Second Year B. Tech (EL&CE)

Semester : IV **Subject:** Basic IoT Laboratory

Name: Shreerang Mhatre **Class: SY**

Roll No: 29 **Batch: A2**

Experiment No: 02

Name of the Experiment: Understanding Arduino IDE and Interfacing Basic Sensors with hardware platforms.

Performed on:

Submitted on:

Marks	Teacher's Signature with date

Aim: Understanding Arduino IDE and Interfacing Basic Sensors with hardware platforms.

Prerequisite: Basic knowledge of sensors, Layout of Arduino Uno board

Objective:

1. To understand Arduino IDE
2. To understand sensor specification and working and applications
3. To sense the physical quantity using sensor and interface with Arduino Uno

Components and equipment required:

Arduino Uno Model, LED, Resistors, Sensors, LEDs, USB Cable, Breadboard etc.

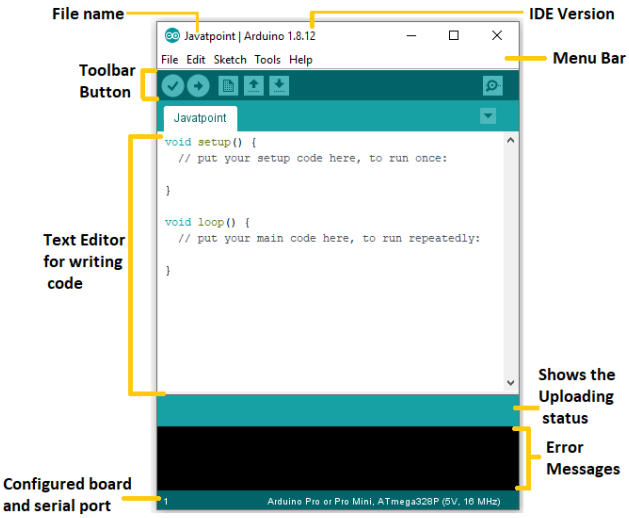
Theory:

The Arduino is an open source microcontroller development platform paired with an intuitive Programming language called as Arduino integrated development environment (IDE). As it is open source hardware, all the design files, schematics and source code are freely available to everybody.

Arduino IDE Basics:

Reference Link: https://www.javatpoint.com/arduino-ide

IDE stands for Integrated Development Environment - An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

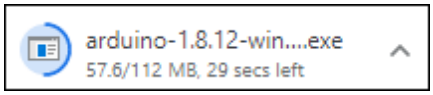


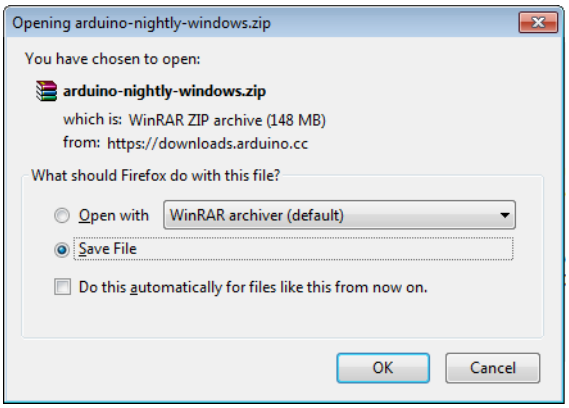
The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

Installation of Arduino IDE:

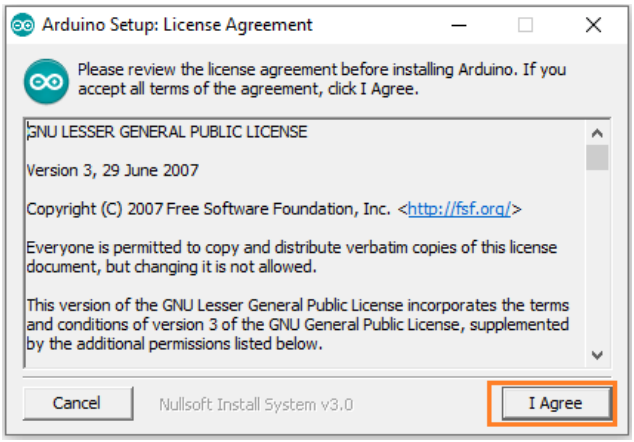
1. Go to the official website of Arduino (https://www.arduino.cc/) > Click on **SOFTWARE** < click on **DOWNLOADS**, as shown below:
2. Select option to download for Windows

