EXPERIMENT NO. 8

**Aim :** To make a mini weather station from Arduino UNO board, 16×2 LCD, and DHT11 sensor.

Apparatus Required : DHT11 temperature sensor, LDR, 16×2 LCD module, Arduino UNO board, 330 Ω and 1 kΩ resistance, 10 kΩ trimmer breadboard, wires.

Theory :

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

LCD 16×2 Pin Diagram
The 16×2 LCD pinout is shown below.
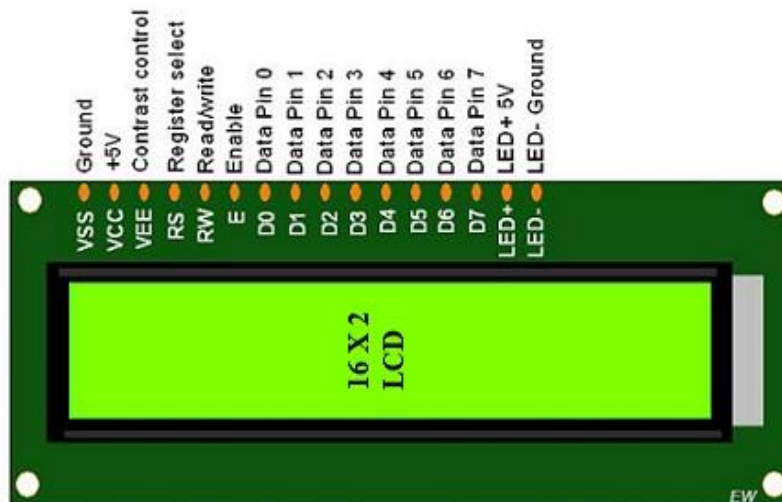
- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.

- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.
  lcd-16x2-pin-diagram.
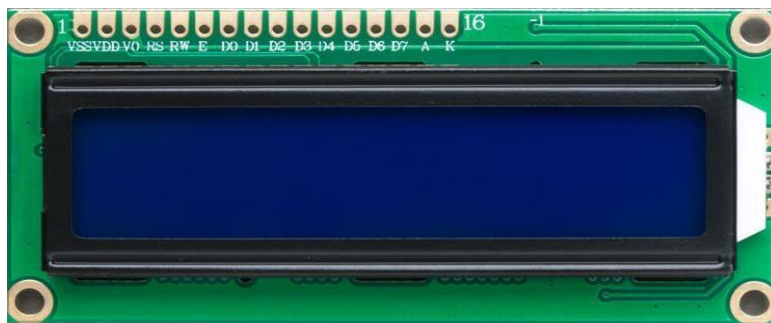
Hitachi HD44780 chipset

LDR (Light Dependent Resistor) as the name states is a special type of resistor that works on the photoconductivity principle means that resistance changes according to the intensity of light. Its resistance decreases with an increase in the intensity of light. It is often used as a light sensor, light meter, Automatic Street lights, and in areas where we need to have light sensitivity. It is also called a Light Sensor.

LDR are usually available in 5mm, 8mm, 12mm and 25mm dimensions.
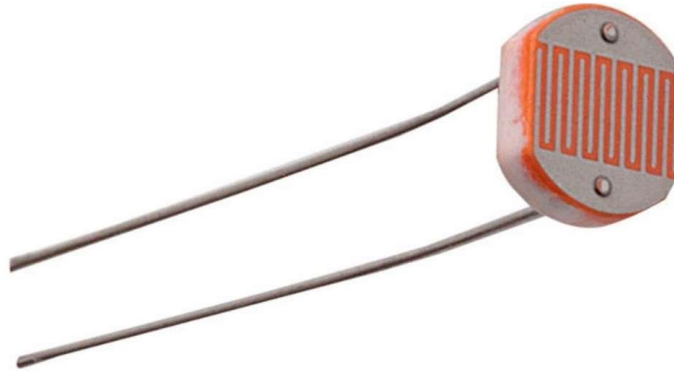
DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously.

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.

The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. The sampling rate of this sensor is 1Hz .i.e. it gives one reading for every second. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA.
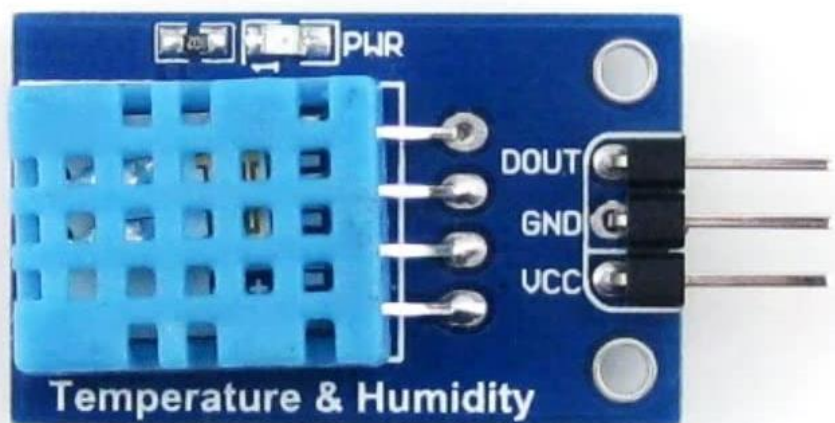

