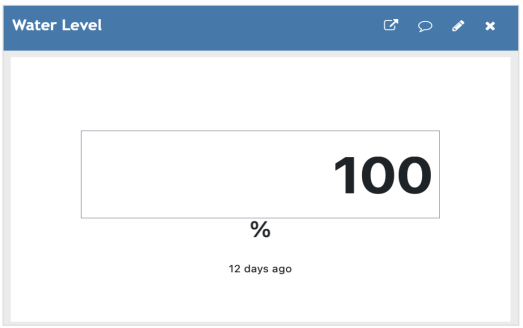
1164
ppm
12 days ago


Field 3 Chart
Project
24.0
23.9
Temperature
15:07:00
15:08:00
15:09:00
Date
ThingSpeak.com


Temprature
23.88
°C
12 days ago


Field 4 Chart
Project
100
Water Level
15:07:00
15:08:00
15:09:00
Date
ThingSpeak.com


Water Level
100
%
12 days ago

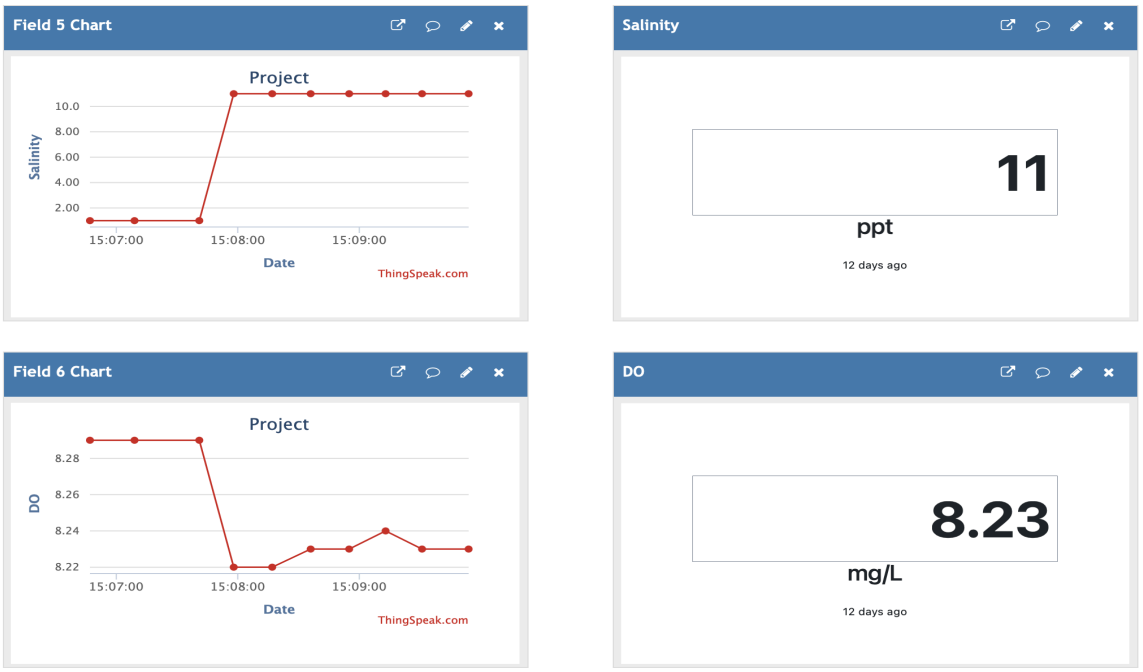


Figure 18: IoT Dashboard

Power Management

- The system runs primarily on a **12V DC battery** that powers both microcontrollers and sensors.
- A **solar panel** recharges the battery and ensures uninterrupted monitoring during power outages.

5.3 Evaluation of the Solution to Meet Desired Need

Real-Time Performance Testing

Parameter	Ideal Range	Test Range	System Response
pH	6.5 – 8.5	6.2 – 8.6	Blower ON if <6.5; Buffering alert sent
DO (mg/L)	5.5 – 6.7	4.8 – 7.2	Wind blower triggered below threshold
Salinity (ppt)	20 – 32	18.5 – 33.0	Servo-operated water exchange initiated
Temp (°C)	28 – 32	27.4 – 33.2	Auto alerts; passive cooling advised
Water Level	Midline	Low / Overflow	Pump activation / alert triggered

The system was tested under controlled hatchery-like conditions.

Automation Response and Power Efficiency

- Actuation delay (servo or blower trigger) was recorded under 1.2 seconds after breach detection.
- Full system power draw under normal operation was ~4.5W, with successful solar recharge cycles under daylight conditions.

User Interaction Evaluation

The LCD + Keypad system allowed users to adjust thresholds, reset the system, and view local readings without internet access. Hatchery staff with minimal technical knowledge were able to operate the system effectively after short training.

5.4 Conclusion

The final design of the smart water monitoring system for shrimp hatcheries successfully integrates affordable, locally available components to deliver real-time environmental control and monitoring. It is tailored to the climate and conditions of Bangladeshi hatcheries, especially during pre-monsoon periods. By combining solar energy, remote data access, and responsive automation, this system enhances hatchery resilience, supports shrimp health, and reduces manual labor. The project is ready for pilot implementation and can be scaled to larger hatchery operations.

Figure 19: Complete Setup

Chapter 6: Impact Analysis and Project Sustainability. [CO3, CO4]

6.1 Introduction

Our project has significant importance in multiple contexts, like societal, legal, health, environmental, economic, and cultural. We have stakeholders like the Department of Fisheries under the Ministry of Labor [8], hatchery owners, and farmers. We have to check and balance all the requirements of the stakeholders with the best of our abilities to fulfill their needs.

6.2 Assess the impact of solution

Societal Impact
The solution will address a great societal impact. If it is implied the farmers will not need to check the quality manually, and as the whole system is automated, it will reduce loss and improve livelihood, which will lead to enriched life and food security.

Health Impact
As the whole system is automatic, it will reduce the shrimp waste and, in turn, increase shrimp health. So that it will ensure safer production. Moreover, it will contribute to global health standards for aquaculture. In addition, it will reduce human exposure to the contaminated water during manual tasks.

Safety Impact
The system ensures operational safety by minimizing human exposure to contaminated water or chemicals. The automation system (sensors, motors) will ensure the threshold level of water, which will be safe for the aquaculture.

Legal and Regulatory Impact
By adhering to codes and conduct stated by the Department of Fisheries, the projects help hatcheries remain compliant with regulatory requirements. Stored data can be used as evidence for regulatory inspection and certifications in case of audits.

Cultural Impact
In many rural areas, fisheries and hatcheries are generational businesses. By introducing automation in the industry, people from the new generation will want to work in this field. Moreover, there will be increased jobs for skilled experts.

6.3 Evaluate the sustainability

The proposed project offers a revolutionary solution to the common difficulties in shrimp aquaculture. The system promotes efficient uses of resources and reduces environmental damage. By providing real-time data and automation, this project significantly reduces waste of water, chemicals, and energy.

The project will likely ensure economic stability and livelihood security for shrimp farmers. In coastal Bangladesh, shrimp aquaculture is the primary source of income. The project will help them to maintain shrimp health and productivity.

The shrimp aquaculture industry is feeling increasing pressure due to climate change, stricter regulations, and demand for food safety. Traditional methods are often labor-dependent, waste resources, and are often more reactive than preventive.

The project addresses the urgent need for sustainable practices.

Reducing Waste: Water is needed to replace when a change in quality occurs. So it reduces waste of water.

Optimizing Energy Use: The motors and actuators will only be triggered when sensor data go beyond the threshold. So it will help to optimize energy.

Preserving Ecosystems: By maintaining optimal water, it prevents the release of hazardous water into the environment.

Reducing Labor Dependency: By making the whole system automatic, it reduces the chance of exposure of harmful content to humans.

The sustainability of the project can be validated through the core pillars

Environmental Sustainability

- An automated system reduces the waste of water, which in turn reduces the fresh water use.
- Maintaining ideal conditions reduces the use of chemicals and antibiotics.
- Sensors, motors, and actuators are used based on actual needs , so it is energy efficient.
-

Economic Sustainability

- The system uses affordable hardware components (Arduino, ESP32), so it is affordable for farmers.
- Healthier shrimps will turn to lower mortality and higher profits.

- The proposed solution can be scaled to larger ponds or other fisheries.

Social Sustainability

- While the system reduces the need for manual labor , it opens up a path for technical and skilled individuals.
- Introducing smart aquaculture shrimp in rural areas has the possibility of gaining the interest of local individuals to study the subject.
-

6.4 Conclusion

This engineering project adheres to the principle of sustainable development through its resource-efficient design. It not only improves environmental aspects and shrimp health but also increases the livelihoods related to MP farming. This project validates a sustainable model for real-world aquaculture.

Chapter 7: Engineering Project Management. [CO11, CO14]

7.1 Introduction

At the outset of a project, clearly defining its scope is essential, especially when working within a strict timeline. Project management outlines the strategy for achieving objectives and identifies the expected deliverables. Beyond organizing tasks, it also ensures consistent communication among team members and stakeholders. Additionally, it involves establishing contingency plans to handle unexpected situations. Utilizing project management tools can streamline many tasks, making it easier to track progress and identify potential issues early on. Project management should also be an ongoing process, allowing teams to adapt quickly to any changes. Ultimately, well-executed project management not only helps achieve project goals but also strengthens the team and lays the groundwork for future success.

7.2 Define, plan and manage engineering project

EEE400P/EEE499P/ECE402P

Table 10: EEE400P/EEE499P/ECE402P Project Plan

Task	Start Date	End Date	Duration
Topic Selection	24th May	5th June	13 Days
Finding Complex Engineering Problems	24th May	31st May	7 Days
Review of Related Research Papers	1st June	6th June	6 Days
Selection of Research Topic	3rd June	5th June	3 Days
Project Concept Note	7th june	27th june	20 Days
Tentative Objective and Problem Statement	7th June	18th June	11 Days
Multiple Design Approach	7th June	27th June	20 Days

Specification, Requirements, and Constraints	9th June	11th June	3 Days
Comparison Between Design Approaches	13th June	26th June	13 Days
Preparation of Progress Presentation	27st June	4th July	7 Days
FYDP P Progress Presentation	4th July	4th July	1 Day

Project Proposal	18th July	18th August	29 Days
Background Research and Methodology	18th July	11th August	21 Days
Project Plan	25th July	9th August	20 Days
Budget and Expected Outcome	25th July	5th August	11 Days
Sustainability, Safety & Ethical Consideration	18th July	25th August	7 Days
Risk Factor Management	18th July	29th July	11 Days
Final Project Proposal Note	29th July	21st August	22 Days
Preparation of Final Presentation	25th August	23rd September	28 Days
Mock Presentation	23rd September	23rd September	1 Day
Final Presentation	26th September	26th September	1 Day

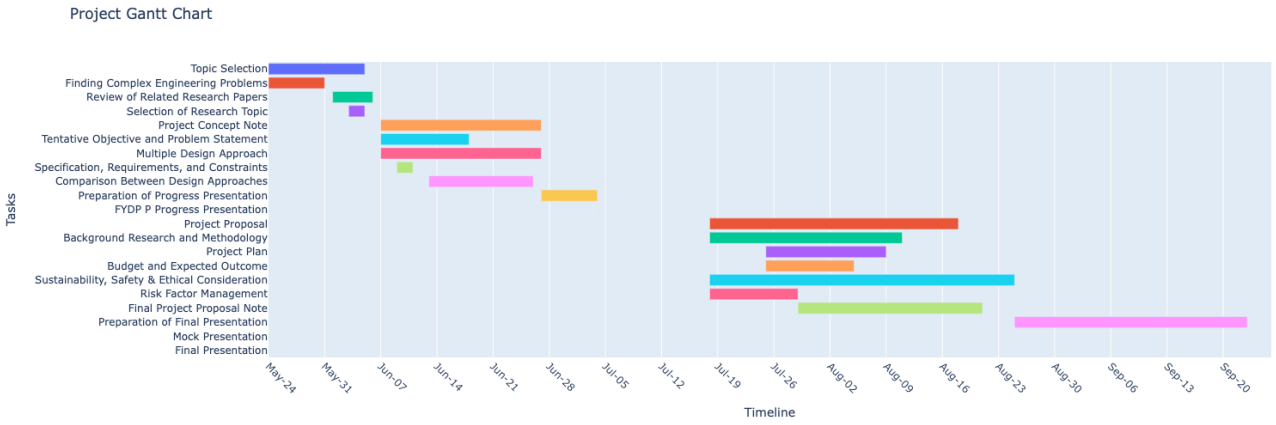


Figure 16: Gantt chart for EEE400P/EEE499P/ECE402P

EEE400D/EEE499D/ECE402D

Table 11: EEE400D/EEE499D/ECE402D Project Plan

Task	***Start Date***	***End Date***	***Duration***
Market Analysis	24th October	27th November	34 Days
Engaging the Stakeholders	1st November	26th November	26 Days
Evaluation of Similar Products Available in the Market	24th October	31st October	8 Days
Simulation of Optimal Approach	24th November	25th December	31 Days
Analyzing Optimal Approach	21st 1st November	2nd December	12 Days
Modification of Design Approach if needed	28th 1st November	2nd December	5 Days
Software Simulation	28th 1st November	25th December	27 Days
Debug Software Simulated Results	25th December	31st December	6 Days

