TECHWIZ
EMPOWERING I.T.

TEAM: ***SUPTECH***

MEMBERS: • ***M. Arsalan Sup*** ***Student ID: 1252082***

•***M. Nabeel Nadeem*** ***Student ID:1220598***

•***Hanniel Anan*** ***Student ID: 1195537***

•***Abdul Rafay*** ***Student ID:1211893***

Abstract

Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitored in real time.

In this project "Python Based Water Monitoring System" we design and develop a low-cost system for real time monitoring of the water quality using IOT, (internet of things). The system consists of several sensors used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, flow sensor of the water can be measured. The measured values from the sensors can be processed by the core controller. The measured values from the sensors can be processed by the core controller. The Raspberry Pi model can be used as a core controller. Finally, the sensor data can be viewed on internet using WI-FI system.

Keywords - Temperature Sensors, pH Sensor, Turbidity Sensor, Arduino Uno, Raspberry Pi.

•Introduction

In today's world, water is an essential resource without which we cannot survive; thus, water can be considered a critical resource in the lives of people who benefit from its use while also being harmed by its misuse and unpredictability. (Flooding, droughts, salinity, acidity, and degraded quality) Water pollution is one of them. Greatest concerns about green globalization To ensure a safe supply of drinking water. The project is based on resolving water pollution issues by identifying the underlying issues present in water quality by analyzing the intrinsic issues that cause the quality of water from different sources to degrade and cause water-borne diseases. This project was inspired primarily by the number of diseases present in most Indian localities, which cause significant harm to the populace, particularly in rural areas and areas where water is not readily available or easily checked. This project is extremely relevant in today's world where money is time. As a result, the system enables us to easily monitor the quality of water in real time.

•Purpose

Water quality has been shown to be distributed over most areas (both rural and cities) have deteriorated over time because of the sources from which they supply their water. Depicted, dirty, defective on the part of responsible civil society maintenance of water quality. It could also be due to improper maintenance A machine that performs activities necessary to purify or improve water quality distributed to households. It has been observed that this strongly influences the water count. Infected disease in the city. This project is working to achieve a reasonable assessment of some water quality. Of the most basic parameters, **i.e**. temperature is monitored and climate Changes do not affect water. PH is monitored to keep it as high as possible. Optimal range, suitable for human consumption and prevents the spread of disease microbes. Water flow is monitored to ensure there are no interruptions or leaks to maintain a certain flow rate which also prevents the growth of fungi and small plants transport network. Finally, as the turbidity of the water is monitored, we can measure the number of contaminants in the water and arrange this if necessary If the water quality is not within acceptable limits, any action necessary to change the water quality offer. A great advantage of this system is the ability to monitor product quality in real time. Water (that is, its immediate quality is monitored), immediately granting us the ability Determine if the water is actually drinkable. the system gives us that Possibility to instantly identify water attributes or parameters and check if they are present No additional measures should be taken to purify or improve water quality water monitoring system New Horizon College of Engineering 2018-2019 3 sent to us. This will help you make clear purchasing decisions Save money and time with or without additional equipment.

•Scope of the project

This project is run considering that all sensor readings from the sensors are reasonable. Out of Stock These values contain the parameters of the water sample to be tested. temperature, pH, turbidity, flow rate, etc.

•Problem definition

Today, the number of diseases caused by microorganisms in water in Pakistan it’s increasing at an alarming rate and presents a significant problem that hinders growth. Increasing population and its impact on the effective functioning of entire cities is one of the greatest. This is because most bodies of water are polluted and there is no good way to tell if they are polluted. The water sent to us is either treated properly or no effective measures are taken About water quality management of water sources. As seen in most lakes in our cities, water quality has deteriorated significantly. Bubbles from impurities released into the lake. water is Be sure to treat it to make it suitable for consumption and daily use. Besides, we should have a means of measuring quality in terms of easily accessible parameters Understand and monitor quality in real time. Now that many people gather People who care about water especially in summer, the government has started to identify this Water may not have been treated before use and solutions are needed to identify the reasons behind the increasing pollution of water sources in this city. one of Some of the most important reasons are that supply groups are unlimited. water in the neighborhood. In most cases water is also supplied by private providers Severe water shortage impacts local water quality as a result, we receive many complaints. Although not visible in the early stages, only everyone with a weakened immune system, such as the elderly and newborns Infants are affected. If you allow it to grow, it will definitely lead to a massive epidemic ratio. Therefore, a suitable method for determining water quality is required.

•Objective of the study

This project focuses on the above problem by introducing dynamic IOT Python. Based water monitoring system using Raspberry Pi to determine water level and volume Detects contamination, pH fluctuations and the presence of bacteria. water waste and you can also find water purity

SENSORS & PROBES REQUIRED:

•PH TUBE SENSOR

Description:

Need to measure water quality and other parameters but haven't got any low cost pH meter? Find it difficult to use with Raspberry PI4? Here comes an analog pH meter, specially designed for Raspberry PI4 controllers and has built-in simple, convenient and practical connection and features. It has an LED which works as the Power Indicator, a BNC connector and PH2.0 sensor interface. To use it, just connect the pH sensor with BNC connector, and plug the PH2.0 interface into the analog input port of any Raspberry PI4 controller. If pre-programmed, you will get the pH value easily. Comes in compact plastic box with foams for better mobile storage. Attention In order to ensure the accuracy of the pH probe, you need to use the standard solution to calibrate it regularly. Generally, the period is about half a year. If you measure the dirty aqueous solution, you need to increase the frequency of calibration.

Specifications:

- Water quality testing
- Aquaculture
- Module Power: 5.00V
- Module Size: 43mm×32mm
- Measuring Range:0-14PH
- Measuring Temperature :0-60 ℃
- Accuracy: ± 0.1pH (25 ℃)
- Response Time: ≤ 1min
- pH Sensor with BNC Connector
- PH2.0 Interface (3foot patch)
- Gain Adjustment Potentiometer
- Power Indicator LED
- Cable Length from sensor to BNC connector:660mm

Price: 6800

•TURBIDITY SENSOR

Description:

The turbidity sensor detects water quality by measuring the levels of turbidity, or the opaqueness. It uses light to detect suspended particles in water by measuring the light transmittance and scattering rate, which changes with the amount of total suspended solids (TSS) in water. As the TTS increases, the liquid turbidity level increases. Turbidity sensors are used to measure water quality in rivers and streams, wastewater and effluent measurements, control instrumentation for settling ponds, sediment transport research and laboratory measurements. This liquid sensor provides analog and digital signal output modes. The threshold is adjustable when in digital signal mode. You can select the mode according to your MCU.

Specifications:

- Response Time: <500ms
- Insulation Resistance: 100M (Min)
- Output Method:
- Analog output: 0-4.5V

- Digital Output: High/Low level signal (you can adjust the threshold value by adjusting the potentiometer)
- Operating Temperature: 5℃~90℃
- Storage Temperature: -10℃~90℃
- Weight: 30g
- Adapter Dimensions: 38mm*28mm*10mm/1.5inches *1.1inches*0.4inches

Price: 2800

•WATER FLOW SENSOR

Description:

This Gravity: liquid flow sensor is designed based on the electromagnetic principle. It adopts O-ring rubber seal and uses silicone sealant at the outlet end to strength water-resistance. With high anti-interference and anti-impact, the sensor offers reliable performance and long service life. Also, it is designed with G3/4 thread connectors for easy installation.

The sensor can be used with microcontrollers like Raspberry PI4 UNO to measure the flow of liquids with high concentration and low viscosity like water, diesel, engine oil, milk, paint, detergent, honey, etc. (no impurity in liquid)

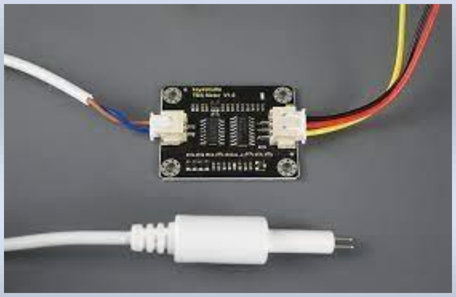
Specifications:

- Gravity interface, easy to wire
- Wide voltage of 3.5~24V
- Measure the flow of the high-concentration but low-viscosity liquid
- RoHS compliant
- Operating Voltage: DC3.5~24V
- Operating Current: ≤10mA (DC5V)
- Output Mode: NPN pulse signal
- Pipe Diameter: G3/4
- Thread I.D.: 16mm/0.63"
- Thread O.D.: 26mm/1.02"
- Thread Length: 18.7mm/0.74"
- Water Pressure Resistance: ≤1.2MPA
- Insulation Resistance: >100MΩ
- Flow Range: 30-3000L/H
- Error: ±1% (20-3000L/H)
- High Level of Output Pulse: >DC4.7V (input voltage DC5V)
- Low Level of Output Pulse: <DC0.5V (input voltage DC5V)
- Duty Cycle of Output Pulse: 50%±10%
- Flow & Pulse Correlation: 1L=75 pulses
- Operating Temperature: ≤80°C
- Operating Humidity: 35%~90%RH (no frosting)
- Storage Temperature: -25°~+80°C
- Storage Humidity: 25%~95%RH
- Dimensions: 92×47×39mm/3.62×1.85×1.54"

- ## Price:

PKR: 750

•TDS SENSOR



• Description:

The Grove - TDS Sensor detects the Total Dissolved Solids (TDS) levels in the water which can be used to indicate the water quality. The Grove - TDS Sensor can be applied in water quality applications such as TDS meter, well water, aquarium, hydroponics, etc.

• Specifications:

- Input voltage 3.3V / 5V
- Output Voltage 0 ~ 2.3V
- Working Current 3 ~ 6 mA
- TDS Measurement Range 0 ~ 1000ppm
- Connection Interface Grove 4-Pin / XHB 2.54mm 2P
- Interface Analog
- Cable Length 60cm
- Connection Interface XHB 2.54mm 2P

• Price:

PKR: 3500

•LCD DISPLAY (16x2)

Description:

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

Specifications:

PCB Dimensions:	80mm x 35mm x 11mm
Screen Dimensions:	64.5mm x 16mm

Price

PKR: 450

ADS 1115 ATD Converter:

Description:

This converter will of course prove useful to all those not possessing a microcontroller with an analogue-to-digital converter. It can also be added to a pre-existing CAN for taking more precise measurements of small and large signals. Such a device can be used to create a temperature measuring tool, an automation or process control system, or even a battery level indicator. Its tiny size means it can be used in extremely compact portable projects.

Specifications:

- 2 mm × 1.5 mm × 0.4 mm
- Wide Supply Range: 2.0 V to 5.5 V
- Low Current Consumption: 150 µA (Continuous-Conversion Mode)
- Programmable Data Rate: 8 SPS to 860 SPS
- Single-Cycle Settling
- Internal Low-Drift Voltage Reference
- Internal Oscillator
- 2C Interface: Four Pin-Selectable Addresses
- Four Single-Ended or Two Differential Inputs (ADS1115)
- Programmable Comparator (ADS1114 and ADS1115)
- Operating Temperature Range: –40°C to +125°C

Price

PKR: 450.

•Raspberry Pi-4

Description:

Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior-generation Raspberry Pi 3 Model B+, while retaining backwards compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems.

