BIRLA INSTITUTE OF TECHNOLOGY, MESRA, PATNA CAMPUS

SMART IRRIGATION SYSTEM USING INTERNET OF THINGS

FINAL YEAR PROJECT

2018-2022

SMART IRRIGATION SYSTEM USING INTERNET OF THINGS

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- BRANCH :- INFORMATION TECHNOLOGY

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ACKNOWLEDGEMENTS

I would like to thank our guide **Dr. Upendra Kumar** for giving me this opportunity to work on this wonderful project and helping me in the project for last two semester with his knowledge, experience & innovative ideas. He continuously assisted us as a mentor and group in charge & always tried to bring the best out of us.

I would like to thank to my institute Birla institute of technology, Mesra and Department of Computer Science and Engineering for their support and giving necessary equipment's & resources on time.

Last, but certainly not the least, I want to thank my family and friends for their support and blessings which truly led to the successful completion of the project. I am grateful to all of them.

HARSH KUMAR BHARTI

(BTECH/15227/18)

ABSTRACT

- The main objective of this project is to detect the soil moisture content within the soil and depending on that it will start sprinkle the water.

- As System is becoming hard to find now a days in world and there is an urgency to adopting smart ways of irrigation and The project describes all about how irrigation is possible by handling smartly using IOT.

- This project aims for saving precious time and avoiding problems like constant vigilance also.

- It also helps in preserving water by providing automatically water to the Plants or field by looking forward about what quantity of the water is required.

- During this IOT system all the information that are received from the sensors and the varied parameters are given to the Node microcontroller unit as an analog input.

- There will be a preset value of soil moisture sensor that fixed in micro controller and When it goes beyond the particular threshold value then the water is automatically irrigated to the crops and once the required amount of water is fulfilled it get stopped automatically.

- The Microcontroller transmits all that information on the online through a network of IOT within the kind of WIFI module ESP8266 that's attached there.

- This enhances automated irrigation because the pump is commonly switched on or off through information given to the controller and this whole information is shipped to the user's movable and to the thingspeak cloud too.

OBJECTIVE

- To implement IT based Smart Irrigation System using ESP8266 NodeMCU

BACKGROUND

- Smart irrigation System is having wide scope to automate the complete irrigation system and Here I will be building an IoT based Irrigation System using ESP8266 NodeMCU Module, Soil Moisture Sensor Module and DHT11 Sensor.
- It will irrigate the plant based on the moisture level in the soil, Temperature and Humidity and also send the Data to ThingSpeak Server to keep track of the land condition.
- The System also consist of a water pump module which will be used to sprinkle water on the land depending upon the land environmental condition such as Moisture, Temperature and Humidity.

INTRODUCTION

- India is the second largest country by population and its 70% population covers in rural areas. So, agriculture plays an important role for development of country.
- In our country, even during this 21th century irrigation depends on the monsoon which has insufficient source of water and many other manual ways.
- There is no any methodology for irrigation and In Agriculture it usually depending upon the soil type and crop type.
- In agriculture, irrigation is one of the foremost important issues faced by farmers especially within the areas where spring water level is incredibly low or the land is dry. Already few automated systems for irrigation are there which has predefined set of instruction. It starts the pump even in rain. This winds up in water wastage.
- This project focuses on reducing the water wastage and minimizing the manual labor on agricultural land.

- A soil sensor will collect the moisture content at regular interval of sometime and pump are started accordingly. When soil absorbs required amount of water, it'll switch the pump On & Off using internet of things.

- The data regarding the moisture content at a particular time and pump status are sent to the cloud for the long-term purpose of data analysis.

- Data and standing are also monitored remotely using Mobile application.

- This method will allow farmers to continuously monitor the moisture level within the sector, controlling the supply remotely over the net.

- When moisture goes below a specific level, sprinklers would be turned on automatically, thus achieving optimal irrigation by using Internet of Things.

AREA OF UTILITY

- The primary focus of this project is to help the farmers and reduce their efforts by reducing the water wastage and minimizing the labor.
- This project model is good for large plant irrigation land and gardening land.

LITERATURE SURVEY

- In the irrigation field, soil moisture sensor and temperature sensors are placed inside the root of plant and the microcontroller handles the sensor information and transmits data.
- One algorithm was developed to measure threshold values of the temperature sensor and soil moisture sensor that was programmed into a microcontroller to manage the quantity of water.

BASICS OF INTERNET OF THINGS

- The Internet of Things (IOT) could be a system interrelated between computing devices, digital machines, and many other objects or animals supplied with unique identifiers and also the ability to transfer the data over a network without any requiring human-to-human or human-to-computer interaction.

- The Internet of Things (IOT) is that the network of physical objects devices, vehicles, buildings and other items Immersed with electronics, software, sensors, and network connectivity that permits these objects to collect and exchange data.

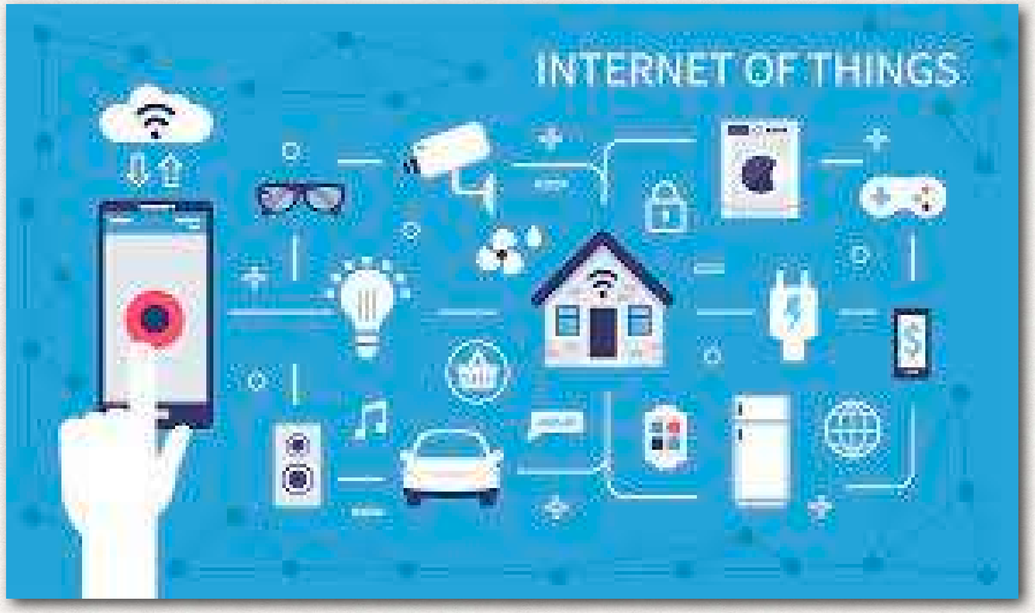
- The IOT allows objects to be sensed and controlled it remotely across the existing network infrastructure and creating opportunities for more direct integration of the physical world into computer-based systems, and resulting into improved efficiency, accuracy and economic benefits.

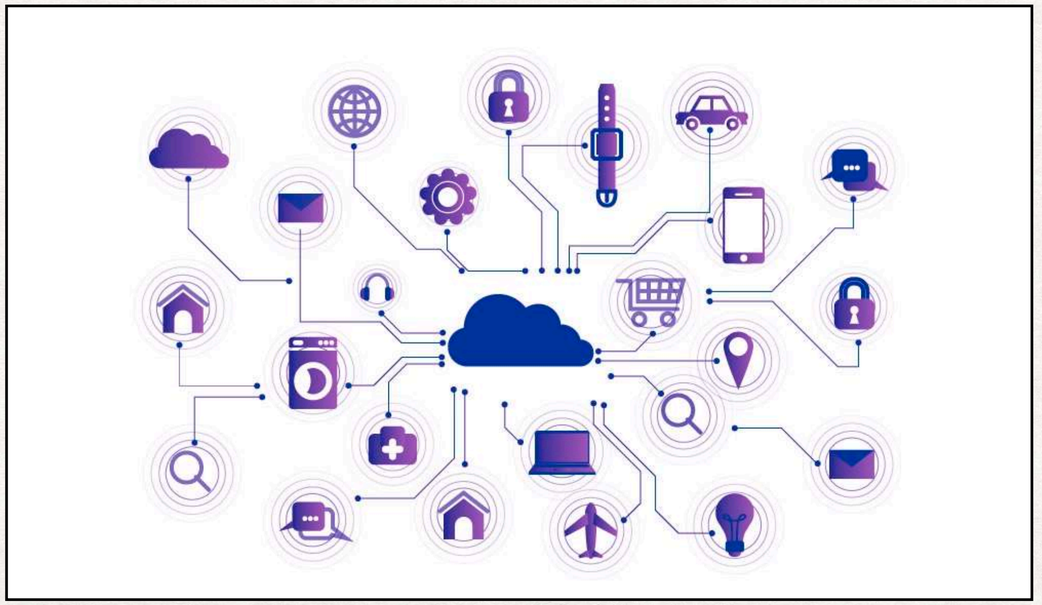
- When it's augmented with sensors, the technology becomes an instance in more general in class of cyber and physical systems, which also encompasses technologies like smart grids, smart homes, intelligent transportation and smart cities.

