Indian Institute of Technology, Jodhpur

Lab Manual

Sensors and IoT

LAB - 1

Date: Aug 26, 2024

Part 1 : Setting Up NodeMCU

1. Plug in the NodeMCU into your system.
2. Open Start and search for "Device Manager"
3. A device should be visible under "Other Devices" by the name of "USB Serial"

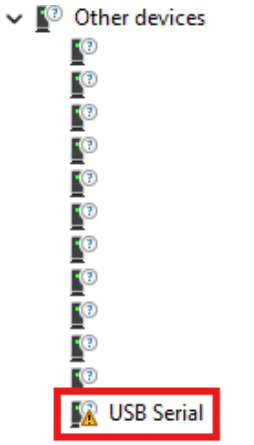

Figure 1: Finding NodeMCU

4. If the device is not visible check under Ports for a device named "USB-SERIAL CH340 (COMXX)" if such a device is visible note the COM number of the device and proceed to Part 2.

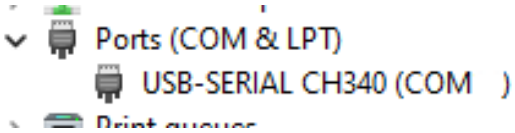

Figure 2: Successful device detection

5. If the device is visible under the Other Devices, right click the line item and click Update Driver

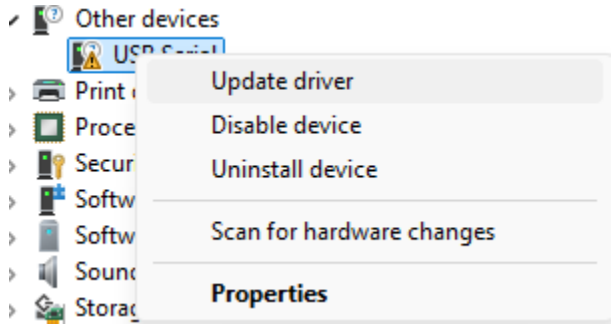