Specifications:

- Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
- 1GB, 2GB, 4GB or 8GB LPDDR4-3200 SDRAM (depending on model)
- 2.4 GHz and 5.0 GHz IEEE 802.11ac wireless, Bluetooth 5.0, BLE
- Gigabit Ethernet
- 2 USB 3.0 ports; 2 USB 2.0 ports.
- Raspberry Pi standard 40 pin GPIO header (fully backwards compatible with previous boards)
- 2 × micro-HDMI ports (up to 4kp60 supported)
- 2-lane MIPI DSI display port
- 2-lane MIPI CSI camera port
- 4-pole stereo audio and composite video port
- H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode)
- OpenGL ES 3.1, Vulkan 1.0

- Micro-SD card slot for loading operating system and data storage
- 5V DC via USB-C connector (minimum 3A*)
- 5V DC via GPIO header (minimum 3A*)
- Power over Ethernet (PoE) enabled (requires separate PoE HAT)
- Operating temperature: 0 – 50 degrees Cambia.

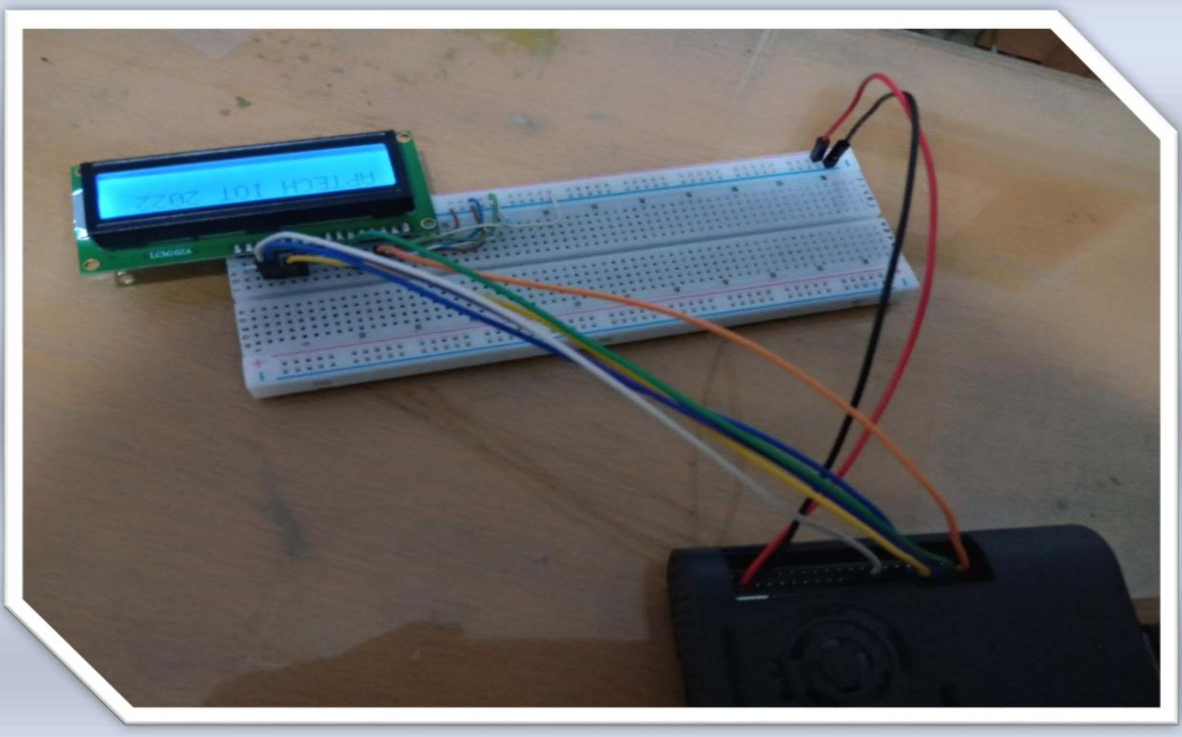
- **Price**

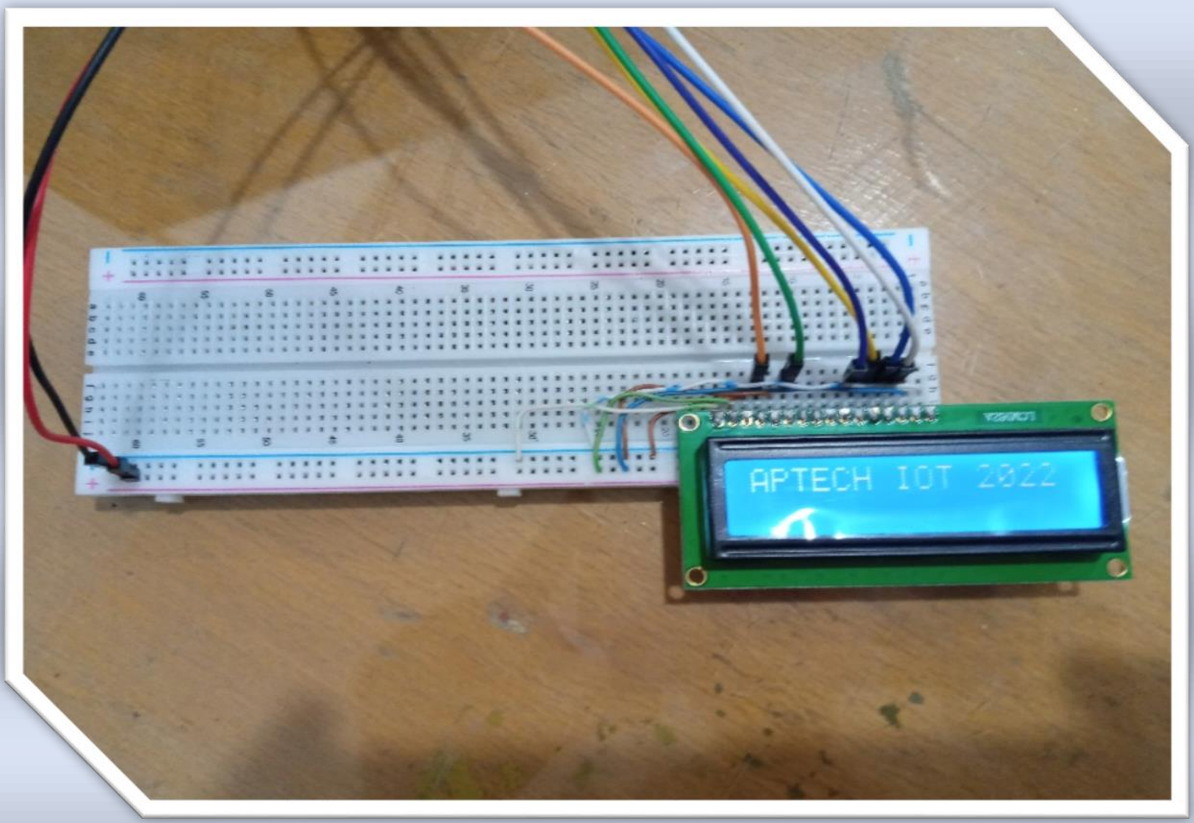
PKR: 55000.

