

TECH CLUBS NEW TECHNOLOGIES

Artificial
Intelligence



IOT



Drones



Robotics



(IOT) INTERNET OF THINGS

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TECH CLUBS

INTERNET OF THINGS



EXPLORERS CLUB

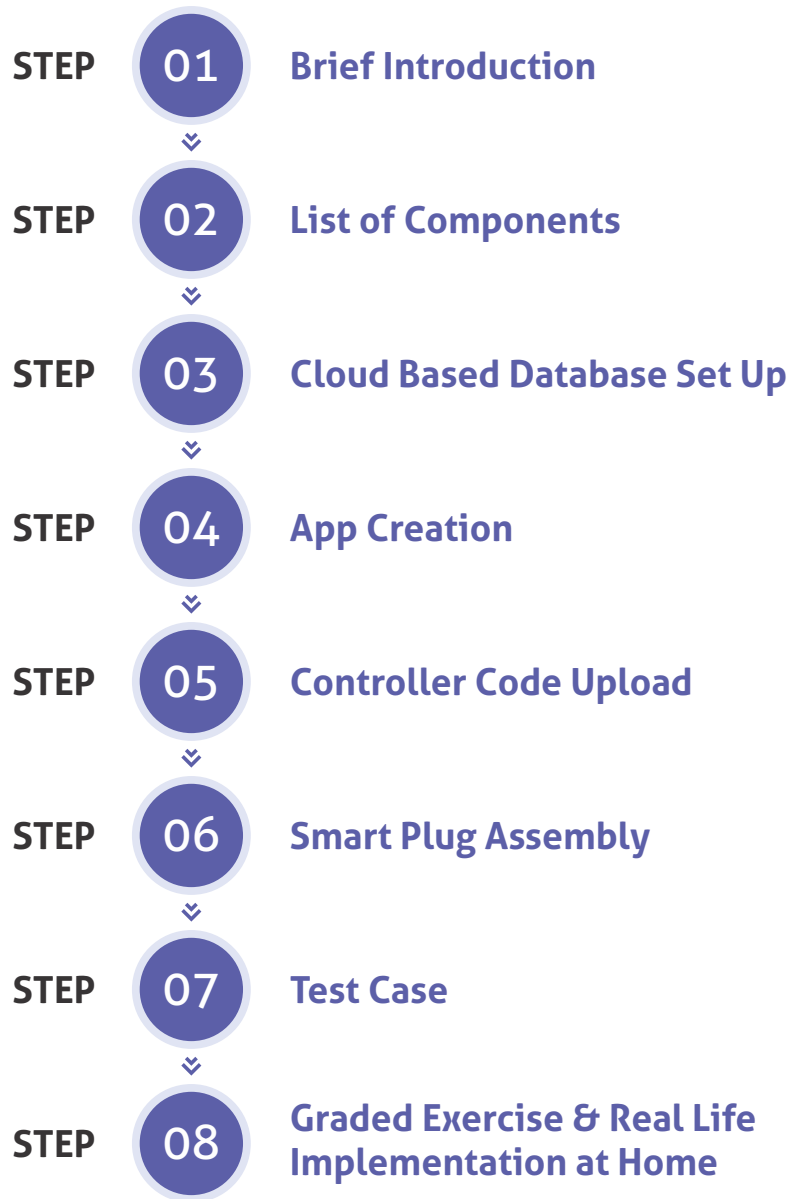
INTERNET OF THINGS



SMART PLUG
CLOUD BASED WIRELESS CONTROL

SMART PLUG

Cloud Based Control



1. SMART PLUG

Cloud Based Control

Smart Plug is an Internet of Things based DIY Kit designed for students and DIY enthusiasts to make any device smart.

Smart Plug communicates with your smartphone over the Internet. It allows you to remotely power on/off any household device which is plugged into Smart Plug.

Smart Plug can be controlled with a mobile app. This manual contains step-by-step instructions to build an Android App to allow communication with Smart Plug.



Brief working

When the user presses a button on the app, data is sent by the app and is stored on the cloud. Value 1 is sent if ON button is pressed and value 0 is sent if OFF button is pressed.



NodeMCU on the kit constantly reads data from the cloud. If it reads value 1 from the cloud, it switches ON the relay which turns the appliance ON. If the NodeMCU reads value 0 from the cloud, it switches OFF the relay which turns OFF the appliance.

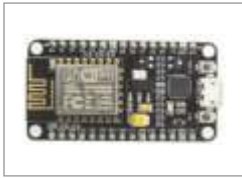
Special points

Smart plug can handle upto 10 amperes of current only.