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

Circuit Diagram:

Legend:
1. RS to pin 12
2. En to pin 11
3. D4 to pin 5
4. D5 to pin 4
5. D6 to pin 3
6. D7 to pin 2
7. RW to GND
8. LED- to GND
9. Vss to GND
10. Vcc to 5V
11. LED+ to 5V via 330 resistance
12. V0 to trimmer variable
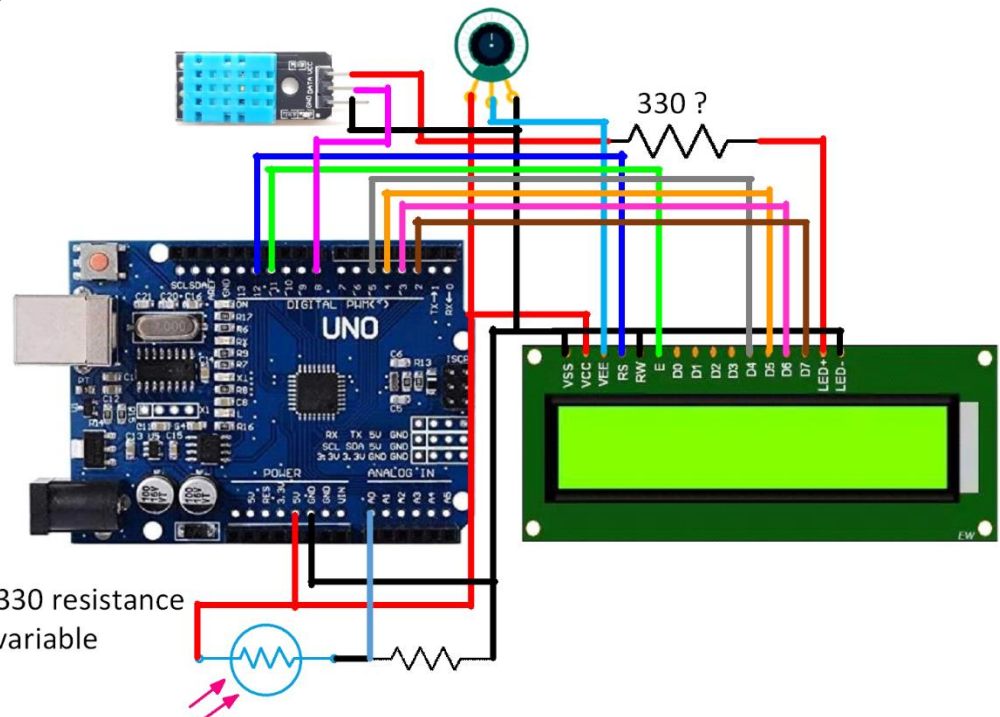
Code :

```
#include<LiquidCrystal.h>
#include<DHT.h>
#define DHTTYPE DHT11
int ldrpin =A0;
int ldrval=0;
char *light[]={"Day","Night"};
int dhtpin=8 ;
float temp;
float humi;

DHT dht(dhtpin,DHTTYPE);
int rs=12,en=11,d4=5,d5=4,d6=3,d7=2;
LiquidCrystal lcd(rs, en,d4,d5, d6,d7);


void setup(){
  pinMode(LED_BUILTIN, OUTPUT);
lcd.begin(16,2);
dht.begin();
lcd.print("   Welcome To");
lcd.setCursor(0,1);
lcd.print("Weather *Station");
delay(3500);
```

```
    lcd.clear();
    }

    void loop() {
     ldrval= analogRead(ldrpin);
    temp=dht.readTemperature();   //to read the temperature from DHT AND TOO STORE
    IN VARIABLE
    humi=dht.readHumidity();     // to read the humidity dht and to store in the
    variable
    lcd.clear();        //Clear the lcd
    lcd.setCursor(0,0);   //set the 1 point 0
    lcd.print("  Temp=");
    lcd.print(temp);      //to print temperature value read from the DHT sensor
    lcd.print("\337C");  //to print degree C
    lcd.setCursor(0,1);    //set line 2 pont 0
    if(ldrval>200){
      lcd.print(light[0]);   //printing day
      digitalWrite(LED_BUILTIN, LOW);
    }
    else{
      lcd.print(light[1]);  //printing night
      digitalWrite(LED_BUILTIN, HIGH); // LIGHT ON
    }
    lcd.print(" | Hum=");    //printing Humidity
    lcd.print(humi);  //to print humidity value read from DHT sensor

    lcd.print("%");
    delay(500);  // delay between iterations
    }
```

Result : Hence, We successfully 16×2 LCD with Arduino UNO and write a
program to display numbers and/or text on it.