Session: 2

NodeMCU Programming

Topics covered in this session:

1. Prerequisites
2. Resources
3. Arduino IDE Installation
4. Introduction to NodeMCU hardware and Arduino IDE - Program Structure and how LEDs work?
5. Blink Code.
6. DIY using Simulation!!!

1.1 Prerequisites

- Basic Programming knowledge. (C, C++, etc)
- Understanding of Electronics. (Basic Electronics)

2 Resources Needed:

- Integrated Development Environment installed. (Arduino IDE)
- 1 NodeMCU ESP8266 WiFi microcontroller
- 1 Breadboard, 1 LED & Resistor for LED, Few jumper wires
- 1 Micro-USB cable
- A Laptop

Arduino IDE Installation

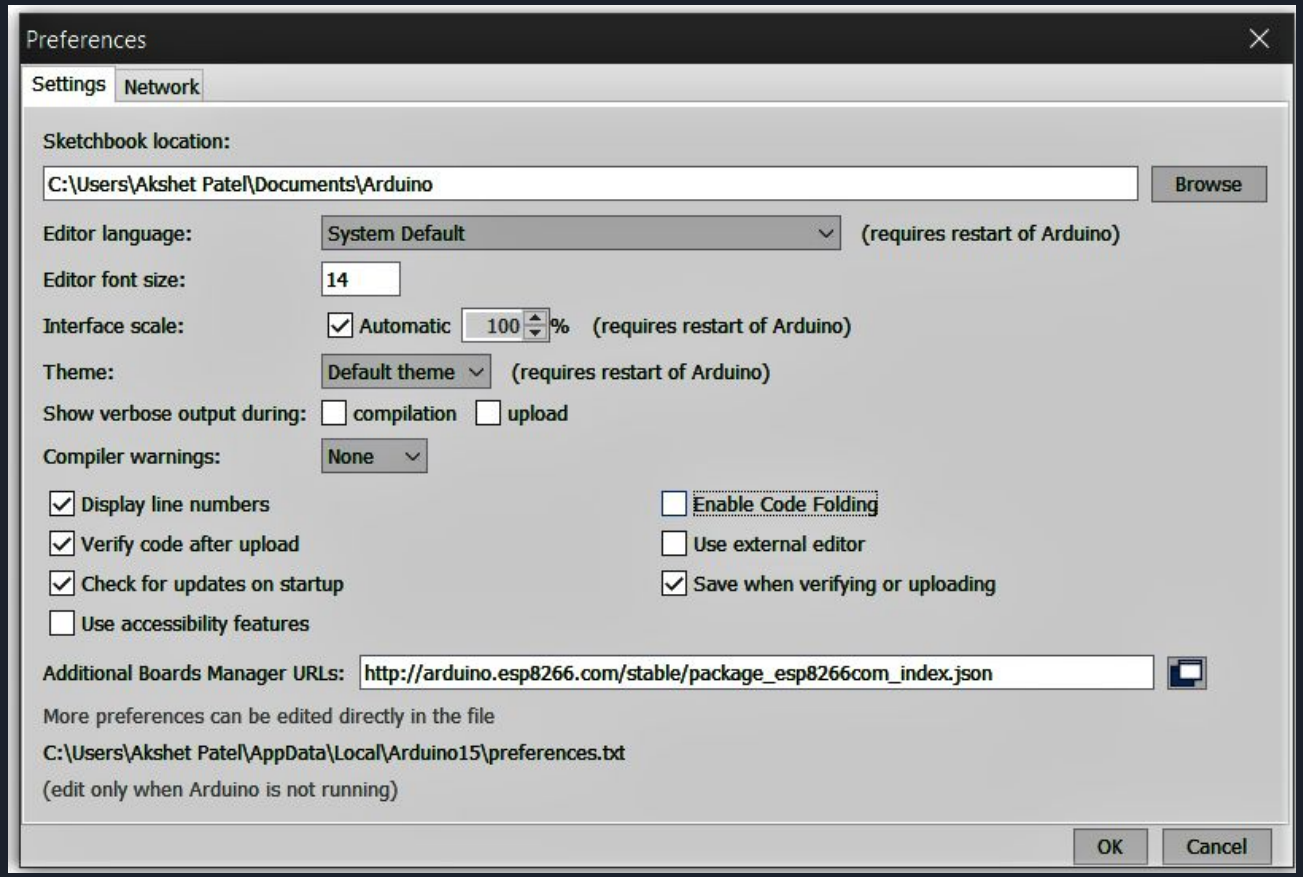
1. Install the Arduino IDE from https://www.arduino.cc/en/Main/Software
Install the IDE and the drivers that come with it.

