



# Andhra Pradesh State Skill Development Corporation



## INTERNET OF THINGS (IoT)

### INTRODUCTION OF NODE MCU

## NodeMCU

### INTRODUCTION:

The Internet of Things (IoT) has been a trending field in the world of technology. It has changed the way we work. Physical objects and the digital world are connected now more than ever. Keeping this in mind, Espressif Systems (A Shanghai-based Semiconductor Company) has released an adorable, bite-sized WiFi enabled microcontroller – ESP8266, it can monitor and control things from anywhere in the world – perfect for just about any IoT project.

### WHAT IS NODEMCU

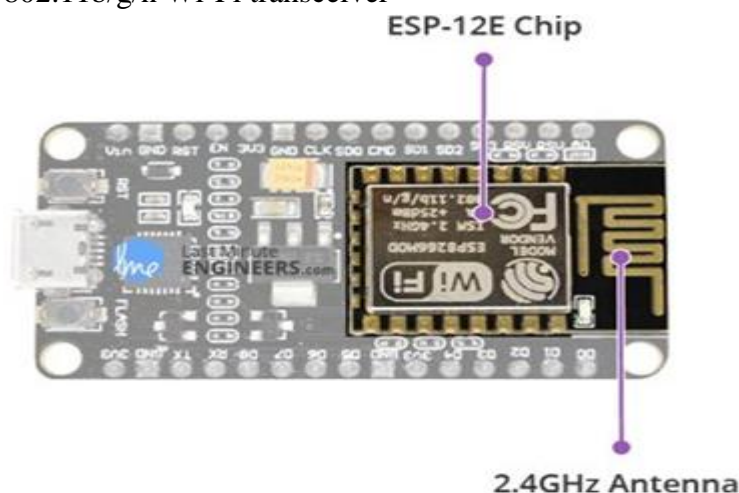
- nodeMCU is a low cost, open source electronics platform.
- It is a Combination of Firmware & Hardware.
- Node: Firmware
- MCU: Micro-controller Unit
- Firmware uses LUA Scripting Language.
- It is Developed by ESPRESSIF Systems.
- nodeMCU 0.9 is ESP 12 Board(Blue)
- nodeMCU 1.0 is ESP 12E Board(Black)

### ESP-12E Module

The development board equips the ESP-12E module containing ESP8266 chip having Tensilica Xtensa® 32-bit LX106 RISC microprocessor which operates at 80 to 160 MHz adjustable clock frequency and supports RTOS.

### ESP-12E Chip

- Tensilica Xtensa® 32-bit LX106
- 80 to 160 MHz Clock Freq.
- 128kB internal RAM
- 4MB external flash
- 802.11b/g/n Wi-Fi transceiver



### Power Requirement

As the operating voltage range of ESP8266 is 3V to 3.6V, the board comes with a LDO

voltage regulator to keep the voltage steady at 3.3V.

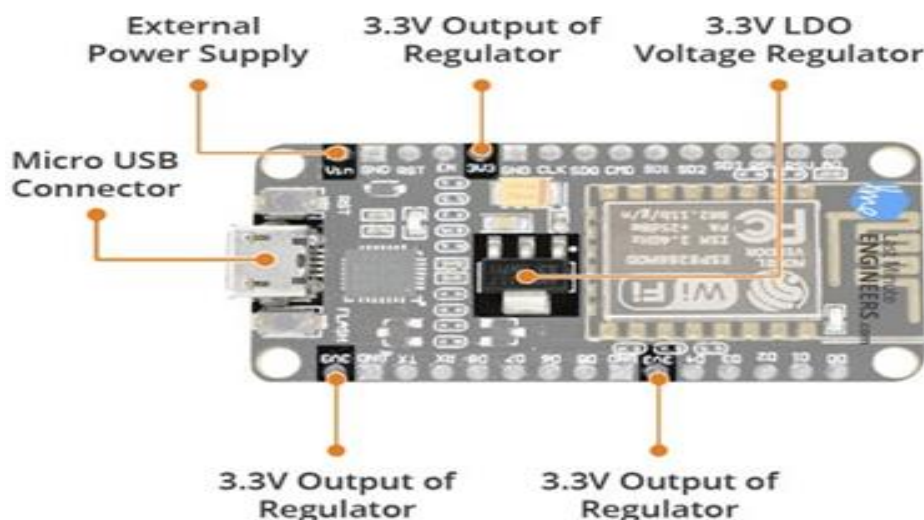
Power to the ESP8266 NodeMCU is supplied via the on-board MicroB USB connector.