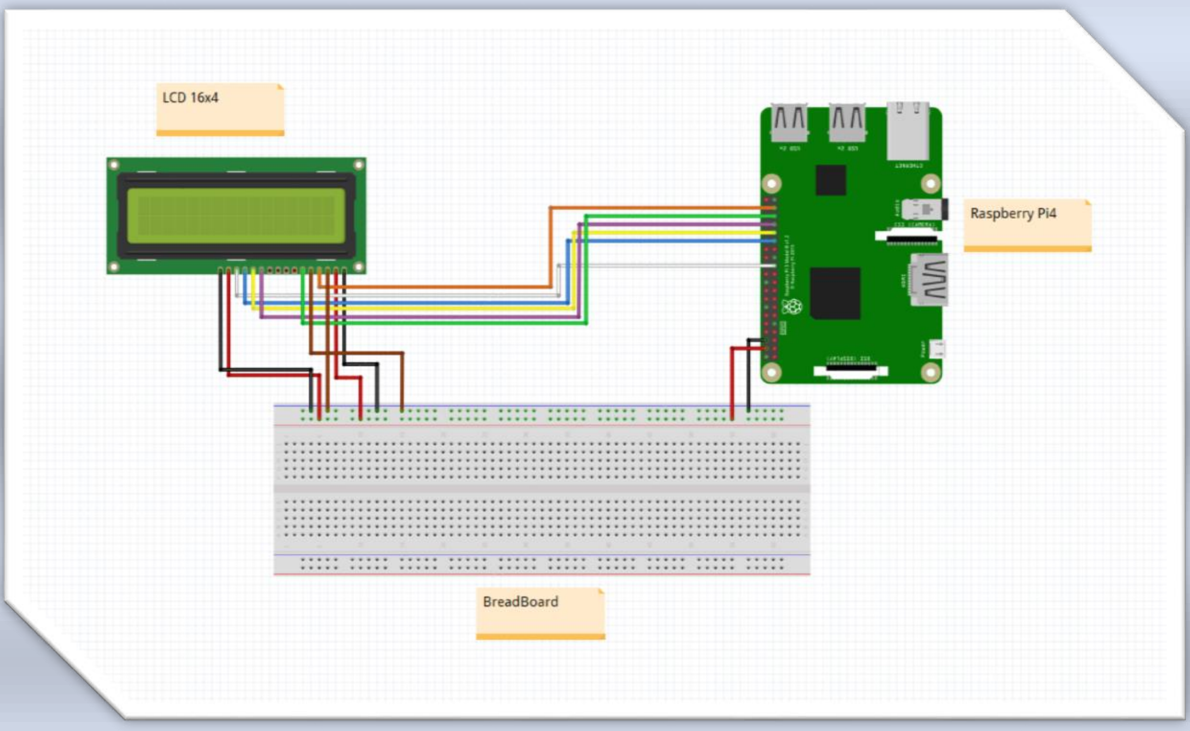
TESTING AND UNDERSTANDING CIRCUITARY

- **CIRCUIT DIAGRAMS FOR TESTING:**

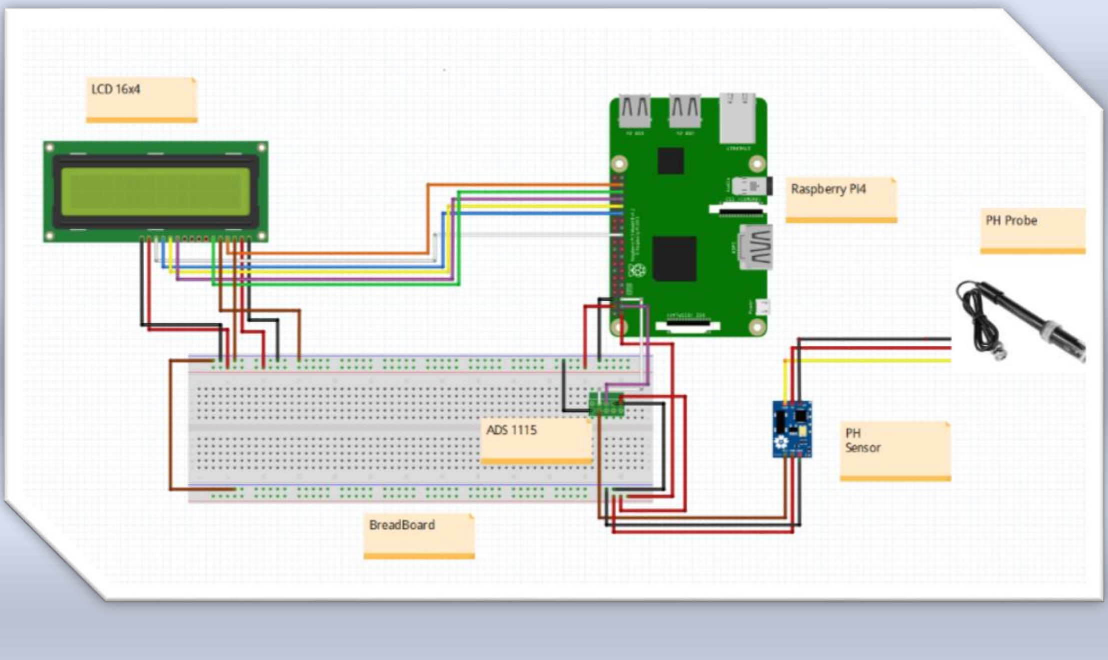
- **LCD TESTING:**

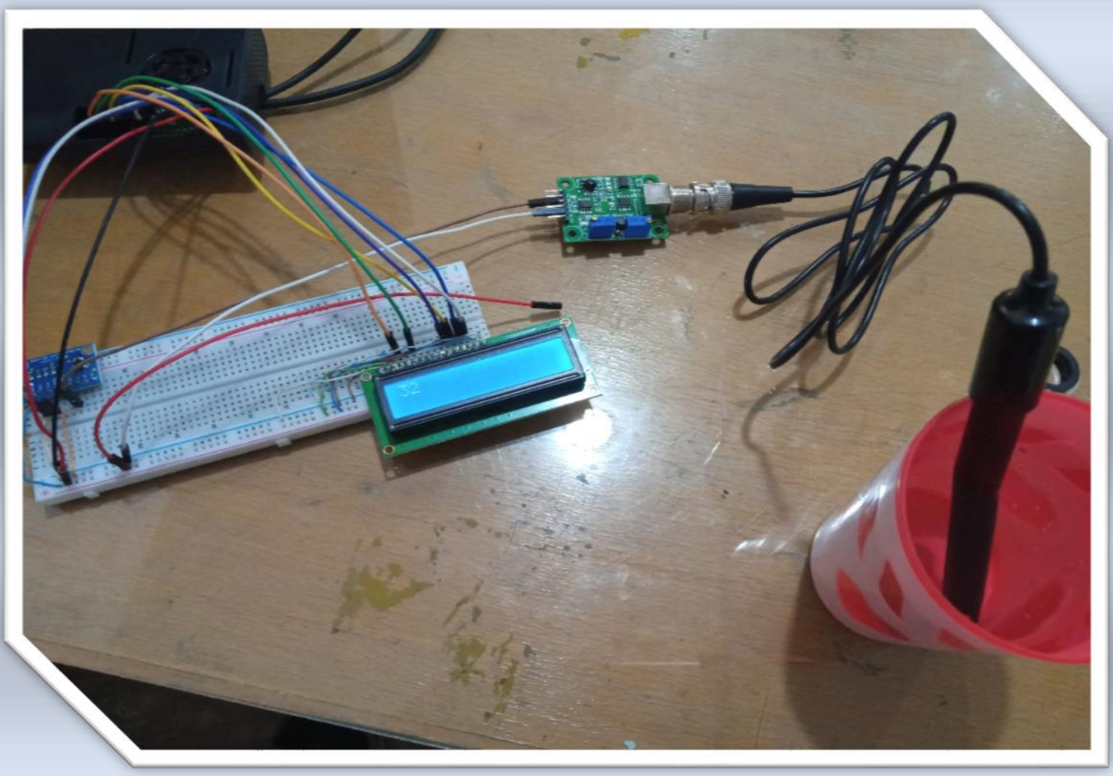

APTECH IOT 2022
LCM1602A


APTECH IOT 2022


LCD 16x4
Raspberry Pi4
BreadBoard

- **PH TESTING:**


LCD 16x4
Raspberry Pi4
PH Probe
ADS 1115
PH
Sensor
BreadBoard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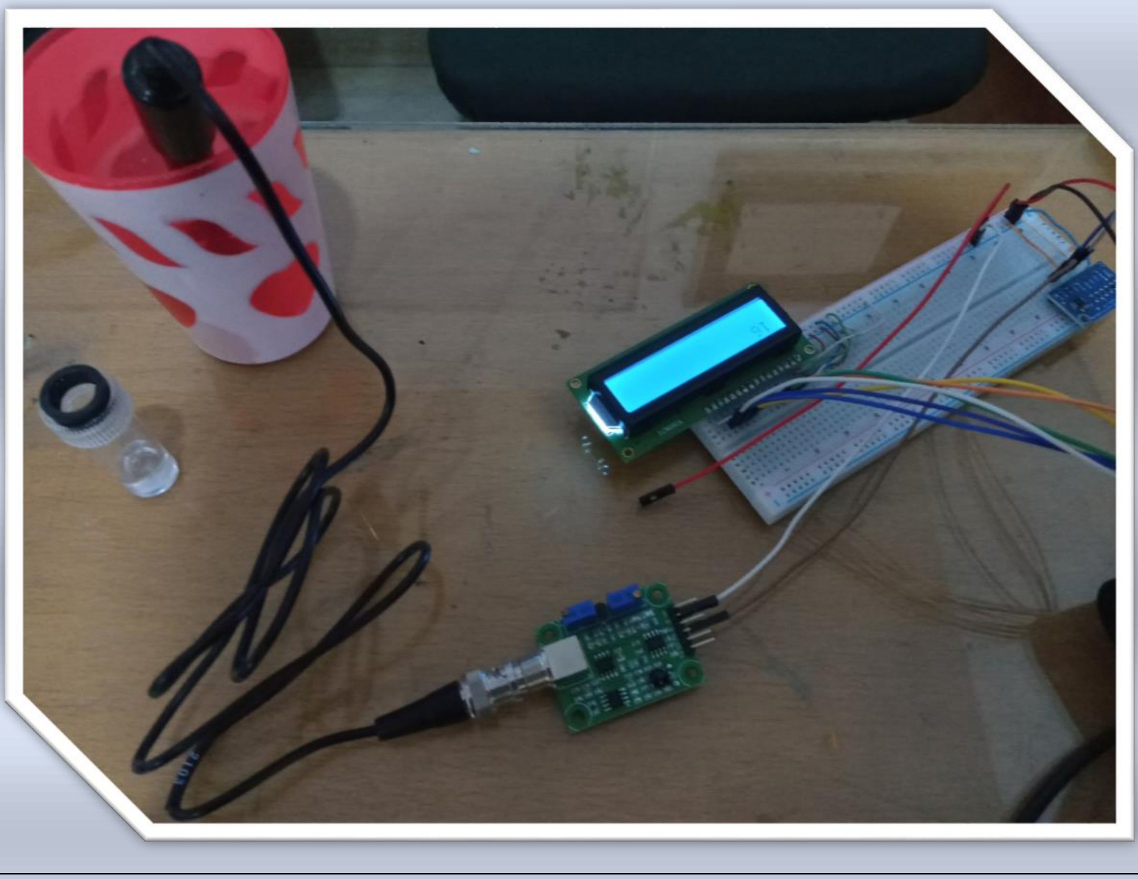
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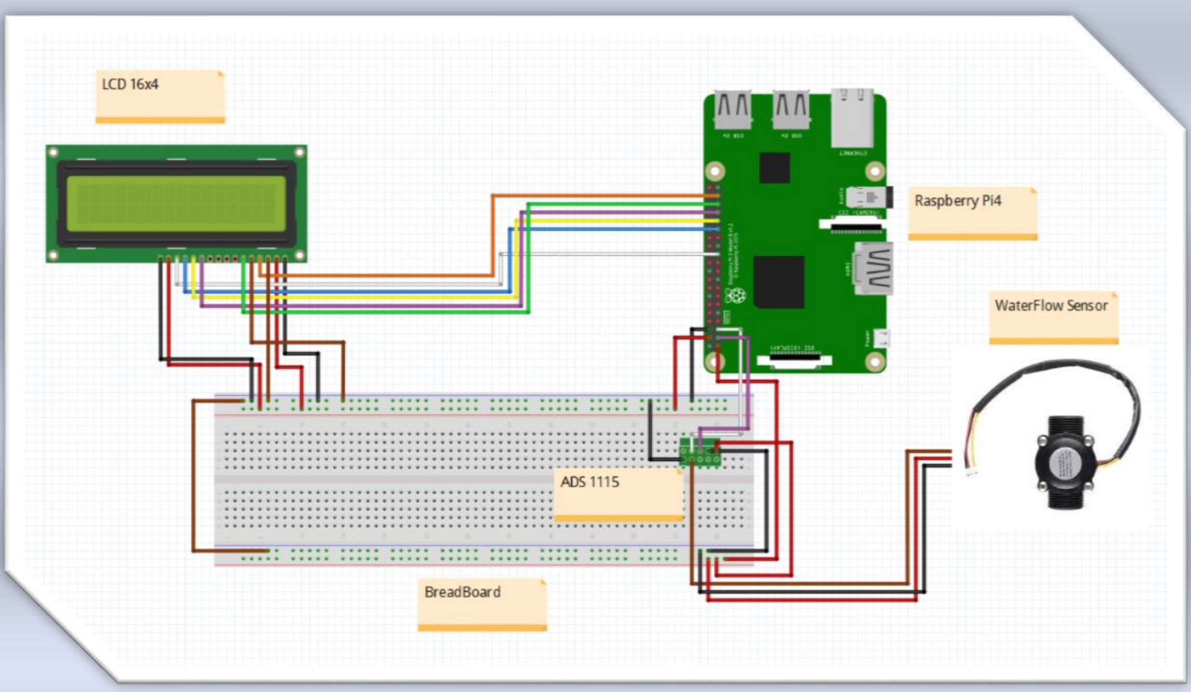
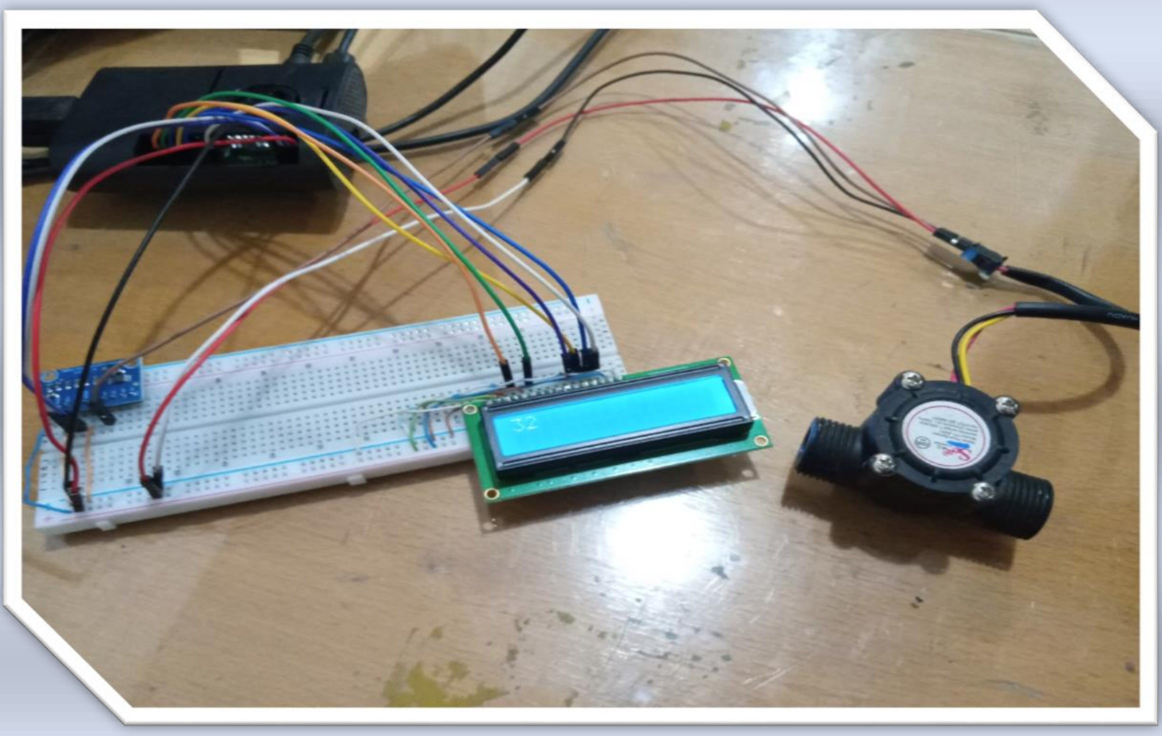
- **WATERFLOW TESTING:**