MAC: Install also these drivers
https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

2. Open Arduino IDE and add the board manager link to the preferences.

Open “Preferences” menu in File -> Preferences
Check the boxes in the preferences according to the picture in the next slide for a better development interface.

Also, add the link
http://arduino.esp8266.com/stable/package_esp8266com_index.json to “Additional Boards Manager URLs” and save settings by pressing OK.


Preferences
Settings
Network
Sketchbook location:
C:\Users\Akshet Patel\Documents\Arduino
Browse
Editor language:
System Default
(requires restart of Arduino)
Editor font size:
14
Interface scale:
Automatic
100
%
(requires restart of Arduino)
Theme:
Default theme
(requires restart of Arduino)
Show verbose output during:
compilation
upload
Compiler warnings:
None
Display line numbers
Enable Code Folding
Verify code after upload
Use external editor
Check for updates on startup
Save when verifying or uploading
Use accessibility features
Additional Boards Manager URLs:
http://arduino.esp8266.com/stable/package_esp8266com_index.json
More preferences can be edited directly in the file
C:\Users\Akshet Patel\AppData\Local\Arduino15\preferences.txt
(edit only when Arduino is not running)
OK
Cancel

3. Install the new board manager for ESP8266 chip

In the Arduino IDE Go to Tools -> Board (...) -> Boards manager...

Search for “ESP8266”, click the suggested result and press install.

4. Confirm the installation and choose the NodeMCU board for the current board

Go to Tools -> Board (...) and select “NodeMCU 1.0 (ESP 12-E module)” from the list.

DONE WITH THE CONFIGURATION!

Programming the NodeMCU Using Arduino IDE:

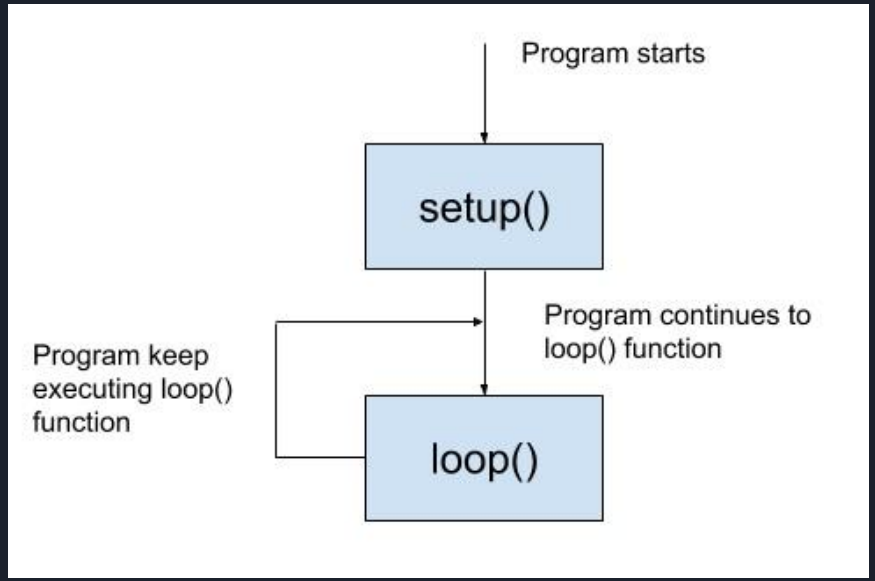
- Arduino IDE - Text editing program
- Sketch (Code File) > High Level Language > Compile > Machine Language
- IDE - Translates and Compiles the code - Understand by NodeMCU
- Mistakes/ Errors?
- The serial monitor - interacting - using the computer - real-time monitoring and analysing.

Introduction to hardware and Arduino IDE - Program Structure & How LEDs work?

- Each arduino program has two mandatory functions: setup() and loop().
- The code inside the setup() function is executed once .
- The loop() function is run constantly while the microcontroller is powered.

Basic operation of an arduino program:

A function is a group of statements that together perform a task.



Commands in setup() function:

- **Declaring pins:**
  Variables
  const int LED = 4;
  // NOTE! You can use either 4 or D2 value for the same pin.

- **Defining the type of the pin, or the pin mode:**
  pinMode(pin, mode); // e.g. pinMode(LED, OUTPUT);
- **Modes:**
  INPUT // e.g. buttons, switches, keyboards, etc.
  OUTPUT // e.g. LEDs, screens, etc.

