SKILL ACTIVITY NO: 1

Date : 06/02/2025

(To be filled by the Instructor)

Title : Interfacing keypad, pushbutton, buzzer and display (LED, LCD, 8x8 matrix LED) with Arduino.

Skills / competencies to be acquired :

1. Arduino
2. Use of keypad.
3. Use of Push Button
4. Use of buzzer.
5. Use of LED / LCD display.
6.
7.
8.

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this activity is to learn & demonstrate how to interface various components like a keypad, pushbutton, buzzer & different types of displays (LED, LCD, 8x8 matrix LED) with an Arduino. By completing this project, you will gain hand-on experience in controlling input and output devices using Arduino platform.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Setting up the Arduino environment.
2) Connecting the Keypad.
3) Connecting the pushbutton.
4) Connecting the Buzzer.
5) Interfacing the LED Display.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Arduino
2. Keypad
3. Buzzer
4. LED/LCD display
5. Laptop
6. 7-segment LED display
7. LCD display
8. Jumper wires & Breadboard

4. What skills did you acquire ?

1. Arduino
2. Use of keypad
3. Use of push button
4. Use of buzzer
5. Use of LED/LCD display
6.
7.
8.

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

SKILL ACTIVITY NO: 2

Date : 13/02/25

(To be filled by the Instructor)

Title : Interfacing various sensors and actuators with Arduino.

Skills / competencies to be acquired :

1. Arduino.
2. Arduino IDE
3. DHT 11 sensor.
4. IR Sensor
5. DC motor.
6.
7.
8.

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

The purpose of this skill is to integrate and control sensors (such as DHT 11, IR) and actuators (such as DC motor) using an Arduino. This will enable real-time sensing, processing & control of physical systems. Understanding this skill involves working with micro-controllers to read sensor data, process it, and then interact with physical devices like other actuators.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Setting up Arduino and Arduino IDE :-
- Install Arduino IDE from (https://www.arduino.cc/en/software).
- Connect your Arduino board (like arduino Uno) to your computer using USB cable.
- Open the Arduino IDE & select the correct board & port under the tools menu.

2) Interfacing the DHT 11 Sensor :-
- The DHT11 sensor is digital sensor that outputs temperature & humidity data.
- Connect the sensor to Arduino.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Arduino
2. Arduino IDE
3. DHT11 sensor
4. IR sensor
5. DC motor.
6.
7.
8.

4. What skills did you acquire ?

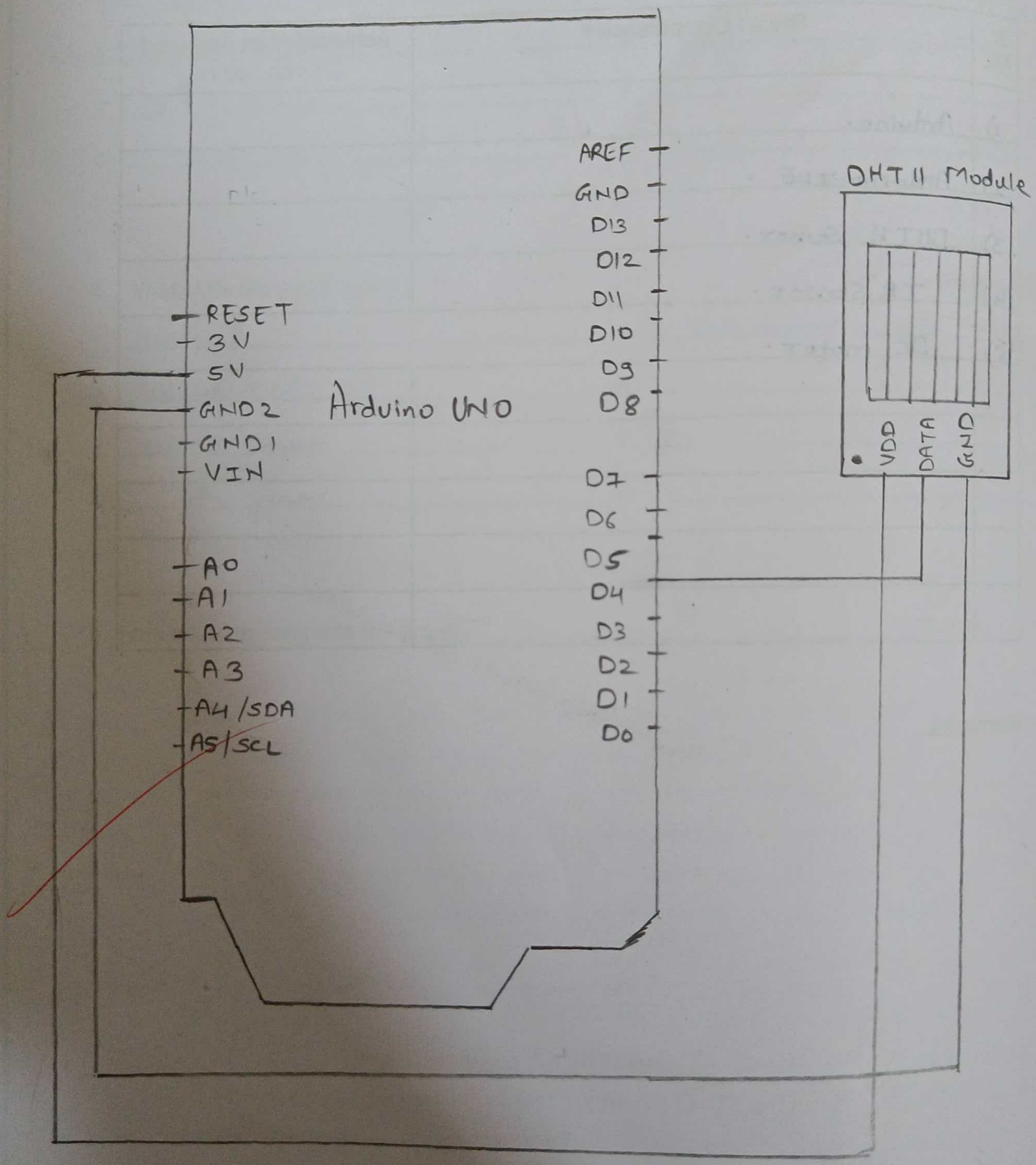
1. Arduino
2. Arduino IDE
3. DHT 11 Sensor
4. IR Sensor
5. DC motor
6.
7.
8.