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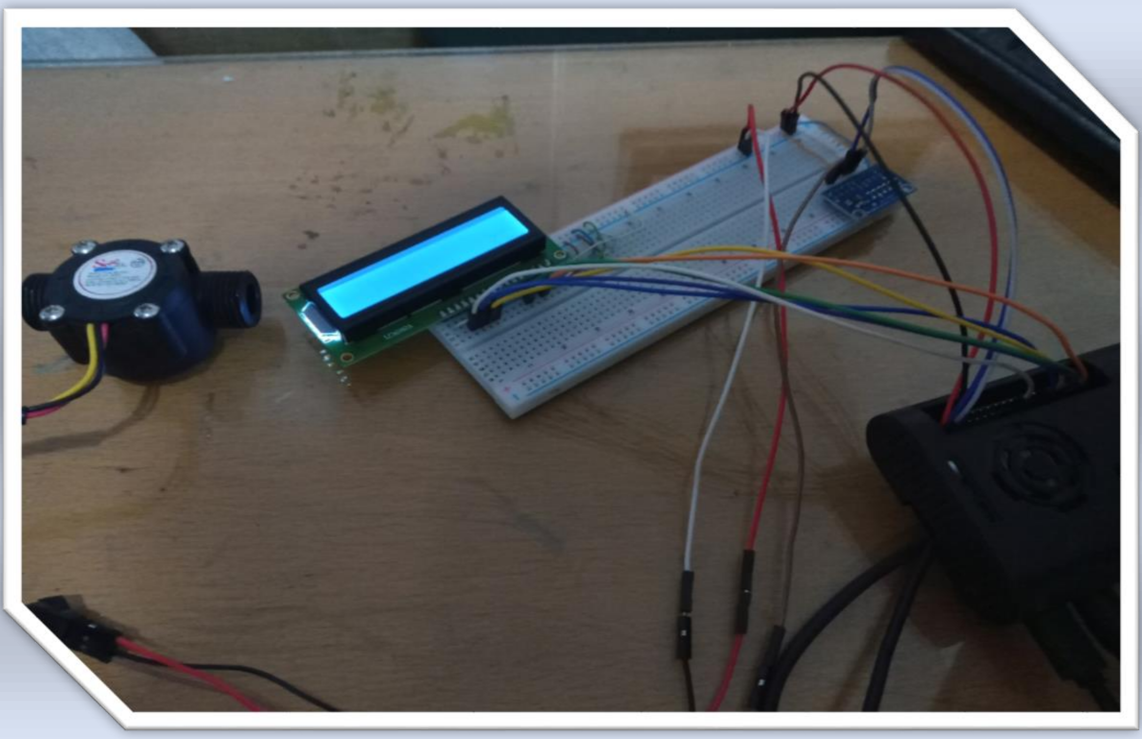
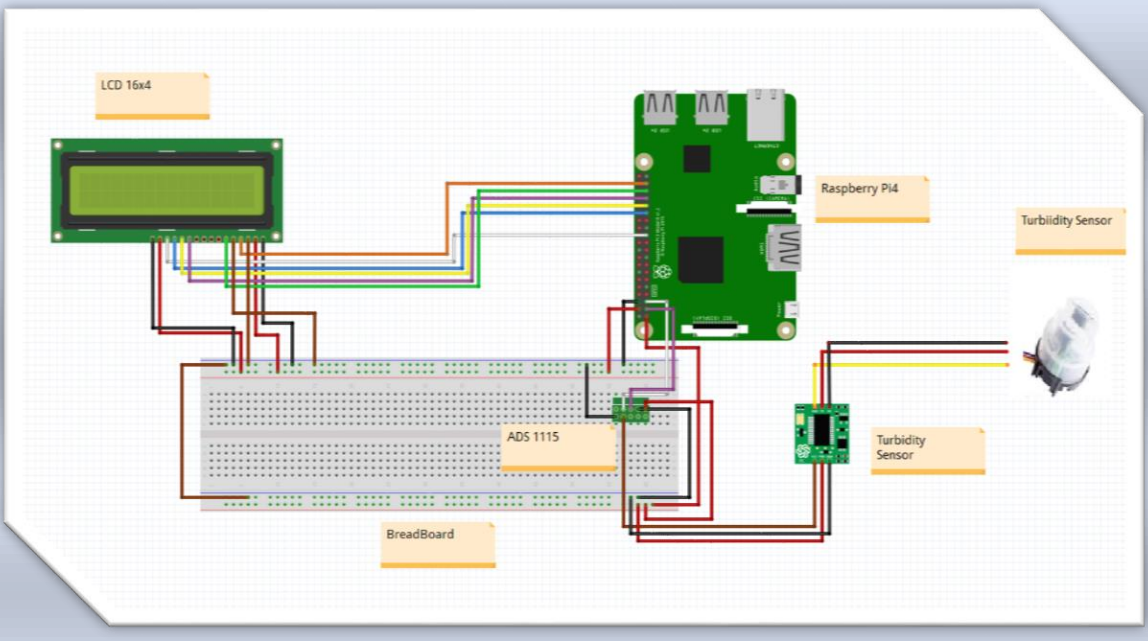
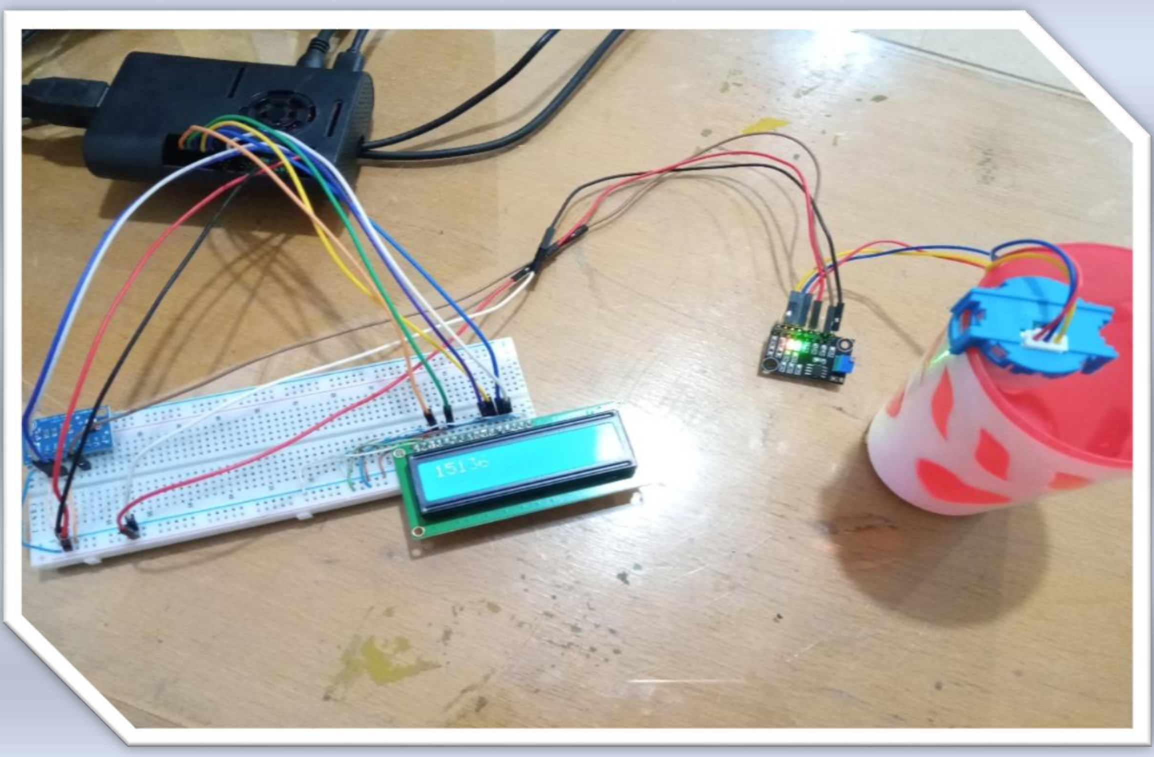
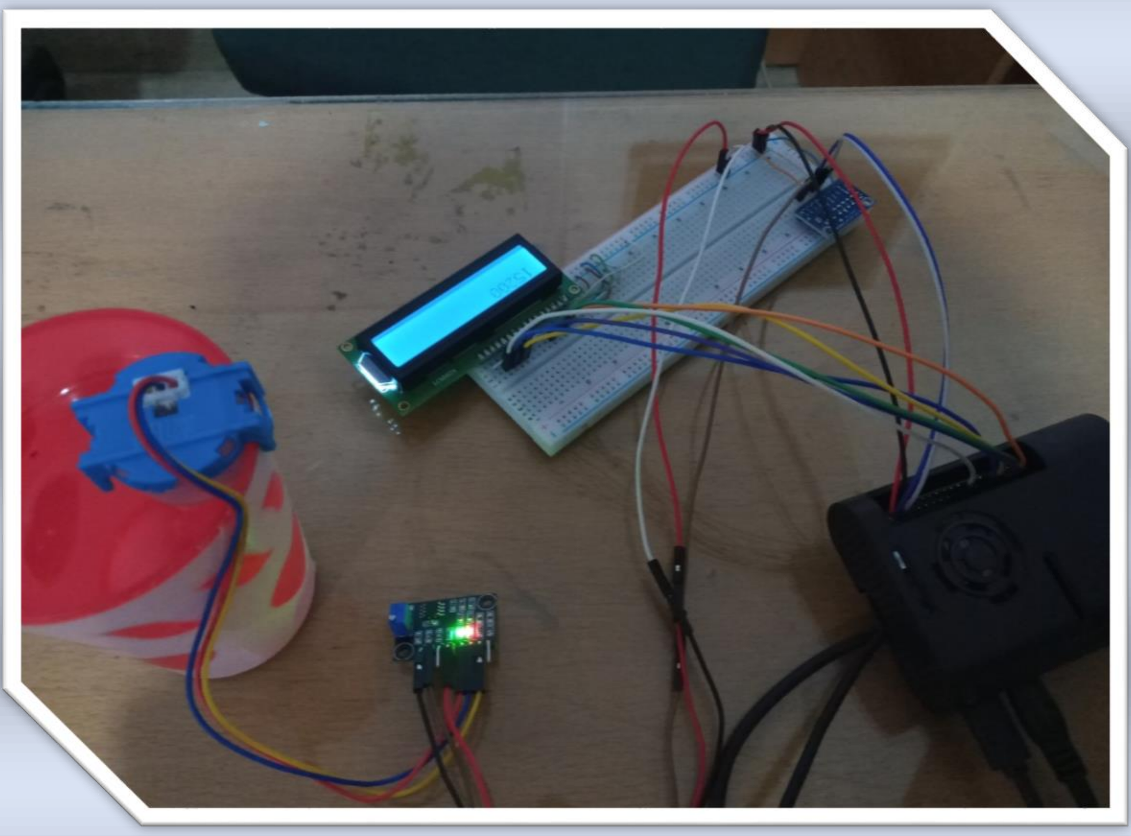