## Power Requirement

- Operating Voltage: 2.5V to 3.6V
- On-board 3.3V 600mA regulator
- 80mA Operating Current
- 20  $\mu$ A during Sleep Mode

## Warning:

The ESP8266 requires a 3.3V power supply and 3.3V logic levels for communication. The GPIO pins are not 5V-tolerant! If you want to interface the board with 5V (or higher) components, you'll need to do some level shifting.



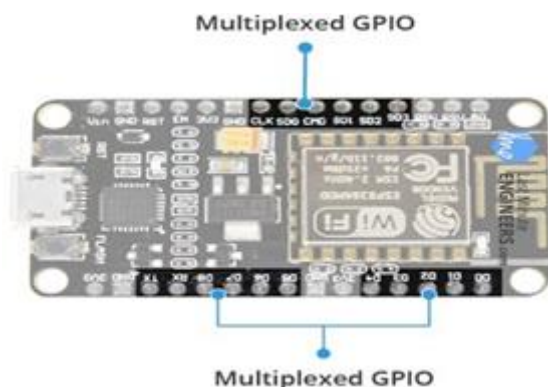
## Peripherals and I/O

The ESP8266 NodeMCU has a total 17 GPIO pins broken out to the pin headers on both sides of the development board. These pins can be assigned to all sorts of peripheral duties, including:

- ADC channel – A 10-bit ADC channel.
- UART interface – UART interface is used to load code serially.
- PWM outputs – PWM pins for dimming LEDs or controlling motors.
- SPI, I2C & I2S interface – SPI and I2C interface to hook up all sorts of sensors and peripherals.
- I2S interface – I2S interface if you want to add sound to your project.

## Multiplexed I/Os

- 1 ADC channels
- 2 UART interfaces
- 3 PWM outputs
- 4 SPI, I2C & I2S interface



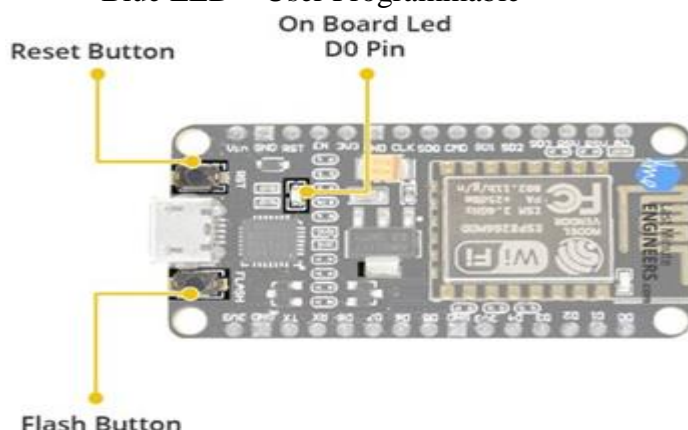
## On-board Switches & LED Indicator

The ESP8266 NodeMCU features two buttons. One marked as RST located on the top left corner is the Reset button, used of course to reset the ESP8266 chip. The other FLASH button on the bottom left corner is the download button used while upgrading firmware.

The board also has a LED indicator which is user programmable and is connected to the D0 pin of the board.