5. Time taken to complete the activity ? 1 (hours)

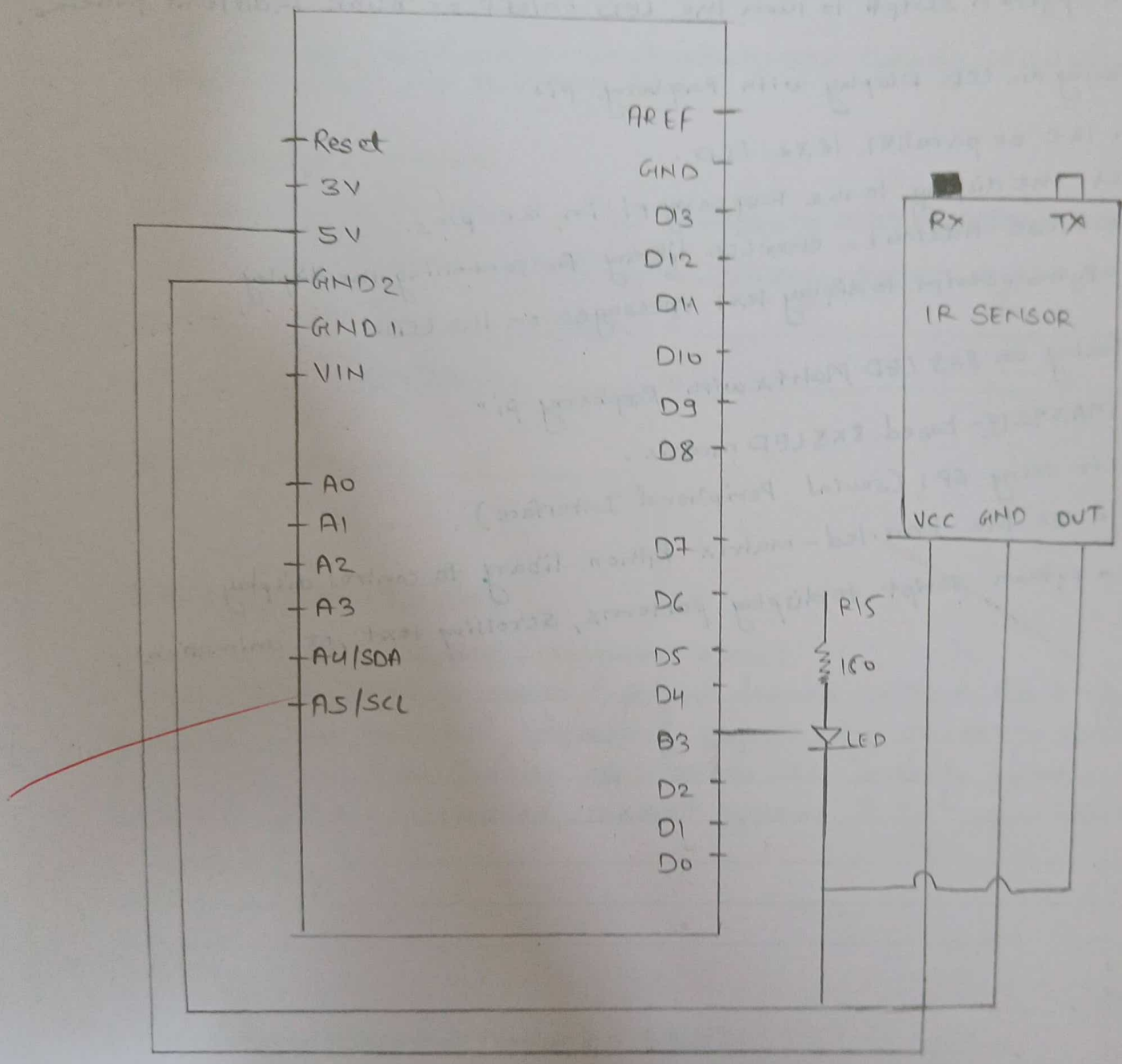
(Signature)
Instructor

(Signature)

Arduino UNO interfaced with DHT11 sensor :-



Arduino UNO interfaced with IR Sensor:-



* Interfacing an LED with Raspberry Pi:

- Connect ~~pico or~~ LED with current-limiting resistor to GPIO pin.
- Write python script to turn the LED on/off or blink in different patterns.

* Interfacing an LCD Display with Raspberry Pi:

- Use an I2C or parallel 16x2 LCD.
- Connect the display to the Raspberry Pi in I2C pins.
- Install & use Adafruit_CharLCD library for controlling the display.
- Write a Python script to display text messages on the LCD.

* Interfacing an 8x8 LED Matrix with Raspberry Pi:

- Use a MAX7219-based 8x8 LED matrix.
- Connect it using SPI (Serial Peripheral Interface),
- Install & use the luma.led_matrix Python libary to control display.
- Write a python script to display patterns, scrolling text, or animations.

SKILL ACTIVITY NO: 3

Date : 27/02/25

(To be filled by the Instructor)

Title : Interfacing Keypad, Pushbutton, Buzzer, and Display (LED, LCD, 8×8 Matrix LED) with Raspberry Pi.

Skills / competencies to be acquired :

1. Understanding GPIO pins.
2. Working with libraries like RPi.GPIO.
3. Reading Input from a pushbutton.
4. Controlling output devices.
5. Displaying text & patterns on LED.
6. Writing python scripts in RPi.
7. _____
8. _____

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