- Each of thing is uniquely identifiable through its own system but is prepared to inter-operate within this Internet infrastructure.

- So, Internet of Things or it's an architecture that has specialized hardware boards, Software systems, web APIs, protocols which together creates a seamless environment which allows smart devices to be connected to internet.

- Such data could also be accessed and system are going to be triggered over internet. Also, devices may be connected to internet using various means like Wi-Fi, Ethernet so on.





The Internet of Things

Networks suitable
for the exchange between objects

Distribution of connected objects
particularly in Smart Stores

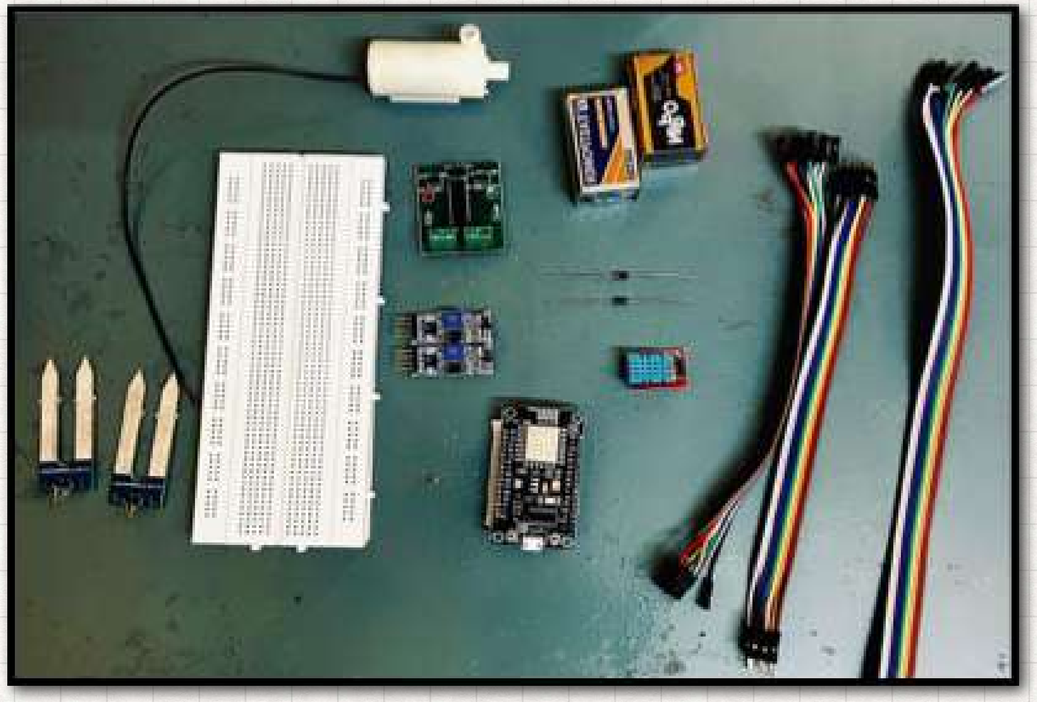
IoT

Value-added services
in health, wellbeing, the connected home or the smart city

Datavenue:
data & IoT solutions and services for businesses regarding collection, storage, security, processing and availability of data generated by connected objects

LIST OF COMPONENTS

- Node-MCU ESP8266
- Cable Connectors
- Battery
- Water Pump and Hose Pipe
- YL-38 Soil Moisture Sensor Module
- YL-69 Soil Moisture Probe
- Motor Driver PCB
- Male to Female Jumper Connector
- Female to Female Jumper Connector
- Male to Male Jumper Connector
- DHT11–Temperature and Humidity Sensor



DESCRIPTION

NODEMCU ESP8266

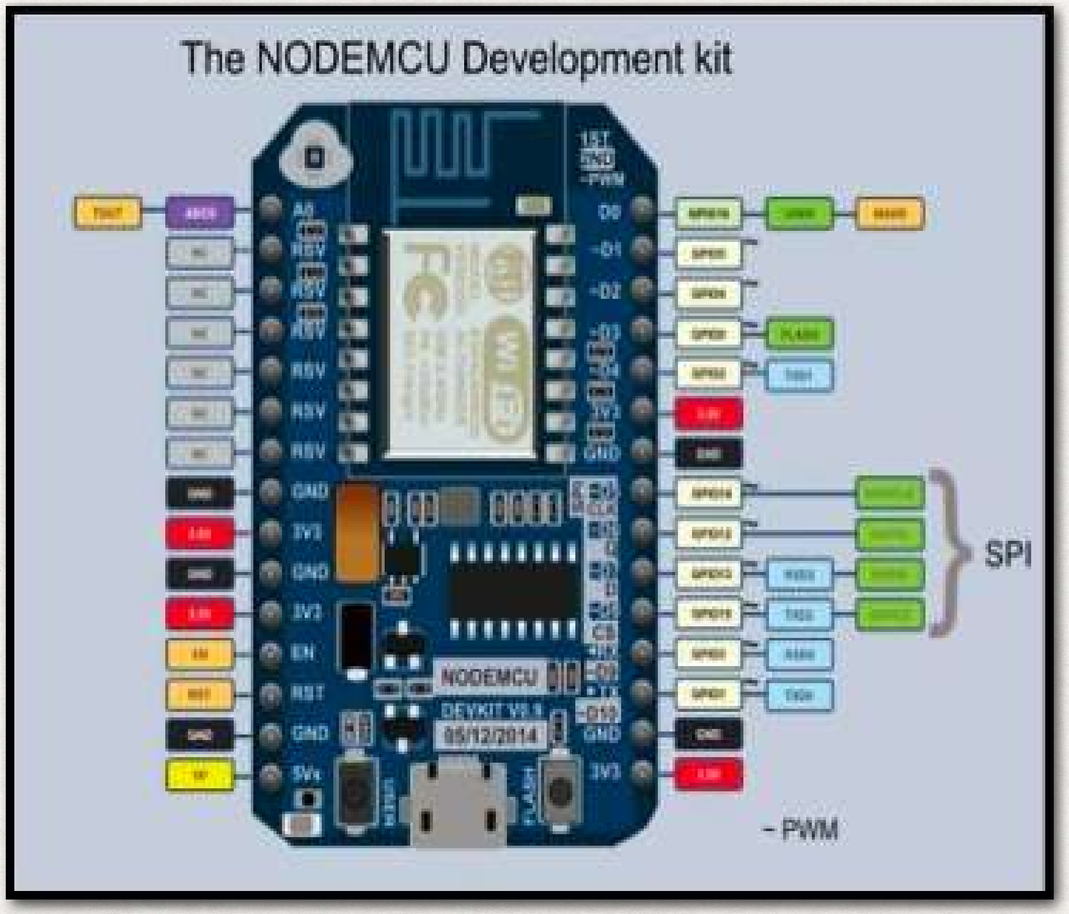
- ESP8266 is a complete and self-contained Wi-Fi network solutions that carry software applications, and all another application processor with all Wi-Fi networking capabilities.