Simulated Result Analysis	31st December	5th January	5 Days
Project Report Submission and Presentation	14th December	4th January	20 Days
Preparation for Presentation	14th December	4th January	20 Days
Mock Presentation	5th January	5th January	1 Day
Progress Presentation	9th January	9th January	1 Day
Project Report Submission	15th January	15th January	1 Day

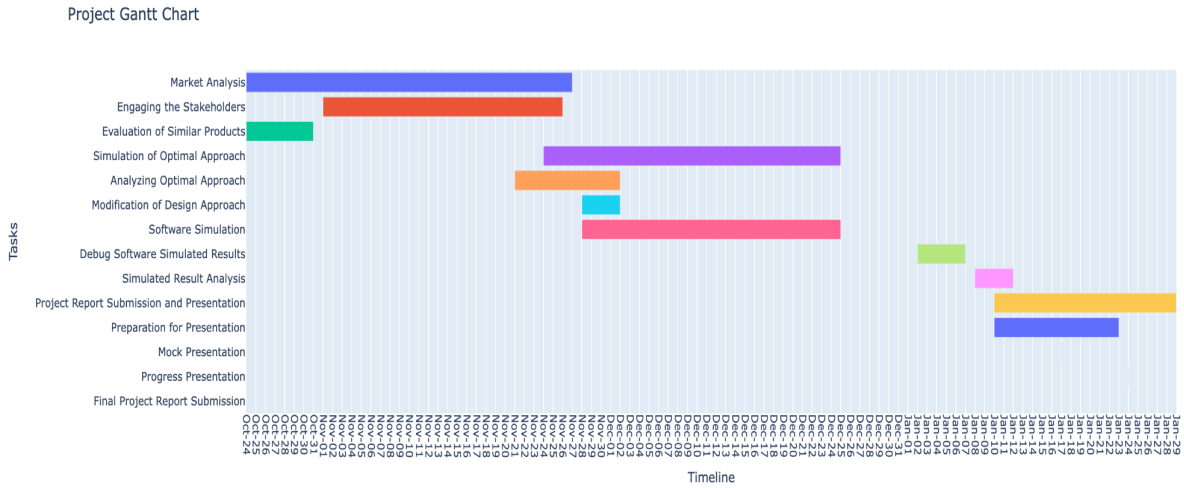


Figure 17: Gantt chart for EEE400D/EEE499D/ECE402D

EEE 400C /EEE499C/ECE402C

Table 12: EEE400C/EEE499C/ECE402C

Task	***Start Date***	***End Date***	***Duration***
Prototype Implementation	15th February	21st March	35 Days
Designing PCB	15th *February*	6th March	20 Days
Components Testing	1st March	16th March	16 Days
Compilation of components	14th March	23rd March	10 Days
Develop the Prototype	10th April	11th May	32 Days

Trial & Error Phase 1	10th April	15th April	6 Days
Trial and Error Phase 2	15th April	22nd April	8 Days
Trial and Error Phase 3	22nd April	5th May	13 Days
Troubleshooting	20th April	10th May	20 Days
Final Prototype	11th May	11th May	1 Day
Final Prototype Presentation	14th May	14th June	21 Days
Preparation for Presentation	11th May	14st May	11 Days
Mock Presentation	14th May	14th May	1 Day
Final Presentation	15th May	15th May	1 Day
Project Report Submission	21st June	21st June	1 Day

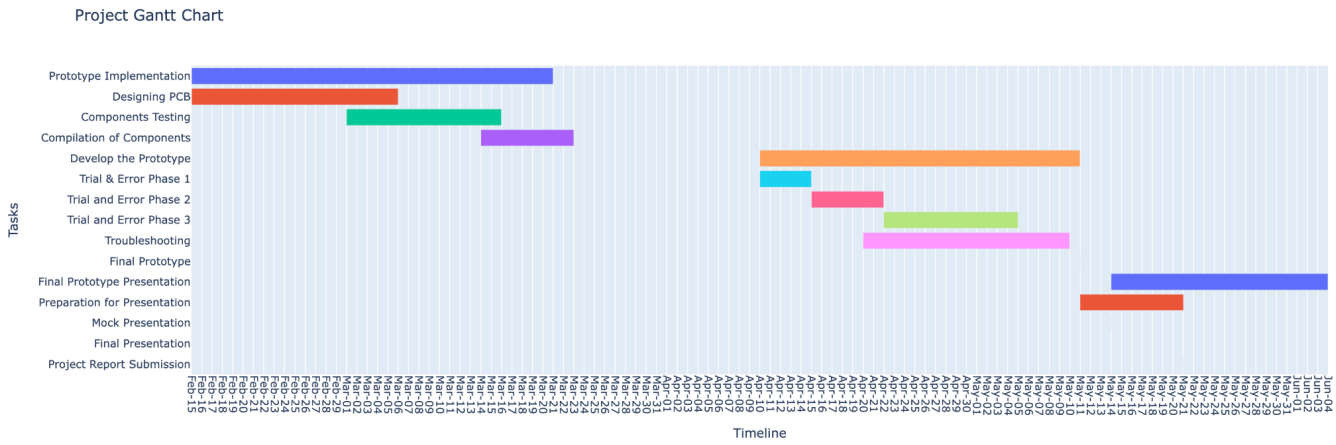


Figure 18: Gantt chart for EEE400C/EEE499C/ECE402C

7.3 Evaluate project progress

	Risk Event	Management Procedure	Contingency Plan
1	Hardware Component Failure	Requires regular testing of the hardware.	Always ready to acquire a backup component.

2	Software bug in algorithm	Always test and run simulation.	Always prepare a secondary code in separate device.
3	Water overflowing	Build a system which will automatically replace overflown water.	Use of bigger tank is advised.
4	System not working when water parameters go beyond threshold	Always test the system. Use different threshold and use different type of liquid to test	Calculate and note the threshold where the system runs smoothly.
5	Electrical hazard	Use proper insulation and isolation for all electrical components. Main circuit mus not come near water.	The wiring can be covered with waterproof materials.

7.4 Conclusion

Project management creates the foundation of all successful projects. Without proper project management and regulations, it is hard to be persistent in executing a project's objectives. Even if management was at its best and adhering to preordained guidelines, there could always be a chance of unwanted risks. So, contingency plans for different probable risks should also be kept. These factors do ensure sufficient delivery of the basic objectives of the project.

Chapter 8: Economical Analysis [CO12]

8.1 Introduction

Our main target of the project is to automate the water quality management by thus we could remove the man made errors and by which mortality rate of the shrimp will be significantly lower. It is common to have a 50% mortality rate in shrimp farming which equates to 1.2 billions in premature shrimp death per day.

8.2 Economic analysis

The economic impact between manual and automatic water quality management is significant. It generally depends on shrimp mortality, labor cost, chemical price, initial investment , and man management.

Here are some aspects:

Manual Water Quality Management

- **Low Investment:** No investment needed for expensive sensors, motors, controllers, etc.
- **Simple Technology :** Easy to implement, no expertise needed.
- **Labor Costs:** For a big hatchery, a significant number of laborers needed to maintain the premise. So the labor cost gets higher.
- **Human Error:** Missed reading or missed actions will turn to significant stock losses which will result in significant economic loss.
- **Record Keeping:** Manual record keeping is prone to errors.

Automatic Water Quality Management

- **Real time monitoring and alerts:** when any of the aspects of the water changes (Eg: heat, salinity, ph), it can take immediate action.
- **Labor cost:** In an automated system it won't be necessary to employ too many people to maintain, As for that labor cost decreases significantly.
- **Improved Survival and growth rate:** Improved water quality leads to higher yield rate.

- **Data analysis:** Allows for data storage, and future quality prediction.
  Remote Access: System can be accessed and monitored from outside the premises.
- **High initial investment :** Sensors, motors, controllers, software are costly.
- **Maintenance and calibration:** Requires highly skilled personnel to maintain the equipment..
- **Technical Deficiency :** Power outage and system failure can pose risks.

Initially it seems like Automatic water quality monitoring systems will cost much higher than traditional ones. However it will reduce premature shrimp death which will equate to much higher yield. Ultimately Automatic water quality monitoring will be profitable.

8.3 Cost benefit analysis

Cost benefit analysis translates to highest output or result from cost effective input. Cheaper doesn't always calculate the best results. The basic ideas of both the Design Approach 1 and Design Approach are the same. Using Arduino as a microcontroller we would build an automation system. The main difference was how the data will be sent. In design approach 1 data will be sent through a gsm module which will result in a higher cost as every time it will send data the network provider will charge an amount. Where through the wifi module , a one time charge should be sufficient.

8.4 Evaluate economic and financial aspects

Smart water quality monitoring and management systems will work wonders for shrimp farming. As mentioned before ,due to the manual system shrimp mortality comes to 50%. Smart systems will reduce that aspect significantly. The initial system set up and maintenance can be high but in the long run it will produce results. Moreover if the automation system takes hold in the agriculture industry more and more skilled workers will be needed to implement them so it will bring jobs for skilled workers.

8.5 Conclusion

The higher cost of the initial system might disappoint some hatchery owners but final yield will satisfy them. This system has potential to lower the mortality rate up to 10% or less which will result in significant profit. Implementing the project will help to gain financial profitability and higher yield means much more shrimp for general people.

Chapter 9: Ethics and Professional Responsibilities CO13, CO2

9.1 Introduction

Ethical and professional responsibilities are an important foundation of an engineering project. A project should be made to improve all humankind. Not a chosen few. A project should not be harmful to nature, children and other people. Professional responsibility should go hand to hand. These factors turns the project into a viable solution.

9.2 Identify ethical issues and professional responsibility

Here are the Ethical Considerations and responsibilities should be addressed

- There should be no obstructions of common property wetlands and flowing rivers and canals for aquaculture. [8]
- In case of salt water hatchery water should not enter the common agriculture land.[8]
- There should be no unauthorized use of other people's land. [8]
- No kind of hormonal growth medicine should be used in the hatchery.

9.3 Apply ethical issues and professional responsibility

To solve the problems, which might arise during the project, these steps mentioned below should be taken

- There should be adequate distance from the hatchery and wetland.
- A proper boundary should be maintained in around the hatchery and all the water resources
- A proper deed and lease should be maintained of the land in which the hatchery was established.
- The chemicals, medicines and the workers should be strictly monitored.

9.4 Conclusion

Ethical and professional responsibility should be held in greater value. Our ethical responsibilities will help ourselves to make the project accepted everywhere. If we stand by our ethical responsibilities , we should be satisfied.

Chapter 10: Conclusion and Future work

10.1 Project Summary/Conclusion

This project helps to improve the management of water quality in shrimp farming. The system uses multiple sensors to detect the condition of water materials, such as pH, salinity, temperature, dissolved oxygen, and water level. By using Arduino, it creates a system whenever the sensor output goes beyond the threshold; by use of a servo motor , related liquid will mix with water to maintain optimum water quality. Using ESP32, real-time monitoring of the water quality can be done. Using full automation , the burden of manual observation and wastage of water can be lessened. Moreover, this project hopes to create a significant impact by increasing production and enriching the livelihoods of shrimp farmers.