3. Select Just Download option, the downloading process will start. The downloading file will look like the below image:





4. After completion of downloading process, open the downloaded files then Accept the license by clicking on '**I Agree**' button, as shown below

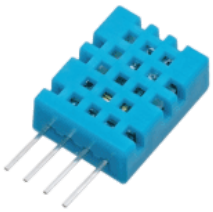


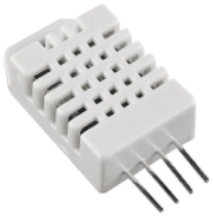
5. Complete the installation of process by selecting install options for various drivers.
6. The Arduino IDE software will appear on your desktop, as shown below:

7. After selecting this icon the Arduino IDE window will appear on which we can write the program

Temperature and Humidity sensor interfacing with Arduino

DHT11 sensor measures and provides humidity and temperature values serially over a single wire. It can measure relative humidity in percentage (20 to 90% RH) and temperature in degree Celsius in the range of 0 to 50°C. It has 4 pins; one of which is used for data communication in serial form. Pulses of different TON and TOFF are decoded as logic 1 or logic 0 or start pulse or end of a frame. DHT11 is a Digital Sensor consisting of two different sensors in a single package. The sensor contains an NTC (Negative Temperature Coefficient) Temperature Sensor, a Resistive-type Humidity Sensor and an 8-bit Microcontroller to convert the analog signals from these sensors and produce a Digital Output.

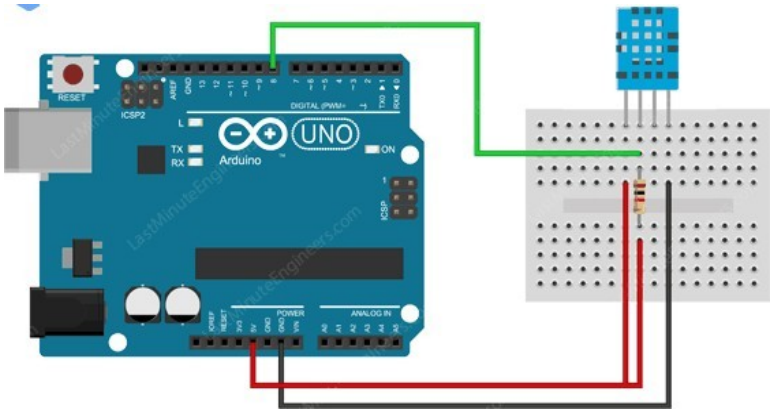




DHT11		DHT22
0 - 50°C / ± 2°C	*Temperature Range*	-40 - 125 °C / ± 0.5 °C
20 - 80% / ± 5%	*Humidity Range*	0 - 100 % / ± 2-5%
1Hz (one reading every second)	*Sampling Rate*	0.5 Hz (one reading every two seconds)
15.5mm x 12mm x 5.5mm	*Body Size*	15.1mm x 25mm x 7.7mm
3 - 5V	*Operating Voltage*	3 - 5V
2.5mA	*Max Current During Measuring*	2.5mA

The DHT22 is the more expensive version which obviously has better specifications. Its temperature measuring range is from -40 to +125 degrees Celsius with +-0.5 degrees accuracy, while the DHT11 temperature range is from 0 to 50 degrees Celsius with +-2 degrees accuracy. Also the DHT22 sensor has better humidity measuring range, from 0 to 100% with 2-5% accuracy, while the DHT11 humidity range is from 20 to 80% with 5% accuracy.
Sampling rate for the DHT11 is 1Hz or one reading every second, while the DHT22 sampling rate is 0.5Hz or one reading every two seconds and also the DHT11 has smaller body size. The operating voltage of both sensors is from 3 to 5 volts, while the max current used when measuring is 2.5mA.