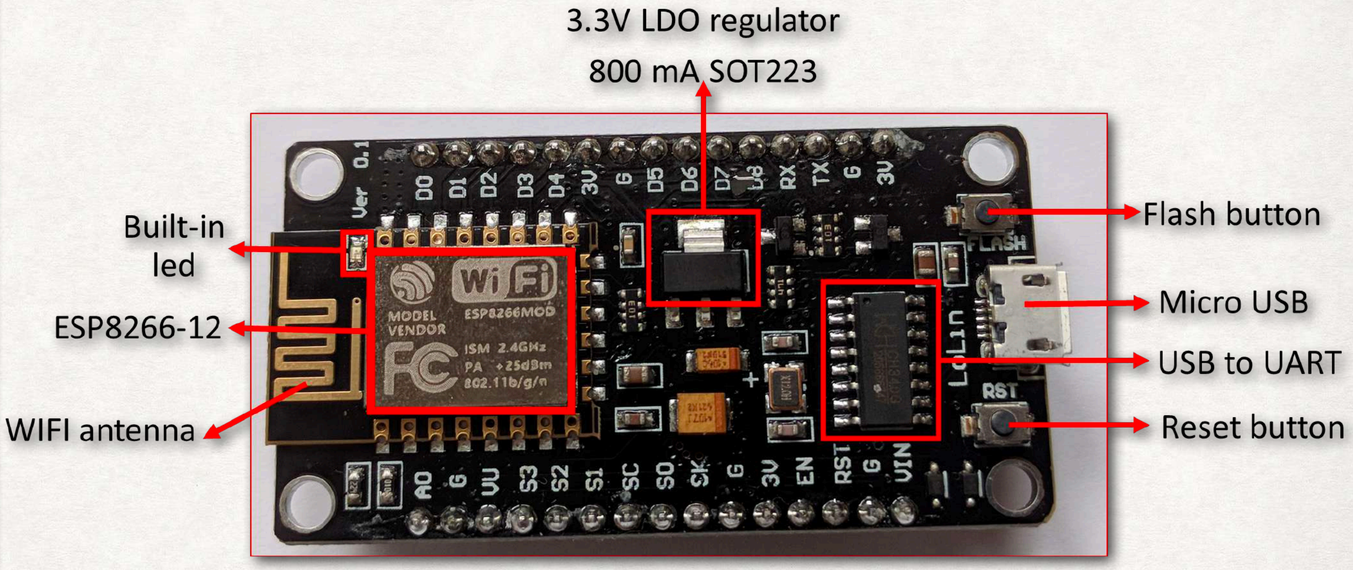
- ESP8266 when the device is mounted and the only application of the applying processor, is non-volatile storage and often started directly from an external Move.

- Built-in hidden memory will help to improve system performance and reduce memory requirements. Another situation is when wireless Internet access assume the task of Wi-Fi adapter, then we can add it to any microcontroller-based design, and also the connection is easy, just by SPI / SDIO interface or central processing unit AHB bridge interface.

- Processing and storage capacity on ESP8266 is powerful, it may be integrated via GPIO ports sensors and the other applications specific equipment to attain all-time low within the development and operation of a minimum occupy system resources.

- The ESP8266 highly integrated chip, including antenna switch and power management converter, so with minimal external circuitry, and includes front-end module, including the whole solution designed to attenuate the space occupied by PCB.





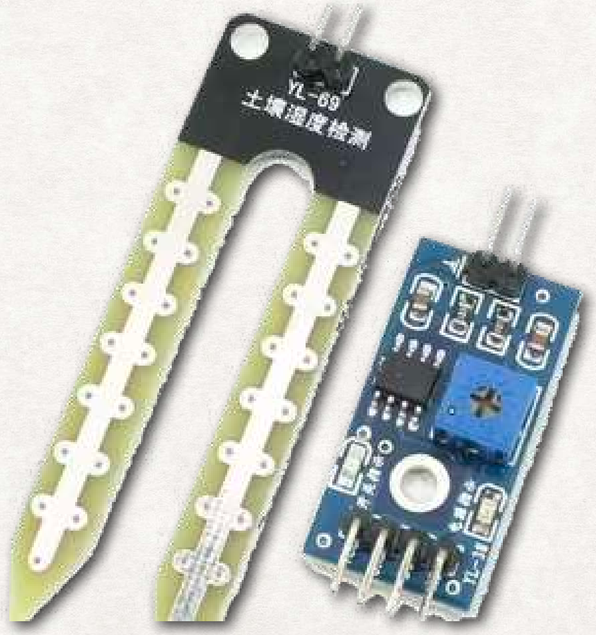
SOIL MOISTURE SENSOR

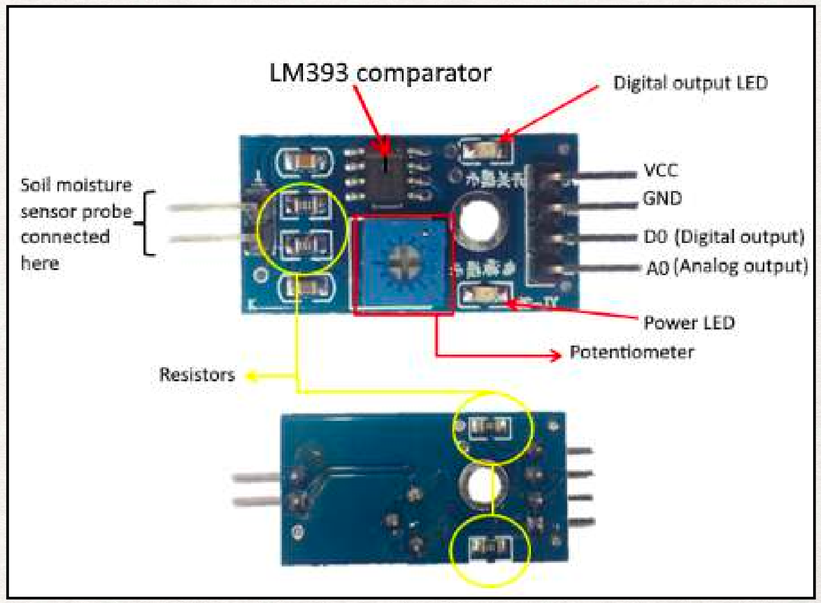
- Soil moisture sensors is measuring the volumetric water content in soil.
- Since the direct measurement of free-soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using another property of the soil, like electrical phenomenon, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.
- The relations between the measured property and soil moisture must be calibrated and will vary looking on environmental factors like temperature, soil type, or electric conductivity. Reflected microwave radiation is plagued by the soil moisture and is employed for remote sensing in agriculture.
- These Portable probe instruments are utilized by farmers or gardeners.

- This moisture sensor can read the quantity of moisture present within the soil surrounding it.

- It is a low-tech sensor, but an ideal for monitoring an urban garden, or your pet plant's water levels and this is often a requirement have tool for a connected garden.

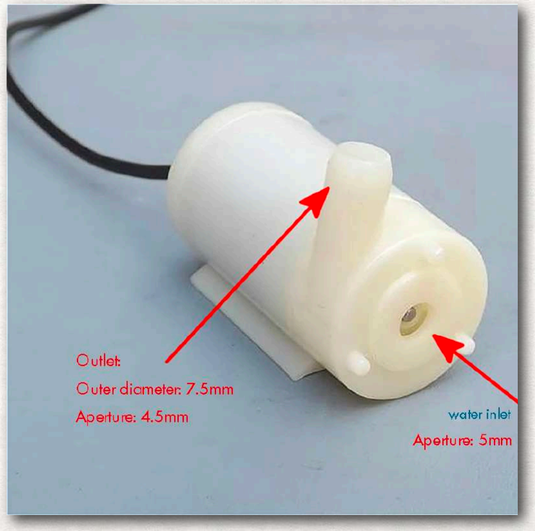
- This sensor uses the 2 probes to pass current through the soil, then it reads that resistance to induce the moisture level.





SUBMERSIBLE WATER PUMP

- A submersible pump or sub pump is a device which contains a hermetically sealed motor close-coupled to the pump body.
- The full assembly is submerged within the fluid to be pumped.
- Small DC Submersible water pumps push fluid to the surface as against jet pumps having to tug fluids.
- Submersibles are more efficient than jet pumps. it's usually operated between 3v to12v.

