

# Smart Metering System

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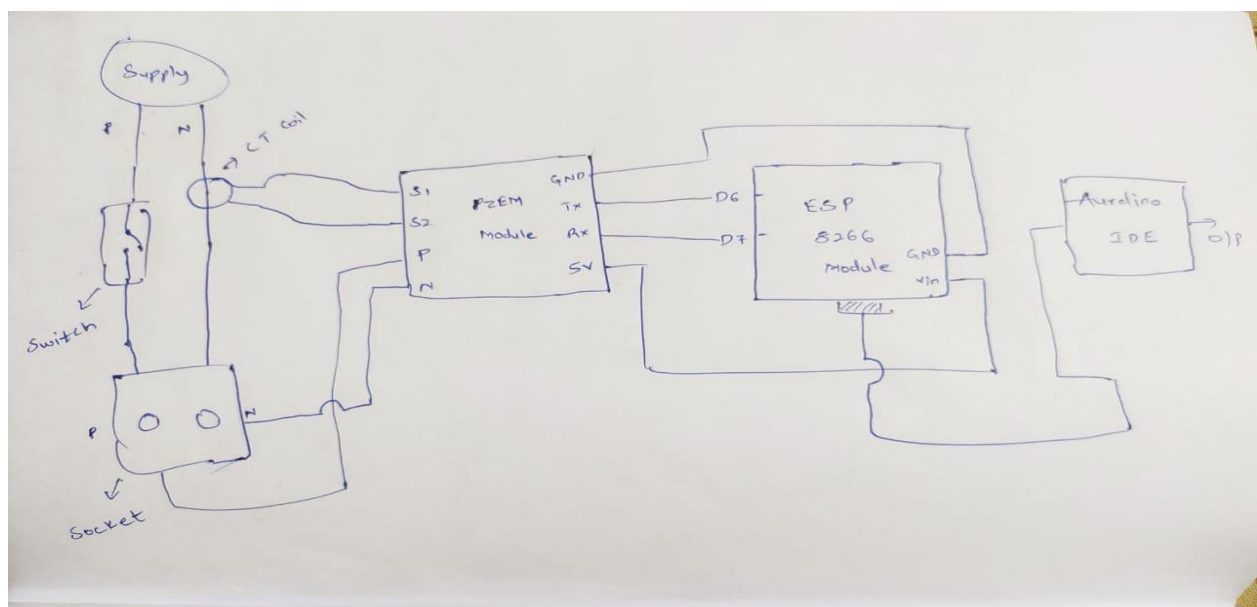
## Introduction :

In this project we have implemented the Smart Metering System also called as Energy Monitoring System. We will monitor the various parameters like voltage, current, power factor, and power consumed by the load. We can access the real time through the google sheets(which acts as a cloud) from anywhere. By continuous monitoring we can estimate or get to know how much power is consumed by the appliances so that we can accordingly plan and consume the electricity. With this system we can estimate the electricity bill to some extent and be aware of fraudulent billing in electricity bills.