10.2 Future Work

The system has left a great deal for future potential. To gain the accurate results of the sensors industrial-level sensor can be adapted. Moreover, Raspberry Pi, instead of Arduino, can be used as a microcontroller to include more complex systems. Our system already provides real-time data. Data can be used for machine learning and pattern recognition so that in the future it will be clear when and how the water quality changes and what steps can be taken. In huge hatcheries, adding multiple motors can be costly. So elevated solution tanks with sprinkler systems will mitigate to lessen the cost. These additions will greatly enhance the productivity and increase food safety.

Chapter 11: Identification of Complex Engineering Problems and Activities.

11.1: Identify the attribute of complex engineering problem (EP)

	Attributes	**Put tick (√) as appropriate**
P1	Depth of knowledge required	√
P2	Range of conflicting requirements	
P3	Depth of analysis required	√
P4	Familiarity of issues	√
P5	Extent of applicable codes	√
P6	Extent of stakeholder involvement and needs	√

P7	Interdependence	

Note: Project must have P1, and some or all from P2-P7

11.2: Provide reasoning how the project address selected attribute (EP)

P1.Depth of Knowledge : To complete this project, will need to have depth of knowledge in various engineering properties such as Engineering fundamentals, engineering design, research literature ..

P3.Depth of Analysis: Will need deep analysis of all the components as how will the sensors work, efficient way to signal transmit, power of motors to work sufficiently.

P4.Familiarity of Issue: The main issue is not familiar with engineering knowledge as it's mostly on aquaculture.

P5.Extent of Applicable Codes : The codes determined by the department of fisheries under the Labour ministry should be maintained accurately

.

P6.Extent of Stakeholder Involvement and Needs: The project will involve the needs of the hatchery owners, the workers and on the board side the Department of fisheries.

11.3 Identify the attribute of complex engineering activities (EA)

	Attributes	**Put tick (√) as appropriate**
A1	Range of resource	√
A2	Level of interaction	√
A3	Innovation	
A4	Consequences for society and the environment	√
A5	Familiarity	√

Note: Project must have some or all of the characteristics from attributes A1 to A5

11.4 Provide reasoning how the project address selected attribute (EA)

Range of Resource: Will need a range of resources such as people, money, hatchery, broodstock, equipment.

Level of Interaction : Level of interaction will be applied between, aquaculture, electronic properties, censors.

Consequences for Society and the Environment: This project has the goal of improving the shrimp farming environment which will help to improve production which will in broad term also help the economy.

Familiarity : Previously done projects aren't applicable to hatcheries. This project will specifically focus on the problems faced in this particular field.

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Appendix

Code for Design Approach 1:

```
#include <Servo.h> // Include the Servo library

Servo servo1;        // Servo for LM35 control
Servo servo2;        // Servo for pH sensor control
Servo servo3;        // Servo for DO sensor control
Servo servo4;        // Servo for Salinity sensor control

int lm35Pin = A0;       // Pin connected to LM35 sensor
int phSensorPin = A1;   // Pin connected to pH sensor
int waterLevelPin = A2; // Pin connected to Water Level sensor
int doSensorPin = A4;   // Pin connected to MQ3 for DO sensor
int salinitySensorPin = A5; // Pin connected to Salinity sensor

int servo1Pin = 2;      // Pin connected to Servo 1 (LM35)
```

```
int servo2Pin = 3;      // Pin connected to Servo 2 (pH sensor)
int servo3Pin = 6;      // Pin connected to Servo 3 (DO sensor)
int servo4Pin = 7;      // Pin connected to Servo 4 (Salinity sensor)

int motorIn1 = 4;       // L293D IN1 connected to Arduino pin 4
int motorIn2 = 5;       // L293D IN2 connected to Arduino pin 5

float temperature;      // Variable to store temperature
float phValue;          // Variable to store pH value
float waterLevel;       // Variable to store water level
float doValue;          // Variable to store dissolved oxygen value
float salinityValue;    // Variable to store salinity value

void setup() {
  servo1.attach(servo1Pin); // Attach Servo 1
  servo2.attach(servo2Pin); // Attach Servo 2
  servo3.attach(servo3Pin); // Attach Servo 3
  servo4.attach(servo4Pin); // Attach Servo 4

  pinMode(motorIn1, OUTPUT); // Set L293D IN1 as output
  pinMode(motorIn2, OUTPUT); // Set L293D IN2 as output

  // Set initial states
  servo1.write(0);
  servo2.write(0);
  servo3.write(0);
  servo4.write(0);

  digitalWrite(motorIn1, LOW);
  digitalWrite(motorIn2, LOW);

  Serial.begin(9600); // Initialize serial communication
}

void loop() {
  // --- LM35 Temperature Sensor ---
  int tempValue = analogRead(lm35Pin);
   temperature = (tempValue * 5.0 / 1023.0) * 100.0; // Convert to
Celsius

  Serial.print("Temperature: ");
  Serial.println(temperature);
```

```
  if (temperature < 26 || temperature > 34) {
    servo1.write(90); // Turn Servo 1 ON
    Serial.println("Servo 1 ON: 90 degrees");
  } else {
    servo1.write(0); // Turn Servo 1 OFF
    Serial.println("Servo 1 OFF: 0 degrees");
  }

  // --- pH Sensor ---
  int phRawValue = analogRead(phSensorPin);
  phValue = (phRawValue * 5.0 / 1023.0) * 3.0; // Adjust as per sensor
calibration

  Serial.print("pH Value: ");
  Serial.println(phValue);

  if (phValue < 7.5 || phValue > 8.5) {
    servo2.write(90); // Turn Servo 2 ON
    Serial.println("Servo 2 ON: 90 degrees");
  } else {
    servo2.write(0); // Turn Servo 2 OFF
    Serial.println("Servo 2 OFF: 0 degrees");
  }

  // --- Water Level Sensor ---
  int waterLevelRaw = analogRead(waterLevelPin);
   waterLevel = (waterLevelRaw * 50.0 / 1023.0); // Convert to range
0-50 cm

  Serial.print("Water Level: ");
  Serial.println(waterLevel);

  if (waterLevel < 34 || waterLevel > 45) {
    digitalWrite(motorIn1, HIGH);
    digitalWrite(motorIn2, LOW);
    Serial.println("DC Motor ON");
  } else {
    digitalWrite(motorIn1, LOW);
    digitalWrite(motorIn2, LOW);
    Serial.println("DC Motor OFF");
  }

  // --- Dissolved Oxygen (DO) Sensor ---
```

```
  int doRawValue = analogRead(doSensorPin);
   doValue = (doRawValue * 20.0 / 1023.0); // Simulated conversion for
MQ3 to DO levels (0-20 ppm)

  Serial.print("Dissolved Oxygen: ");
  Serial.println(doValue);

  if (doValue < 3) {
    servo3.write(90); // Turn Servo 3 ON
    Serial.println("Servo 3 ON: 90 degrees");
  } else {
    servo3.write(0); // Turn Servo 3 OFF
    Serial.println("Servo 3 OFF: 0 degrees");
  }

  // --- Salinity Sensor ---
  int salinityRaw = analogRead(salinitySensorPin);
   salinityValue = (salinityRaw * 5.0 / 1023.0) * 50.0; // Scale to 0-50
ppt range

  Serial.print("Salinity Value: ");
  Serial.println(salinityValue);

  if (salinityValue < 30 || salinityValue > 32) {
    servo4.write(90); // Turn Servo 4 ON
    Serial.println("Servo 4 ON: 90 degrees");
  } else {
    servo4.write(0); // Turn Servo 4 OFF
    Serial.println("Servo 4 OFF: 0 degrees");
  }

  delay(500); // Delay for stability
}
```

GSM Module

```
#include <SoftwareSerial.h>

SoftwareSerial gsmSerial(10, 11); // RX, TX pins for GSM module (Pin 10
connected to RX of GSM, Pin 11 connected to TX of GSM)

int lm35Pin = A0;  // LM35 connected to analog pin A0
float temperature;  // Variable to store temperature value
```

```
void setup() {
  // Start serial communication for Arduino virtual terminal (Pin 0 for
RX, Pin 1 for TX)
  Serial.begin(9600); // Virtual Terminal for Arduino Uno

  // Start software serial for GSM communication (Pin 10 for RX and Pin
11 for TX)
  gsmSerial.begin(9600); // GSM Module

  // Initial message to Virtual Terminal
  Serial.println("Arduino LM35 Temperature Monitoring System");

  // Debugging message for GSM initialization
  Serial.println("Initializing GSM Module...");

  // Test if GSM module is responding
   gsmSerial.println("AT"); // Send AT command to check if the GSM
module responds
  delay(1000); // Wait for response
  if (gsmSerial.available()) {
    String gsmResponse = gsmSerial.readString();
    Serial.print("GSM Response: ");
      Serial.println(gsmResponse); // Display the response in Arduino
Virtual Terminal
  } else {
    Serial.println("GSM module not responding!");
  }
}

void loop() {
  // Read the LM35 sensor value
  int sensorValue = analogRead(lm35Pin);
   temperature = (sensorValue * 5.0 * 100.0) / 1024.0;  // Convert the
analog value to Celsius

  // Print the temperature value to Arduino's Virtual Terminal
  Serial.print("Temperature: ");
  Serial.print(temperature);
  Serial.println(" C");

   // Send the temperature data to the GSM module (which will be
monitored by the GSM Virtual Terminal)
  gsmSerial.print("Temperature: ");
```

```
  gsmSerial.print(temperature);
  gsmSerial.println(" C");

    // Wait for the data to be transmitted and update the virtual
terminal output
  delay(2000);  // Delay for 2 seconds before reading again
}
```