Smart plug does not require any batteries

2. LIST OF COMPONENTS

A snap shot of all the components that go into making a smart plug



Node MCU X1



Single Relay
Board X1



AC DC
Convertor



PCB X1



Socket X1



Switch X1



Electric Plug X1



Micro USB Cable
X1



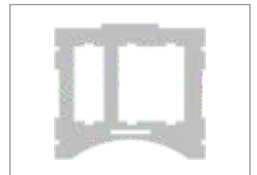
Left Side Plate
X1



Right Side Plate
X1



Back Plate X1



Front Plate X1



Top Plate X1



Partition X1



Bottom Plate X1



F-F Jumper
Wires



Nut and Bolts
Pairs 16



Wires



Allen Key X1



Screw Driver X1

3. CLOUD BASED DATA BASE SET UP

Collect | Analyse | Act on IOT Data

STEP 1: LOG IN THINGSPEAK

Create an account

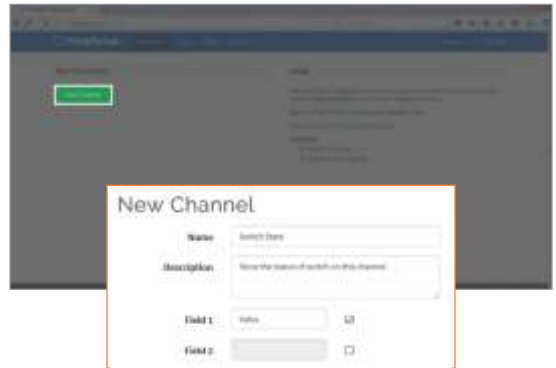
<https://www.thingspeak.com/>



STEP 2: CREATE A NEW CHANNEL

To store and retrieve data

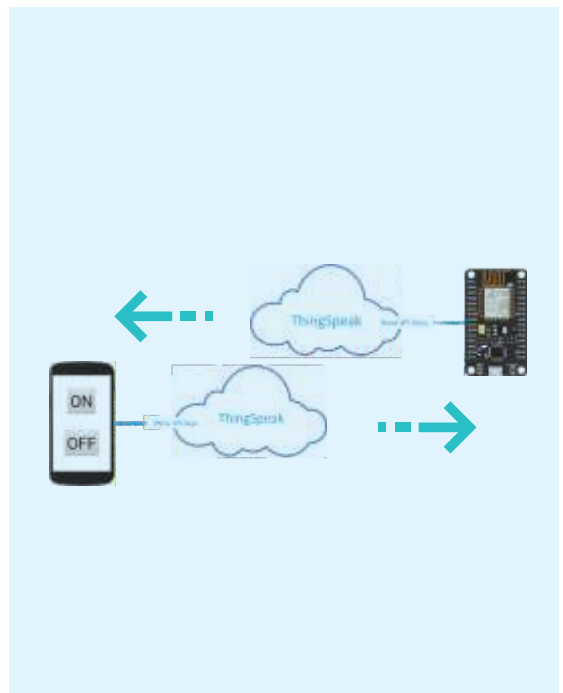
Save the channel after filling in the details.
(Name, Channel 1)



STEP 3: ACCESS API KEYS

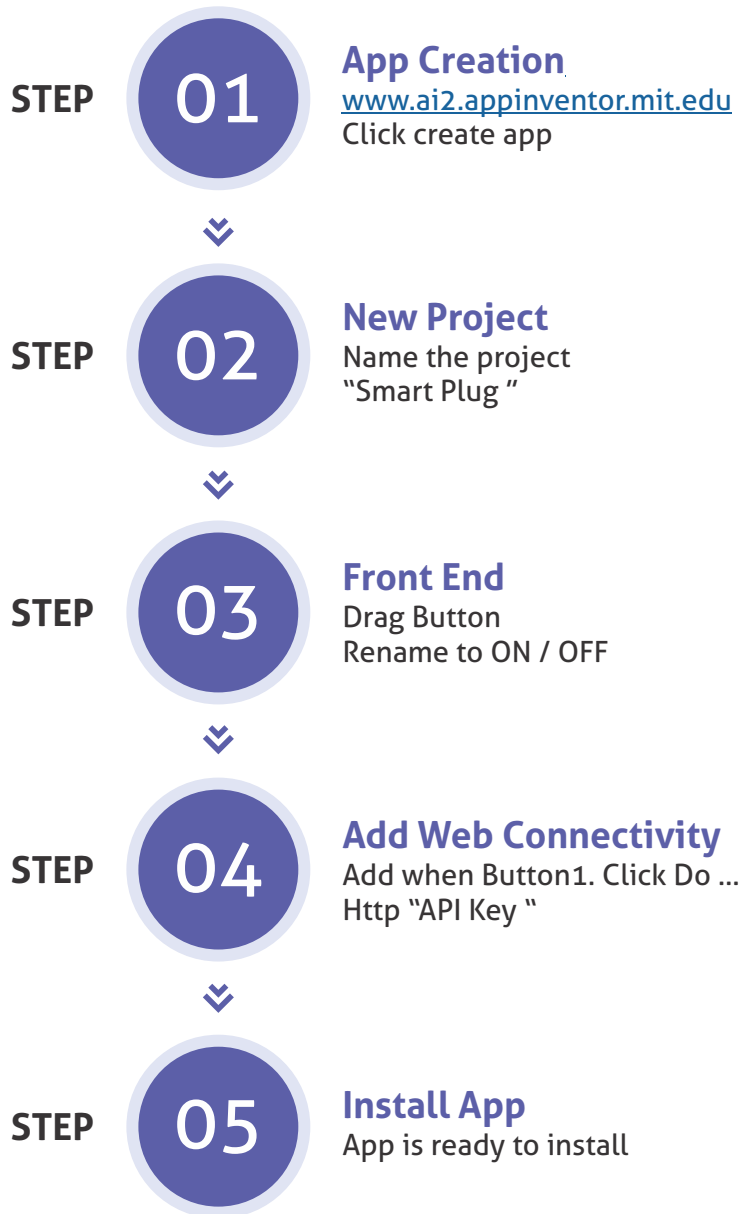
API key allows data to be written

API read key allows data to be read



4. APP CREATION

Flow Chart



4. APP CREATION

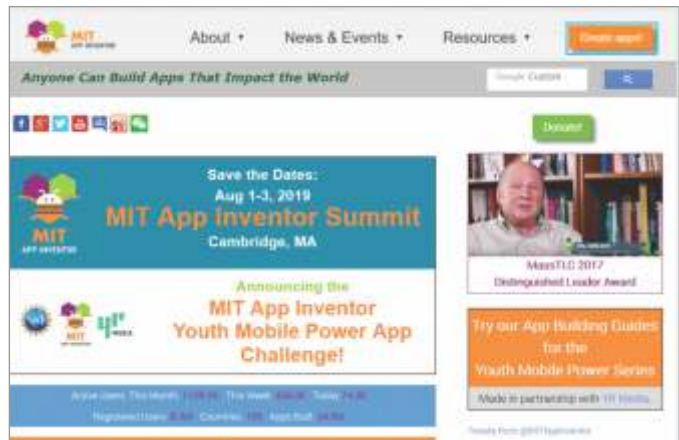
O2I Smart Plug

STEP 1: APP CREATION

Step 1.1:

Go to ai2.appinventor.mit.edu

And click "Create Apps"



Sign in

Continue to mit.edu

Email or phone

[Forgot email?](#)

To continue, Google will share your name, email address and profile picture with mit.edu.

[Create account](#)

Next

Step 1.2:

A google sign will be required to create an app. Use your GMAIL ID or create a new one.

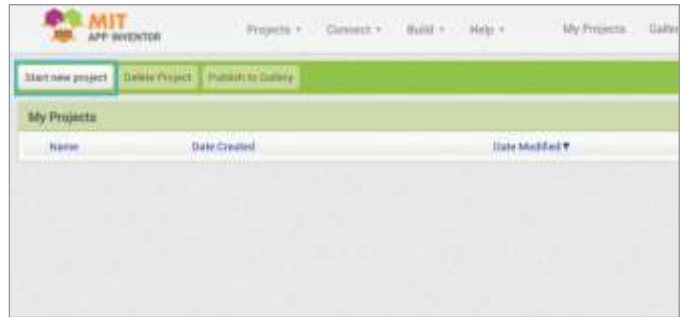
4. APP CREATION

O2I Smart Plug

STEP 2: NEW PROJECTS

Step 2.1:

Click on the "Create Project" button.