### Switches & Indicators

- RST – Reset the ESP8266 chip
- FLASH – Download new programs
- Blue LED – User Programmable



## Serial Communication

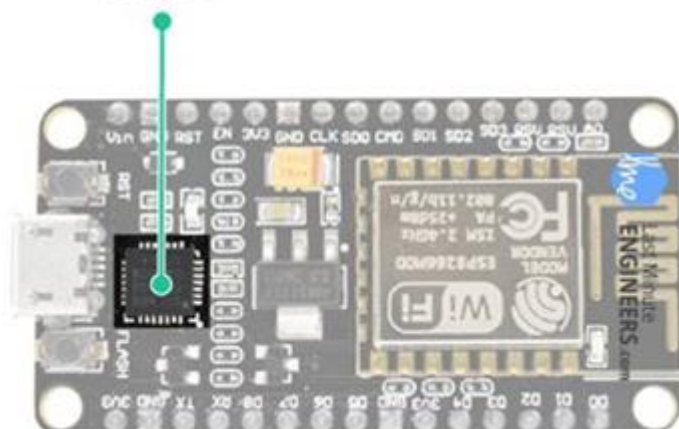
The board includes CP2102 USB-to-UART Bridge Controller from [Silicon Labs](https://www.siliconlabs.com/), which converts USB signal to serial and allows your computer to program and communicate with the ESP8266 chip.

### Serial Communication

- CP2102 USB-to-UART converter
- 4.5 Mbps communication speed
- Flow Control support



## USB To TTL Converter CP2102



## WHY NODEMCU ?

- Arduino like Hardware IO.
- Integrated Support for Wi-Fi SoC.
- Low Energy Consumption.
- Simple But Smart Device.
- Best board in now a days in for prototype any IOT product.

### TECHNICAL SPECIFICATION:-

#### ARCHITECTURE:-

- Tensilica Xtensa 32-bit
- 80 to 160 MHz Clock Freq.
- 128kB Internal RAM
- 4MB External flash
- 802.11 b/g/n Wi-Fi Transceiver.

#### POWER PINS

- 2.5V to 3.6V, 80mA
- On-board 3.3V 600mA

#### PINS

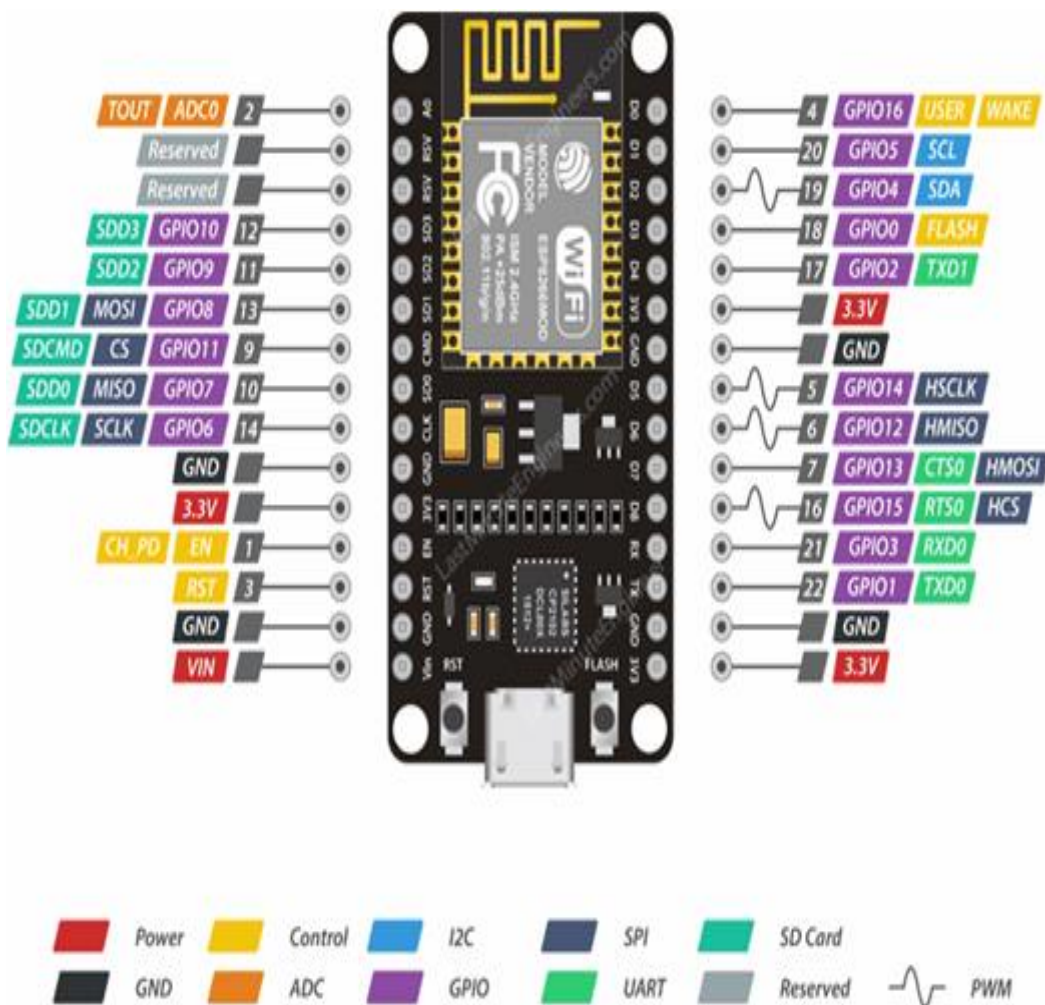
- Digital Pins D0 to D10
- Analog Pin A0