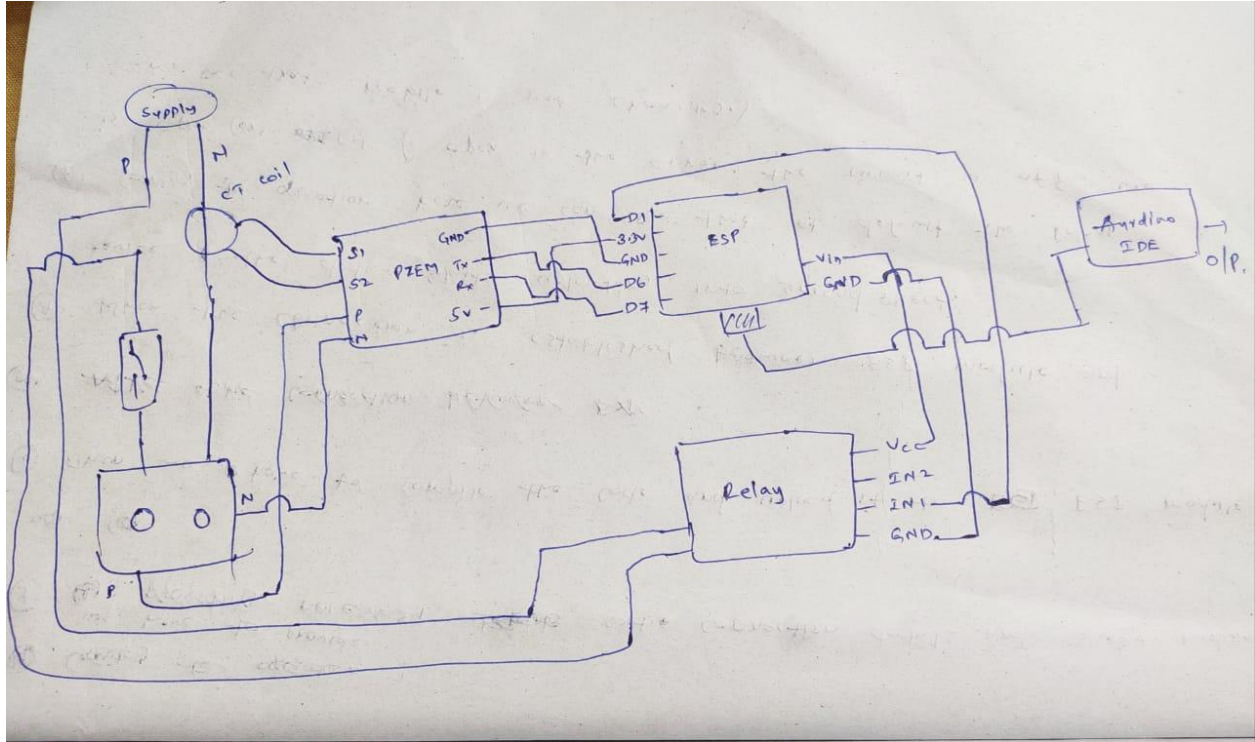
## Components which are required :

- PZEM004T multi-functional meter, CT (current transformer coil) of AC type.
- ESP8266 module, 2 channel relay module.
- 6A switch, 6A plug socket, 12 module plastic casing box.
- Multi strand wires, Jumper wires, Plugs, Tester, wire cutter, tape etc.

## Circuit Diagram (Without Relay) :



## Circuit Diagram (With Relay) :



## Working Principle :

Here we connect a plug which is used to take the input from the supply to the socket via switch. Here we use socket to connect the load. Before connecting the neutral terminal of the supply to socket we place Current Transformer coil around the neutral wire and then we connect the Current Transformer coil terminals to the PZEM module and we give load terminals as input to the PZEM module. PZEM measures various parameters like voltage, current, power factor and power consumed by the load. And the output of the PZEM module is connected to the input of the ESP8266 module. This module is connected to a laptop via USB cable and using Arduino software we upload the code into the ESP module where it sends the minute to minute electrical parameters values collected from PZEM module to google spreadsheets (cloud). We need to include necessary libraries for working of ESP module with Arduino IDE.

Up to now we can only monitor the real time power consumption of plug load. So now we develop the circuit as a closed loop by giving feedback with help of a relay. For controlling

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we use a two channel relay module where it is connected in series with the mains phase wire. Activating the relay which is an electrically controlled switch (closing/opening) makes the circuit open/close thus by controlling the power consumption of the appliance. Here we need to include two more libraries in Arduino IDE. The Arduino code will generate an IP address by opening it in the URL . We get a web server named “ESP Web Server” through which we can control the circuit remotely. When we turn ON in the web server the relay gets OFF and the circuit is ON and the power is consumed by the load. When we turn OFF in the server the relay gets ON and the circuit is OFF and no power is consumed by the load.