Step 2.2:

Name your project "Smart Plug"

STEP 3: FRONT END DESIGN

Step 3.1:

Drag a Button



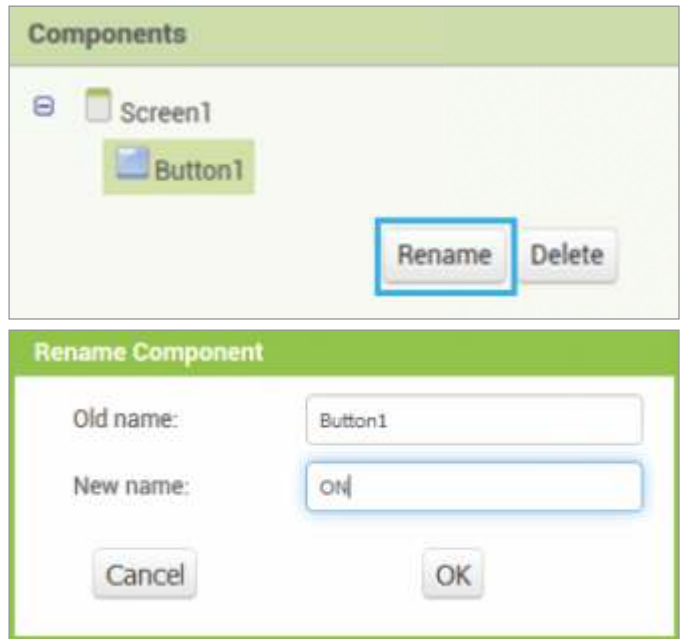
4. APP CREATION

O2I Smart Plug

STEP 3: FRONT END DESIGN

Step 3.2:

Rename it to "ON". This will change its name on the backend side of the app



Step 3.3:

Rename the name on Frontend side too.

4. APP CREATION

O2I Smart Plug

STEP 3: FRONT END DESIGN

Step 3.4:

Similarly, add another button and change its name to "OFF" on both backend and frontend side



Step 3.5:

Add web component to the screen from the "Connectivity" Palette

STEP 4: WEB CONNECTIVITY

Step 4.1:

Drag the web component from the "Connectivity" Palette



4. APP CREATION

O2I Smart Plug

STEP 4: WEB CONNECTIVITY

Step 4.2:

From the "ON" button drawer, select "when Button1. Click do" block and drag it in the workspace.



Step 4.3:

Add a "set Web1.Url" block and connect it to the "when Button1.Click do" block



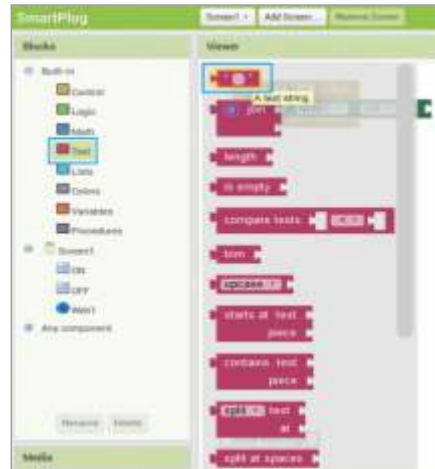
4. APP CREATION

O2I Smart Plug

STEP 4: WEB CONNECTIVITY

Step 4.4:

Add a “text string” block and connect it to “set Web1.Url” block



Step 4.5:

In the text block, write the following:

https://api.thingspeak.com/update?api_key=3MOK54S7MBTBIODA&field1=1

In place of the word “3MOK54S7MBTBIODA”, write the WRITE API KEY of your own ThingSpeak channel.



Step 4.6:

Add a “call.Web1.get” block to send the http request.

4. APP CREATION

O2I Smart Plug

STEP 4: WEB CONNECTIVITY

Step 4.7:

By clicking the "ON" button, value of 1 will be sent to Thing Speak Channel at field 1

[https://api.thingspeak.com/update?api_key=3MOK54S7MBTBIODA &field1=1](https://api.thingspeak.com/update?api_key=3MOK54S7MBTBIODA&field1=1)

Step 4.8:

By clicking the "OFF" button, value of 0 will be sent to Thing Speak Channel at field 0

https://api.thingspeak.com/update?api_key=3MOK54S7MBTBIODA&field1=0

In place of "3MOK54S7MBTBIODA", write the WRITE API KEY of your own ThingSpeak channel.



STEP 5: INSTALL THE APP

Click on the "App(provide QR code .apk)".

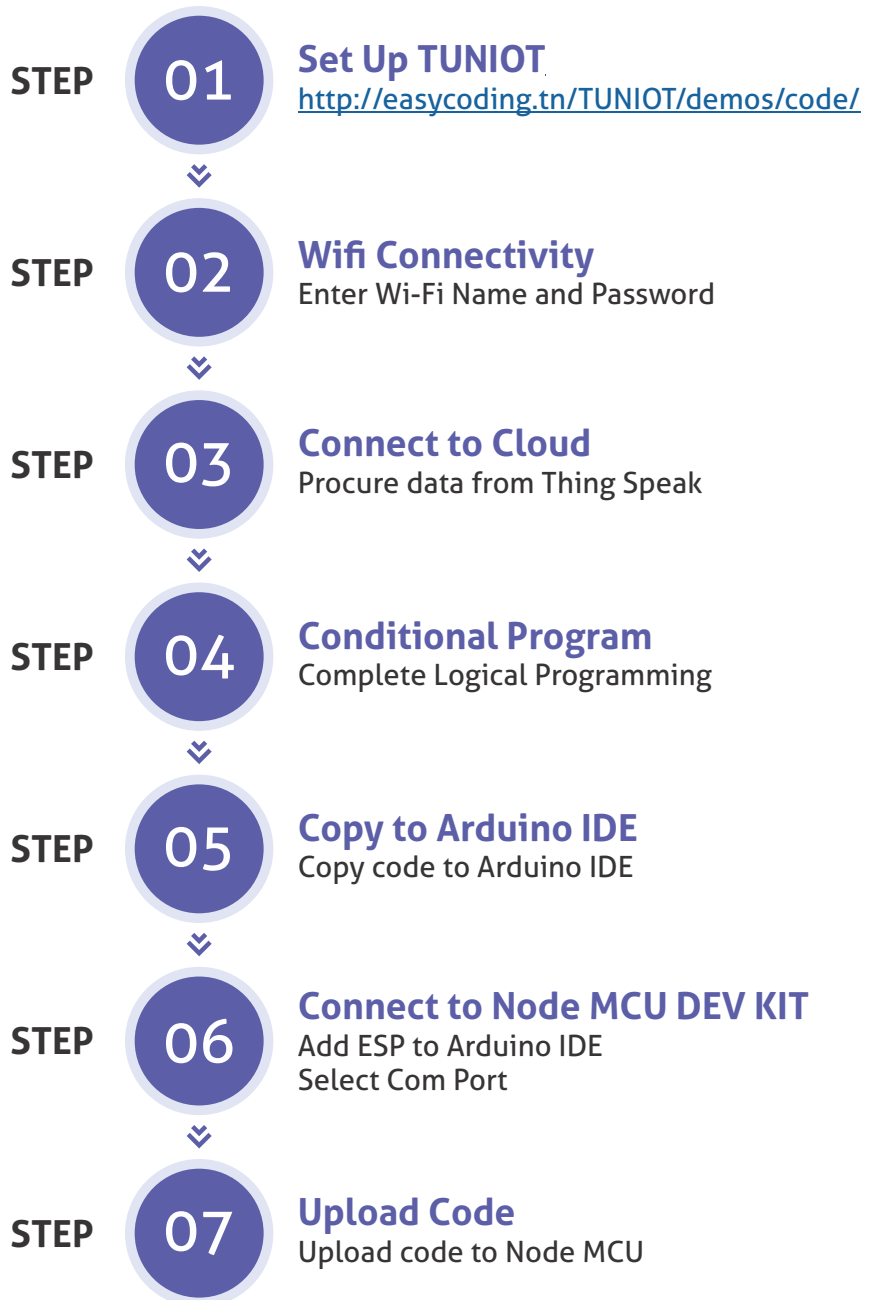
Scan the QR code from your smartphone, it will download the apk to your phone's local storage.