Figure 3: Installing Driver

6. Click Search Automatically for Drivers

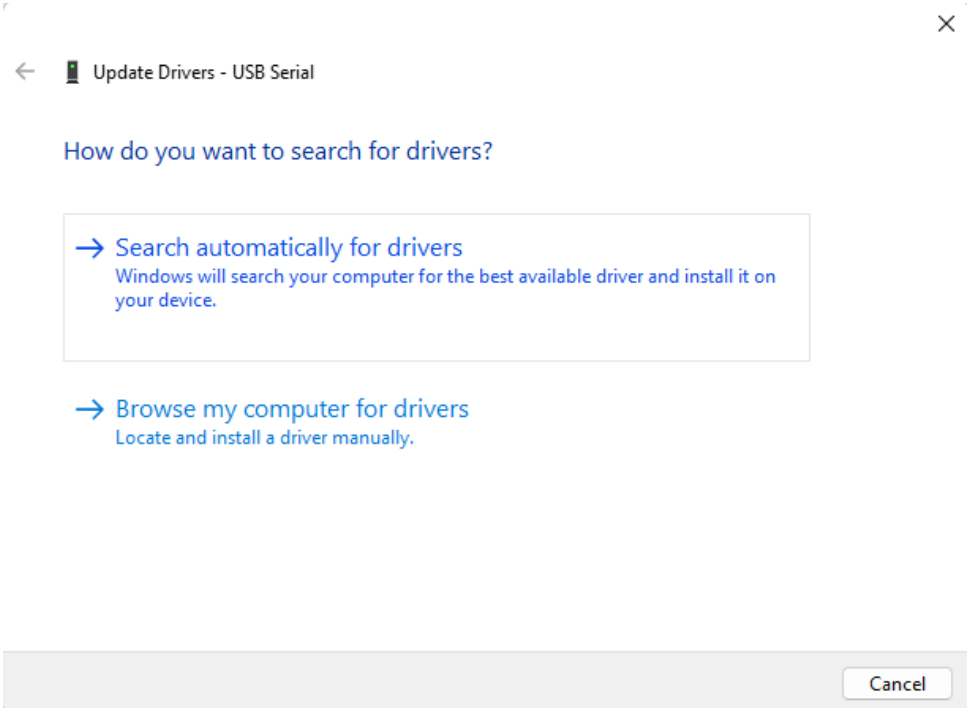

Figure 4: Automatic Driver Installation

7. The driver should get automatically installed

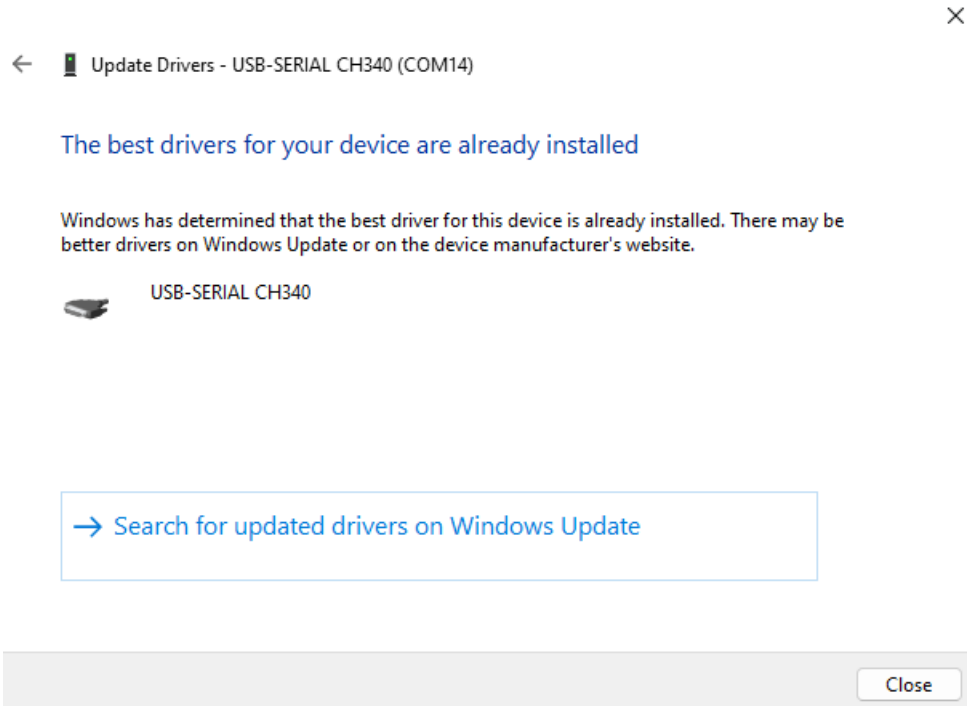

Figure 5: Successful Driver Installation

8. Make a note of the COM number and proceed to next step.

Part 2 : Setting Up NodeMCU in Arduino IDE

1. Open Arduino IDE and connect the NodeMCU to your system.
2. Click on the board selector on top right corner.

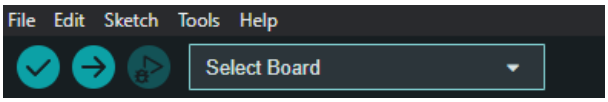

Figure 6: Board Selector

3. Click on the COM port from previous part.

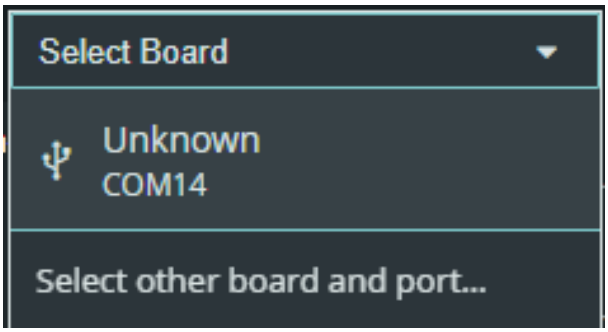

Figure 7: COM port selection

4. Search for NodeMCU in the boards section and click OK.