- **Interfacing Diagram**



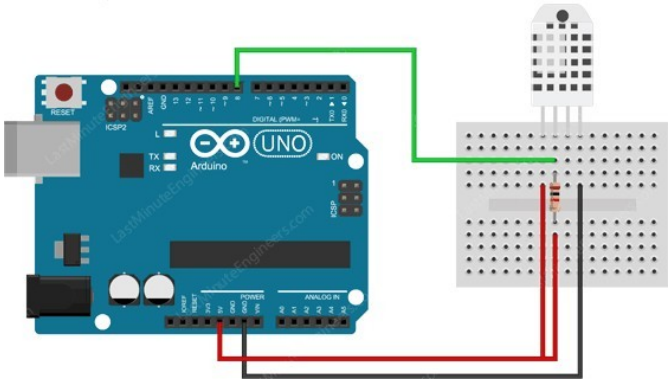


Figure 2.2: DHT11 and DHT 22 Sensor interfacing with Arduino Uno

Procedure:

1. Connect the DHT 11/DHT 22 with Arduino Uno board as per the given connection diagram
2. Write program in Arduino IDE
3. Build the program and Run.
4. Check output in terms of temperature and humidity values on Serial monitor.

Conclusion:

Post Lab Questions:

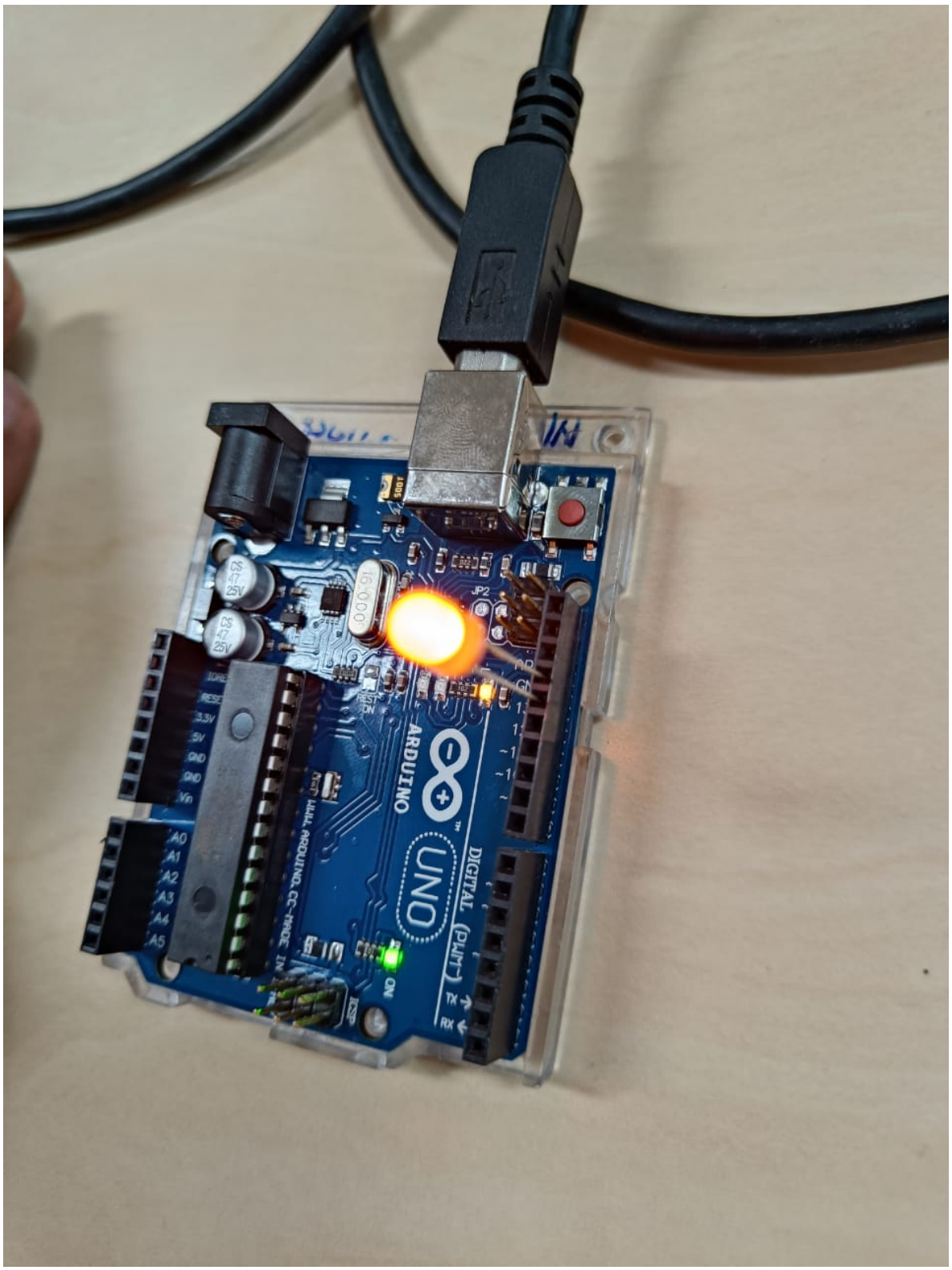
1. List out various analog sensors and explain any one in brief
2. List out various digital sensors and explain any one in brief
3. State the applications of any one sensors
4. Explain the commonly used command of Arduino IDE