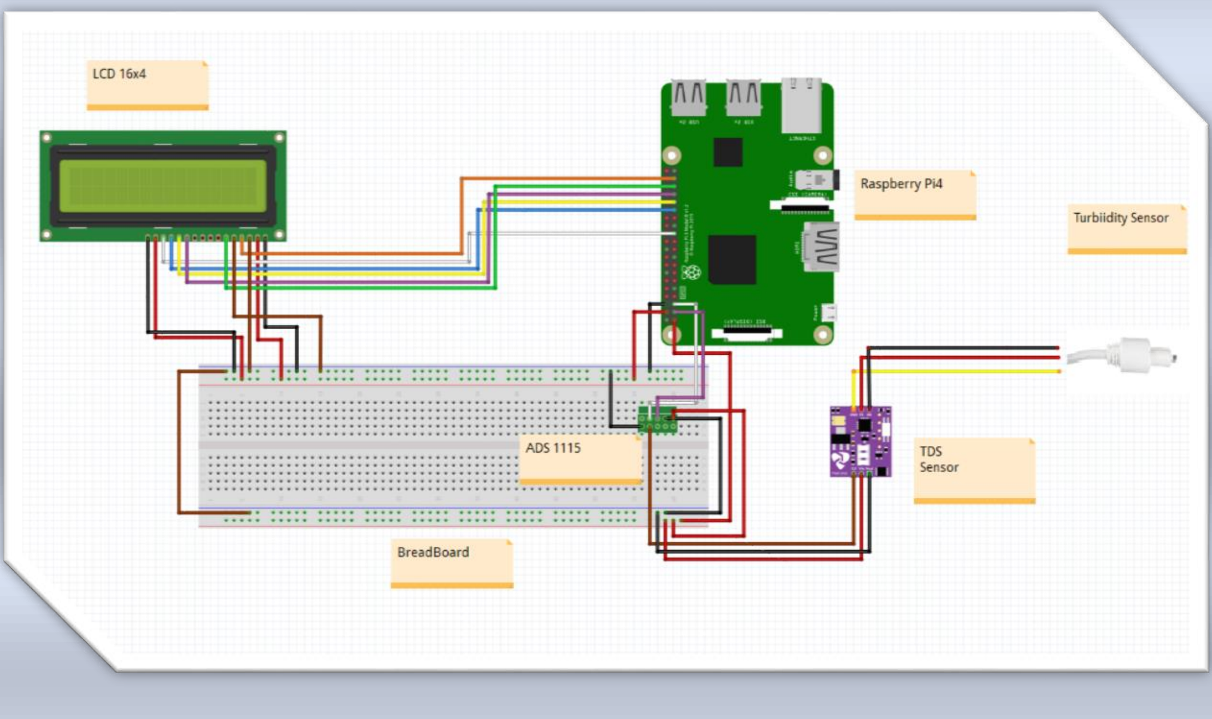
• TURBIDITY TESTING:

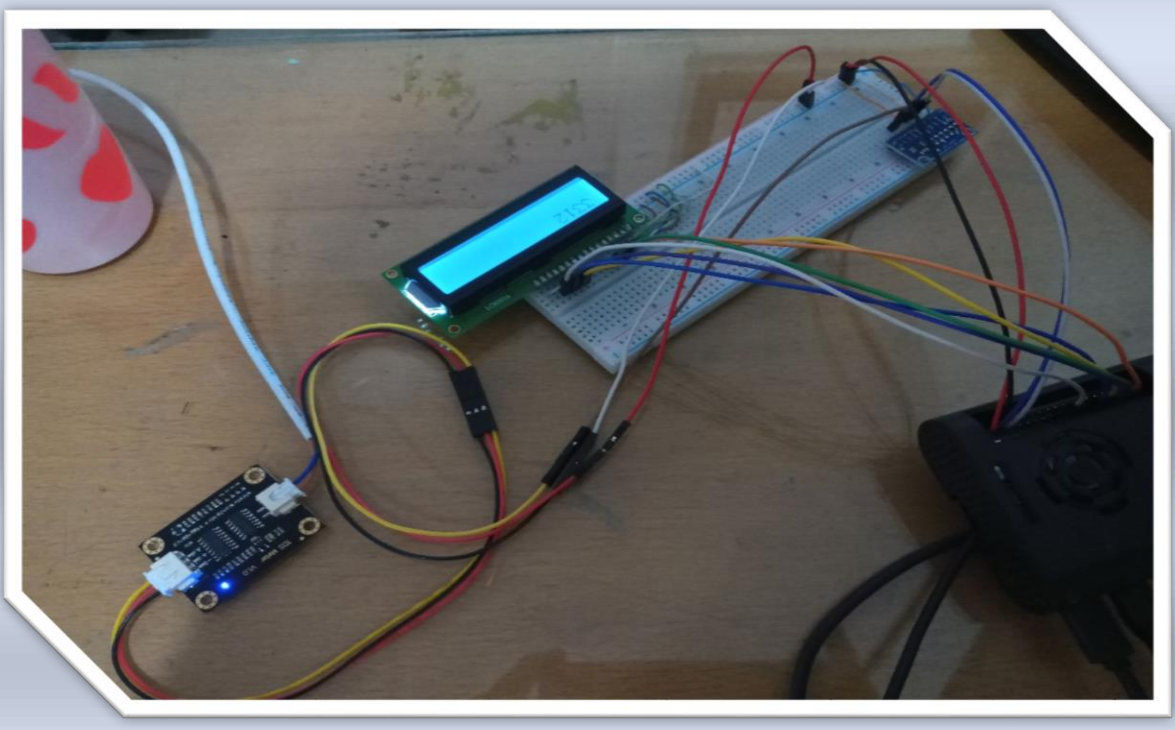


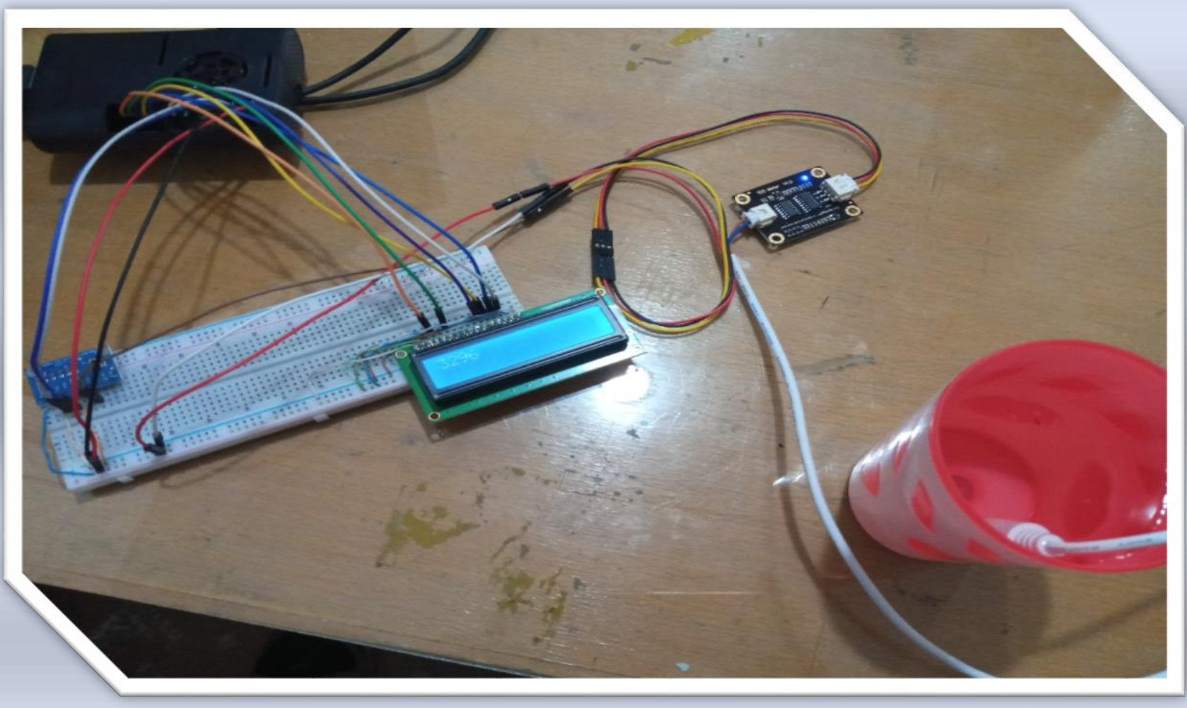




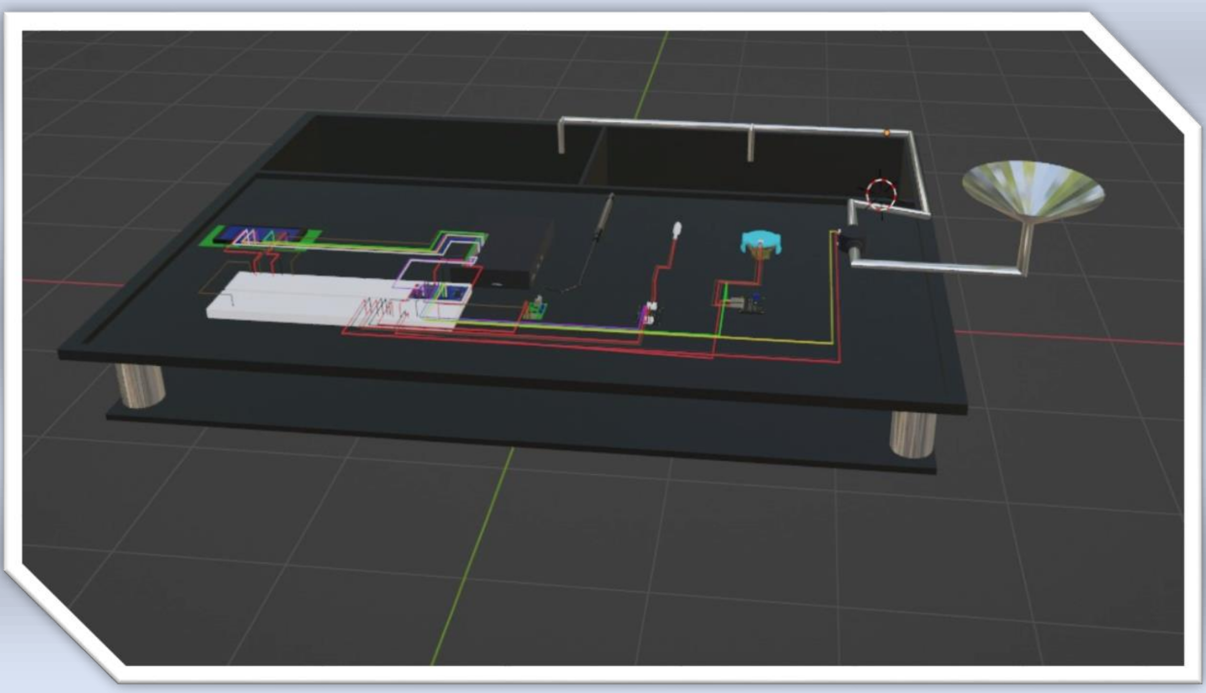
TDS TESTING

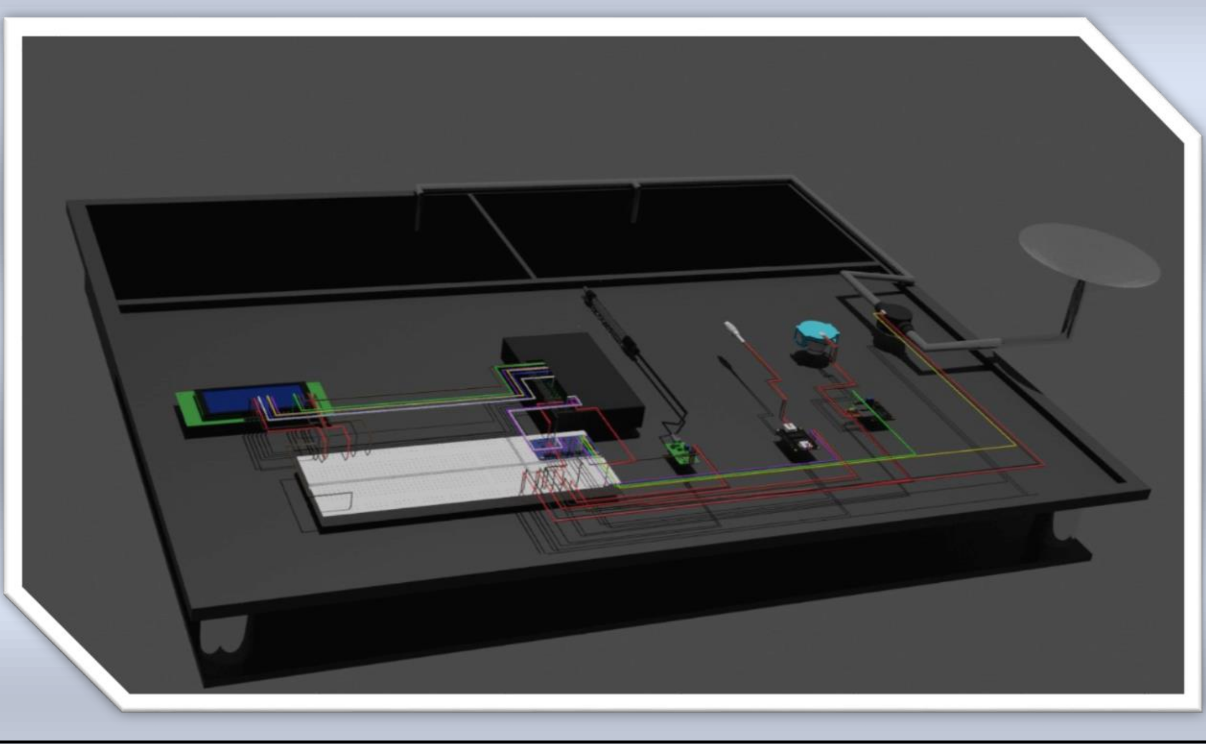

LCD 16x4
Raspberry Pi4
Turbiidity Sensor
ADS 1115
TDS
Sensor
BreadBoard



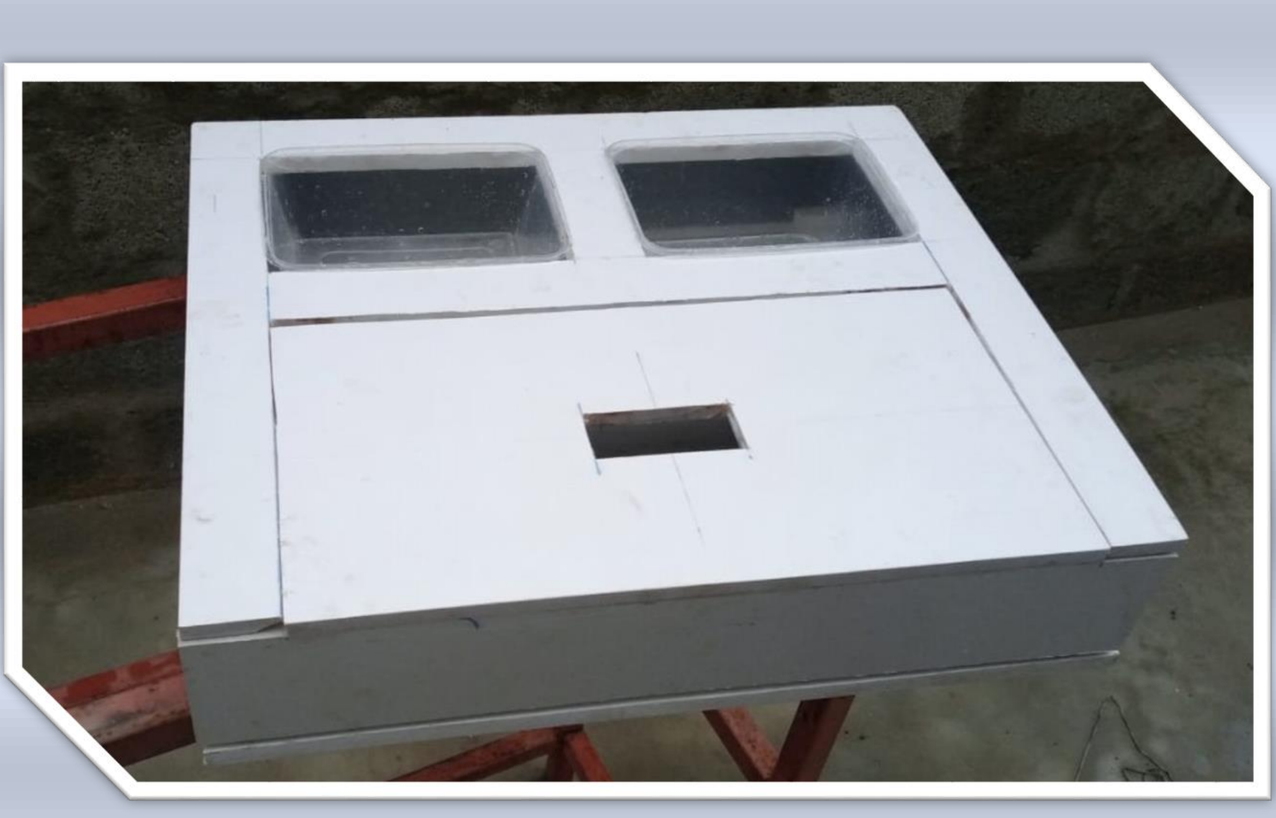

3296

3D Models of casing



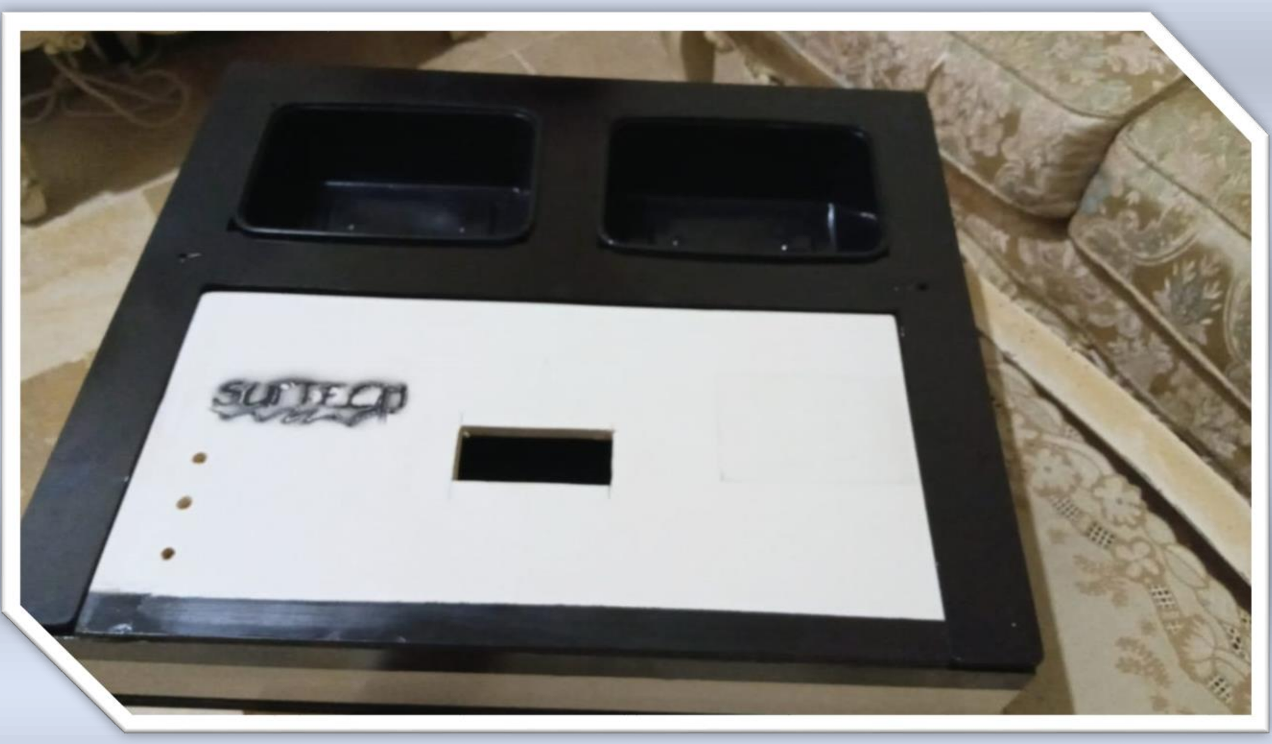


First look of Project Casing

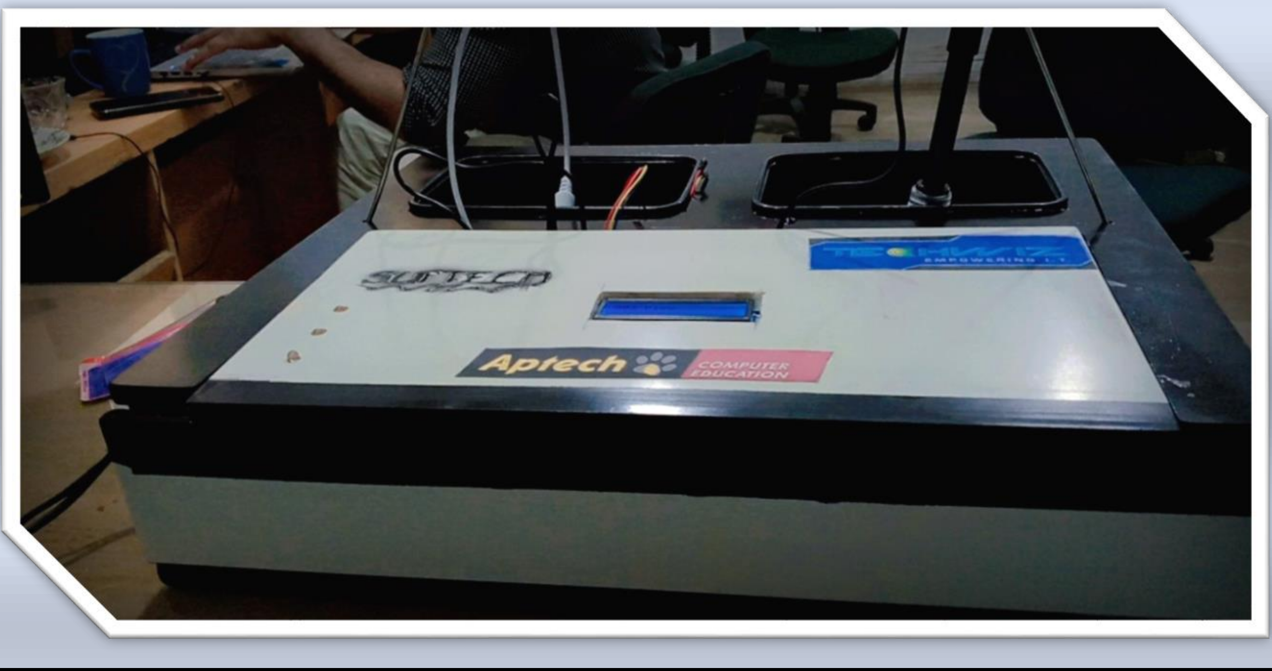


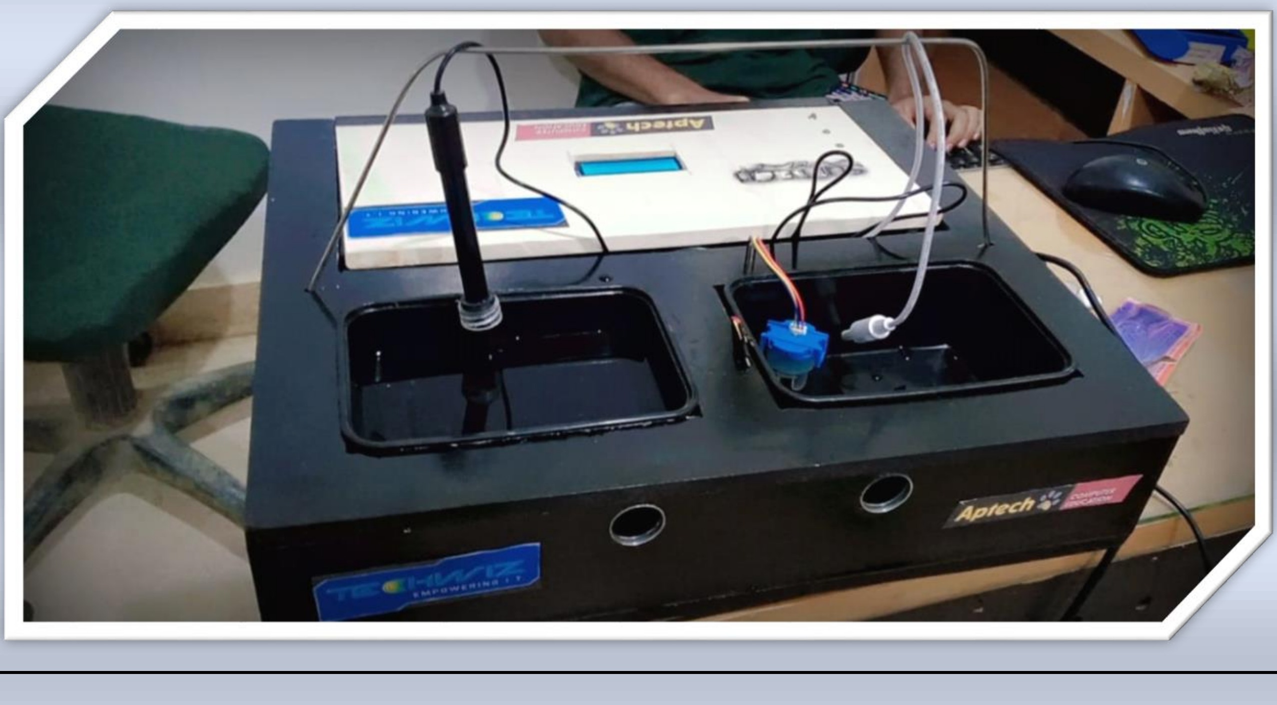
Second look on project casing after paints

Semi final look of project casing with logo



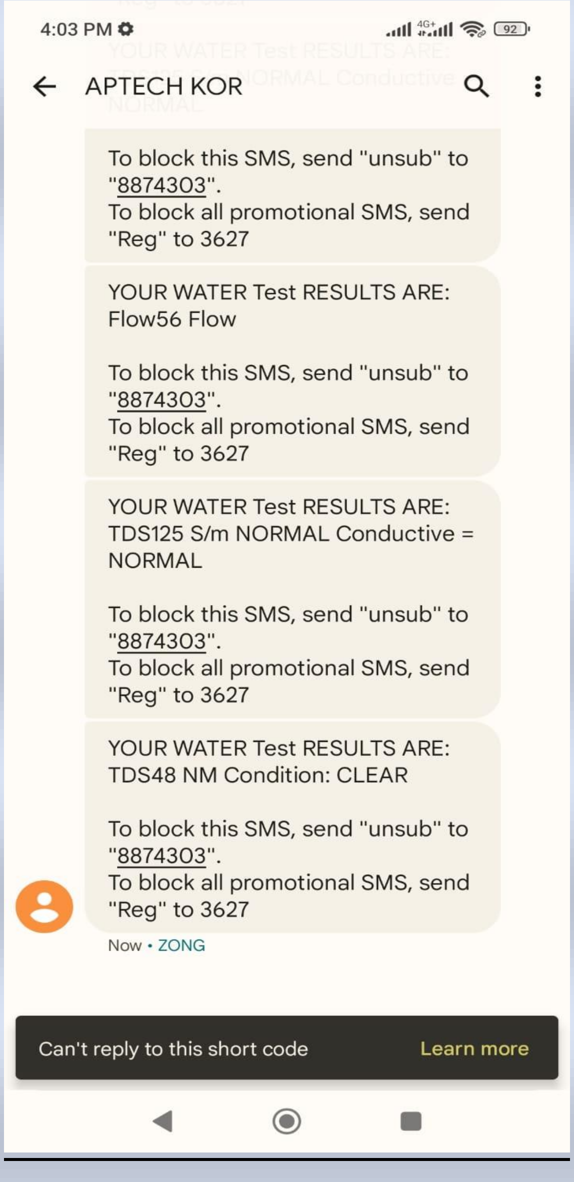
Final look of project casing





Casing Price: **PKR: 3500**

Results on SMS:



YOUR WATER Test RESULTS ARE:
TDS125 S/m NORMAL Conductive
NORMAL

To block this SMS, send "unsub" to "8874303".
To block all promotional SMS, send "Reg" to 3627

YOUR WATER Test RESULTS ARE:
Flow56 Flow

To block this SMS, send "unsub" to "8874303".
To block all promotional SMS, send "Reg" to 3627

YOUR WATER Test RESULTS ARE:
TDS125 S/m NORMAL Conductive = NORMAL

To block this SMS, send "unsub" to "8874303".
To block all promotional SMS, send "Reg" to 3627

YOUR WATER Test RESULTS ARE:
TDS48 NM Condition: CLEAR

To block this SMS, send "unsub" to "8874303".
To block all promotional SMS, send "Reg" to 3627

Results on WhatsApp:

Source Code:

```
import time
import board
import busio
import adafruit_ads1x15.ads1115 as ADS
from adafruit_ads1x15.analog_in import AnalogIn
import lcd
import requests


def sendMsg(sms_api_msg_body):
    sms_api_id = "aptech15"
    sms_api_password = "111554"
    sms_api_number = '923131115563'
    sms_api_brand_name= "APTECH KOR"
    url = "http://api.m4sms.com/api/sendsms?id="+sms_api_id+"&pass="+sms_api_password+"&mobile="+sms_api_number+"&brandname="+sms_api_brand_name+"&msg="+sms_api_msg_body+"&language=English&network=1;"
    r = requests.get(url)
    print(r.text)


def sendWhatsAppMsg():
    headers = {

    'Authorization': 'Bearer
EAAKqBIer3dwBAFZA7t3RkXtgaqWiKipZBujVx47OwY3Sja1fJ992MUBEc9rx4XB5ZAIZCZCgwOoyhZAQwuO8GWh1j0i
FmwuNmAJrecPWSLTyaONjNHd392Y3JOqn6ouXLyavC4FXU8dQGgEcDq3flwjEeW6e2D6ac3DbqiyqqmtJ0okRVXyAw
xxZBH1idZCwWQjDm0N0RnbTGAZDZD',

    'Content-Type': 'application/json',

    }

    data = '{ \\"messaging_product\\": \\"whatsapp\\", \\"to\\": \\"923457847091\\", \\"type\\": \\"template\\",
\\"template\\": { \\"name\\": \\"hello_world\\", \\"language\\": { \\"code\\": \\"en_US\\" } } }'

