4th assignment

Title: IoT based Smart Energy Meter Design

The design consists of wireless sensor network and protocol for the intelligent energy and web applications capable of reading the device automatically and sending the information to power users to view their present energy meter reading. Using this scheme will make consumers conscious of the use of electricity in their home to decrease energy wastage and consumption costs. The ESP8266 WiFi module will be integrated with the 16-bit ADC, AC current sensor and the TCP / IP protocol will be implemented for communication between the meter and the web application.

Requirements: **Smart Meter; Power Monitoring; Internet of things; WIFI ESP8266; Arduino; Smart Home; Wireless Sensor Network; Non-Invasive AC Current Sensor; Thingspeak**

The ESP8266 module is the system's center processing unit in our proposed IoTs system and is responsible for communication between the digital energy meter and the gateway web server to read the meter parameters and display the power Management system on the web app. Our system application design has two primary components, the first is the digital energy meter with integrated ESP8266 Wi-Fi Module and the second is the power management system gateway internet server.

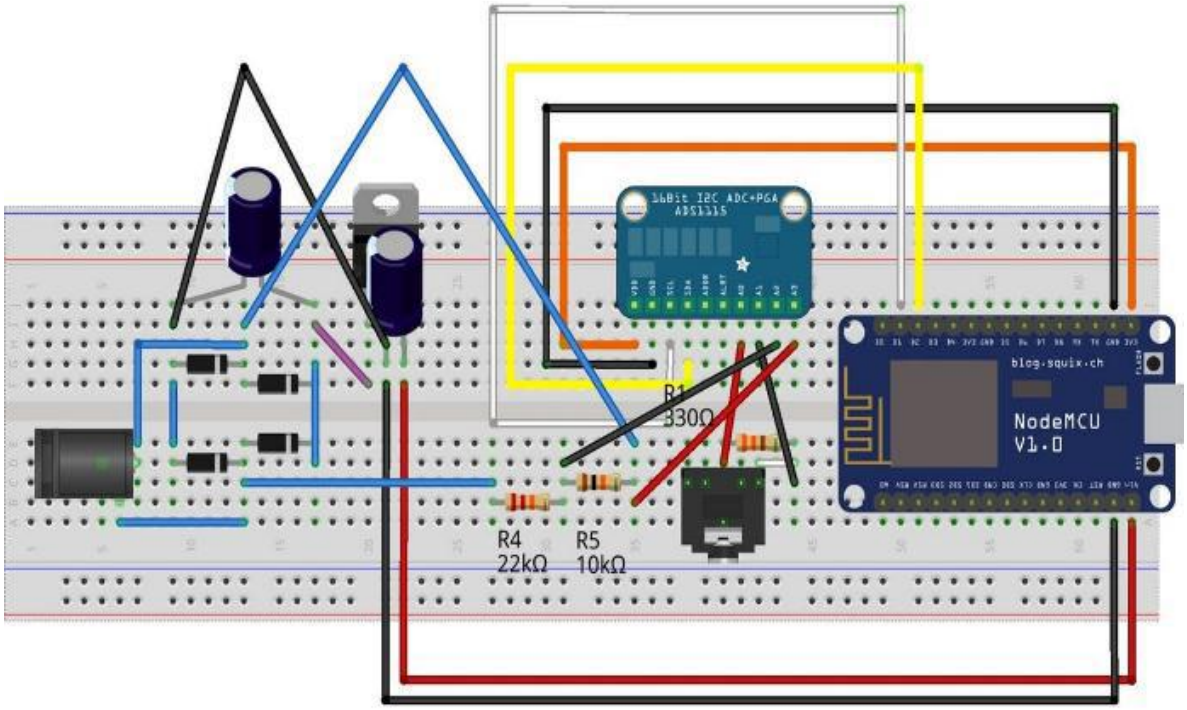

Figure 1Circuit of digital energy meter with Wi-Fi module ESP8266

The electronic energy meter comprises of ESP8266(Version 12E)-3.3V/80MHz with ADS1115(4-Channel 16-bit ADC) which is the primary feature for calculating meter parameters such as present, voltage, power, power factor in W, V, A and information transmission to ThingSpeak Server. The meter's current sensor can function up to 100 Ampere and is intended to be readily used with micro controllers, such as the esp8266. This present SCT-013-000 sensor device can provide low-cost alternatives for communication devices with AC current sensing.This device package enables simple application, including load detection and management, switching mode power supplies, and present defect security in particular Applications. The single phase voltage and current sensor unit is the ultra-micro current transformer SCT-013-000, analog and tiny size signal output with high precision, excellent voltage and energy measurement consistency. The voltage of the sensor module is up to 250VAC AC. It can be

linked to ADS1115's ADC pin. Only for apparent power is this fundamental version. The ADS1115 is used in differential mode to keep the component count low and the circuit as simple as possible, eliminating the need for bias resistors. The difficult part is getting an electrician authorized to wire the clamp to the primary wire coming into the premises on the current sensor. Since we only have 1 channel, we will monitor the general power instead of the power per circuit. Real power can be measured using a 12V DIN-Rail transformer as long as problems with the charging power factor are calibrated. How this can be done? Using a bridge rectifier, the ESP8266 can be operated in this configuration as shown. Care must be taken to prevent overloading the ADC when sampling AC voltage. The ADC can manage the highest peak-to-peak voltage with scale factor 1 is about 8V, the RMS AC voltage is about 2.8V. Different other factors are also evaluated when wired up in this mode, including power factor, real and apparent power and line voltage