Code for Design Approach 2:

```
#include <EEPROM.h>
#include <Wire.h>
#include <Keypad.h>
#include <LiquidCrystal_I2C.h>
#include "GravityTDS.h"
#include "DFRobot_PH.h"
#include <OneWire.h>
#include <DallasTemperature.h>

#define ONE_WIRE_BUS      10
#define PH_PIN            A1
#define TdsSensorPin      A0
#define MosturePin        A2

#define R1    22
#define R2    23
#define R3    24
#define R4    25
#define R5    26
#define R6    27
#define R7    28

#define lv1    36
#define lv2    37
#define lv3    38
#define lv4    39
#define lv5    40

const byte numRows = 4;          //number of rows on the keypad
const byte numCols = 4;          //number of columns on the keypad
```

```
char keymap[numRows][numCols] =
{
  {'1', '2', '3', 'A'},
  {'4', '5', '6', 'B'},
  {'7', '8', '9', 'C'},
  {'*', '0', '#', 'D'}
};

char keypressed;
short a = 0, i = 0, j = 0;

int temp_h = 0, ph_h = 0, ph_l = 0, salinity_h = 0, salinity_l = 0,
w_lvl = 0, do_lvl = 0;

byte rowPins[numRows] = {6, 7, 8, 9};
byte colPins[numCols] = {2, 3, 4, 5};

LiquidCrystal_I2C lcd(0x27, 20, 4);
Keypad myKeypad = Keypad(makeKeymap(keymap), rowPins, colPins, numRows,
numCols);

OneWire oneWire(ONE_WIRE_BUS);
GravityTDS gravityTds;
DFRobot_PH ph;
DallasTemperature sensors(&oneWire);

float calibration_value = 25.00 - 0.61;
int phval = 0;
float voltageph = 0, ph_act = 0;
unsigned long int avgval;
int buffer_arr[10], temp;
//float Salinity = 0;
float doSaturation = 0;

int tdsValue = 0;

unsigned long previousMillis = 0;
unsigned long previousMillis1 = 0;
const long interval = 18000;

int R1_mood = 0, R2_mood = 0, R3_mood = 0, R4_mood = 0;

void setup(void)
```

```
{
  Serial.begin(9600);
  Serial1.begin(9600);
  lcd.init();
  lcd.backlight();

  EEPROM.get(20, temp_h);
  EEPROM.get(60, ph_h);
  EEPROM.get(10, ph_l);
  EEPROM.get(20, salinity_h);
  EEPROM.get(30, salinity_l);
  EEPROM.get(40, w_lvl);
  EEPROM.get(50, do_lvl);

  Serial.print(temp_h);
  Serial.print("\t");
  Serial.print(ph_h);
  Serial.print("\t");
  Serial.print(ph_l);
  Serial.print("\t");
  Serial.print(salinity_h);
  Serial.print("\t");
  Serial.print(salinity_l);
  Serial.print("\t");
  Serial.print(w_lvl);
  Serial.print("\t");
  Serial.println(do_lvl);

  pinMode(lv1, INPUT);
  pinMode(lv2, INPUT);
  pinMode(lv3, INPUT);
  pinMode(lv4, INPUT);
  pinMode(lv5, INPUT);

  pinMode(R1, OUTPUT);
  pinMode(R2, OUTPUT);
  pinMode(R3, OUTPUT);
  pinMode(R4, OUTPUT);
  pinMode(R5, OUTPUT);
  pinMode(R6, OUTPUT);
  pinMode(R7, OUTPUT);

  digitalWrite(R1, HIGH);
```

```
  digitalWrite(R2, HIGH);
  digitalWrite(R3, HIGH);
  digitalWrite(R4, HIGH);
  digitalWrite(R5, HIGH);
  digitalWrite(R6, HIGH);
  digitalWrite(R7, HIGH);

  sensors.begin();
  gravityTds.setPin(TdsSensorPin);
  gravityTds.setAref(5.0);
  gravityTds.setAdcRange(1024);
  gravityTds.setKvalueAddress(150);
  gravityTds.begin();

  ph.begin();

  lcd.clear();
}

void loop(void)
{
  int MosValue = 0;
  int lv1_v = !digitalRead(lv1);
  int lv2_v = !digitalRead(lv2);
  int lv3_v = !digitalRead(lv3);
  int lv4_v = !digitalRead(lv4);
  int lv5_v = !digitalRead(lv5);

  if (lv1_v == 0 && lv2_v == 0 && lv3_v == 0 && lv4_v == 0 && lv5_v ==
0) {
    MosValue = 0;
  }
   else if (lv1_v == 1 && lv2_v == 0 && lv3_v == 0 && lv4_v == 0 &&
lv5_v == 0) {
    MosValue = 20;
  }
   else if (lv1_v == 1 && lv2_v == 1 && lv3_v == 0 && lv4_v == 0 &&
lv5_v == 0) {
    MosValue = 40;
  }
   else if (lv1_v == 1 && lv2_v == 1 && lv3_v == 1 && lv4_v == 0 &&
lv5_v == 0) {
    MosValue = 60;
```

```
  }
   else if (lv1_v == 1 && lv2_v == 1 && lv3_v == 1 && lv4_v == 1 &&
lv5_v == 0) {
    MosValue = 80;
  }
   else if (lv1_v == 1 && lv2_v == 1 && lv3_v == 1 && lv4_v == 1 &&
lv5_v == 1) {
    MosValue = 100;
  }
  else {
    MosValue = 0;
  }

  keypressed = myKeypad.getKey();
  if (keypressed != NO_KEY)
    Serial.println(keypressed);
  if (keypressed == '*') {
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("*ENTER Temperature:*");
    lcd.setCursor(3, 1);
    lcd.print("* High Level *");
    ReadTH();

    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("*ENTER Ph:*");
    lcd.setCursor(3, 1);
    lcd.print("* High Level *");
    ReadPH();

    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("*ENTER Ph:*");
    lcd.setCursor(3, 1);
    lcd.print("* Low Level *");
    ReadPL();

    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("* ENTER Salinity : *");
    lcd.setCursor(3, 1);
    lcd.print("* High Level *");
```

```
  ReadSH();

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("* ENTER Salinity : *");
  lcd.setCursor(3, 1);
  lcd.print("* Low Level *");
  ReadSL();

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("* ENTER Water LvL: *");
  ReadWL();

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("*ENTER Oxygen LvL: *");
  ReadDOL();

  lcd.clear();
}

sensors.requestTemperatures();
float tempC = sensors.getTempCByIndex(0);

int emerjancy = analogRead(MositurePin);
emerjancy = map(emerjancy, 530, 680, 0, 100);
if (emerjancy >= 100) {
  emerjancy = 100;
}
if (emerjancy <= 0) {
  emerjancy = 0;
}

if (tempC == DEVICE_DISCONNECTED_C)
{
  tempC = 0;
}

gravityTds.setTemperature(tempC);
gravityTds.update();
tdsValue = (gravityTds.getTdsValue() - 28);
if (tdsValue <= 0)
```

```
    tdsValue = 0;

  static unsigned long timepoint = millis();
  if (millis() - timepoint > 1000U) {            //time interval: 1s
    timepoint = millis();
     voltageph = (analogRead(PH_PIN) / 1024.0 * 5000) / 2.0299; // read
the voltage

    ph_act = (ph.readPH(voltageph, tempC) + .04);
  }
  ph.calibration(voltageph, tempC);

  if (ph_act < 1) {
    ph_act = 0;
  }
  float sa = tdsValue;
  float Salinity = sa / 100;
   doSaturation = (14.621 - (0.41022 * tempC) + 0.007991 * (tempC *
tempC)
                       - 0.000077774 * (tempC * tempC * tempC)) * (1 -
0.000975 * Salinity);

  float sss =  sa / 100;

  Serial.print("pH Val:");
  Serial.println(ph_act);
  Serial.print("TDS : ");
  Serial.print(tdsValue);
  Serial.println("ppm");
  Serial.print("Temperature : ");
  Serial.print(tempC);
  Serial.println("°C");
  Serial.print("Water Level : ");
  Serial.print(MosValue);
  Serial.println("%");
  Serial.print("Salinity : ");
  Serial.print(sss);
  Serial.println("ppt");
  Serial.print("DO : ");
  Serial.print(doSaturation);
  Serial.println("mg/L");

  lcd.setCursor(0, 0);
```

```
lcd.print("pH:");
lcd.print(ph_act);
lcd.print(", T:");
lcd.print(tempC);
lcd.print((char)223);
lcd.print("C ");
lcd.setCursor(0 , 1);
lcd.print("S:");
lcd.print(Salinity);
lcd.print(" ppt  ");
lcd.setCursor(0 , 2);
lcd.print("DO:");
lcd.print(doSaturation);
lcd.print(" mg/L  ");
lcd.setCursor(0 , 3);
lcd.print("WL:");
lcd.print(MosValue);
lcd.print("%  ");

if (tempC > temp_h || MosValue < w_lvl || Salinity > salinity_h) {
  digitalWrite(R1, LOW);
  if (R1_mood == 0) {
    R1_mood = 1;
    previousMillis1 = millis();
  }
}
else {
  digitalWrite(R1, HIGH);
  R1_mood = 0;
}

if (ph_act < ph_l) {
  digitalWrite(R2, LOW);
  if (R2_mood == 0) {
    R2_mood = 1;
    previousMillis1 = millis();
  }
}
else {
  digitalWrite(R2, HIGH);
  R2_mood = 0;
}
```

```
  if (ph_act > ph_h) {
    digitalWrite(R3, LOW);
    if (R3_mood == 0) {
      R3_mood = 1;
      previousMillis1 = millis();
    }
  }
  else {
    digitalWrite(R3, HIGH);
    R3_mood = 0;
  }

  if (Salinity < salinity_l) {
    digitalWrite(R4, LOW);
    if (R4_mood == 0) {
      R4_mood = 1;
      previousMillis1 = millis();
    }
  }
  else {
    digitalWrite(R4, HIGH);
    R4_mood = 0;
  }

  if (doSaturation < do_lvl) {
    digitalWrite(R6, LOW);
  }
  else {
    unsigned long currentMillis = millis();
    if (currentMillis - previousMillis1 >= 5000) {
      previousMillis1 = currentMillis;
      digitalWrite(R6, HIGH);
    }
    else {
       if (R1_mood == 1 || R2_mood == 1 || R3_mood == 1 || R4_mood == 1)
{
        digitalWrite(R5, LOW);
      }
      else {
        digitalWrite(R6, HIGH);
      }
    }
  }
```

```
  if (emerjancy > 10) {
    digitalWrite(R5, LOW);
  }
  else {
    digitalWrite(R5, HIGH);
  }

  unsigned long currentMillis = millis();

  if (currentMillis - previousMillis >= interval) {
    previousMillis = currentMillis;
     String sms = "#" + String(ph_act) + "@" + String(tdsValue) + "@" +
String(tempC) + "@" + String(MosValue) + "@" + String(Salinity) + "@" +
String(doSaturation) + "*";
    Serial1.println(sms);
    Serial.println(sms);
  }
  delay(50);
}

void ReadTH() {
  i = 0;
  a = 0;
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
     if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 2);
      lcd.print(keypressed);
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
```

```
      lcd.print("*ENTER Temperature:*");
      lcd.setCursor(3, 1);
      lcd.print("* High Level *");
    }
  }
  temp_h = PID.toInt();
  Serial.println(temp_h);
  EEPROM.put(20, temp_h);
  keypressed = NO_KEY;
}

void ReadPH() {
  i = 0;
  a = 0;
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
     if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 2);
      lcd.print(keypressed);
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("*ENTER Ph:*");
      lcd.setCursor(3, 1);
      lcd.print("* High Level *");
    }
  }
  ph_h = PID.toInt();
  EEPROM.put(60, ph_h);
  keypressed = NO_KEY;
}
```

```
void ReadPL() {
  i = 0;
  a = 0;
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
     if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 2);
      lcd.print(keypressed);
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("*ENTER Ph:*");
      lcd.setCursor(3, 1);
      lcd.print("* Low Level *");
    }
  }
  ph_l = PID.toInt();
  EEPROM.put(10, ph_l);
  keypressed = NO_KEY;
}

void ReadSH() {
  i = 0;
  a = 0;
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
     if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 2);
      lcd.print(keypressed);
```

```
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("* ENTER Salinity : *");
      lcd.setCursor(3, 1);
      lcd.print("* High Level *");
    }
  }
  salinity_h = PID.toInt();
  EEPROM.put(20, salinity_h);
  keypressed = NO_KEY;
}

void ReadSL() {
  i = 0;
  a = 0;
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
    if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 2);
      lcd.print(keypressed);
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
```

```
      lcd.print("* ENTER Salinity : *");
      lcd.setCursor(3, 1);
      lcd.print("* Low Level *");
    }
  }
  salinity_l = PID.toInt();
  EEPROM.put(30, salinity_l);
  keypressed = NO_KEY;
}

void ReadWL() {
  i = 0;
  a = 0;
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
    if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 1);
      lcd.print(keypressed);
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("* ENTER Water LvL: *");
    }
  }
  w_lvl = PID.toInt();
  EEPROM.put(40, w_lvl);
  keypressed = NO_KEY;
}

void ReadDOL() {
  i = 0;
  a = 0;
```

```
  j = 0;
  String PID;
  while (keypressed != '#') {
    keypressed = myKeypad.getKey();
     if (keypressed != NO_KEY && keypressed != '#' && keypressed != 'C')
{
      lcd.setCursor(j, 1);
      lcd.print(keypressed);
      j++;
      PID = PID + String(keypressed);
    }
    if (keypressed == 'C') {
      i = 0;
      a = 0;
      j = 0;
      String asss;
      PID = asss;
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("*ENTER Oxygen LvL: *");
    }
  }
  do_lvl = PID.toInt();
  EEPROM.put(50, do_lvl);
  keypressed = NO_KEY;
}
```