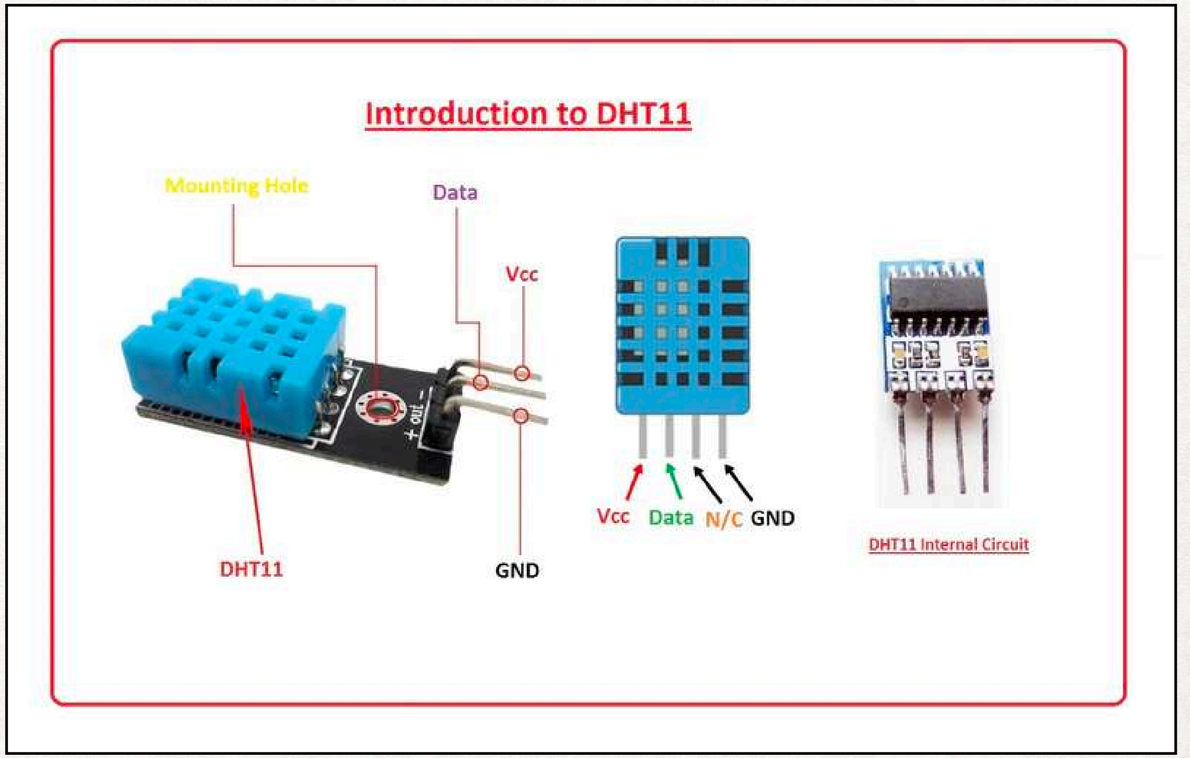


DHT11 TEMPERATURE AND HUMIDITY SENSOR

- It is a basic and low-cost digital temperature and humidity sensor.
- This comes in a blue perforated plastic enclosure. This has three pin, which are Vcc, Gnd and Data pin.

DHT11 Sensor Specifications:-

- Temperature measurement accuracy: ±2.0
- Output Signal Digital
- Temperature Range 0 to 50º C
- Humidity Range: 20 to 90% RH
- Humidity Accuracy: ± 5% RH
- Power Supply: 3.3 to 5V
- Size: 2.3cm x 1.2cm x 0.5cm.

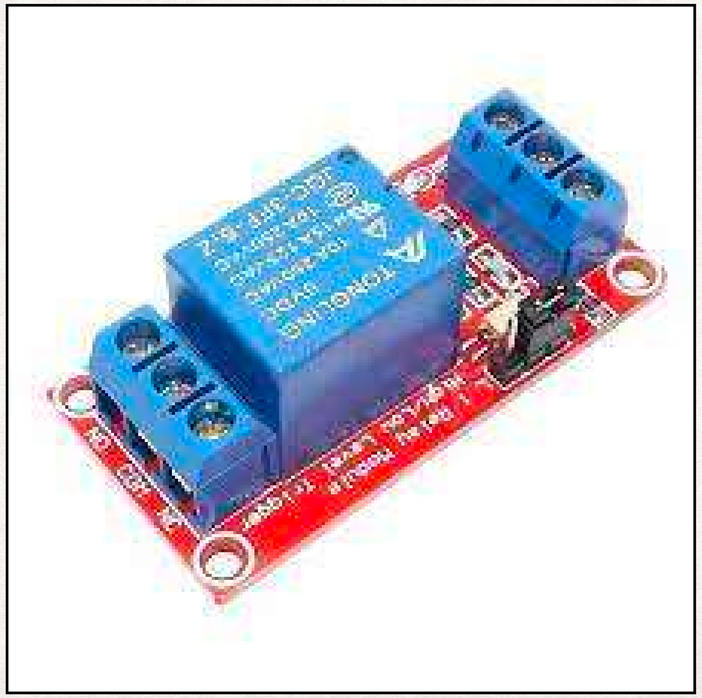


5V 10A RELAY MODULE

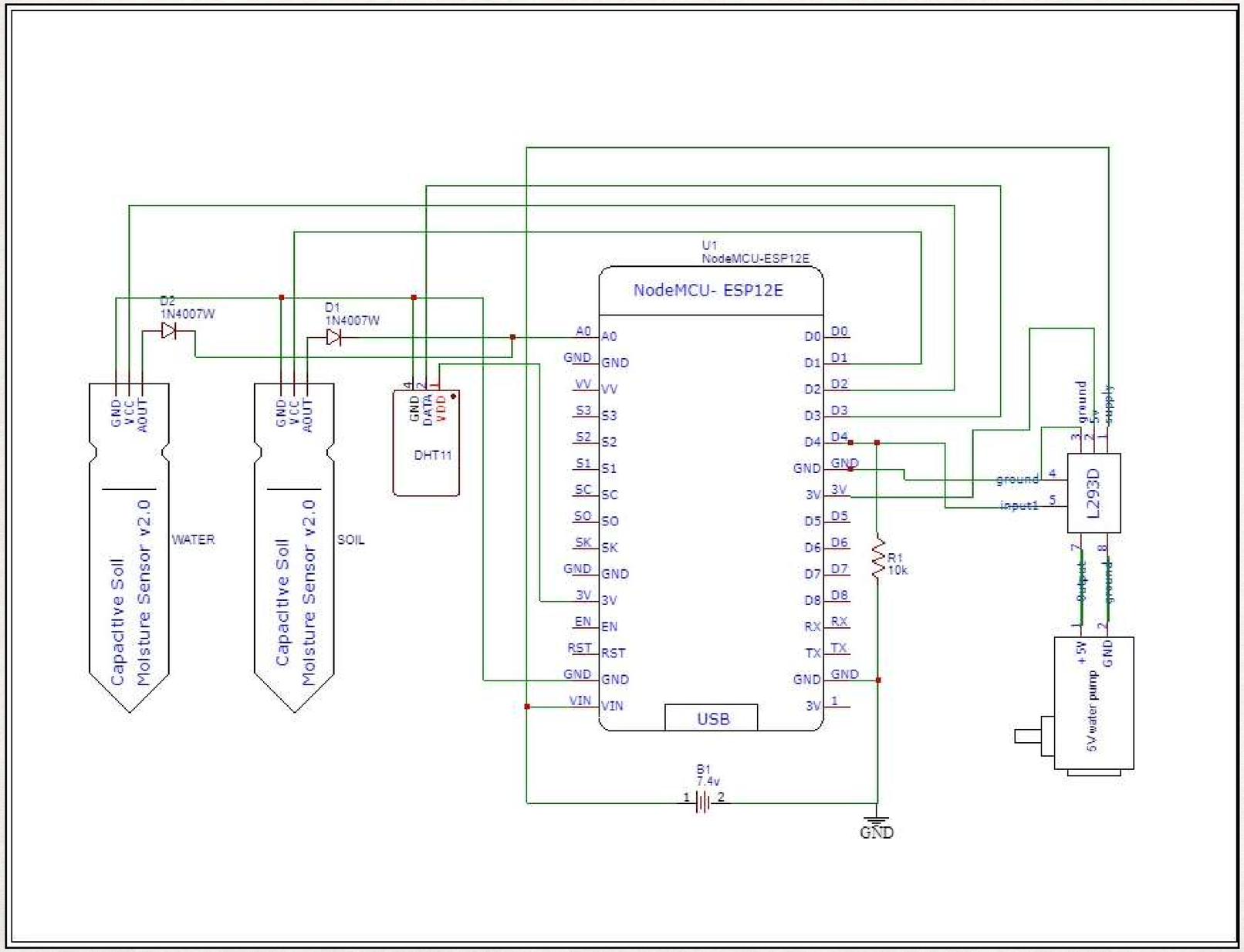
- This 5V Relay module helps us to switch (control) AC/DC loads from a microcontroller like NODE MCU, PIC, ARM etc.
- We can turn on or turn off loads that consume upto 10A using this Relay module.
- The module also comes with a power indicator led and signal indicator led. Input/ Trigger voltage: 5V