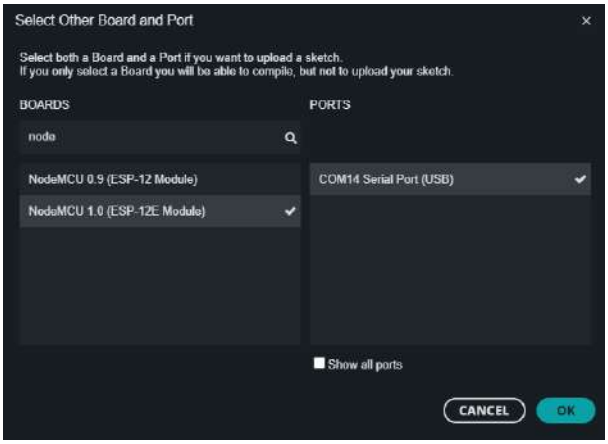

Figure 8: Board Selection

5. Goto File - Examples - Basic - Blink

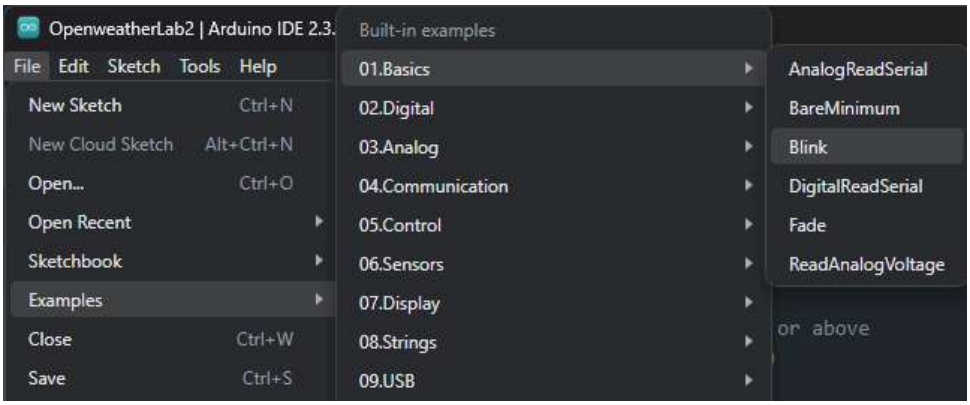

Figure 9: Opening basic Blink Program

6. Click on the Upload button. This will compile the simple blink program and program the NodeMCU to blink its on board LED in constant intervals.

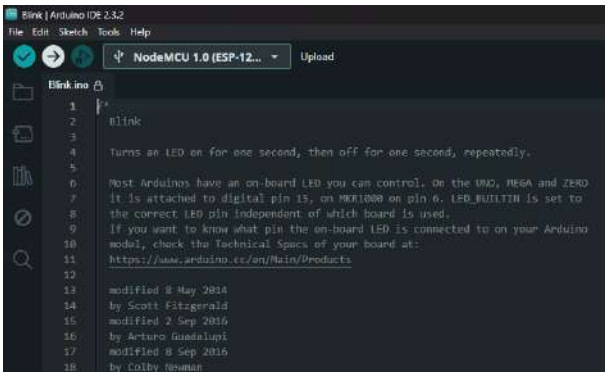

Figure 10: Program compilation and upload

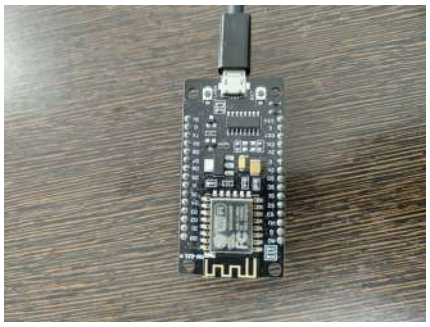

Figure 11: NodeMCU with LED off

Figure 12: NodeMCU with LED on

Part 3 : Network Setup

In order to use the Wi-Fi functionality of the NodeMCU, wireless setup needs to be done. In order to prevent network issues with the institute network, it is requested to configure wireless hotspot of your laptops as understated.