    response = requests.post('https://graph.facebook.com/v13.0/109450551816278/messages', headers=headers,
data=data)


i2c = busio.I2C(board.SCL, board.SDA)


ads0 = ADS.ADS1115(i2c)

ads1 = ADS.ADS1115(i2c)

ads2 = ADS.ADS1115(i2c)

ads3 = ADS.ADS1115(i2c)


ads0.gain = 1

ads1.gain = 1

ads2.gain = 1

ads3.gain = 1


channel0 = AnalogIn(ads0, ADS.P0)

channel1 = AnalogIn(ads1, ADS.P1)

channel2 = AnalogIn(ads2, ADS.P2)

channel3 = AnalogIn(ads3, ADS.P3)


print("(:>5)\t(:>5)".format('raw','v'))
```

```
run = True

while run:

    #channel0

    roundedVolts = round(channel0.voltage)
    values = [channel0.value , roundedVolts]
    time.sleep(0.5)
    lcd.lcd_init()
    lcd.lcd_byte(lcd.LCD_LINE_2, lcd.LCD_CMD)
    PHValue = str(round(channel0.value/10000)) +" Ph"
    lcd.lcd_string(str(PHValue),2)

    if PHValue == '-3.5' :
        print("Water is 'SLIGHTLY BASIC' in condition")
        PHCondition = "SLIGHTLY BASIC"
        PH_Values = str(PHValue)+ PHCondition
        print(PH_Values)
        sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + PH_Values)
        sendWhatsAppMsg()
    elif PHValue== '-7' :
        print("Water is 'HEAVILY BASIC' in condition")
        PHCondition = "HEAVILY BASIC"
        PH_Values = str(PHValue)+ PHCondition
        print(PH_Values)
        sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + PH_Values)
        sendWhatsAppMsg()

    elif PHValue == '0' :

        print("Water is 'NORMAL' in condition")

        PHCondition = "NORMAL"

        PH_Values = str(PHValue)+ PHCondition

        print(PH_Values)

        sendWhatsAppMsg()

        sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + PH_Values)

    elif PHValue == '3.5' :

        print("Water is 'SLIGHTLY ACIDIC' in condition")

        PHCondition = "SLIGHTLY ACIDIC"

        PH_VAlues = str(PHValue)+ PHCondition

        print(PH_VAlues)

        sendWhatsAppMsg()

        sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + PH_VAlues)

    elif PHValue== '14':

        print("Water is 'HEAVILY ACIDIC' in condition")

        PHCondition = "HEAVILY ACIDIC"

        PH_VAlues = str(PHValue)+ PHCondition

        print(PH_VAlues)

        sendWhatsAppMsg()

        sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + PH_VAlues)



    # #channel1


    roundedVolts = round(channel1.voltage)

    values = [channel1.value , roundedVolts]
```