To interface various input & output devices with a Raspberry pi, enabling users to build interactive projects. By mastering these interfaces, one can develop applications like security systems, interactive displays, embedded control systems & IOT applications.

2. Steps performed in this activity (Explain in 5 - 6 lines)

~~Raspberry Pi, pushbutton, keypad, LED, buzzer, LCD, 8×8 matrix,~~

to. 1) Interfacing a Pushbutton with Raspberry Pi :

- Connect a pushbutton to Raspberry Pi GPIO using a pull-up pull-down resistor.

2) Interfacing a keypad with Raspberry Pi :

- Use 4×4 or 3×4 matrix. Connect keypad rows & columns. Write python scripts.

3) Interfacing a Buzzer with Raspberry Pi :

- Connect piezo or active buzzer to GPIO pin. Use PWM to control sound patterns.
- Write Python script.

4) Interfacing an LED with Raspberry Pi

5) Interfacing an LCD display with Raspberry Pi.

6) Interfacing an 8×8 LED matrix with Raspberry Pi.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Raspberry Pi.
2. Push button
3. Keypad, LCD, 8×8 LED matrix
4. LED, buzzer, jumper wires
5. Breadboard, Raspbian OS
6. Python
7. Geany Python IDE.
8.

4. What skills did you acquire ?

1. Understanding GPIO pins.
2. Working with libraries like RPi.GPIO
3. Reading input from a push button.
4. Controlling output devices.
5. Displaying text & patterns on LED.
6. Writing python scripts in Rpi.
7.
8.

5. Time taken to complete the activity ? 1 (hours)

SKILL ACTIVITY NO: 4

Date : 4/3/25

(To be filled by the Instructor)

Title : Interfacing sensors and actuators with Raspberry Pi.