CODE for IOT:

```
#include <WiFiManager.h>
#include <WiFiClientSecure.h>
#include "ThingSpeak.h"

WiFiClient client1;

String apiKey = "3SA6YF1CM6T39O5U";
const char* server = "api.thingspeak.com";

String readString;
const char* host = "script.google.com";
const int httpsPort = 443;
WiFiClientSecure client;
```

```
String                                  GAS_ID                                  =
"AKfycbxg1yMj6RFKLNtjD-E_Uu3DbwpHkmHeXpqWb4xKnO-mZBSImbFa8EPzTyFmmYO28u
1f";

unsigned long myChannelNumber = 2873731;
const char * myWriteAPIKey = "Q1PM4QDYRM5N57IG";
// Initialize our values
String myStatus = "";

char* esp_ssid = "IoT Project";
char* esp_pass = "1234567890";

String smss, sms, sms1, sms2, sms3, sms4, sms5, sms6;
int temp = 0, n = 0, k = 0, j = 0, jj = 0, jjj = 0, jjjj = 0, jjjjj =
0, jjjjjj = 0, asd = 0;
char str[100], msg[100];

const int Erasing_button = 0;

void configModeCallback (WiFiManager *myWiFiManager) {
  Serial.println(WiFi.softAPIP());
  Serial.println(myWiFiManager->getConfigPortalSSID());
}

void setup() {
  Serial.begin(9600);
  pinMode(Erasing_button, INPUT);
  pinMode(D4, OUTPUT);

  for (uint8_t t = 4; t > 0; t--) {
    digitalWrite(D4, LOW);
    delay(500);
    Serial.println(t);
    digitalWrite(D4, HIGH);
    delay(500);
  }

  // Press and hold the button to erase all the credentials
  if (digitalRead(Erasing_button) == LOW)
  {
    WiFiManager wifiManager;
    wifiManager.resetSettings();
    ESP.restart();
```

```
    delay(1000);
  }

  WiFiManager wifiManager;
  wifiManager.setAPCallback(configModeCallback);
  if (!wifiManager.autoConnect(esp_ssid, esp_pass)) {
    Serial.println("failed to connect and hit timeout");
    ESP.restart();
    delay(1000);
  }
  Serial.println("connected...yeey :)");
  digitalWrite(D4, LOW);
  ThingSpeak.begin(client1);  // Initialize ThingSpeak
}

void loop() {
  serialEvent();
}

void serialEvent()
{
  while (Serial.available())
  {
    char ch = (char)Serial.read();
    str[n++] = ch;
    if (ch == '*')
    {
      temp = 1;
      break;
    }
  }
  if (temp == 1)
  {
    for (int i = 0; i < n; i++) {
      if (str[i] == '#') {
        j = i;
      }

      if (str[i] == '@') {
        if (asd == 0) {
          jj = i;
          asd++;
        }
```

```
        else if (asd == 1) {
          jjj = i;
          asd++;
        }
        else if (asd == 2) {
          jjjj = i;
          asd++;
        }
        else if (asd == 3) {
          jjjjj = i;
          asd++;
        }
        else if (asd == 4) {
          jjjjjj = i;
          asd++;
        }
      }

      if (str[i] == '*')
      {
        k = i;
        break;
      }
    }
    int l = 0;
    sms = String(str);
    sms1 = sms.substring(j + 1, jj);
    sms2 = sms.substring(jj + 1, jjj);
    sms3 = sms.substring(jjj + 1, jjjj);
    sms4 = sms.substring(jjjj + 1, jjjjj);
    sms5 = sms.substring(jjjjj + 1, jjjjjj);
    sms6 = sms.substring(jjjjjj + 1, k);

    temp = 0;
    n = 0;
    asd = 0;
    Google_Sheet();
    thingspeak();
  }
}

void Google_Sheet() {
  client.setInsecure();
```

```
  Serial.print("connecting to ");
  Serial.println(host);
  if (!client.connect(host, httpsPort)) {
    Serial.println("connection failed");
    return;
  }
   String url = "/macros/s/" + GAS_ID + "/exec?value1=" + sms1 +
"&value2=" + sms2 + "&value3=" + sms3 + "&value4=" + sms4 + "&value5="
+ sms5 + "&value6=" + sms6;
  Serial.print("requesting URL: ");
  Serial.println(url);
  client.print(String("GET ") + url + " HTTP/1.1\r\n" + "Host: " + host
+ "\r\n" + "User-Agent: BuildFailureDetectorESP8266\r\n" + "Connection:
close\r\n\r\n");
  Serial.println("request sent");
  while (client.connected()) {
    String line = client.readStringUntil('\n');
    if (line == "\r") {
      Serial.println("headers received");
      break;
    }
  }
  String line = client.readStringUntil('\n');
  if (line.startsWith("{\"state\":\"success\"")) {
    Serial.println("esp8266/Arduino CI successfull!");
  } else {
    Serial.println("esp8266/Arduino CI has failed");
  }
  Serial.println("reply was:");
  Serial.println("==========");
  Serial.println(line);
  Serial.println("==========");
  Serial.println("closing connection");
  client.stop();
}

void thingspeak()
{
  Serial.println("Channel");
  //// set the fields with the values
  float ph = sms1.toFloat();
  int tds = sms2.toInt();
  float temp = sms3.toFloat();
```

```
  int wl = sms4.toInt();
  float doi = sms6.toFloat();
  int sl = sms5.toInt();
  ThingSpeak.setField(1, ph);
  ThingSpeak.setField(2, tds);
  ThingSpeak.setField(3, temp);
  ThingSpeak.setField(4, wl);
  ThingSpeak.setField(5, sl);
  ThingSpeak.setField(6, doi);

  // set the status
  ThingSpeak.setStatus(myStatus);

  // write to the ThingSpeak channel
  int x = ThingSpeak.writeFields(myChannelNumber, myWriteAPIKey);
  if (x == 200) {
    Serial.println("Channel update successful.");
  }
  else {
      Serial.println("Problem updating channel. HTTP error code " +
String(x));
  }
}
```

Title: Smart Water Quality Monitoring And Management System for Shrimp Hatchery

Group 08

Final Year Design Project (P) Summer 2024				
Student Details	**NAME**	**ID**	**EMAIL ADDRESS**	**PHONE**
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Member 3	Maruf Ahmed	17321026	maruf.ahmed@g.bracu.ac.bd	01681095230
Member 4	Muhtasim Billah Nahin	20121013	muhtasim.billah.nahin@g.bracu.ac.bd	01680282929

ATC Details		
ATC 8		
ATC	**Name and Designation**	**Email Address**
Chair	Dr. Touhidur Rahman Professor, Department of EEE Brac University	touhidur.rahman@bracu.ac.bd
Member 1	Shahed Alam Senior Lecturer, Department of EEE Brac University	shahed.alam@bracu.ac.bd
Member 2	Atib Mohammad Oni Lecturer, Department of EEE, Brac University	atib.mohammad@bracu.ac.bd

General Notes:

1. In addition to the detailed journal/logbook fill out the summary/key steps and progress of your work.
2. Reflect planning assignments, who has what responsibilities.
3. The logbook should contain all activities performed by the team members (Individual and team activities)

Date/Time/ Place	Attendee	Summary of Meeting Minutes	Responsible	Comment by ATC
25.05.2024 **FYDP Class 1** (In person)	**FacultyMember** Mohaimenul Islam **Students** 1. Shahed al Faiyad 2. Tahsin Karim 3. Maruf Ahmed 4. Muhtasim Billah Nahin.	1.Introduction to overall FYDP pro- jects 2.Overview of complex engineering pro- jects and how to find them.		
31.05.2024 **ATC** Meeting 1 (in person))	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1. Shahed al Faiyad 2. Tahsin Karim 3. Maruf Ahmed 4. Muhtasim Billah Nahin.	1. Five project ideas were demonstrated by the students to the ATC panel. 2. Project ideas were selected to research further and demonstrate in the next ATC meeting with evi- dence that it can be simulated on software		1. The ATC The meeting will be held every Wednesday at 9 PM. 2. Find if the software simulation is possible for the project ideas that were discussed in the ATC meeting with enough evidence.
01.06.2024 **FYDP Class 2** (In person)	**Faculty Member** Prof. Dr. Md. Mosaddequr Rahman **Students** 1. Shahed al Faiyad 2. Tahsin Karim 3. Maruf Ahmed 4. Muhtasim Billah Nahin.	1. Discussion on engi- neering design pro- cesses 2. Overview of the steps to complete a project		

03.06.2024 **Group Meeting 1** (in person)	**Students** 1. Shahed al Faiyad 2. Tahsin Karim 3. Maruf Ahmed 4. Muhtasim Billah Nahin	**Task 1:** Research on advanced fire detec-tion and extinguishing simulation **Task 2:** Research on Sign language inter- preter simulation	**Task 1:** Everyon e **Task 2:** Everyoe Progress: **Task 1**: Completed **Task 2**: Completed	
05.06.2024	**Students**	**Task 1:** Advance fire detection and	**Task 1:** faiyad,maruf,nahin	

Group Meeting 2 (Online)	1. Shahed al Faiyad 2. Tahsin Karim 3. Maruf Ahmed 4. Muhtasim Billah Nahin	extinguisher block di- agram and simulation parameters **Task 2:** Discussion oin pen different ap- proaches to fire detec- tion system	**Task 2:** Everyone Progress: **Task 1**: Completed **Task 2**: Completed	
07.06.2024 **ATC Meeting 2** (in person)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1. Shahed al Faiyad 2. Tahsin Karim 3. Maruf Ahmed 4. Muhtasim Billah Nahin	1. The project idea was presented by group 3 and approved by the ATC panel. 2. Design approaches for the project ad- vance fire detection and extinguisher were demonstrated by group 3 3. Relevant research papers on the project topic were displayed		1. Find different research papers related to the project proposal. 2. Start prepar- ing a log book and concept note.
08.06.2024 **FYDP Class 3** (In person)	**Faculty Member** Prof.Dr. Arshadur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Understandin g the Objectives, and figur- ing out an existing Complex Engineering problem. 2. Completion Guide- lines of the BSEEE Curriculum's Final Year Design Project		

08.06.2024 **Group Meeting 3** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Look through different research pa- pers related to project proposals. **Task 2:** Start of log book preparation.	**Task 1:** Everyone **Task 2:** Everyone Progress: **Task 1:** Completed **Task 2:** Completed	
13.06.2024	**Students**	**Task 1:** Start of Con- cept note preparation.	**Task 1:** Everyone	

Group Meeting 4 (Online)	1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin		Progress: **Task 1:** Completed	
14.06.2024 **ATC Meeting 3** (in person)	**ATC Members:** . 1. Prof. Dr. Touhidur Rahman . 2.Shahed Alam . 3.Atib Mohamad Oni	1. Review of group 3 logbook. 2. Review of group 3 concept notebook.		1. Correct the er- rors in the log book according to the instruc- tions. 2. Correct the er- rors in the con- cept notebook according to the instructions
15.06.2024 **FYDP Class 4** (In person)	**Faculty Member** Dr. Abu S.M Mohsin **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Guidelines on how to identify complex engineering problems. 2. Discussion on pro- ject titles and objec- tives, specifications, etc.		
16.06.2024 **Group Meeting 5** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Formatting the concept notebook. **Task 2:** Re-design the first design ap- proach.	**Task 1:** Everyone **Task 2:** Tahsin Progress: **Task 1:** Completed **Task 2:** Completed	
20.06.2024 **Group Meeting 6** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Research on 2nd design approach and re-design. **Task 2:** Research on Applicable Standards and codes.	**Task 1:** Everyone Progress: **Task 1:** In pro- gress **Task 2:** Completed	

22.06.2024 **FYDP Class 5** (In person)	**Faculty Member:** Abdullah Hill Kafi **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Overview of project safety, sustainability and green system designs. 2. Environment al im- pact in engineering design.		
24.06..2024 **Group Meeting 7** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Update specifications.	**Task 1:** Everyone **Task 1:** Completed	
28.06.2024 **ATC Meeting 4** (in person)	**ATC Members:** . 1. Prof. Dr. Touhidur Rahman . 2.Shahed Alam . 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of group 3 logbook. 2. Review of group 3 concept note.		1. Start prepar- ing presentation slides.
29.06.2024 **FYDP Class 6** (In person)	**Faculty Member:** Abdullah Hill Kafi **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of engi- neering ethical prac- tices. 2. Codes and stand- ards for engineering projects.		
02.07.2024 **Group Meeting 8** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** update speci- fications for project. **Task 2:** Presentation slides preparation.	**Task 1:** Everyone **Task 2:** Everyone Progress: **Task 1:** Completed	

			Task 2: Completed	
06.07..2024 **Group Meeting 9** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Budget planning.	**Task 1:** Everyone Progress: **Task 1:** Completed	
18.07.2024 **Group Meeting 10** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Project Proposal Discussion and Preparation.	**Task 1:** Everyone Progress: **Task 1:** Completed	
21.07.2024 **FYDP Class 7** (Online)	**Faculty Member:** Mohaimenul Islam **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of Project Proposal Preparation.		
21.07.2024 **ATC Meeting 5**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Overview of project proposal contents.		1. Start preparation of project proposal. 2. Gather information on the system. specifications of the project.
24.07.2024 **Group Meeting 11** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Ethical Considerations **Task 2:** Budget **Task 3:** Expected Outcome **Task 4:** Sustainability	**Task 1:** Tahsin Mifta **Task 2:** Maruf Ahmed	

			Task 3: Maruf Ahmed **Task 4:** Tahsin Mifta Progress: **Task 1:** Completed **Task 2:** Completed **Task 3:** Completed **Task 4:** Completed	
27.07.2024 **Group Meeting 12** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Writing of Methodology **Task 2:** Writing of Project Plan **Task 3:** Writing of risk Management & Anal- ysis **Task 4:** Writing of impact	**Task 1:** Maruf, Tahsin **Task 2:** Faiyad, Nahin, Maruf, Tahsin **Task 3:** Maruf, Tahsin **Task 4:** Nahin, Faiyad Progress: **Task 1:** Completed **Task 2:** In pro- gress **Task 3:** Completed **Task 4:** Completed	
28.07.2024 **FYDP Class 8** (In person)	**Faculty Member:** Mohaimenul Islam **Students:** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Overview on Writ- ing and presentation techniques.		
28.07.2024 **ATC Meeting 6**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni	1. Review of project proposal. 2. Review of log book.		1. Correct the er- rors in the log book.