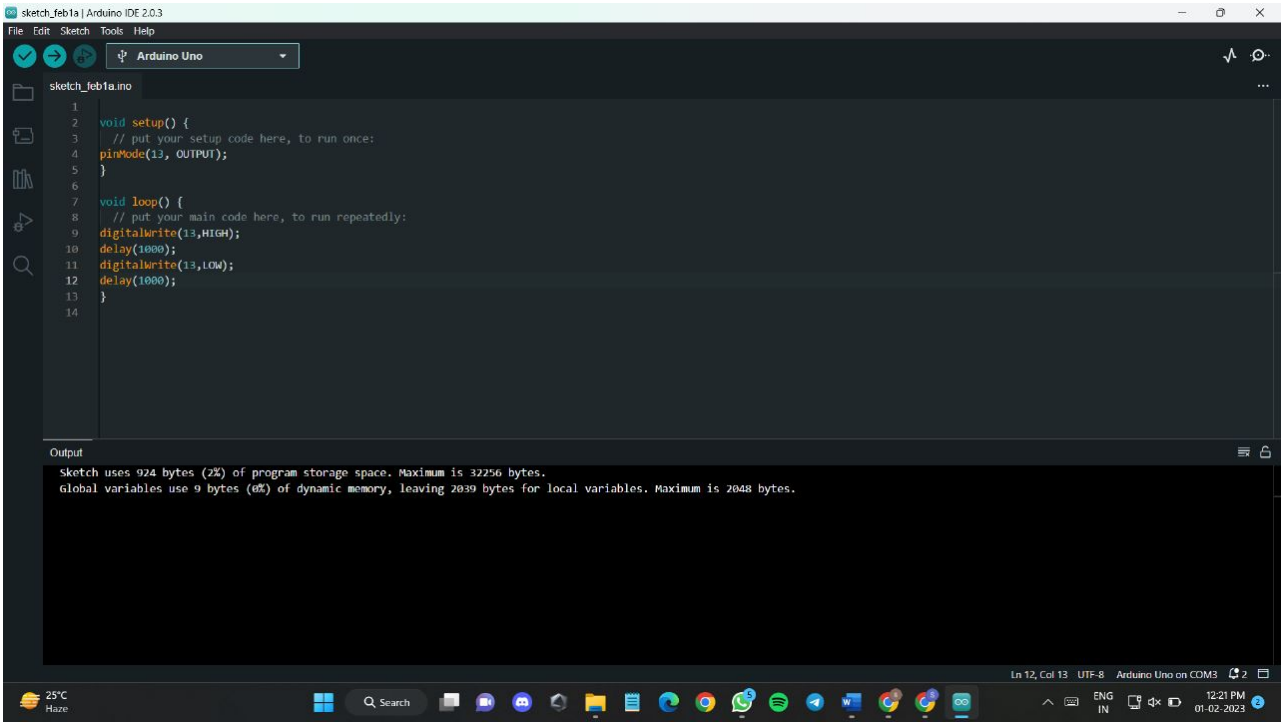
Additional links for more information:

1. **Getting started with Arduino with Spoken-Tutorial**
   https://spoken-tutorial.org/tutorial-

search/?search_foss=Arduino&search_language=English

2. **Using Sensors with Arduino-Arduino Project Hub**
https://create.arduino.cc/projecthub/JANAK13/using-sensors-with-arduino-eab1ec


ARDUINO
UNO
DIGITAL (PWM~)
POWER
ANALOG IN


sketch_feb1a | Arduino IDE 2.0.3
File Edit Sketch Tools Help
Arduino Uno
sketch_feb1a.ino
void setup() {
// put your setup code here, to run once:
pinMode(13, OUTPUT);
}
void loop() {
// put your main code here, to run repeatedly:
digitalWrite(13,HIGH);
delay(1000);
digitalWrite(13,LOW);
delay(1000);
}
Output
Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes.
Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes.
Ln 12, Col 13 UTF-8 Arduino Uno on COM3
25°C Haze
Search
ENG IN
12:21 PM 01-02-2023

Name: Shreerang Mhatre
Roll no: 29
Batch: A2

Exp no. 2

* ~~Procedure~~ Post Lab Questions -

Q1. List out various analog sensors and explain any one in brief

→ Analog sensors are sensors that generate an output signal that varies continously in response to change in the input parameter being measured-
Some analog sensors are -
1) Temperature sensors
2) Pressure sensors
3) Light sensors
4) Accelerometers
5) Strain gauges
6) Proximity sensors.

· Thermistor - A thermistor is a type of temp sensor that uses the change in electrical resistance of a material to measure temperature. As the temperature of the thermistor increases, its electrical resistance decreases, and vice versa. This change in resistance can be measured using a simple voltage divider circuit, where the thermistor ~~ther~~ is placed in series with a known resistance.

Q2) List out varias digital sensors and explain any one in brief.

→ Digital sensors, unlike analog sensors, provide a discrete output signal that is either a 0 or 1.

Some digital sensors are -

1) Motion sensors
2) Light sensors
3) Proximity sensors
4) Magnetic sensors
5) Humidity sensors
6) Gas sensors.

Passive Infrared motion sensor -

This sensor detects the presence of a person or an object by measuring the infrared radiation emitted by them. The PIR sensor consits of a pyroelectric sensor and a Fresnel lens, which are both sensitive to infrared radiation. When an object moves within the field, ~~of~~ views of the sensor it causes a change in the infrared radiation detected by the pyroelectric sensor.

Q3) State the applications of any one sensors.

→ Accelerometer - It is used to measure acceleration or changes in velocity. Some applications are -

(1) Automotive industry -
Accelerometers are used in cars and other vehicles to detect changes in acceleration and determine the orientation.

(2) Aerospace industry -
Accelerometers are used in aircraft, rockets and satellites to measure changes in acceleration & determine the orientation of aircraft.

(3) Industrial automation:-
Accelerometers are used in industrial automation systems to monitor the vibration levels of machinery.

(4) Consumer electronics -
Accelerometers are used in smartphones, tables and other portable electronic devices to detect changes in orientation and adjust the display accordingly.

Q4) Explain the commonly used command of Arduino IDE.

→ Arduino IDE is an integrated development environment that is used to program and upload code to Arduino boards.

① Verify / compile -
This command is used to check the code for any syntax errors and compile it into a machine-readable format.

② Upload -
This command is used to upload the compiled code to the Arduino board.

③ Serial Monitor -
This command opens a serial communication window that allows you to send and receive data between the Arduino board and the computer.

④ New sketch -
This command opens a new sketch window where you can write your code.