Install it, and app is ready to control your O2i Smart Plug



5. CODE DEVELOP

Flow Chart



5. CODE DESIGN - NODE MCU

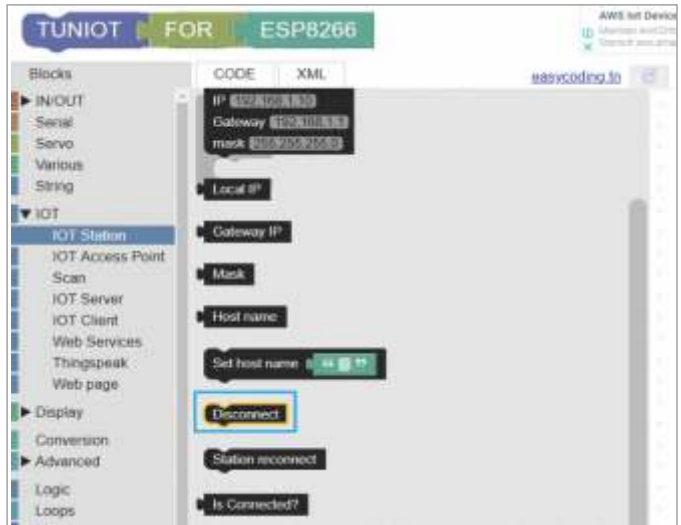
O2I Smart Plug

First we'll work on the setup block as it'll run only once and initialize the NodeMCU

STEP 1: SET UP TUNIOT

Step 1.1:

First place the "Disconnect" block in the setup block.



Step 1.2:

Give one second delay using the "Delay" block



5. CODE DESIGN - NODE MCU

02I Smart Plug

STEP 2: WIFI CONNECTIVITY

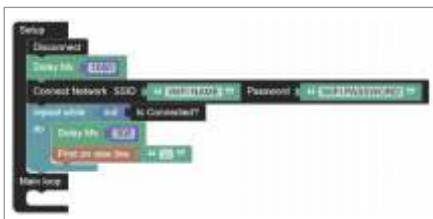
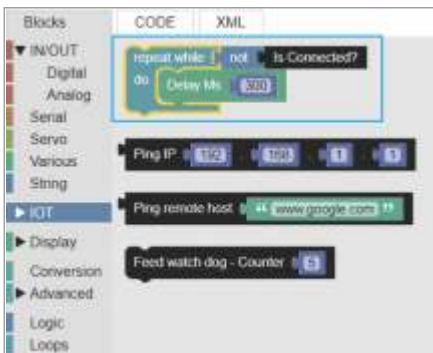
Step 2.1:

“Connect Network” block tell the NodeMCU to connect to the Wi-Fi whose details are being entered in the SSID and Password field



Step 2.2:

Now a “repeat while” block is used to wait till the Wi-Fi is connected. And for our reference a dot (.) is being printed every 300ms

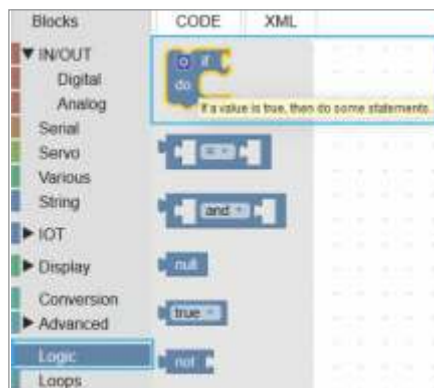
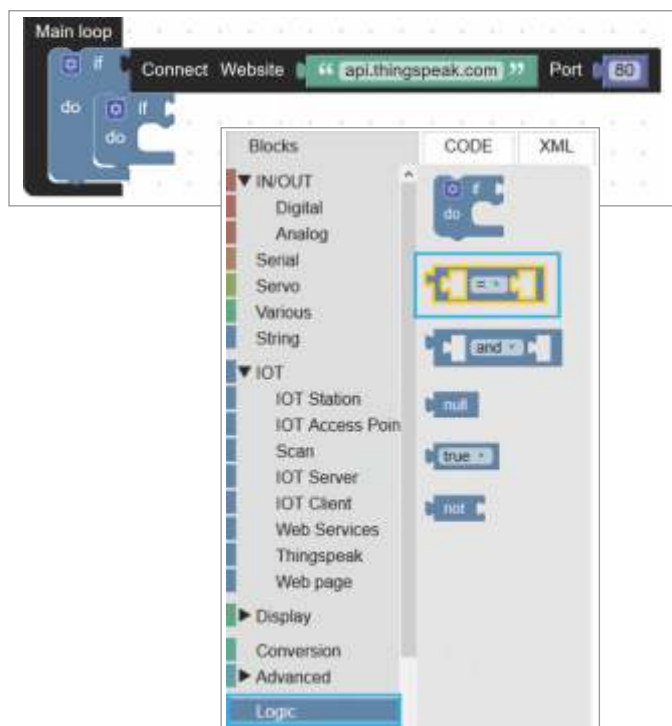


O2I Smart Plug

STEP 4: CONDITIONAL PROGRAM

Step 4.1:

Use the “if-do” block to make some conditional logic programming. This will be used to check the value of the ThingSpeak channel and power ON/OFF the relay module accordingly.