#### GPIO

- 17 GPIO pins

## ESP8266 NodeMCU Pinout

The ESP8266 NodeMCU has a total of 30 pins that interface it to the outside world. The connections are as follows:

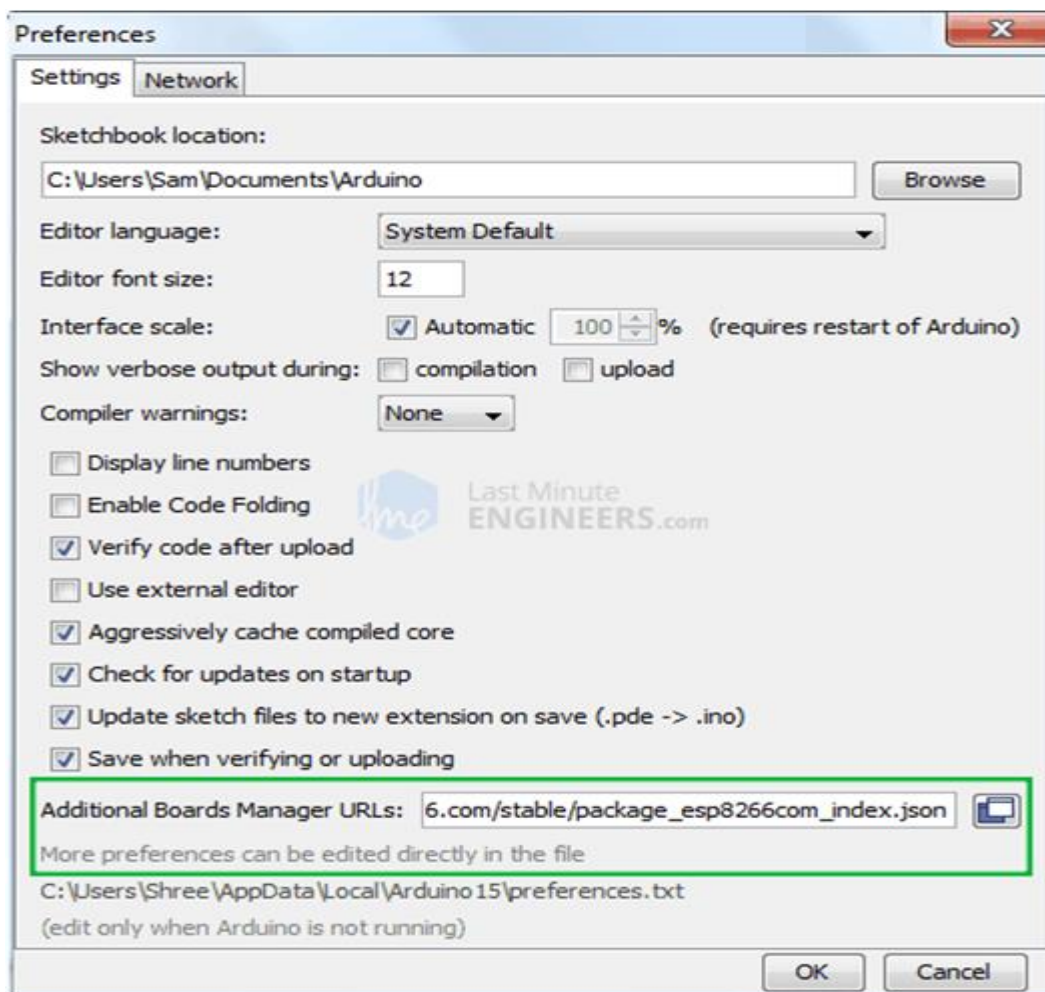


## Installing the ESP8266 Core on Windows OS

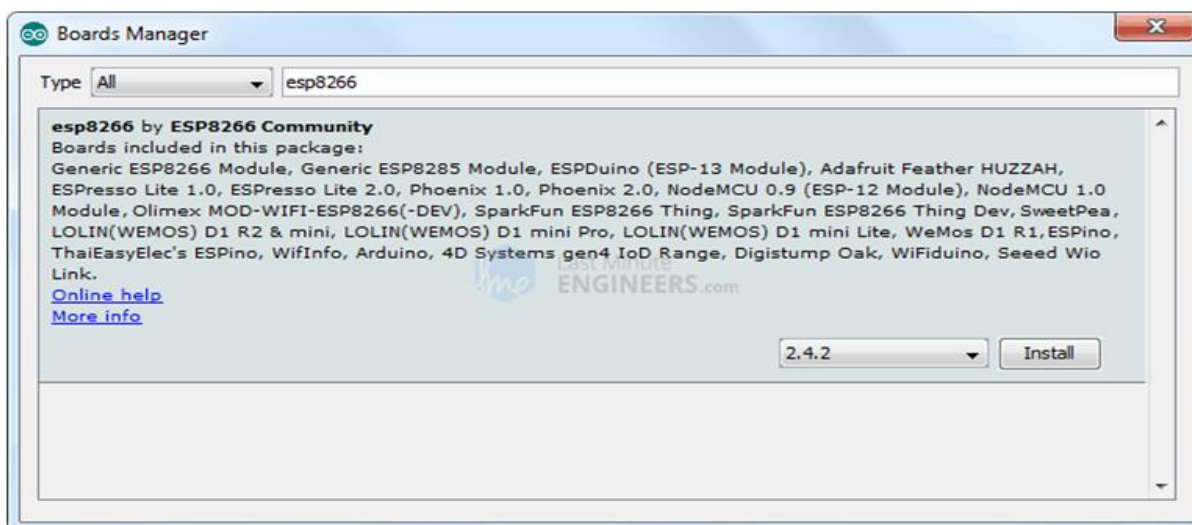
To begin, we'll need to update the board manager with a custom URL. Open up Arduino IDE and go to File > Preferences. Then, copy below URL into the Additional Board Manager URLs text box situated on the bottom of the window

[http://arduino.esp8266.com/stable/package\\_esp8266com\\_index.json](http://arduino.esp8266.com/stable/package_esp8266com_index.json)

## Package installing process:



Hit OK. Then navigate to the Board Manager by going to Tools > Boards > Boards Manager. There should be a couple new entries in addition to the standard Arduino boards. Filter your search by typing esp8266. Click on that entry and select Install.



Once you are done, try the example sketch

```
void setup()
```

```
{
pinMode(D0, OUTPUT);
}
void loop()
{
digitalWrite(D0, HIGH);
delay(500);
digitalWrite(D0, LOW);
delay(500);
}
```

Once the code is uploaded, the LED will start blinking. You may need to tap the RST button to get your ESP8266 to begin running the sketch.