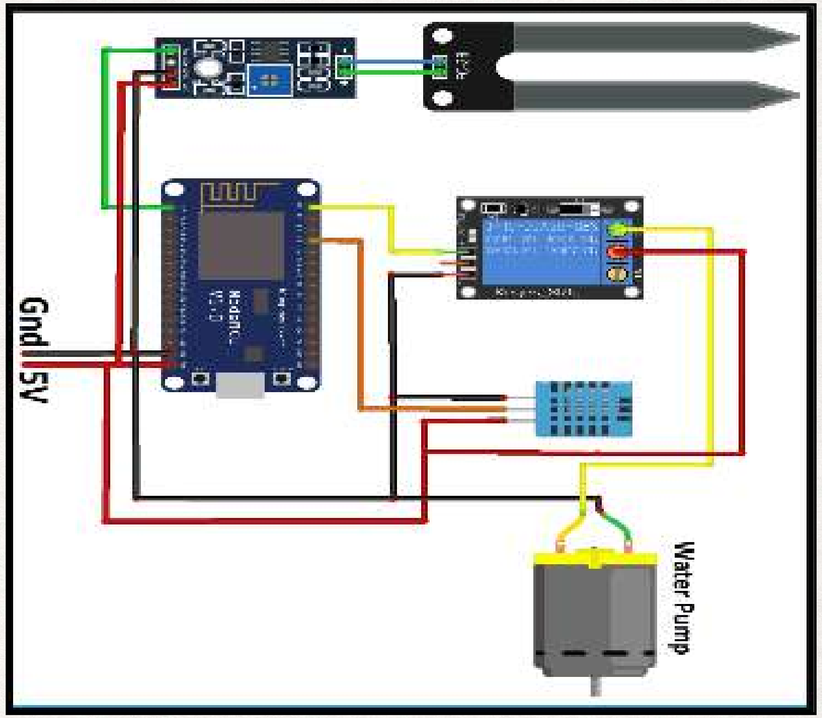
The specifications of the 5V relay module are:-

- Current consumption: 20mA maximum
- AC load voltage: upto 250V
- DC load voltage: upto 30V
- Load current: upto 10A



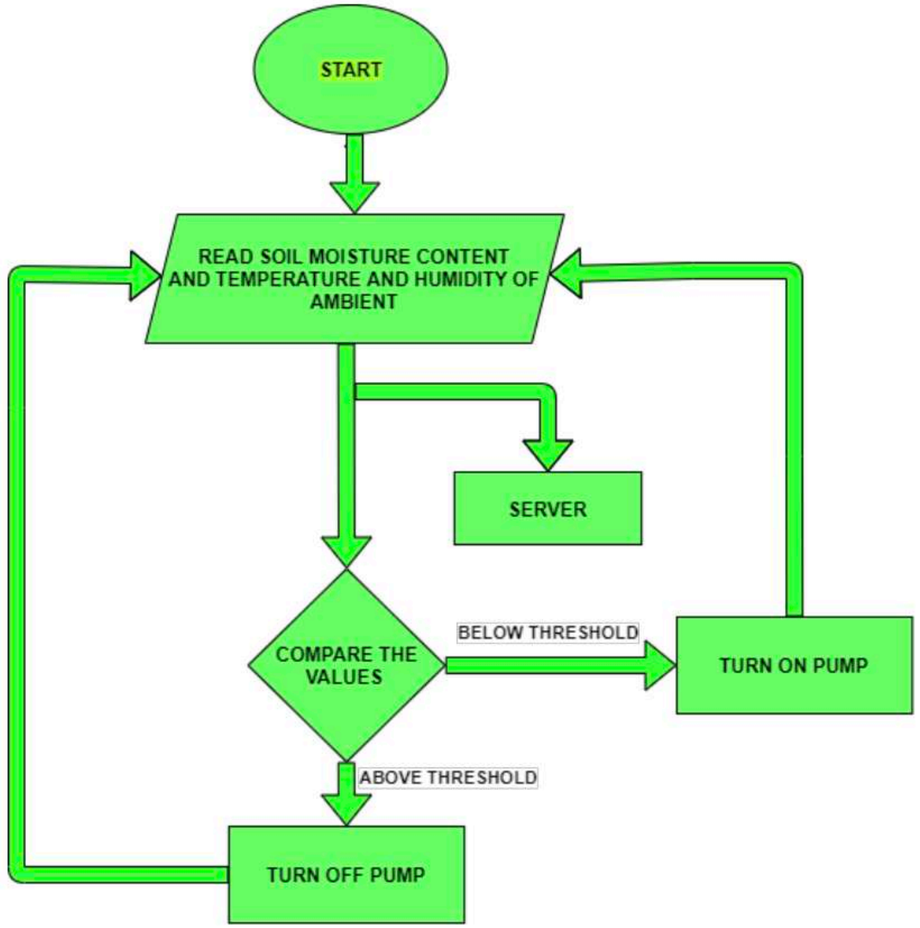
CIRCUIT DIAGRAM

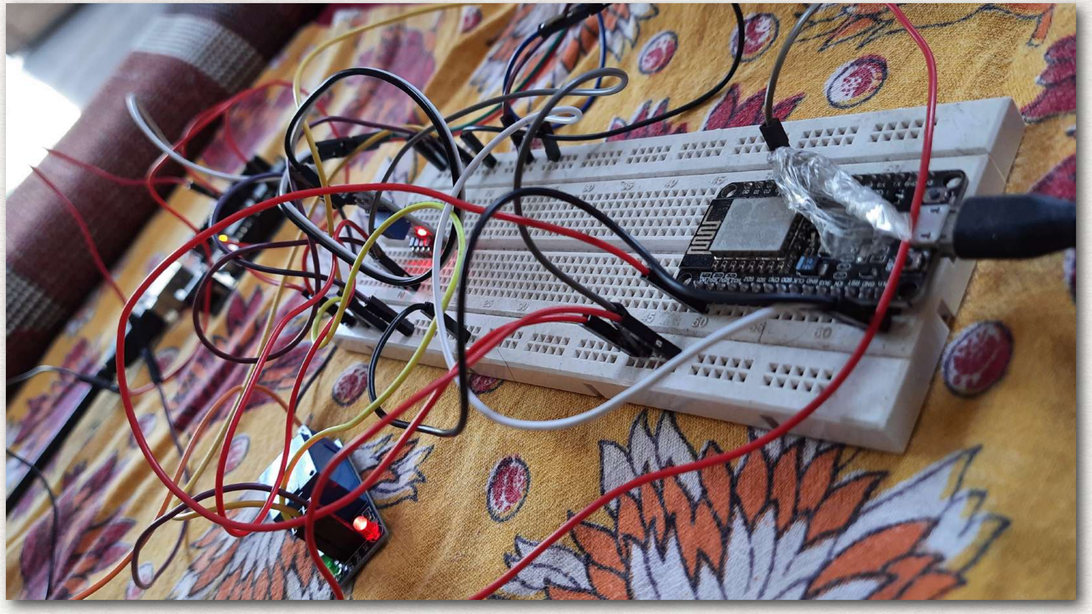




FLOW DIAGRAM

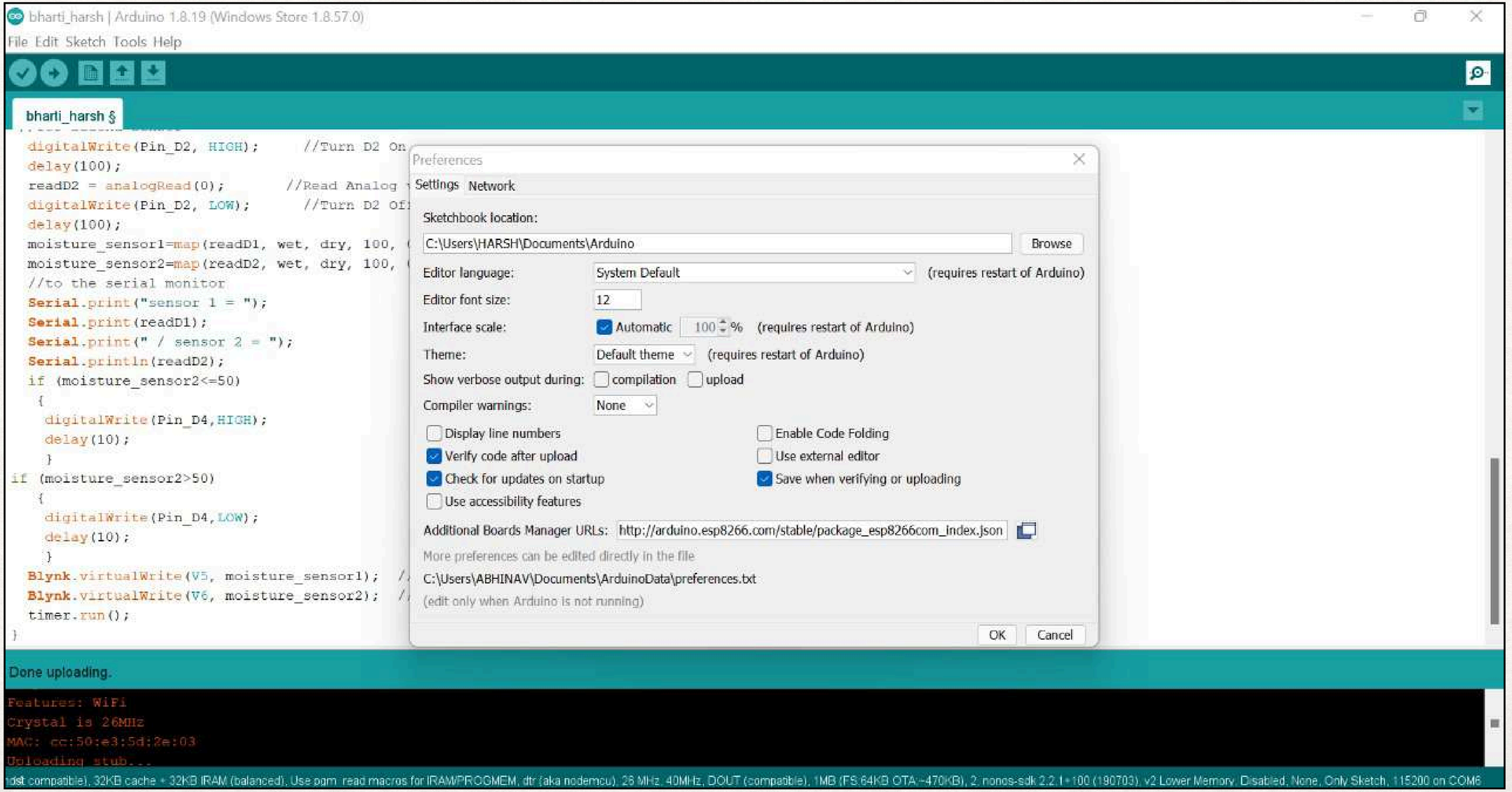
Flow Diagram:





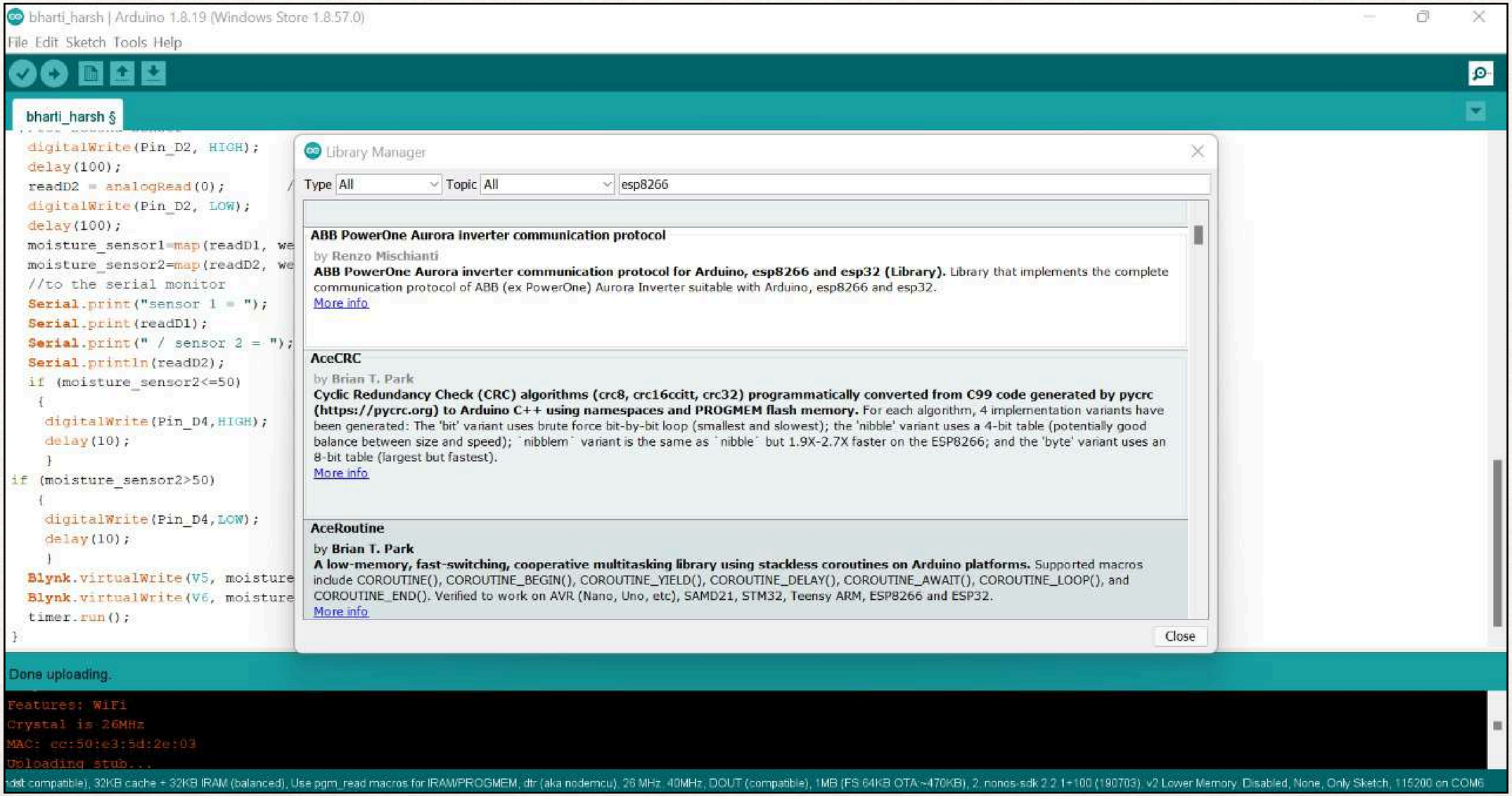
Arduino IDE Software

PREFERENCE PATH SET UP FOR BOARD MANAGER



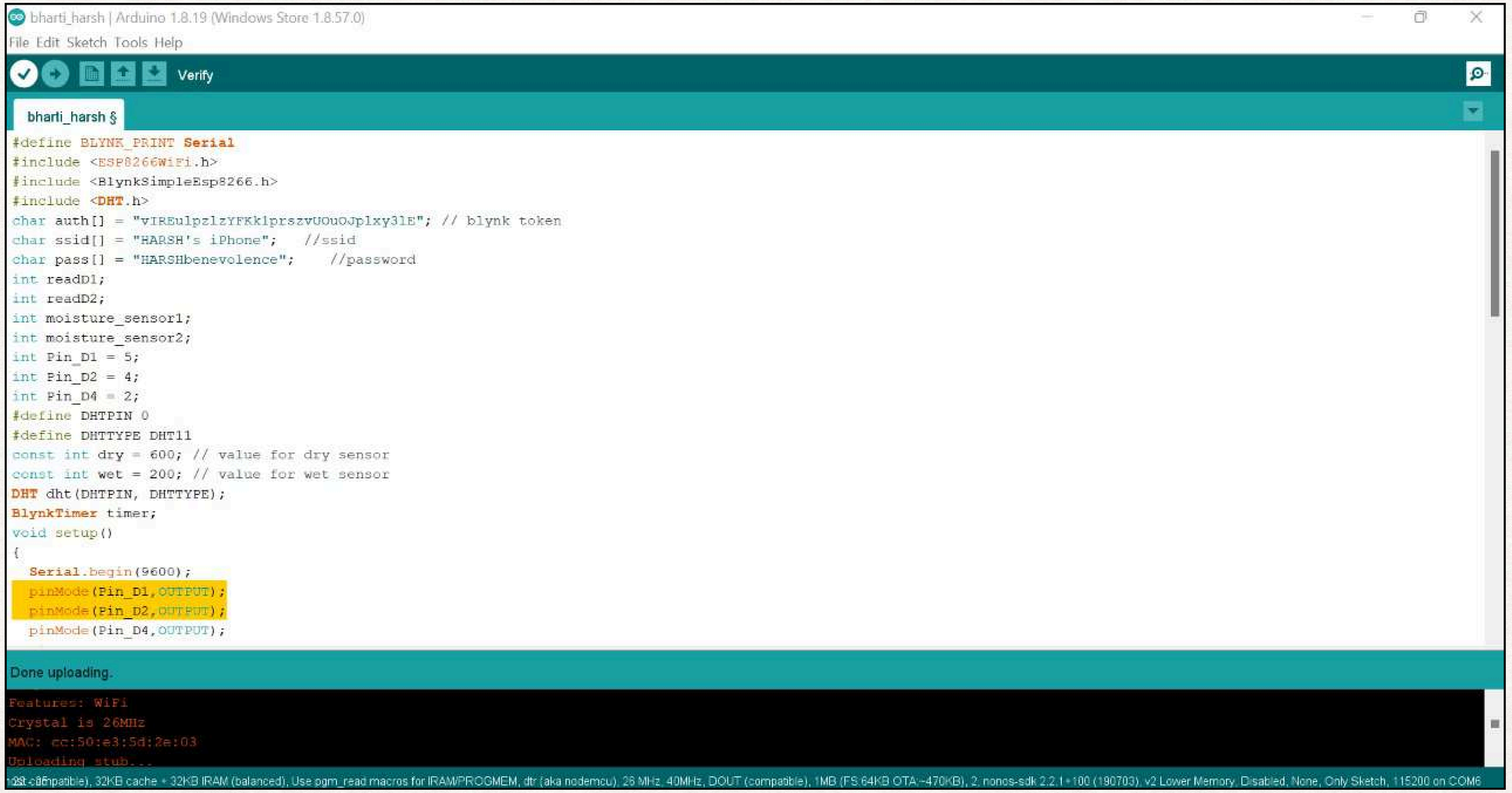
Arduino IDE Software

LIBRARY MANAGER SET UP FOR NODE-MCU



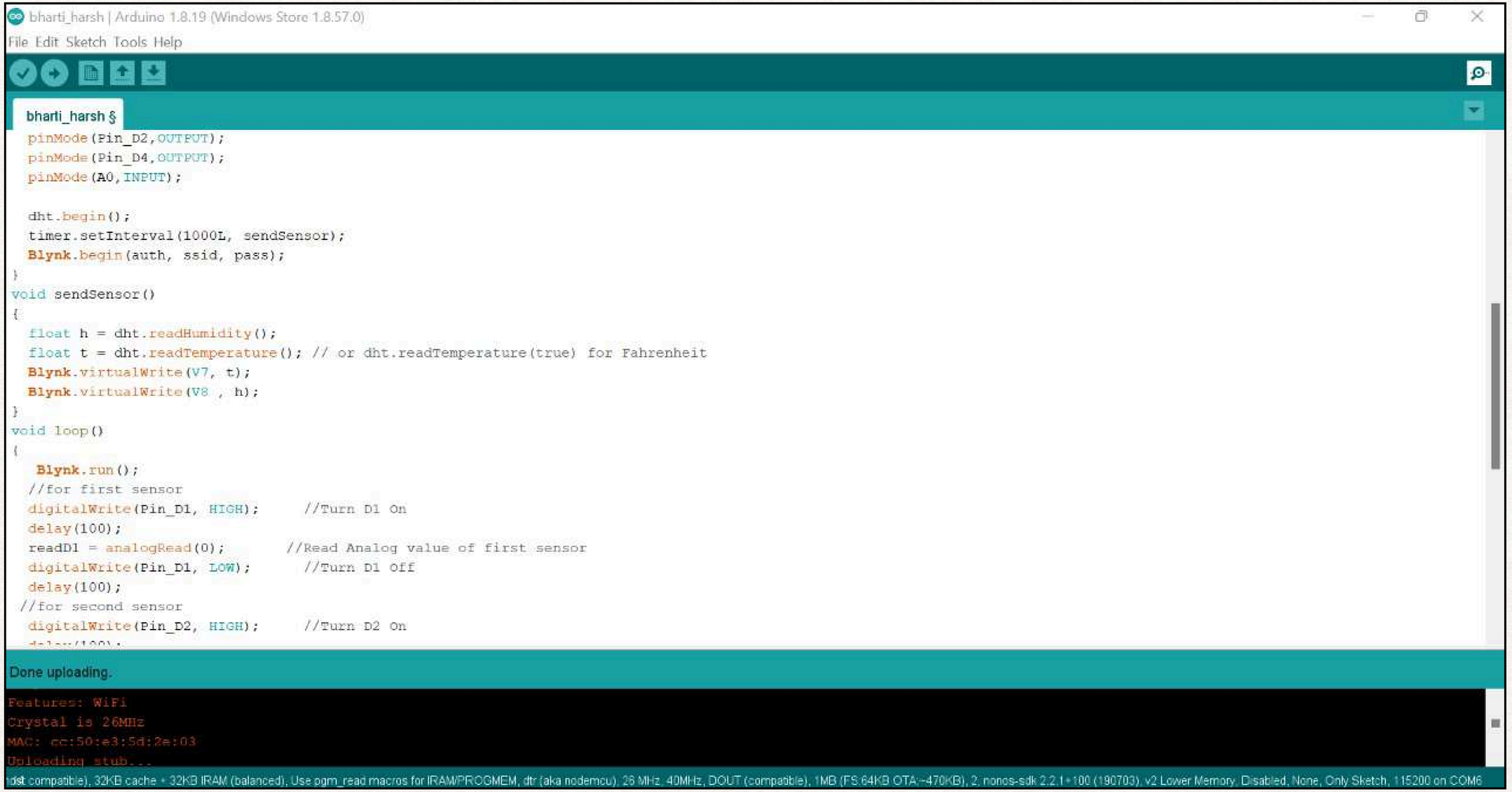
Arduino IDE Software

CODE FOR NODE-MCU



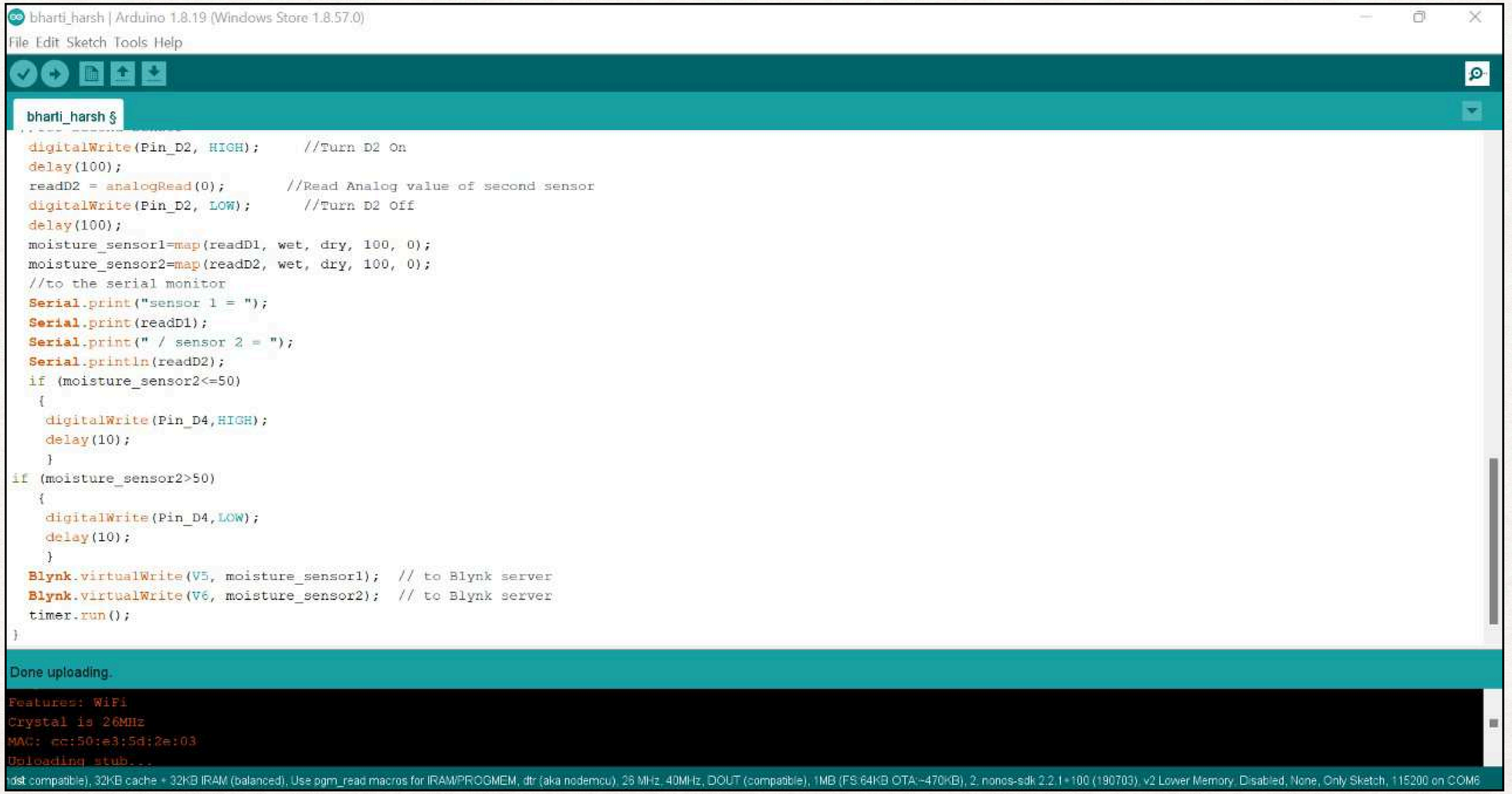
Arduino IDE Software

CODE FOR V_IN & V_OUT



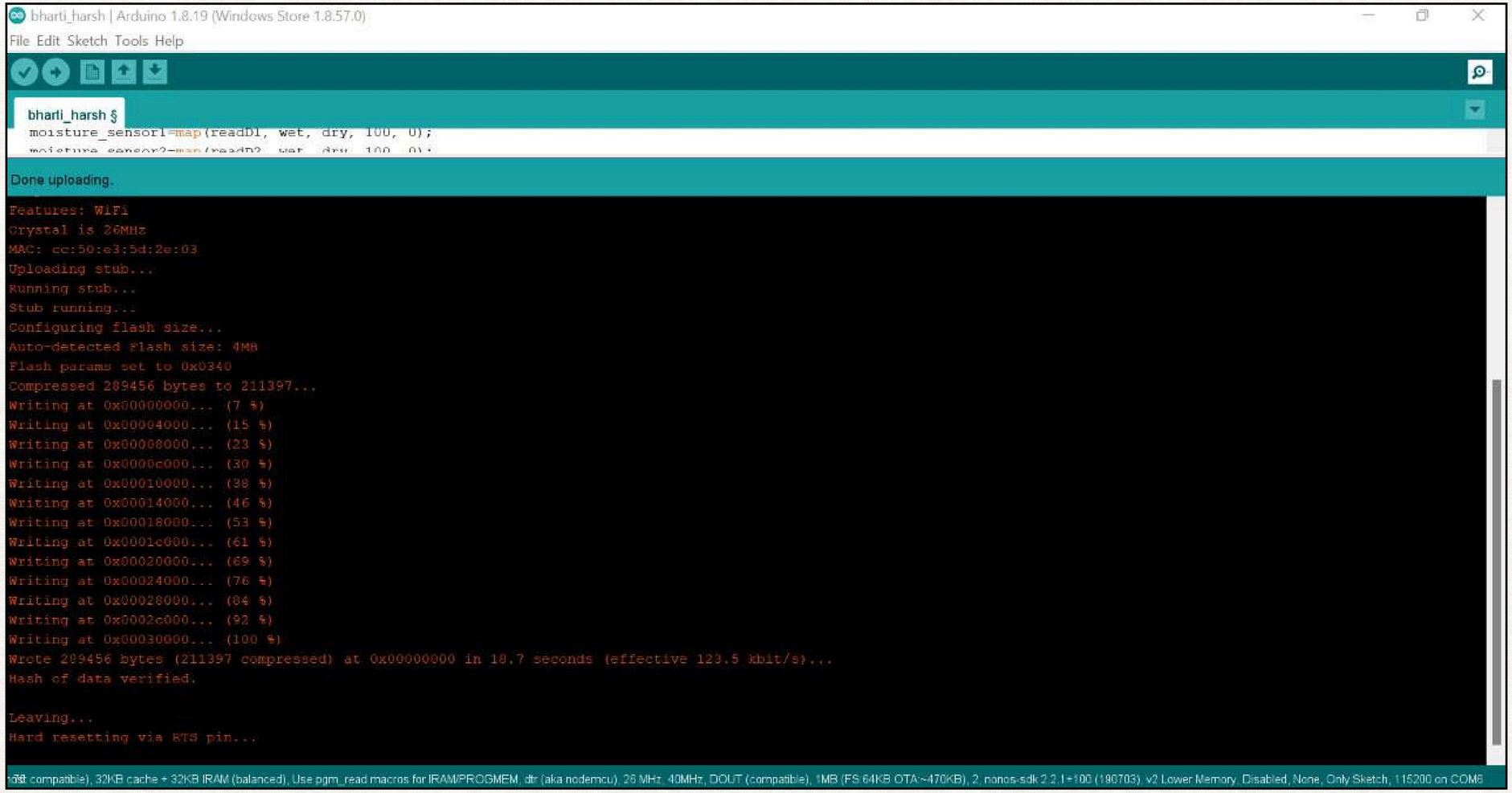
Arduino IDE Software

CODE FOR DHT SENSOR AND MOTOR DRIVER



Arduino IDE Software

COMPILING AND UPLOADING THE CODE IN ESP8266