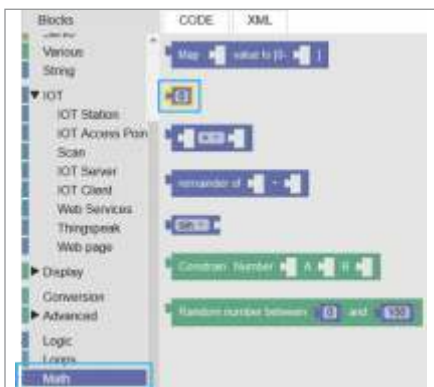
5. CODE DESIGN - NODE MCU

O2I Smart Plug

STEP 4: CONDITIONAL PROGRAM

Step 4.2:

Enter the ThingSpeak details like API key and channel number in the "Read field" block.



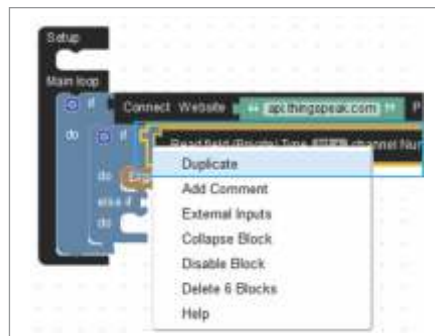
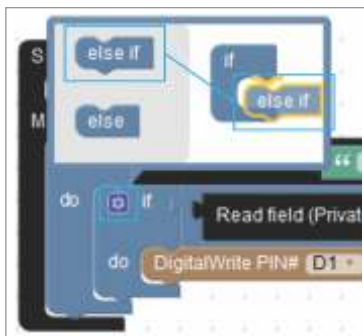
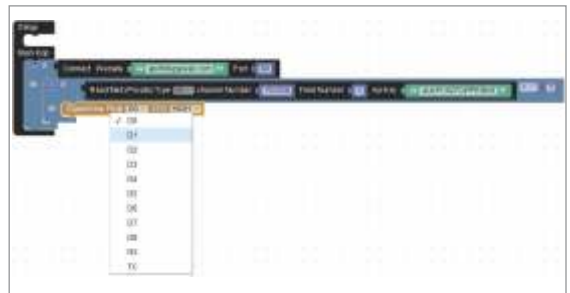
5. CODE DESIGN - NODE MCU

O2I Smart Plug

STEP 4: CONDITIONAL PROGRAM

Step 4.3:

Use "DigitalWrite" block to control the relay (i.e. HIGH/LOW). Here "D1" means the pin no "D1" on the NodeMCU



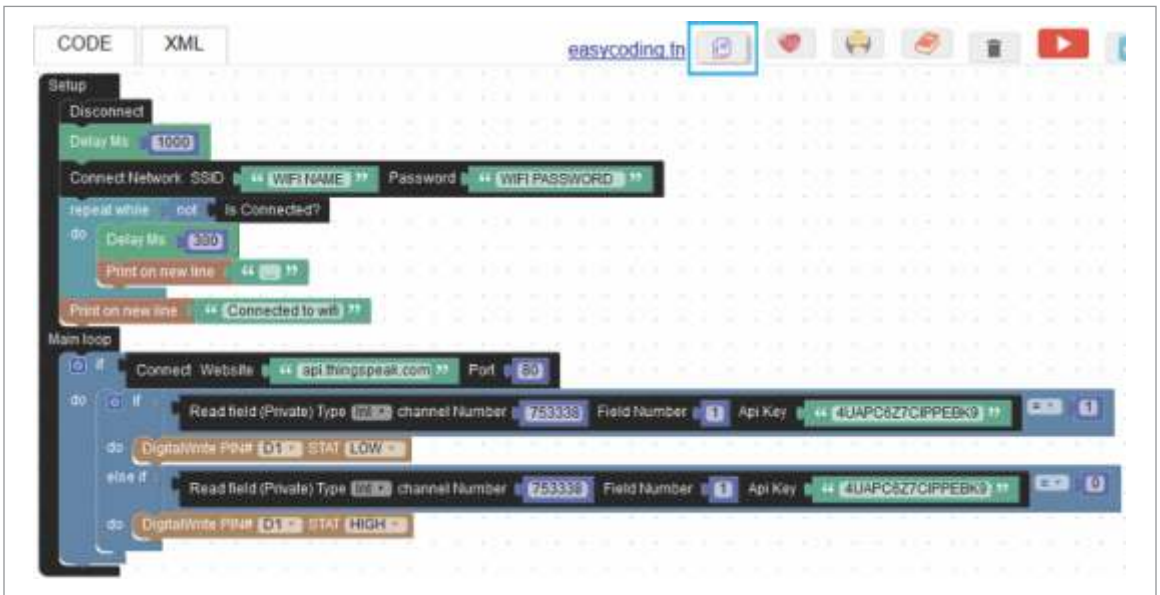
5. CODE DESIGN - NODE MCU

O2I Smart Plug

STEP 5: COPY TO ARDUINO IDE

Step 5.1:

Copy the code from TUNIoT by clicking on the copy button.



Step 5.2:

Paste the copied code in the Arduino IDE



5. CODE DESIGN - NODE MCU

O2I Smart Plug

```
#include <ESP8266WiFi.h>
#include <ThingSpeak.h>
WiFiClient client;
void setup()
{
    Serial.begin(9600);
    ThingSpeak.begin(client);
    pinMode(16, OUTPUT);
    WiFi.disconnect();
    delay(1000);
    WiFi.begin("WIFI NAME", "WIFI PASSWORD");
    while ((!(WiFi.status() == WL_CONNECTED)))
    {
        delay(300);
        Serial.println("...");
    }
    Serial.println("Connected to Wifi");
}
void loop()
{
    if (client.connect("api.thingspeak.com", 80)) {
        if ((ThingSpeak.readIntField(12345, 1, "API KEY"))
== 1)
        {
            digitalWrite(16, LOW);
        } else if ((ThingSpeak.readIntField(12345, 1, "API
KEY")) == 0)
        {
            digitalWrite(16, HIGH);
        }
    }
}
```


6. ASSEMBLY

O2I Smart Plug

STEP 6: CONNECT TO NODE MCU DEV KIT

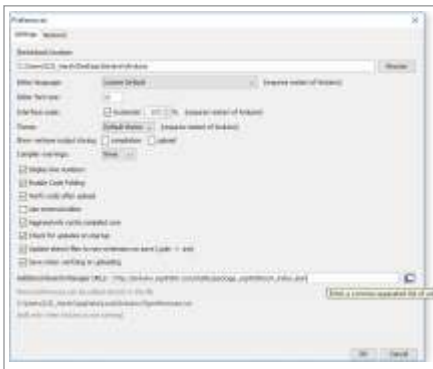
Step 6.1:

Add ESP8266 board in the Arduino IDE, as Arduino doesn't have it by default.