	Students 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin			2. Remove any extra block dia- grams which are not needed. 3. Rewrite refer- ence in IEEE format
01.08.2024 **Group Meeting 13** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Update the safety consideration. **Task 2:** Update the methodology. **Task 3:** Update the attributes of Complex Engineering Prob- lems. **Task 4:** Update the Project plan.	**Task 1:** Maruf **Task 2:** Faiyad **Task 3:** Nahin **Task 4:** Tahsin Progress: **Task 1:** Completed **Task 2:** In pro- gress **Task 3:** Completed **Task 4:** Completed	
03.08.2024 **Group Meeting 14** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Rewrite ref- erence in IEEE for- mat. **Task 2:** Fix paper formatting. **Task 3:** Update the attributes of Complex Engineering Activi- ties.	**Task 1:** Nahin **Task 2:** Maruf, Tahsin **Task 3:** Faiyad Progress: **Task 1:** Completed **Task 2:** In pro- gress **Task 3:** Completed	
04.08..2024 **ATC Meeting 7**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni	1. Review of project proposal. 2. Review of log book.		1. Rephras e the mentioned in- correct sen- tences in the pa- per.

	Students 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin			2. Fix the figure number accord- ingly. 3. Adjust the font size, make it constant. 4. Fix the deci- sion box of the flowchart ac- cording to in- struction. 5. Add a gantt chart for the pro- ject.
16.08.2024 **Group Meeting 15** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Update of the Problem Statement and background re- search. **Task 2:** Update of the project plan. **Task 3:** Fix paper formatting. **Task 4:** Update of the risk management with proper reference.	**Task 1:** Maruf **Task 2:** Maruf **Task 3:** Nahin, Tahsin **Task 4:** Faiyad, Tahsin Progress: **Task 1:** Completed **Task 2:** Completed **Task 3:** Completed **Task 4:** Completed	
17.08.2024 **ATC Meeting 8**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students**	1. Review of project proposal. 2. Review of log book.		1. Prepare for the mock presenta- tion. 2. Prepare slides for the final presentation.

	1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin			3. Fix grammati- cal errors in the project proposal. 4. Fix references in the project proposal.
21.08.2024 **Group Meeting 16** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Start prepara- tion of slides. **Task 2:** Update of the budget.	**Task 1:** Everyone **Task 2:** Maruf Progress: **Task 1:** Completed **Task 2:** Completed	
23.08.2024 **Group Meeting 17** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Addition of risk management in the slide **Task 2:** Update of the diagram. **Task 3:** Addition of system level specifi- cation. **Task 4:** Formatting the slides.	**Task 1:** Tahsin **Task 2:** Nahin **Task 3:** Nahin, Faiyad,Maruf **Task 4:** Tahsin, Faiyad	
24.08..2024 **ATC Meeting 9**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni	1. Mock Presentation to the ATC panel		

	Students 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin			
27.08.2024 **Group Meeting 18** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Update of the System specification **Task 2:** Update of the Budget	**Task 1:** Maruf, Tahsin **Task 2:** Nahin Progress: **Task 1:** Completed **Task 2:** Completed	
01.09.2024 **Group Meeting 19** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	**Task 1:** Update of the problem statement and background re-search **Task 2:** Correction of the references **Task 3:** Correction of the paper formatting, grammatical errors.	**Task 1:** Faiyaf **Task 2:** Maruf **Task 3:** Nahin, Maruf Progress: **Task 1:** Completed **Task 2:** Completed **Task 3:** Completed	

Title: Smart Water Quality Monitoring And Management System for Shrimp Hatchery

Group 08

Final Year Design Project (D) Fall 2024				
Student Details	**NAME**	**ID**	**EMAIL ADDRESS**	**PHONE**
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Member 3	Maruf Ahmed	17321026	maruf.ahmed@g.bracu.ac.bd	01681095230
Member 4	Muhtasim Billah Nahin		muhtasim.billah.nahin@g.bracu.ac.bd	

ATC Details		
ATC 8		
ATC	**Name and Designation**	**Email Address**
Chair	Dr. Touhidur Rahman Professor, Department of EEE Brac University	touhidur.rahman@bracu.ac.bd
Member 1	Shahed Alam Senior Lecturer, Department of EEE Brac University	shahed.alam@bracu.ac.bd
Member 2	Atib Mohammad Oni Lecturer, Department of EEE, Brac University	atib.mohammad@bracu.ac.bd

General Notes:

1. In addition to detail journal/logbook fill out the summary/key steps and progress of your work
2. Reflect planning assignments, who has what responsibilities.
3. The logbook should contain all activities performed by the team members (Individual and team activities).

Date/Time/ Place	Attendee	Summary of Meeting Minutes	Responsible	Comment by ATC
24.10.2024 **FYDP Class 1** (In Person)	**Faculty Member** Tashfin Mahmud **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Introduction to over- all FYDP-D project methods. 2. General guidelines on how to develop and design simulations.		
10.10.2024 ATC Meeting 1A (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Brief on how the FYDP-D curriculum will be held. 2. General guidelines on design report writing 3. Briefing on simula- tion for 2 design ap- proaches.		1. Categ orize all FYDP-D tasks and up- date gantt chart 2. Start work- ing on the de- sign report.
10.10.2024 ATC Meeting 1B (In Person)	**ATC Members:** 1. Atib Mohammed Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Fire Detection algo- rithm demo demonstra- tion 2. Discussion on vari- ous approaches on fire detection algorithms.		1. Prep are a fire detection algorithm for design ap- proach 1
13.10.2024 ATC Meeting 1C (In Person)	**ATC Members:** 1. Shahed Alam **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on pro- ject plan. 2. Brief on various fire detection algorithms.		1. Prep are an algorithm for design ap- proach 1
15.10.2024 Group	**Students**	1. Design approach 1 research on algorithms.	**Task 1:** Maruf, Nahin	

Meeting 1 (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	2. Design approach 2 research on algorithms. 3. Gantt chart listing	**Task 2:** Nahin, Faiyad **Task 3:** Maruf **Progress:** **Task 1:**In progress **Task 2:**In progress **Task 3:**Completed	
20.10.2024 **Group Meeting 2** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 algorithm coding and training using gray scaling method. 2. Design approach 1 algorithm coding and training using calori- metric method 3. Design approach 2 coding and training for thermal cameras. 4. Preparation of Gantt chart	**Task 1:** Maruf **Task 2:** Nahin **Task 3:** Tahsin, Faiyad **Task 4:** Tahsin **Progress:** **Task 1:**In progress (lack of datasets) **Task 2:**In progress (Algorithm error) **Task 3:**In progress (Uploaded normal video footage due to lack of thermal camera) **Task 4:** Complete	

21.10.2024 Group Meeting 3 (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 algorithm coding and training using gray scaling method 2. Design approach 1 algorithm coding and training using the calorimetric method. 3. Design approach 2 coding and training for thermal cameras.	**Task 1:** Tahsin, Faiyad, Maruf **Task 2:** Tahsin **Progress:** **Task 1:**In progress (training and finalizing simulation parameters) **Task 2:**In progress (Lack of HRR datasets) **Task 3:**In progress (Uploaded thermal image footage and got around 40% accuracy)	

22.10.2024 **Group Meeting 4** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 algorithm coding and training using gray scaling method. 2. Design approach 1 algorithm coding and training using the calo- rimetric method. 3. Design approach 2 coding and training for thermal cameras. 4. Start writing a draft Design report	**Task 1:** Tahsin **Task 2:** Maruf **Task 3:** Maruf, Nahin **Task 4:** Nahin **Progress:** **Task 1**:In progress (Working on im- proving accuracy) **Task 2**:In progress (Complicated algo- rithm structure for detection) **Task 3:**In progress (Uploaded thermal video footage and got around 40% accuracy) **Task 4:** Complete	
24.10.2024 **ATC Meeting 2A**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of the log- book 2. Review of design re- port and gantt chart. 3. Discussions on de- sign approach 1 simula- tion. 4. Discussion on design approach 2 simulation		1. Upd ate the design report. 2. Includ e all the research papers in IEEE format. 3. Work on the design ap- proach 1 simu- lation. 4. Make prepa- ration for the mock presenta- tion.

24.10.2024 ATC Meeting 2B	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on design approach 1 gray scale method algorithm and datasets. 2. Discussion on design approach 2 algorithm with thermal camera, accuracy improvements. 3. Guidelines on how to get datasets for the sim- ulation programs.		1. Find da- tasets for both design ap- proaches. 2. Prepar e sim- ulations for both design ap- proaches.
26.10.2024 Group Meeting 5 (In Person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 algorithm coding and training using gray scaling method. 2. Implementa tion of design approach 1 in Proteus simulation. 3. Collecting dataset sample from kaggle and roboflow platform	**Progress:** **Task 1:**In progress **Task 2:**In progress **Task 3:** Complete **Task 4:** Complete	
27.10.2024 ATC Meeting 2C (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on design approach 1 gray scaling method algorithm im- provements.		1. Prepar e sim- ulation for both design ap- proaches. 2. Start prepar- ing presentation slides for the progress presentation.

30.10.2024 **Group Meeting 6** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Preparation of slides for progress presenta- tions. 2. Making sure that all the PO's are met for the presentation slides 3. Updating design re- port (Background re- search, objectives) 4. Update Logbook	**Task 1:** Maruf, Nahin, Faiyad **Task 2:** Tahsin **Task 3:** Maruf **Task 4:** Tahsin **Progress:** **Task 1:**In progress **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete	
01.10.2024 **ATC Meeting 3A**	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of design re- port and the mistakes that can be fixed. 2. Review of logbook. 3. Review of presenta- tion slides and discus- sion on progress presentation.		1. Highli ght the changes made in the de- sign report. 2. Fix the mis-takes in the presentation slides addressed in the meeting. 3. Write down all the tasks done by every groupmate 4. Add a screen record of the working design in the presenta- tion slides. 5. Add refer- ence for data privacy.

01.11.2024 ATC Meeting 3B (In Person)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on design approach 1 algorithm progression. 2. Review of presenta- tion slides.		1. Fix the mistakes ad- dressed in the meeting 2. Add more information like video foot- age of the detection algorithm in the presentation slides. 3. Add a screen record of the working de- sign. 4. Start working on the design approach 2 proteus simu- lation.