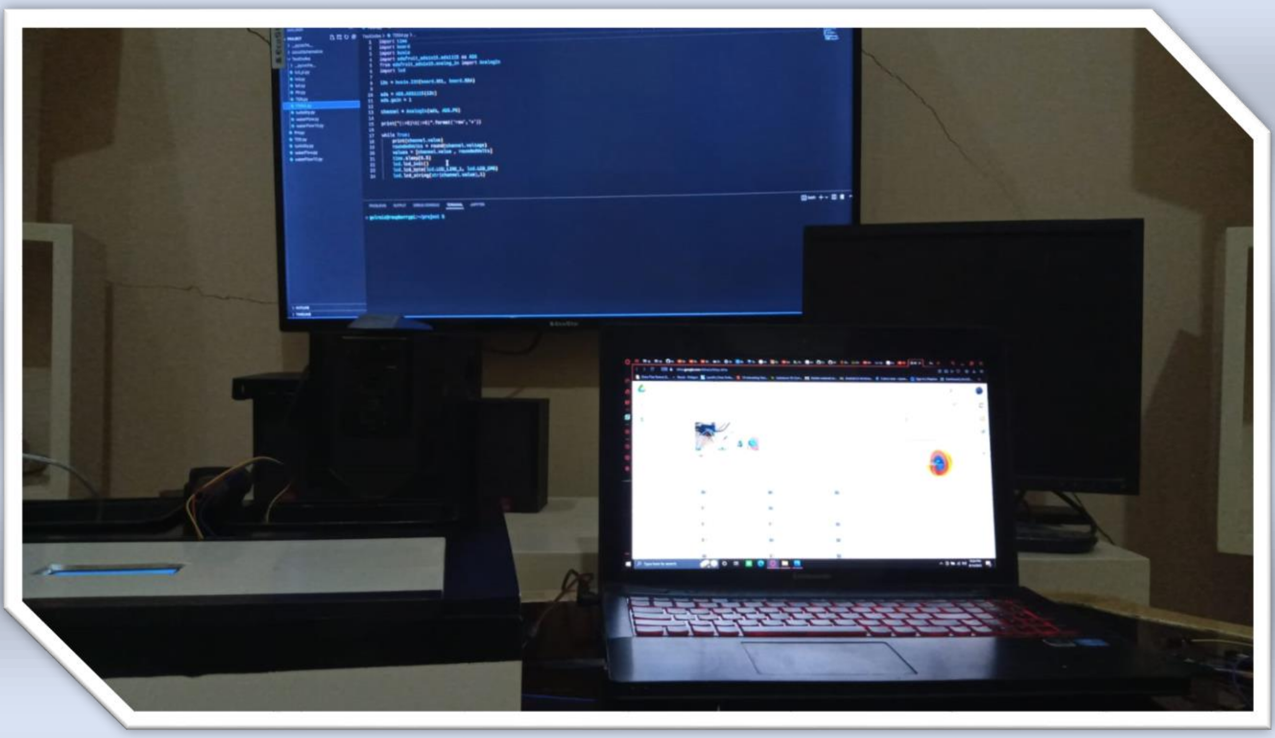
```
time.sleep(0.5)
lcd.lcd_init()
lcd.lcd_byte(lcd.LCD_LINE_2, lcd.LCD_CMD)
TURValue = str(round(channel1.value/500)) +" NM"
lcd.lcd_string(str(TURValue),1)


if TURValue <= '5' :
    print("Water is 'CLEAR' in condition")
    TURCondition = "CLEAR"
    TUR_Values = str(TURValue)+"  Condition: "+TURCondition
    print(TUR_Values)
    sendWhatsAppMsg()
    sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + TUR_Values)
elif TURValue <= '55' :
    print("Slightly Polluted")
    TURCondition = "Slightly Polluted"
    TUR_Values = str(TURValue)+"  Condition: "+TURCondition
    print(TUR_Values)
    sendWhatsAppMsg()
    sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + TUR_Values)
elif TURValue == '515' :
    print("HIGHLY POLLUTED")
    TURCondition = "HIGHLY POLLUTED"
    TUR_Values = str(TURValue)+"  Condition: "+TURCondition
    print(TUR_Values)
    sendWhatsAppMsg()
    sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + TUR_Values)
```

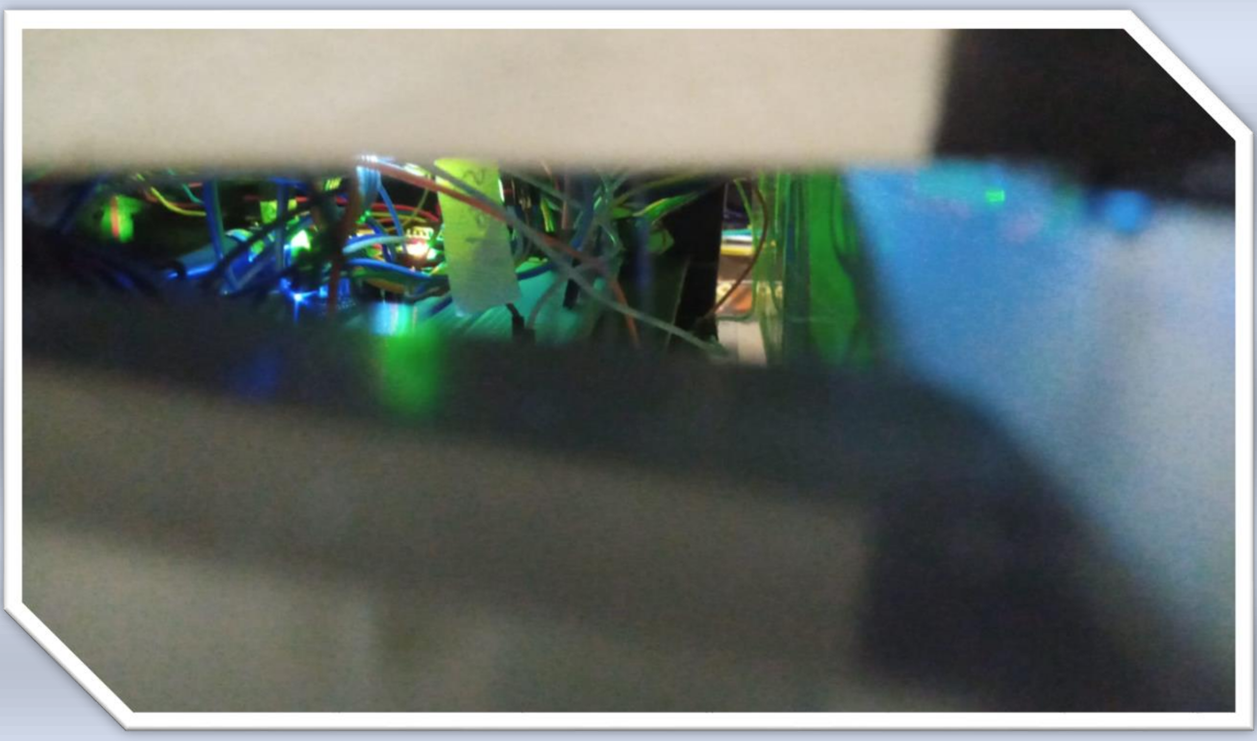
```
# #channel2


roundedVolts = round(channel2.voltage)

values = [channel2.value , roundedVolts]

time.sleep(0.5)

lcd.lcd_init()

lcd.lcd_byte(lcd.LCD_LINE_1, lcd.LCD_CMD)

TDSValue = str(round(channel2.value/50)) +" S/m"

lcd.lcd_string(str(TDSValue),2)


if TDSValue<= '100' :

    print("Water is 'CLEAR' in condition")

    TDSCondition = "Slightly Conductive = High Pollution"

    TDSVAlues = str(TDSValue)+"   "+TDSCondition

    print(TDSVAlues)

    sendWhatsAppMsg()

    sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + TDSVAlues)

elif TDSValue <= '200' :

    print("Slightly Polluted")

    TDSCondition = "NORMAL Conductive = NORMAL"

    TDSVAlues = str(TDSValue)+"   "+TDSCondition

    print(TDSVAlues)

    sendWhatsAppMsg()

    sendMsg("YOUR WATER Test RESULTS ARE:  TDS" + TDSVAlues)

elif TDSValue== '515' :

    print("HIGHLY CONDUCTIVE")
```

```
        TDSCondition = "HIGHLY CONDUCTIVE = CLEAR"
        TDSVAlues = str(TDSValue)+"   "+TDSCondition
        print(TDSVAlues)
        sendWhatsAppMsg()
        sendMsg("YOUR WATER Test RESULTS ARE:  TDS"  + TDSVAlues)
    # #channel3


    roundedVolts = round(channel3.voltage)
    values = [channel3.value , roundedVolts]
    time.sleep(0.5)
    lcd.lcd_init()
    lcd.lcd_byte(lcd.LCD_LINE_2, lcd.LCD_CMD)
    FlowValue = str(round(channel3.value/50)) +" Flow"
    lcd.lcd_string(str(FlowValue),1)
    time.sleep(1)
    TUR_VAlues = str(FlowValue)
    print(FlowValue)
    sendWhatsAppMsg()
    sendMsg("YOUR WATER Test RESULTS ARE:  Flow" + FlowValue)
    break


# User_inp = input("CONTINUE Sampling ? press 1   To CLose Press 0  :")
# if(User_inp == 1):
#     run = True
# elif(User_inp == 0):
#     run = False
```

GITHUB Repository:

https://github.com/ARSSAP/Iot_2022.git





Serial number	Item	Quantity	Price (PKR)
1	Raspberry PI 4 Model B 4GB	1	**55000**
2	ADS 1115	1	**450**
3	TDS Sensor	1	**3500**
4	Turbidity Sensor	1	**2800**
5	PH Sensor	1	**6800**
6	LCD Display 16x2	1	**450**
7	Water Flow Sensor	1	**750**
8	Jumper Wire	3	**450**
9	Bread Board	1	**200**
10	HDMI to Mini HDMI(Female)	1	**500**
11	HDMI to VGA	1	**400**

12	Raspberry PI casing	1	**850**
13	Project casing	1	**3500**
14	Conveyance	1	**3000**
15	Miscellaneous	1	**3000**
	Total		**81,650**