Skills / competencies to be acquired :

1. Raspberry Pi
2. Reading data from analog & digital sensors
3. Understanding GPIO pin configuration for
4. Using Python libraries for interfacing writing python scripts for real-time data acquisition & control.
5.
6.
7. sensors & actuators.
8. with sensors & actuators

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

This skill enables users to interface various sensors & actuators with a Raspberry Pi to develop real-world applications such as automation, robotics and IOT-based systems. By mastering these interfaces, users can build projects involving environment monitoring, motor control, and house automation.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Interfacing a Temperature & Humidity sensor (DHT11/DHT 22) with Raspberry Pi.
2) Interfacing a PIR Motion sensor with Raspberry Pi.
3) Interfacing a Relay module with Raspberry Pi.
4) Interfacing a servo motor with Raspberry Pi.
5) Interfacing an Ultrasonic sensor (HC-SR04) with Raspberry Pi.

3. What resources / materials / equipments / tools did you use for this activity ?

1. Raspberry Pi
2. DHT11/DHT22
3. PIR
4. Motion, Relay, servo, ultrasonic sensor
5. Raspian OS
6. Python
7. Thonny Python IDE
8. Adafruit — DHT.

4. What skills did you acquire ?

1. Raspberry Pi.
2. Reading data from analog & digital sensor.
3. Understanding GPIO pin configuration
4. Using Python libraries for interfacing
5.
6.
7. for sensors & actuators.
8. with sensors & actuators
   writing python scripts for real time data acquistion & control.

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

1) Temperature & Humidity Sensor:

Python Code:

```
import Adafruit_DHT
sensor = Adafruit_DHT.DHT11
pin = 11
humidity, temp = Adafruit_DHT.read_retry(sensor, pin)
print('Temp: {temp} C, Humidity: {Humidity} %')
```

- Connect the sensor's Vcc to 3.3V, GND to ground and Data to a GPIO pin.
- Install the Adafruit_DHT library to read temp & Humidity.

2) PIR Motion Sensor:-

Python Code:

```
import RPi.GPIO as GPIO
import time
PIR_PIN = 17
GPIO.setmode(GPIO.BCM)
GPIO.setup(PIR_PIN, GPIO.IN)
while True:
if GPIO.input(PIR_PIN):
print("Motion Detected")
time.sleep(1)
```

- Connect Vcc to .5V, GND to GND and out to a GPIO pin.
- Use RPi.GPIO to detect motion & trigger an action.

3) Relay Module

Python code:

```
import RPi.GPIO as GPIO
import time
Relay_PIN = 18
GPIO.setmode(GPIO.BCM)
GPIO.setup(Relay_PIN, GPIO.OUT)
GPIO.output(Relay_PIN, GPIO.HIGH)
time.sleep(2)
GPIO output(Relay_Pin, GPIO.LOW)
```

- Connect Vcc to 5V, GND to ground, and IN to GPIO pin.
- Use python to switch the Relay ON & off.

4) Servo Motor :

- Connect the servo's power & ground & control pin to GPIO pin.
- Use pwm to control the servo position.

```
import RPI.GPIO as GPIO
import time
SERVO_PIN = 12
GPIO.setmode (GPIO.BCM)
PWM = GPIO.PWM (SERVO_PIN, 50)
pwm.ChangeDutyCycle (2.5)
time.sleep(1)
pwm.stop()
GPIO.cleanup
```

5) Ultrasonic Sensor :-

- Connect VCC to 3V, GND to ground, TRIG to a GPIO pin, and ECHO to another GPIO pin.
- Use python to calculate the distance based on the time delay between the signal sent & received

Python Code :

```
import RPI.GPIO as GPIO
import time
TRIG = 23
ECHO = 24
GPIO.setmode (GPIO.BCM)
GPIO.setup (ECHO, GPIO.IN)
GPIO.output (TRIG, TRUE)
time.sleep (0.0001)
GPIO.output (TRIG, False)
while GPIO.input (ECHO) == 0;
start_time = time.time()
while GPIO.input (ECHO) == 1;
end_time = time.time()
distance = ((end_time - start_time) * 34300/2
GPIO.cleanup()
```

SKILL ACTIVITY NO: 5

Date : 27/03/25

(To be filled by the Instructor)

Title : Interface ESP32 with DHT11 sensor & upload data to a webpage using Blynk.

Skills / competencies to be acquired :

1. Interfacing of DHT11 Sensor
2. Working with Blynk
3. Configuring ESP32 Wi-fi
4. Writing Arduino code
5. Sending sensor data to cloud.
6. _____
7. _____
8. _____

Duration of activity (hours) : 1 Hr.