02.11.2024 **Group Meeting 7** (Online)	**Students** 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update presentation slides (Background re-search,Specification, Design 1 simulation) 2. Redesign proteus simulation for design approach 1. 3. Practice giving the presentation within 8 minutes. 4. Addition of pump motor in the proteus simulation for design approach 1. 5. Screen recording de- sign approach 1 proteus simulation. 6. Screen recording de- sign approach 2 output video footage.	**Task 1:** Maruf, Tahsin, Faiyad **Task 2:** Tahsin **Task 3:** Everyone **Task 4:** Tahsin **Task 5:** Faiyad **Task 6:** Tahsin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete	

04.11.2024 FYDP Committee Progress presentation (In Person)	**Faculty member:** 1. Tashfin Mahmud 2. Md. Ehsanul Karim 3. Bristi Das 4. Md. Mahmudul Islam **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Suggested to recheck one of the functional and non-functional re- quirements. 2. Asked about the pur- pose of the coordinates aspect of the servo mo- tors. 3. Questioned how was the loss function calcu- lated for the design ap- proach 1 4. How will the object detection procedure work.		
04.11.2024 ATC Meeting 3C (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on design approach 1 proteus sim- ulation and its working.		1. Start build- ing design approach 2 simulation in proteus. 2. Resear ch how to control servo motors using coordi- nate systems in proteus simula- tion.

07.11.2024 Group Meeting 8 (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design report update (Background Research and Survey, Objectives, alignment changes) 2. Add both design ap- proach simulation re- sults. 3. Research on ethical considerations, safety considerations, and up- dates in the design re- port. 4. Added appropriate references for data protection. 5. Added code for both systems in the appendix. 6. Fixing formatting and margin for report. 7. Added selection of modern IT tools. 8. Updated, added and edited table of contents.	**Task 1:** Tahsin **Task 2:** Faiyad **Task 3:** Tahsin **Task 4:** Nahin **Task 5:** Maruf **Task 6:** Faiyad **Task 7:** Nahin **Task 8:** Faiyad **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete **Task 8:** Complete	
02.01..2025 Group Meeting 9 (In Person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discuss among the team how to restart again. 2. Review our model.	**Task:** Everyone	

03.01..2025 ATC Meeting 4A (In Person)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Brief about the future of the project and the scope of improvement.		1. Q1 journal research. 2. Training progress demonstration of both design approaches
04.01.2025 Group Meeting 10 (In Person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Attain new and im- proved datasets for de- sign approach 1. 2. Attain new and im- proved datasets for de- sign approach 2.	**Task 1:** Maruf, Nahin **Task 2:** Faiyad, Tahsin	**Task 1:** In-Progress **Task 2:** In-Progress
05.01.2025 ATC Meeting 4C (In Person)	**ATC Members:** 1. 1. Prof. Dr. Touhidur Rahman 2. 2.Shahed Alam 3. 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Progress report on the project. 2. Current plan and up- coming plan. 3. Updates on the da- taset and training algo- rithm.		

07.01.2025 Group Meeting 11 (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Train with new da- tasets for design ap- proach 1. 2. Accuracy improve- ment of the design ap- proach 2 model. 3. Obtain Q1 Journal Paper.	**Task 1:** Tahsin **Task 2:** Maruf, Faiyad **Task 3:** Maruf, Tahsin	**Task 1:** In-Progress **Task 2:** In-Progress **Task 3:** In-Progress

09.01.2025 ATC Meeting 5A (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. ATC members asked for the report but could not show any update. 2. Discussion on pro- ject report, software simulation, and system algorithm.		1. Finish work- ing on both of the design approach algorithms. 2. Update the design reports 3. Fix the mistakes shown in the meeting.
09.01.2025 ATC Meeting 5B	**Discontinuation of ATC member**			
11.01.2025 Group Meeting 10 (In Person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 training and try to im- prove accuracy.	**Task 1:** Tahsin **Task 2:** Tahsin, Maruf **Task 3:** Nahin	**Task 1:** In-Progress **Task 2:** In-Progress **Task 3:** In-Progress
12.01.2025 ATC Meeting 5C (In Person)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman 2.Shahed Alam 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Progress update on design algorithm, codes. 2. Updates on simula- tion parameters.		1. Start working on proteus design. 2. Update the design report.

16.01.2025 **Group Meeting 11** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 detection algorithm fi- nalization. 2. Yolov8 architecture training, data collection 3. Design approach 1 model testing. 4. Design approach 2 image processing algo- rithm finalization. 5. Report updates on cost, efficiency, manu- facturing, Impact, sus- tainability, and main- tainability 6. Report update on de- sign approach 2 func- tional verification of multiple design solu- tions, graph explana- tion. 7. Report update on functional veri- fication of multiple de- sign solutions for de- sign approach 1. 8. Gantt chart Update. 9. New component up- date and camera model update and formatting	**Task 1:** Nahin **Task 2:** Tahsin **Task 3:** Faiyad **Task 4:** Maruf, Tahsin **Task 5:** Tahsin, Maruf, Faiyad **Task 6:** Tahsin, Maruf **Task 7:** Tahsin **Task 8:** Tahsin, Maruf **Task 9:** Maruf **Task 10:** Maruf **Progress:** **Task 1:**Complete **Task 2:**Complete **Task 3:**Complete **Task 4:**Complete **Task 5:**Complete **Task 6:**Complete **Task 7:**Complete **Task 8:**Complete **Task 9:**Complete **Task 10:**Complete	

18.01.2025 Group Meeting 12 (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 1 proteus simulation file update. 2. Design approach 2 proteus simulation file update. 3. Simulation file mod- ule download and ex- traction for both design approach 1 and 2. 4. Design approach 1 proteus circuit design research on compo- nents and codes. 5. Design approach 2 proteus simulation components research and codes	**Task 1:** Maruf, Tahsin **Task 2:** Tahsin, Maruf **Task 3:** Tahsin, Maruf, Nahin **Task 4:** Faiyad, Nahin **Task 5:** Tahsin, Faiyad **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete	
19.01.2025 ATC Meeting 6C (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on how to add camera module and GSM module with raspberry pi in proteus simulation.		**1.** Updat e Pro- teus circuit de- sign figures in design report. 2. Fix servo motor coordi- nation code for the system

22.01.2025 Group Meeting 13 (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Design approach 2 al- gorithm update to run in VS code using webcam. 2. Proteus circuit design for design approach 1 3. Proteus circuit design for design approach de- sign 2. 4. Update slides for presentation. 5.Design report update.	**Task 1:** Tahsin, Maruf **Task 2:** Nahin **Task 3**: Tahsin, Nahin **Task 4:** Faiyad **Task 5:** Faiyad **Task 6:** Nahin **Progress:** **Task 1:** Complete **Task 2:** In pro- gress (Error running servo motors)	

		6.Optimal design selec- tion using weights and bias.	**Task 3:**In progress (Fatal simulation encountered while running the proteus file) Error running servo motors) **Task 4:**Complete **Task 5:**Complete **Task 6:**Complete	
23.01.2025 **ATC Meet- ing 6A** (Online)	**ATC Members:** . 1. Prof. Dr. Touhidur Rahman . 2.Shahed Alam . 3.Atib Mohamad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Mock presentation of the group 3. 2. Review of the final presentation slides. 3. Review and discus- sion on the design re- port.		**1.** Impr ove the presentation slides format- ting. 2. Fix the mis- take found in the dataset slide. 3. Finis h the presentation in 8 minutes. 4. Fix design report writing mistakes which were pointed out.

24.01.2025 Group Meeting 24 (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update presentation slides. 2. Design approach 2 proteus circuit update. 3. Addition of weights and bias for design ap- proach comparison. 4. Design report format update 5. Report update on modern engineering tools. 6. Report update on new graphs and codes for design approach 1.	**Task 1:** Toushif, Tanveer, Bishwajit **Task 2:** Toushif, Tanveer **Task 3**: Toushif, Asif, Tanveer **Task 4:** Toushif **Task 5:** Asif **Task 6:** Asif, Toushif **Task 7:** Toushif, Tanveer **Task 8:** Tanveer **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete	

		7. Report update on de- sign approach 2 result analysis. 8. Final logbook update		
25.01.2025 ATC Meet- ing 7C	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of Final presentation slides.		1. Be prepared for all kinds of questions for the presenta- tion. 2. Add a little description un- der the images of software icons.
26.01.2025 FYDP Committee Progress presentatio n (In Person)	**Faculty member:** 1. Tashfin Mahmud 2. Md. Ehsanul Karim 3. Bristi Das 4. Md. Mahmudul Islam **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Suggested to explain about the project with a more technical ap- proach and more de- tails. 2. For the design ap- proach 1 faculty sug- gested using more epochs for better accu- racy. 3. For detection part faculty suggested add- ing various fire mitiga- tion methods to make sure fire mitigation is done properly in vari- ous situations.		

Title: Smart Water Quality Monitoring And Management System for Shrimp Hatchery

Group 08

Final Year Design Project (C) Spring 2025				
Student Details	**NAME**	**ID**	**EMAIL ADDRESS**	**PHONE**
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Member 4	Muhtasim Billah Nahin		Muhtasim.billah.nahin@g.bracu.ac.bd	

ATC Details		
ATC 8		
ATC	**Name and Designation**	**Email Address**
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General Notes:

4. In addition to detail journal/logbook fill out the summary/key steps and progress of your work
5. Reflect planning assignments, who has what responsibilities.
6. The logbook should contain all activities performed by the team members (Individual and team activities)

Date/Time/ Place	Attendee	Summary of Meeting Minutes	Responsible	Comment by ATC
15.02.2025 Group Meeting 1 (Online)	**Students:** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Purchase of equipment for the FYDP-C project. 2. Discussion onthe FYDP-C project plan. 3. Finalizing decision for Raspberry Pi for storage solution. 4. Start of equipment integration .	**Task 1:** faiyad, maruf, tahin, nahin **Task 2:** faiyad, maruf, tahin, nahin **Progress:** **Task 1:**In progress **Task 2:**Complete **Task 3:** Complete **Task 4:** Complete	
29.02.2025 **Group** **Meeting 2** (In Person)	**Students:** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Lab slot book for the project. 2. Discuss various parameters for the project station with the lab assistant.	**Task 1:** faiyad, maruf, tahin, nahin **Task 2:** faiyad, maruf, tahin, nahin **Progress:** **Task 1:**Complete **Task 2:** Complete	

03.03.2025 Group Meeting 3 (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Start writing the logbook for FYDP- C. 2. Start writing the FYDP report. .	**Task 1:** Faiyad **Task 2:** Tahsin **Progress:** **Task 1:** Complete **Task 2:** Complete	
07.03.2025 **FYDP Class 1** (In Person)	**FacultyMember** 1. Abu S.M. Mohsin, PhD **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Introduction to overall FYDP-C project methods. 2. General guidelines on how to develop the project according to the suggestions of stakeholders. 3. Discussion on the project showcase and presentation procedure. 4. Brief on how to write the FYDP-C report. 5. Discuss how to maintain the COs and POs for the project.		

		6. Guidelines on Submission format for the FYDP-C report and the plagiarism rate (which should be under 35%).		
10.03.2025 **ATC** **Meeting 1C** (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Brief on how the FYDP-P and FYDP-D curriculum were held.		1. Upload a drive folder containing FYDP-P, FYDP-D documents and research files
11.03.2025 **ATC** **Meeting 1A** (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Brief on how the FYDP-C curriculum will be held. 2. General guidelines on FYDP-C Final report writing.		1. Fix the logbook error mentioned in the meeting. 2. Order all the components needed for the project. 3. Take a video of hardware work for evidence 4. Start preparing slides for the mock presentation.