1. Open Settings and search for "Mobile hotspot"

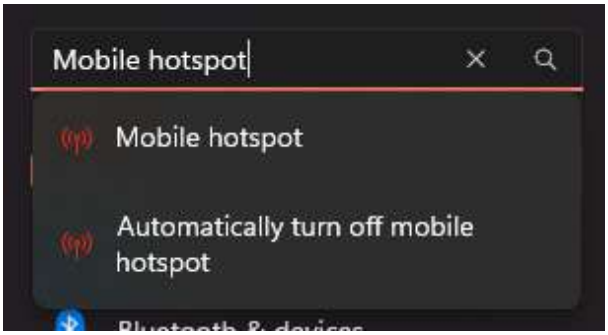

Figure 13: Search for hotspot

2. Click Edit in the Properties section

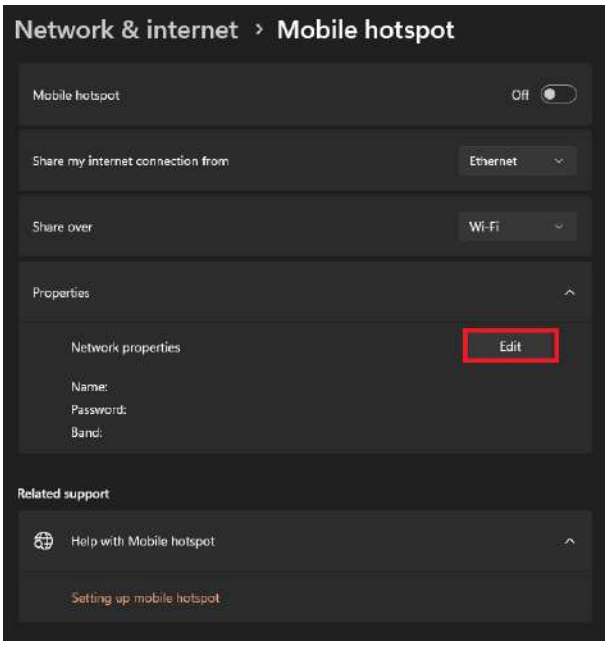

Figure 14: Wi-Fi Properties

3. Set Wi-Fi name and password as per your choice. It is recommended to prevent use of special characters and spaces in the name as well as password.

4. Ensure that the Band is set as 2.4 Ghz as NodeMCU does not support 5 GHz Wi-Fi network

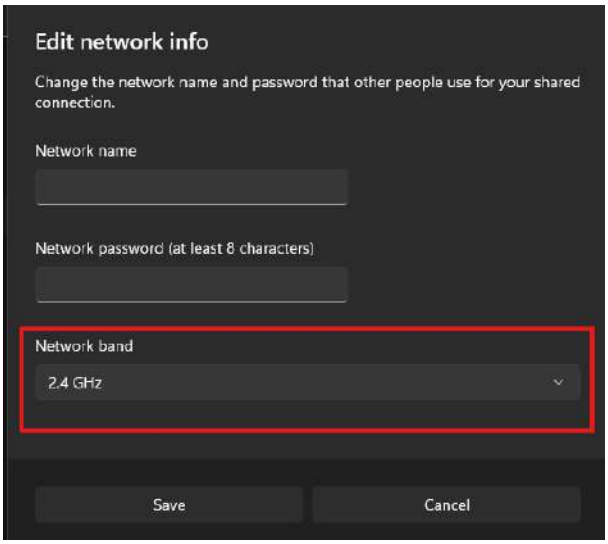

Figure 15: Wi-Fi Configuration

5. Click save
6. Turn on the Wi-Fi hotspot

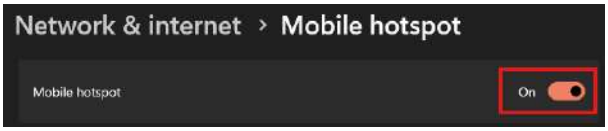

Figure 16: Turn on Wi-Fi

Fetching from API

In order to fetch from the API we will use OpenWeather API to simply fetch and display the weather information on the serial console.