Commands in loop() function:

- Digital pins:

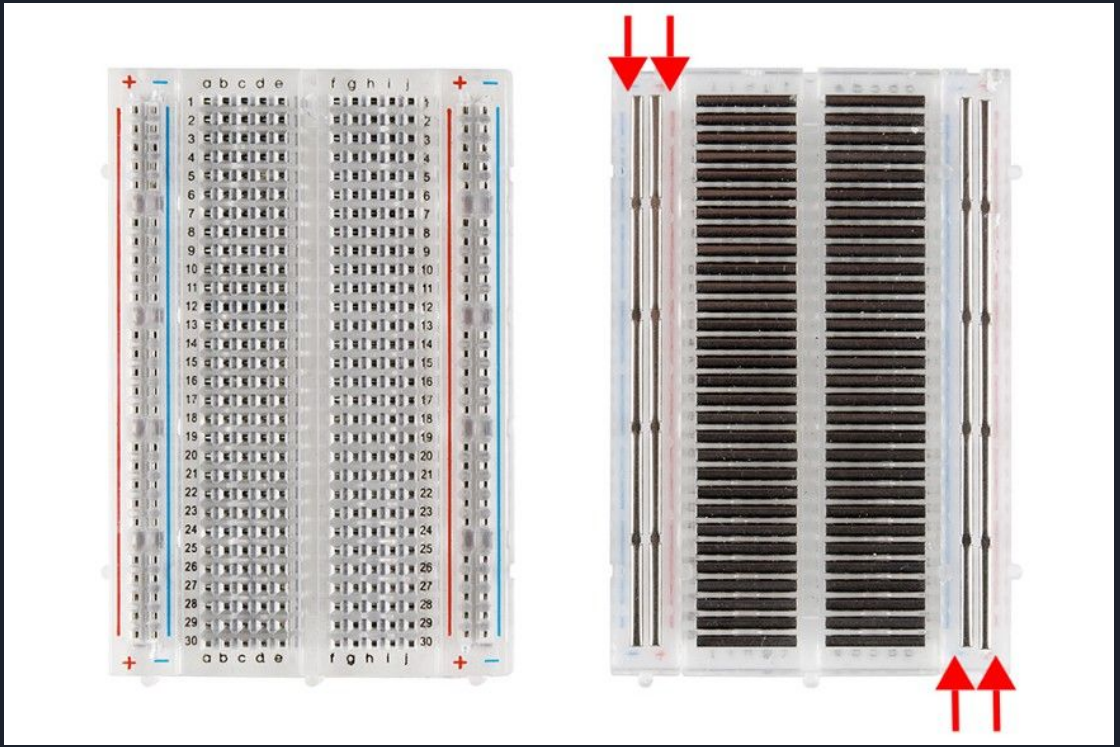
  digitalWrite(pin, value); // values are used to activate the pin.
  digitalRead(pin);

- Values:

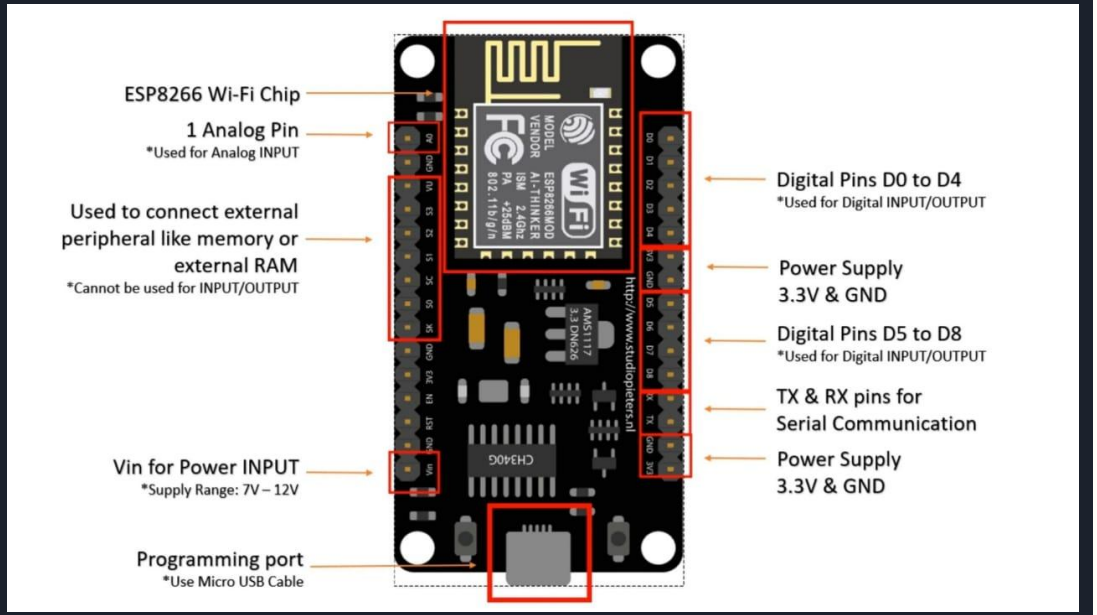
  value - LOW // Off

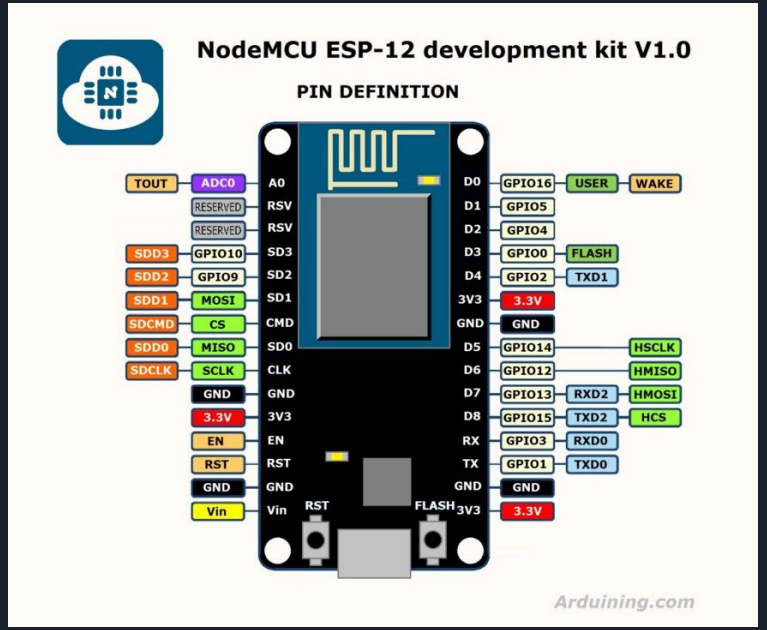
  value - HIGH // On

Breadboard:

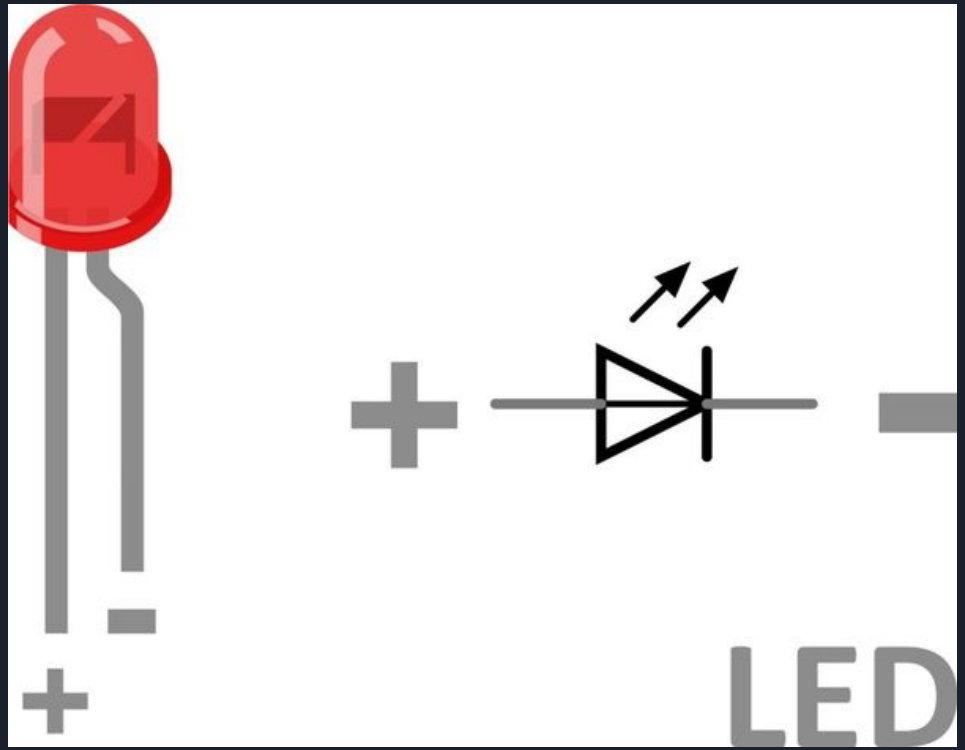

a b c d e
f g h i j
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

NodeMCU Hardware:





LED:



TinkerCAD

- Free online collection of software tools.
- Design basic circuits and also simulate them including Arduino.
- Easy-to-use app for 3D design, electronics, and coding.
- www.tinkercad.com