13.03.2025 **Group** **Meeting 4** (In Person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Report writing on introduction, relevance to current and future industry. 2. Review of journals and articles, finding new relevant papers. 3. Background research on detection and mitigation systems. 4. Report writing on problem statements, background study, and literature gap. 5. Report writing on objectives, requirements, specifications, and constant, systematic overview for design approaches 1, 2, ethics statement, conclusion 6. Report writing on use of modern engineering and IT tools. 7. Developing code for object tracking	**Task 1:** faiyad, maruf, tahin, nahin **Task 2:** faiyad, maruf, tahin, nahin **Task 3:** faiyad, maruf, tahin, nahin **Task 4:** faiyad, maruf, tahin, nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete **Task 8:** Complete	

		8. Building object tracking using webcam 8. Building object tracking using webcam		
14.03.2025 **ATC** **Meeting 1B** (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on FYDP-C final report writing. 2. Brief on how to make the slides for the presentation. 3. Suggestion on how to manage the rotation of the servo mechanism by shifting coordinates.		1. Start preparing slides for the presentation. 2. Keep working on the servo mechanism according to the suggestion.
16.03.2025 **Group** **Meeting** **5** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Report writing on project design approach, introduction , identify multiple design approaches design approach 1, design approach 2, conclusion. 2. Attach analysis of multiple design approaches, optimization of multiple designs, and finding the optimal solution topics from the previous report.	**Task 1:** faiyad, maruf, tahin, nahin **Task 2:** faiyad, maruf, tahin, nahin **Task 3:** faiyad, maruf, tahin, nahin **Task 4:** faiyad, maruf, tahin, nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete	

		3. Attach impact analysis and project sustainability topics from the previous report. 4. Attach engineering project management topics, updated graphical aspect of Gantt chart graph for FYDP-C 5. Update budget for design approach 1 6. Initiate a trial run on servo control systems. 7. Hardware implementation of servo and MCU with power supply. 8. Add 5 new sources and update the references accordingly.	**Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete **Task 8:** Complete	
17.03.2025 **ATC** **Meeting 2C** (In Person)	**ATC Members:** 1. Atib Mohammed Oni **Students** 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on FYDP progress presentation slides, and how to improve some of the parts in slides.		1. Try and find out what is the reason behind the servo jitter. 2. Improve the slides according to instructions

		2. Discussion on how to stabilize the servo jitter.		
18.03.2025 **ATC** **Meeting 2A** (Online)	**ATC Members:** 1. Prof. Dr.Touhidur Rahman 2. Shahed Alam **Students** 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of FYDP progress presentation slides. 2. Review and discussion on the FYDP report. 3. Progress showcase via recorded video how the servo is working.		1. Fix the grammatical mistakes mentioned in the logbook. 2. Write some description under the pictures in the slides. 3. Properly label all the components within the pictures in the slides. 4. Add video evidence of the progress and include it in the slides. 5. Find out why the servo jitters so much and fix it 6. Add the conclusion and future work to the slides.

20.032.205 **Group Meeting 6** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Add video progress to the slides. 2. Add a description under the pictures. 3. Add picture labels for all the pictures. 4. Add the conclusion and future work in the slides. 5. Updat e slide structure. 6. Add a risk management matrix. 7. Update system- level configuration.	**Task 1:** faiyad, maruf, tahin, nahin **Task 2:** faiyad, maruf, tahin, nahin **Task 3:** faiyad, maruf, tahin, nahin **Task 4:** faiyad, maruf, tahin, nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete	
21.03.2025 **FYDP Committee Progress presentation** (In Person)	**Faculty member:** 1. Prof. Dr. Touhidur Rahman 2. Shahed Alam 3. Atib Mohammed Oni **Students**	1. FYDP committee suggested to mention that the project is for commercial space.		

	1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	various lighting conditions. 3. Add a more diverse dataset that includes various fire environments to improve the algorithm's ability to detect fire accurately. 4. Questioned if the algorithm can distinguish between intentional fire and accidental fire.		
21.03.2025 **ATC** **Meeting 2B** (In Person)	**ATC Members:** Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussio n on how the overall FYDP progress presentation went.		1. Begin working on the PCB design for the project
01.04.2025 **ATC** **Meeting 3C** (In Person)	**ATC Members:** **Atib Mohammad Oni** **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on the overall progress of the FYDP. 2.		2. Start setting up the water mechanism to mitigate fire.

01.04.2025 **Group** **Meeting** **7** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Report writing on assessing the impact of the solution. 2. Report writing on evaluating the sustainability, conclusion 3. Report formatting 4. Fix the jitter problem by implementing a dedicated servo driver. 5. Report writing on evaluating project progress, conclusion 6. Report writing on cost-benefit analysis 7. Report writing on technical and non- technical considerations and	**Task 1:** faiyad **Task 2:** nahin **Task 3:** tahsin **Task 4:** maruf **Task 5:faiyad** **Task 6: nahin** **Task 7:** maruf **Task 8:** tahsin **Task 9:tahsin** **Task 10:** nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete **Task 8:** Complete **Task 9:** Complete	

		constraints in the design process. 8. Change the method of servo handling by enabling proper serial communication . 9. Research on IoT 10. Logbook update	**Task 10:** Complete	
02.04.2025 **ATC** **Meeting 3A** (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review and discussion on the FYDP report. 2. Review of the logbook.		1. Highlight all the new points written in the report and logbook. 2. Write a description for the figure 2,4. 3. Show project progress to ATC members in the FYDP lab if available. 4. Start working on the PCB design for the project

04.04.2025 **Group** **Meeting 8** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Purchase a pump and other necessary components. 2. Resolution factor re-calibration for reduced delay. 3. Perform a trial test of the servo subsystem for the automation 4. Test the pump's performance for the DO sensor adjustor	**Task 1:** faiyad, maruf, tahin, nahin **Task 2:** faiyad, maruf, tahin, nahin **Task 3:** faiyad, maruf, tahin, nahin **Task 4:** faiyad, maruf, tahin, nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete	
05.04.2025 **ATC** **Meeting 3B** (In Person)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussi on on how the waterLevel is being controlled. 2. Discussion on the specification of the pump..		1. Adjust the water pressure according to the specification.

08.04.2025 **ATC** **Meeting 4C** (In Person)	**ATC Members:** 1. Atib Mohammed Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update on the overall progress of the project so far.		1. Integrate all subsystems and complete the prototype before the next meeting.
08.04.2025 **Group** **Meeting** **9** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Shifting MCU from micro SD to SSD. 2. Code fine-tuning for the Automation 3. Report writing on Economic Analysis 4. Start drafting on completion of final design and validation. 5. Layout design for the final prototype. 6. Upd ate the logbook	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete	

09.04.2025 **ATC** **Meeting 4A** (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review and discussion on the FYDP report. 2. Review of the logbook.		1. Highlight the updated written part and keep the previous updated highlight.
11.04.2025 **Group** **Meeting** **10** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Faced serial monitor data read error after simulating Iot. 2. Mount the Water motor each of the box 3. Report writing on engineering project management (introduction, conclusion). 4. Report writing on ethics and professional responsibilities (introduction, identify ethical issues and professional responsibility).	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete	

12.04.2025 **ATC** **Meeting 4B** (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update on the overall progress of the project.		1. Latency problem of the system is not a major issue and keep building the subsystems along with the pcb.
15.04.2025 **ATC** **Meeting 5C** (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update on the overall progress of the project. 2. Discuss ion on Arduino setup.		1. If the latency of the system can not be fixed then use the older approach using the SD card.
15.04.2025 **Group** **Meeting 11** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update report on completion of final design. 2. Format the report according to instructions. 3. Include additional code to run the all the sensors and motors 4. Research on Iot and mobile cloud.	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin **Progress:**	

		5. open Iot dashboard 6. Update the logbook	**Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete	
16.04.2025 **ATC** **Meeting 5A** (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review and discussion on the FYDP report. 2. Review of the logbook.		1. Fix the spelling mistake in the logbook 2. Fix the keywords in the report. 3. Fix the figure numbers and report format 4. Change the introduction in 7.1 5. Add a description in the 2.4 table 6. Try to reduce subsystem latency.
17.04.2025 **Group** **Meeting** **12** (Online)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Updated 2.4 table descriptions for design approaches 1 and 2. 2. Updated the keywords in the report.	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin **Progress:**	

		3. Report writing on chapter 9 (apply ethical issues and professional responsibility, conclusion) 4. Updated the technical details under chapter 4 and introduction under chapter 5 5. Fixed water overload problem.	**Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete	
18.04.2025 **Group Meeting 13** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. all the big boxes to construct the base structure of the project. 2. Measured the PVC board to accurately construct the outer layout. 3. Purchased necessary tools to build the structure. 4. Constructed the outer framework of the project.	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete	

19.04.2025 **ATC** **Meeting 5B** (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Discussion on the overall project progress.		1. Make sure the camera is positioned for optimal coverage. 2. Ensure that no components are damaged during the fire ignition process
22.04.2025 **Group** **Meeting** **14** (In person)	**Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Designed and built the mounting mechanism. 2. Constructed a mechanism to securely mount the servo. 3. Positioned and adjusted the servo.	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete	

22.04.2025 ATC Meeting 6C (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Demonstration of the overall project progress to the ATC panel.		1. Implement the water drainage system by next week 2. Integrate the water tank into the overall project structure. 3. Assemble the mounting mechanism in the overall structure.
23.04.2025 ATC Meeting 6A	**ATC Members:** **1.** Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review and discussion on the FYDP report. 2. Review of the logbook.		1. Improve the key- word of the report 2. On page 17 re- move design 1 and design 2 subtitles. 3. Address the er- rors mentioned in the discussion within the report
24.04.2025 Group Meeting 15 (Online)	**Students** 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Update Ethics and Professional Responsibilities . 2. Update the completion of the	**Task 1**: Faiyad maruf **Task 2**: faiyad	

		final design section of the report.	**Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete **Task 5:** Complete **Task 6:** Complete **Task 7:** Complete	
29.04.2025 Group Meeting 16 (In person)	**Students** 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Modeling and implementation of the water reserve tank. 2. Installation of the box with all the sensor and the water motors 3. Adjusting all the boxes with colorful waters	**Task 1**: Faiyad maruf **Task 2**: maruf **Task 3**: mifta **Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete	
29.04.2025 ATC Meeting 7C (In Person)	**ATC Members:** 1. Atib Mohammad Oni **Students** 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Review of the overall progress of the project.		1. Conduct a primary test of the whole system within next week.

30.04.2025 ATC Meeting 7A (Online)	**ATC Members:** 1. Prof. Dr. Touhidur Rahman **Students** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahinr	1. Review and dis- cussion on the FYDP report. 2. Review of the logbook. 3. Discussio n on how to prepare the poster for the final demonstration		1. Start writing the poster. 2. Prepare the pro- totype 3. Complete the re- port and do a simi- larity check after the demonstration 4. Make a video of the prototype and keep it running in a loop format in the final demonstration. 5. Make the figures in the report more clear. 6. Fix the errors made in the report mentioned in the meeting. 7. Send the final re- port to the ATC for final feedback 8. Send the final re- port to the library for a similarity check.
02.05.2025 Group Meeting 17 (In person)	**Students** **1.** 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin**man**	1. Start writing the poster 2. Connect the servo mechanism with the pump subsystem	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin	

		3. Finish preparing the enclosure for the whole system.	**Progress:** **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete	
04.05.2025 Group Meeting 18 (In person)	Students 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Connect the main control unit and check the whole connection. 2. Paint the enclosure alongside other components. 3. Make a small enclosure to put the main control unit in it 4. Perform a trial run of the whole system.	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin **Task 1:** Complete **Task 2:** Complete **Task 3:** Complete **Task 4:** Complete	
06.05.2025 Group Meeting 18 (Online)	Students 1. 1.Shahed al Faiyad 2.Tahsin Karim 3.Maruf Ahmed 4.Muhtasim Billah Nahin	1. Take a picture of the project components and make a video of the whole project.	**Task 1**: Faiyad maruf **Task 2**: faiyad **Task 3**: mifta **Task 4:** maruf **Task 5:** nahin	

		3. Complete writing chapter 4.5 (performance evaluation of developed solution) and chapter 4 conclusion. 4. Complete writing chapter 5.3 (Evaluate the solution to meet desired need) 5. Update the PCB description 6. Make 1 hard copy of the book to show during the project showcase. 7. Make extra copies of the poster using A4 paper to distribute while the project is shown.	**Task 6**: everyone **Task 7:eveyone** Progress: **Task 1**: Complete **Task 2**: Complete **Task 3**: Complete **Task 4**: Complete **Task 5**: Complete **Task 6:** Complete **Task 7**: Complete	