Go to File >> Preferences >> Settings

In the "Additional Board Manager URLs" field add

http://arduino.esp8266.com/stable/package_esp8266com_index.json



Step 6.2:

Now go to Tools >> Boards >> Board Manager and install the ESP8266 board.



6. ASSEMBLY

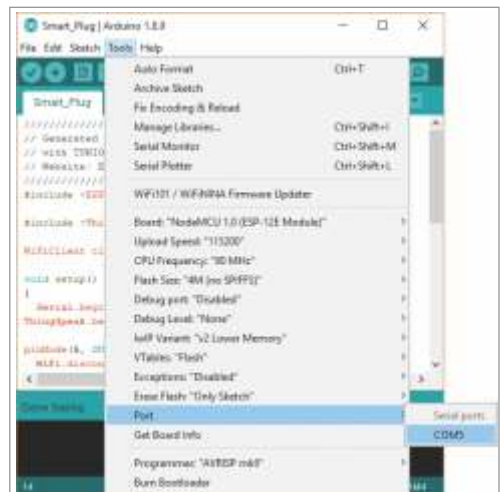
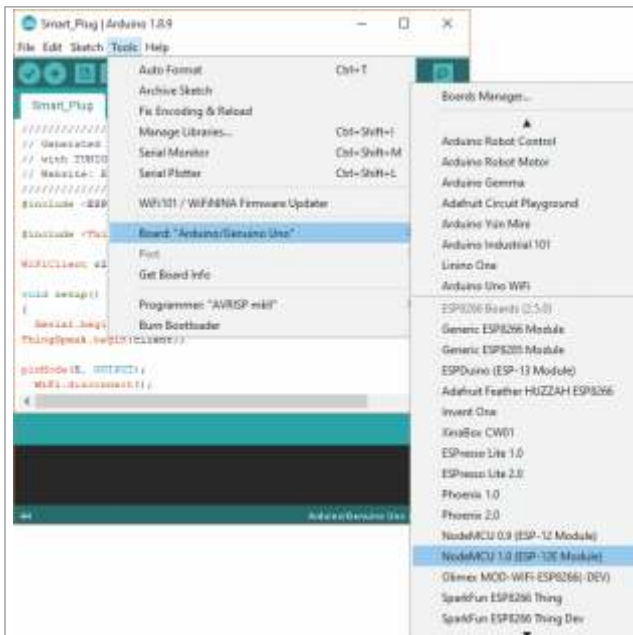
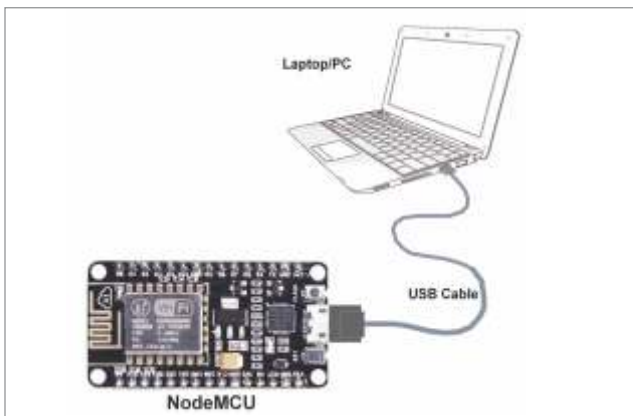
O2I Smart Plug

STEP 6: CONNECT TO NODE MCU DEV KIT

Step 6.3:

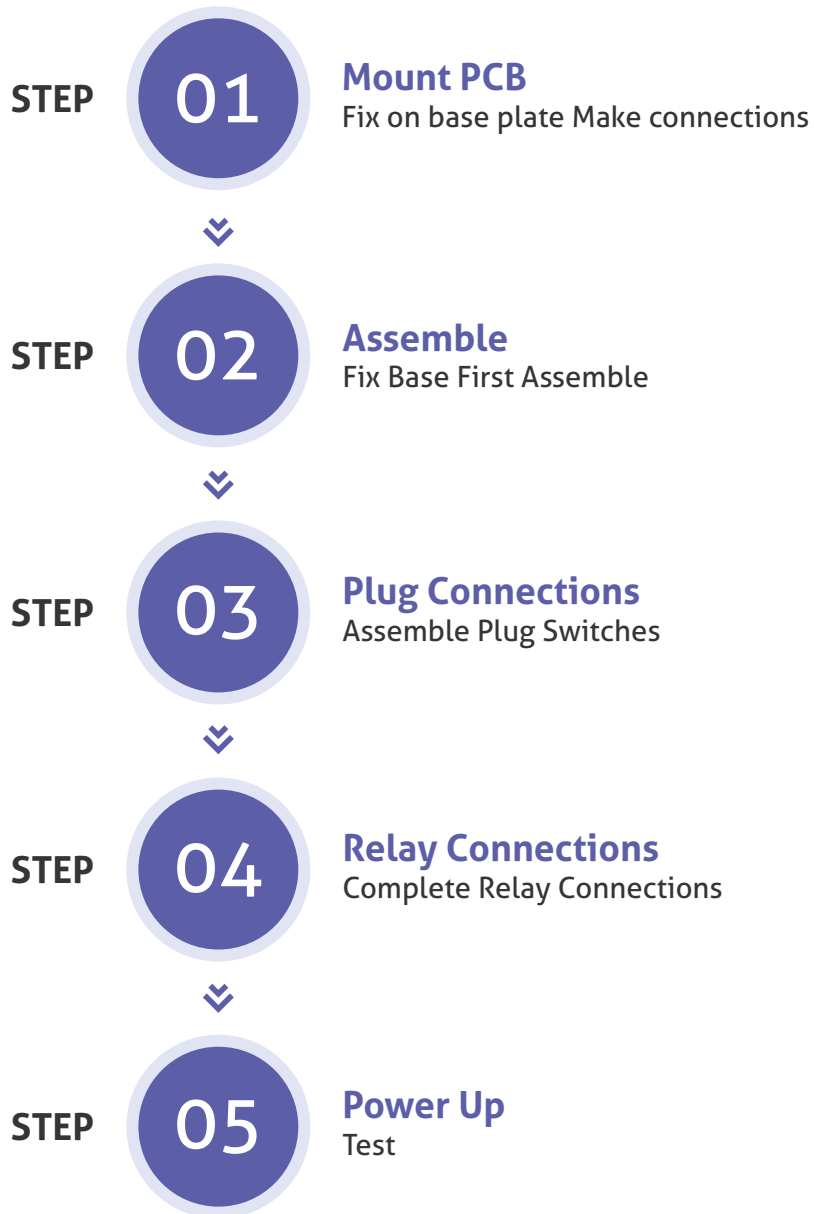
Upload the code to the NodeMCU board

Make sure you've selected the Board as "Node MCU 1.0" and COM Port



6. MECHANICAL ASSEMBLY

Flow Chart



6. ASSEMBLY

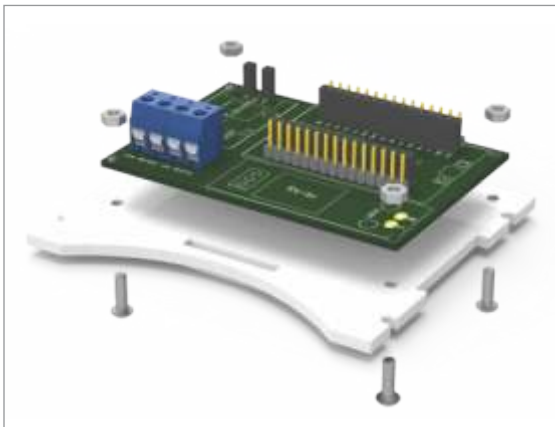
O2I Smart Plug

STEP 1: MOUNT PCB

Step 1.1:

Fix PCB on base plate using the fasteners provided

Mount NodeMCU and AC to DC Converter on the PCB using the header pins provided.
Use double sided tape to mount the Relay Module.



After mounting the components, the PCB should look like this:



6. ASSEMBLY

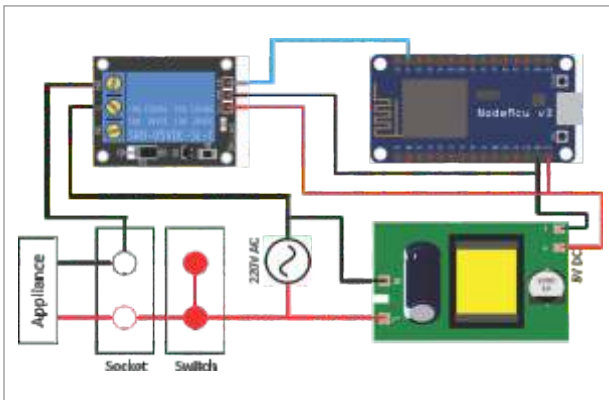
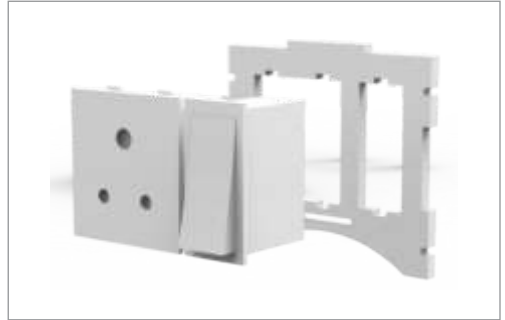
O2I Smart Plug

STEP 1: MOUNT PCB

Step 1.2:

Make connections

Fix the socket and the switch to the front plate.

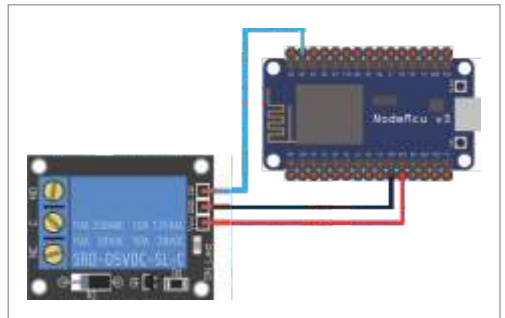


Connections will be made in the Smart Plug according to the layout shown.

Connect the "Vcc" pin of Relay to "GND" pin of NodeMCU.

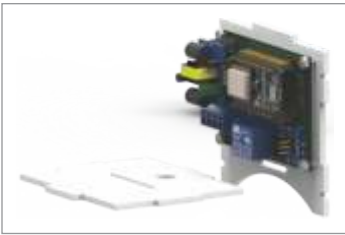
Connect the "GND" pin of Relay to "GND" pin of NodeMCU.

Connect pin "D1" of NodeMCU to the Relay module pin marked "IN".



6. ASSEMBLY

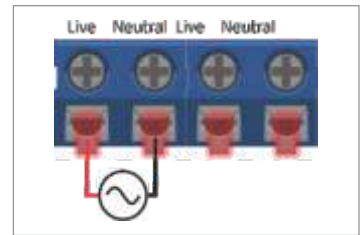
O2I Smart Plug



Fix the base of the box to the front panel.



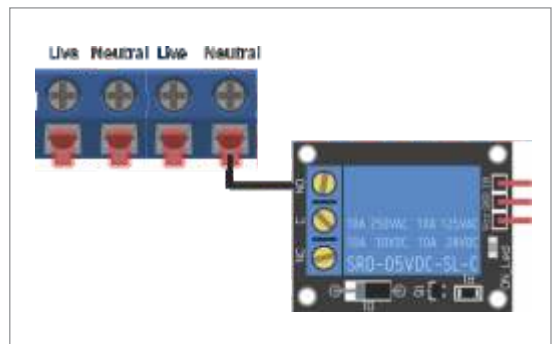
Out the plug and the wire through the hole provided at the base.



Connect the red and black wires from the plug to the screw terminals marked Live and Neutral respectively.

Warning: The terminals marks "Live" and "Neutral" are connected to other terminals marked "Live" and "Neutral" respectively inside the PCB. Connecting the wires of the Plug to two "Live" terminals or two "Neutral" terminals can result in a short.

Connect "NO" terminal of the Relay to the screw terminal marked "Neutral".