1. Open the provided open_weather_API.ino file provided on Google Classroom.
2. Make changes to the ssid and password variables according to previously set Wi-Fi name and password

```
17  const char* ssid = "WIFI_NAME";
18  const char* password = "WIFI_PASSWORD";
19
```

Figure 17: Setting up Wi-Fi for arduino

3. Goto `https://openweather.co.uk/` and click on Sign-in

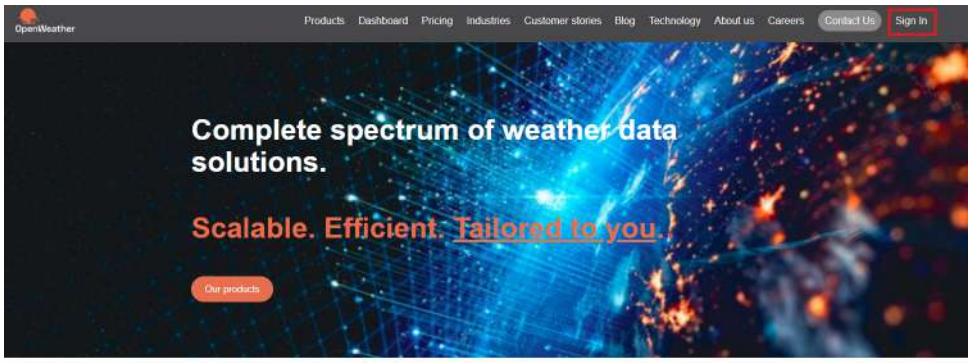

Figure 18: Goto Sign in page

4. Click create Account

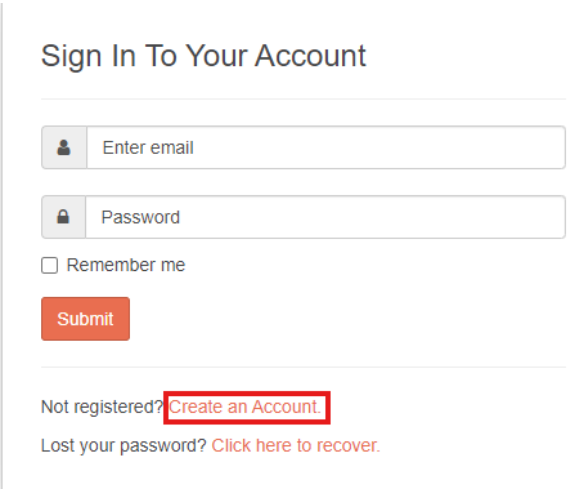

Figure 19: Account creation

5. Fill in the details required for the OpenWeather API account
6. Click on "API keys" and Copy the Default API key.

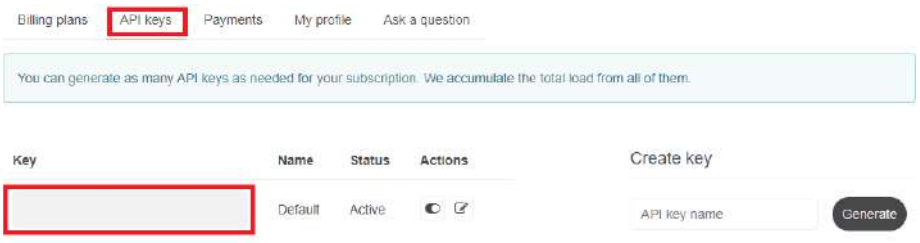

Figure 20: Get API key

7. Paste the API key in the "openWeatherMapApiKey" variable

```
// Your Domain name with URL path or IP address with path
String openWeatherMapApiKey = "YOUR_API_KEY";
// Example:
//String openWeatherMapApiKey = "bd939aa3d23ff33d3c8f5dd1dd4";
```