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

This skill enables learners to interface temperature, humidity and pressure sensor with an ESP32 wifi module and transmit real-time data to the Blynk cloud ~~pot~~ platform. The data can be monitored remotely through a web dashboard or mobile app, making it useful for weather monitoring, home automation, and IoT projects.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Hardware Connections :- • Connect the DHT11 sensor to the ESP32 GPIO pins.
• Ensure proper power supply (3.3V for ESP32, 3.3V/5V for sensors).
• Use pull-up resistors where necessary.
2) Software Setup :- • Install Arduino IDE (or use Micropython on Thonny IDE).
• Install required libraries (DHT, Adafruit BMP / BME, Blynk Simple Esp32).
• Configure Blynk project & get an authentication token.

3. What resources / materials / equipments / tools did you use for this activity ?

1. ESP32 (Node MCU)
2. DHT11 (Temp & Humidity Sensor)
3. Jumper wires & Breadboard.
4. Arduino IDE with ESP32 Board Package
5. Blynk IOT App (Android/ios)
6. Serial Monitor
7. Blynk web Dashboard for online monitoring.
8.

4. What skills did you acquire ?

1. IOT Integration
2. Embedded systems Programming
3. Wireless Communication
4. Data Visualization
5. Sensor Interfacing.
6.
7.
8.

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

3) Writing the Code :- • Initialize ESP32 & connect it to wi-fi.
• Read temp, humidity & pressure from the sensor.
• Send the data to Blynk cloud using Blynk.virtualWrite().

4) Upload & Run :- • Compile & upload the code to ESP32.
• Monitor sensor values on Blynk App.

5) Real-Time Monitoring :- • Use Blynk widgets to display live temp, humidity & pressure.
• Enable graph visualization for tracking trends over time.

SKILL ACTIVITY NO: 6

Date : 24/04/25

(To be filled by the Instructor)

Title : Interfacing ESP8266 with DHT11 sensor & Uploading data to ThingSpeak webpage.

Skills / competencies to be acquired :

1. Interfacing ESP8266 with DHT11.
2. Connecting ESP8266 with wifi.
3. Sending sensor data to ThingSpeak
4. Creating ThingSpeak channels.
5. Real time visualization IOT data.
6. _____
7. _____
8. _____

Duration of activity (hours) : 1

(To be filled by the Student)

1. What is the purpose of this activity ? (Explain in 3 - 4 lines)

This activity aims to demonstrate the process of collecting environmental data (temp, humidity, pressure) using sensors like DHT11 or BMP/BME280 & transmitting the data to ThingSpeak, a cloud-based IOT analytical platform. It builds hands-on skills in sensor interfacing, wi-fi, based communication using ESP8266 & cloud data visualization.

2. Steps performed in this activity (Explain in 5 - 6 lines)

1) Hardware setup: Connect DHT11 or BMP/BME sensor to ESP8266 board.
2) Install below libraries in Arduino IDE: DHTsensor, ThingSpeak, ESP8266wifi.
3) Setup Thingspeak: Create account on Thingspeak. Create new channel & add fields (eg. temp, humidity). Note your write API key.
4) Write & Upload Arduino Code: Connect ESP8266 to wifi. Read sensor data. Use ThingSpeak.writeField() to send data to cloud. Upload code & observe sensor data being updated in real time on ThingSpeak dashboard.
5) Monitor & Validate Output: Open serial monitor to check for connectivity & sensor reading. Login to ThingSpeak & view live graphs.

3. What resources / materials / equipments / tools did you use for this activity ?

1. ESP8266 Node MCU
2. DHT11 Sensor
3. Jumper wires
4. Breadboard
5. USB Cable
6. Arduino IDE
7. ThingSpeak Platform.
8.

4. What skills did you acquire ?

1. Interfacing ESP8266 with DHT11.
2. Connecting ESP8266 with wifi.
3. Sending sensor data to Thingspeak.
4. Creating Thingspeak channels.
5. Real-time visualization of IOT data.
6.
7.
8.

5. Time taken to complete the activity ? 1 (hours)

(Signature)
Instructor

(Signature)
Student

(To be filled by Instructor

Sr. No.	Skills / Competencies
1)	Interfacing ESP8266 with DHT11.
2)	Connecting ESP8266 to wifi.
3)	Sending sensor data to ThingSpeak.
4)	Creating ThingSpeak Channels.
5)	Real time visualization of IOT data.