Connect a black wire to "COM" terminal of the Relay and a red wire to one of the "Live" terminals of Screw Terminals. These wires will be connected to the Switch and Socket later



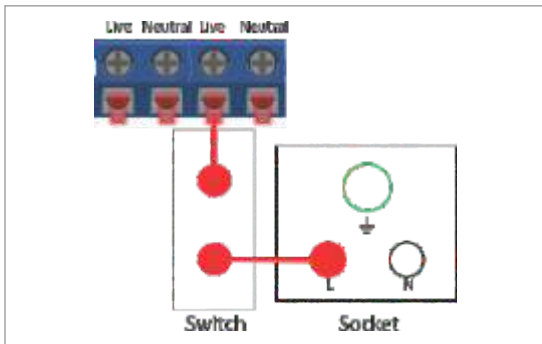
6. ASSEMBLY

O2I Smart Plug

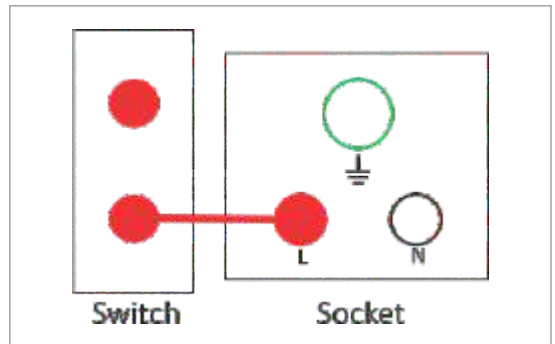
Mount the partition on the base.

Route these three wires from its hole:

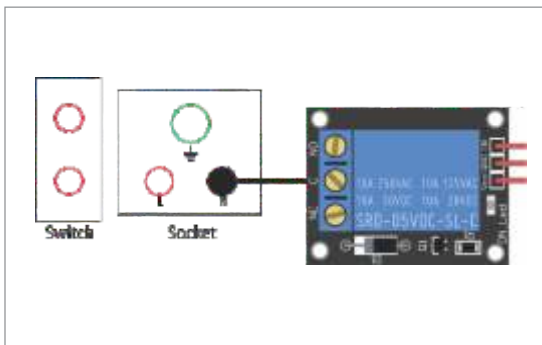
- 1) Red wire from Live Screw Terminal,
- 2) Black wire from COM port of Relay and
- 3) Green- Yellow Wire from the plug.



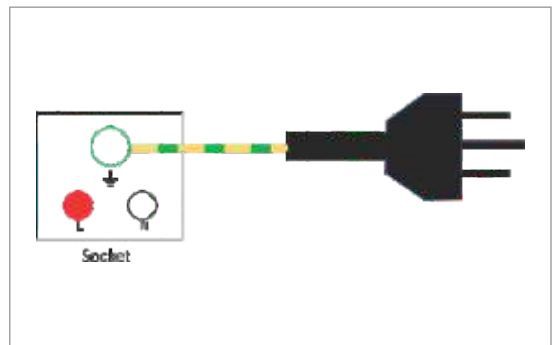
Connect one end of the Switch to the red wire connected to the "Live" Screw Terminal



Connect the other end of the Switch to the end of the socket marked "L".



Connect end of the Socket marked N to the black wire connected to the "COM" terminal of the Relay.

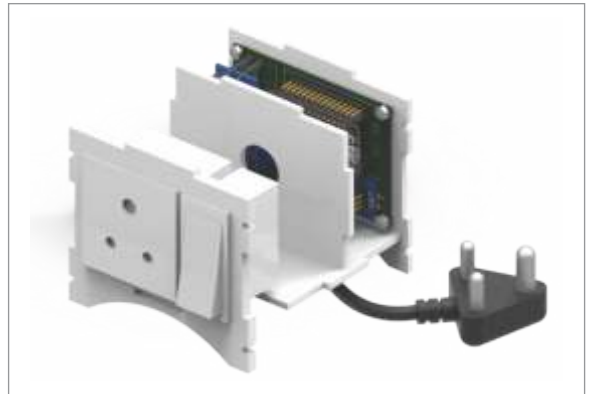


Connect the Green- Yellow Earth wire from the plug to the Earth terminal (with "⏏" symbol next to it) of the socket.

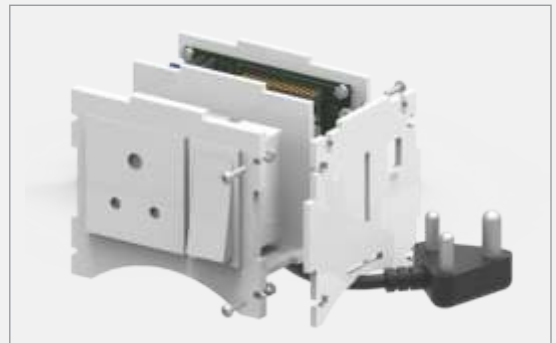
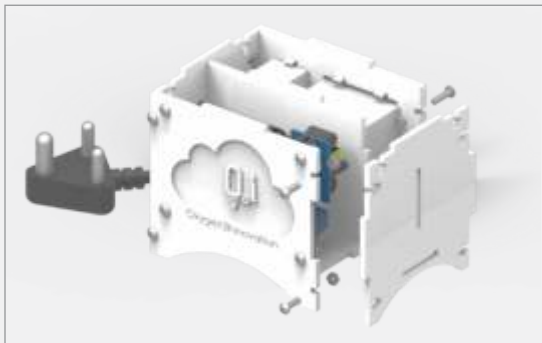
6. ASSEMBLY

O2I Smart Plug

Mount the front of panel (containing the switch and socket) to the base panel.



Mount the side panels and fasten them using the fasteners provided. (Use longer bolts provided to fasten the front panel)



Lastly, mount the top panel and fasten it using the fasteners provided.



Smart Plug is ready!

8. EXERCISES : SMART PLUG ACTIVATE

Graded exercise @ school | Real life implementation @ home

- | 01 ➤ Complete basic tests
- | 02 ➤ Connect the smart plug
- | 03 ➤ Upload program and app
- | 04 ➤ Connect device to be actuated
- | 05 ➤ The best performance wins

Students will be given cloud based exercise and in teams they will complete the exercise and activate the smart plug.

The team that completes the task with all the objectives in the stipulated time will win.



REAL LIFE IMPLEMENTATION

Students will be encouraged to use the Smart Plug to control & monitor appliances at home under parental supervision enabling the use of Technology in Day to day life for beneficial use.

9. SMART PLUG - IOT : COMPETITION

Smart Implementation – O2I – Smart Plug

INTERNET OF THINGS COMPETITION

India Stem Foundation

Children will be encouraged to propose ideas to implement IOT based Technologies for Smart Governance | Smart Workplace | Smart Education.

COMPETITION TASK



IMPORTANT TIME LINES

24th – 25th August 19

ADDITIONAL DETAILS

<https://indiastemfoundation.org/wroindia/opencategory/>



**CYBORG CYBER FORENSICS AND
INFORMATION SECURITY PVT. LTD.**

ISO 27001:2013 Certified Company

📍 E-3 Block, First Floor, Amity Incubator, Sector-125, Noida-201301

☎ +91-8826 144 992, 8826 744 994 ✉ info@ccfis.net