Figure 21: Insert API key in arduino IDE

8. Upload to compile and send the code to NodeMCU

Figure 22: Upload Code

9. Once the upload has finished click on Serial Monitor in top right corner to check the output.

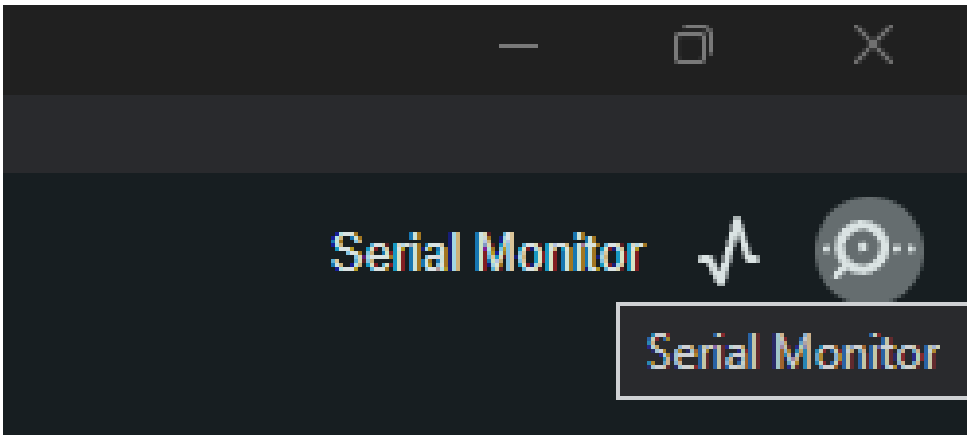

Figure 23: Open Serial Monitor

10. Check the output. In the event the output is not ligible set the baud rate to 115200

Figure 24: Baud rate Update

Sending Data to API

In this section we will upload random data to the ThingSpeak API.

1. Open "thing_speak.ino" file provided on Google Classroom.
2. Update the Wi-Fi configuration as per your system.
3. Goto `https://thingspeak.com/login?skipSSOCheck=true` and click create account.

Figure 25: Create ThingSpeak API

4. Click new channel

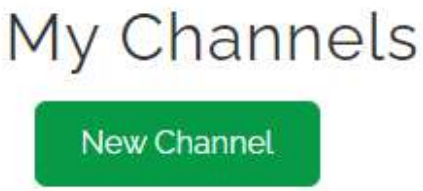

Figure 26: New Channel

5. Give your channel a name and click Save Channel at the bottom of the page

6. Open your channel and go to API keys

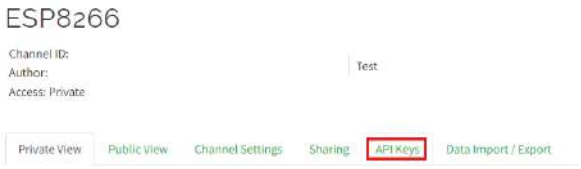

Figure 27: Fetch API key

7. Copy your write API key

Figure 28: Copy wirte API key

8. Paste your API key in the Arduino IDE and upload the code to NodeMCU.
9. In the serial console ensure you are getting "HTTP Response code: 200"
10. Go to thingspeak and click on Private View to visualize the random number data as a graph.