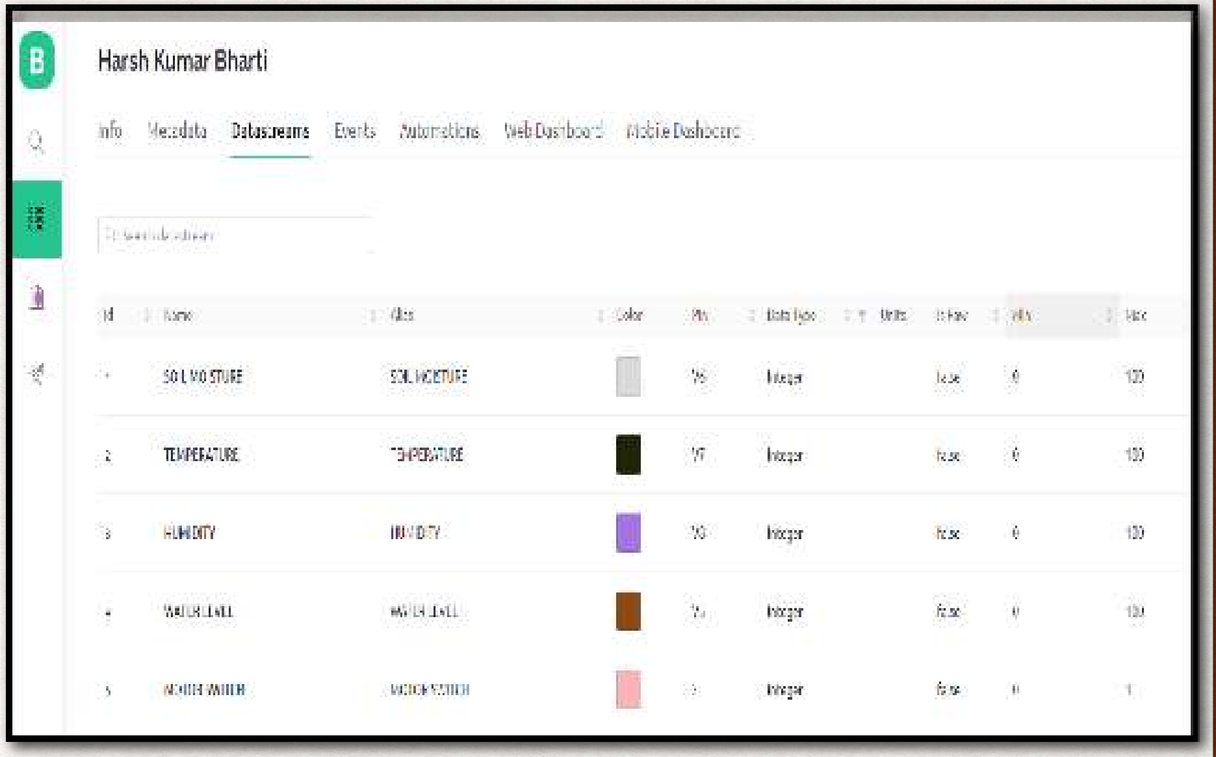


BLYNK ANDROID APP

- Blynk allows to Visualize projects like no other app. Control over one NODE MCU board at a time over Bluetooth, WIFI, internet.
- Create the Visual interfaces for LED's, switches, charts, analog instruments, counters.

BLYNK ANDROID APP

TOKEN NUMBER AND TEMPLATE ID



OBSERVATION

- During the experiment, it was observed that the relay was not working properly due to some intermediate Hardware issue.

- Also it was found that sometimes the DHT 11 was unable to read the temperature and humidity condition due to its internal problem, so it required to take the data after some periodic interval, so it works well with situation.

CONCLUSIONS

- So through the Project, I learnt about the microcontroller NODE- MCU (ESP8266) and also how to interface various sensor used to those microcontroller.
- I also understood how to setup the channel and how to connect the same with NodeMCU to send the data of different parameters at every predefined time periodically.

THANK-YOU