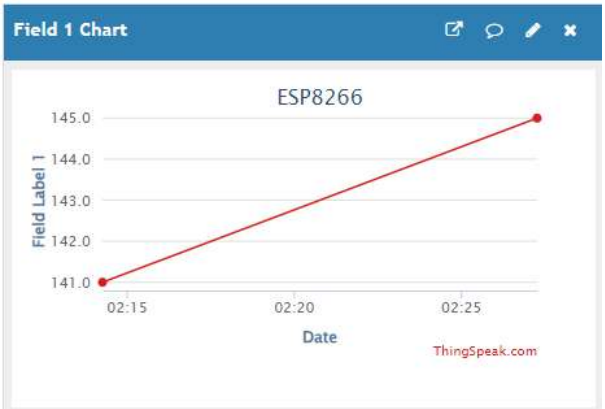

Figure 29: ThingSpeak graph

Assignment : Fetch data from OpenWeather API and upload it to ThingSpeak

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- As part of lab submission fetch the data from the OpenWeather API and upload the fetch data to Thingspeak.
- Crete a new channel as YOURNAME_ROLLNUMBER
- Upload Temperature, Pressure, Humidity and Wind Speed and the random number as part of 5 different graphs.
- The number within the random function needs to be the product of your admission year and the numeric part of your roll number
  - EG - X22XXX002, then the input to your function should be 22 X 002 = 44
  - If your roll number creates an output of less than 20 use 100 as the input number of your function
- Create the report using overleaf with the help of provided template.
- For any help please refer to the references section of this document.
- Submit a report consisting of LAB examples as well as assignment before the due date.
- Plagiarism will be checked and defaulters will be penalized.

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1. Login to `overleaf.com`
2. Click New Project

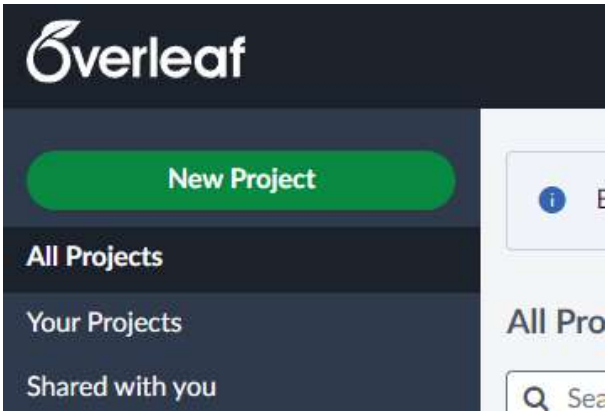

Figure 30: New Project

3. Click Upload Project

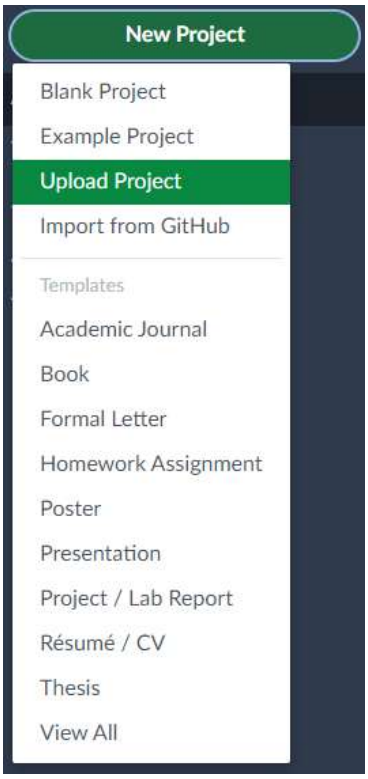

Figure 31: Upload Project

4. Provide the "IOT_LAB_TEMPLATE.zip" in the upload dialog.

5. Go through the main.tex file and navigate to Lab-1/main.tex as well as Lab-2/main.tex to add your lab reports.

6. For the submissions you only need to submit one lab only and not the entire document. In order to do that comment out the respective lab from the top level main.tex

```
128  % \include{Lab-1/main.tex}
129  \include{Lab-2/main.tex}
```

Refrences

- https://openweathermap.org/appid
- https://www.mathworks.com/help/thingspeak/writedata.html
- https://in.mathworks.com/matlabcentral/answers/728058-thingspeak-read-write-mult