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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Option: ELECTRICAL TECHNOLOGY

FINAL YEAR PROJECT REPORT.

TOPIC: DESIGN AND IMPLEMENTATION OF AUTOMATIC POWER THIEF DETECTOR

Final Year Project Submitted in Partial Fulfilment of The Requirements for The Award Of Advanced Diploma In Electrical Technology.

Submitted by:

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Kigali, September 2024

DECLARATION A

I Mugabe Ngana Egide declare that the content of this final year project is definitely my own work. I am completely responsible for the content of this final year project for the award of an Advanced Diploma in ELECTRICAL TECHNOLOGY at ULK Polytechnic Institutes. Other writers' opinions or findings included in this final project are quoted in accordance with ethical standards.

Names: Mugabe Ngana Egide

Signature……

Date:…….

DECLARATION B

I declare that Final year project Entitled “design and implementation of automatic power thief detector” have been supervised and guided by the ULK POLYTECHNIC INSTITUTE Supervisor,

Supervisor Name: Eng. Appolinaire TUYISHIMIRE

Signature: …….

Date:……

DEDICATION

I dedicate this book to the Almighty God who guides me in everything, I try to do and grant me peace in all, my family members and my lectures and supervisor Eng Apollinaire TUYISHIMIRE until my achievements.

My greatest dedication goes to my parents, and all my relatives.

Not forgetting to dedicate this book to my friends who gave their support to the achievement of this project.

ACKNOWLEDGEMENT

It is my privilege to express gratitude to all those who inspired and guided us to complete the project work. This work would have remained incomplete without direct and indirect help of many people who have guided us in the success of this project work. I am grateful to them. Firstly, I thank the almighty God who has guided me through the whole life and studies especially during the final project if it wasn't God, I couldn't do anything. My special thanks are addressed to the government of Rwanda for its appreciable policy of promoting education of all levels. Again, my sincere acknowledgement goes to ULK POLYTECHNIC INSTITUTE, my administration of ULK and the whole academic staff. My sincerely gratitude goes to my supervisor TUYISHIMIRE Apollinaire for his technical and wise advices, suggestions, correction and guidance in this research project to be fulfilled.

ABSTRACT

The proposed work in this book aims on the design and implementation model of electrical energy theft detection. A high percentage of electricity income is lost due to power theft and improper management. However, a bulk of these losses are caused by electricity theft. The illegal usage of electricity must be solved by electronic means, without any human interaction. The purpose of this work is to provide an implementation methodology for electricity theft detection and controlling which allows violators to be detected at a remote location. This design integrates effective solutions for problems faced by electricity distribution system such as power theft and transmission line fault. It includes microcontroller based embedded technology and wireless communication method to find out the electric theft and transmission line fault. Moreover, collecting the meter readings for billing processes from all consumers is a difficult and time-consuming task which requires a great number of labors. In the proposed method global System for Mobile communication (GSM)based technology is used to transmit the meter reading and detection alert automatically to the authorized energy provider via an alert message which eliminates the various issues related to the meter reading and theft detection.

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LIST OF ABBREVIATIONS

- **A**: Amperes
- **AC**: Alternating Current
- **AT** command: Attention command
- **SSR**: Solid-State Relay
- **C**: Capacitor
- **DC**: Direct Current
- **GSM**: Global System for Mobile Communication
- GPRS: General Packet Radio Service
- **GPS**: Global Positioning System
- **GND**: Ground
- **HTTP**: Hyper Text Transfer Protocol
- **LED**: Light Emitting Diode
- **LDR**: Light Dependent Resistor
- **MLCC: Multilayer** ceramic capacitor
- **MCCB**: Molded Case Circuit breaker
- **OCPD**: Over Current Protection Device
- **PLC**: Programmable Logic Controller
- **PCs**: Personal Computers
- **Q**: Charge
- **R**: Resistor
- **RST**: Reset
- **SIM**: Subscriber Identity Module
- **SMS**: Short Message Service
- **TTL**: Transistor-Transistor Logic
- **USB**: Universal Serial Bus
- **VIN**: Input Voltage
- **VS**: Supply Voltage
- **VAC**: AC Voltage
- **VDC**: DC Voltage

CHAPTER 1: GENERAL INTRODUCTION

1.0. INTRODUCTION

Electricity theft is the practice of stealing electrical power from a provider. Violators are not charged for the total number of kilowatt-hours actually used, causing lost revenue for both utility companies and retail electricity providers. Theft of electricity may result in higher fees for legitimate electricity customers, who must make up for the lost revenue so that the utility provider can continue to operate. Electricity theft is also dangerous, because the tampering involved can result in fire or electrocution. Electricity theft is a problem in both developed and developing countries.

1.1.BACKGROUND TO STUDY

Electricity fraud can be defined as a dishonest or illegal use of electricity equipment or service with the intention to avoid billing. Electric utilities lose large amounts of money each year due to fraud by electricity consumers. After running this system, it enables the electricity department to examine the meter readings frequently without the person visiting each house. The reason of this system is to inaccessible monitoring and control of the household energy meter. This can be concluding by the use of AT89S52 microcontroller device that frequently monitors and report the energy meter readings in its unending (nonvolatile) memory location. These entire systems also make beneficial use of a GSM modem for remote monitoring and manage of energy meter. Electricity theft is a very communal problem in many developing countries was high percentage of demand on electricity. Electricity loss can be caused by

Transmission losses and electricity theft. Major portion of power loss is due to power theft. Electricity theft can be classified in the form of meter tampering, illegal connections, billing indiscretions, and unpaid bills.

Ministry of Power and Energy in Rwanda says a very increasing number of electricity thefts occur in every year across domestic electricity utility and industrial electricity supply, which leads to a huge amount of revenue losses of electricity companies.

1.2 STATEMENT OF THE PRBLEM

After distribution of electrical power there is problem of customer who bypass live conductor with aim of stealing electric power this result utility to falls in loss due to higher amount of electric power stolen this project will solve the problem by informing the utility whenever customer bypass the live conductor.

The problem of electric shock is also addressed due to customer who doesn't have knowledge about electricity, also higher penalties to the stealers of electric power is also a problem.

1.3 OBJECTIVES

1.3.1 General objective

To design and implement system which detect automatic electrical power theft with sms notification and auto power cut off for avoiding the community of stealing power once it is detected.

1.3.2 Specific objective

i. To use technology to catch electrical power thieves
ii. To improve effectiveness and efficient present methods of detecting energy theft
iii. To detect the thieves and block those one who want to steal the power.

1.4. RESEARCH QUESTIONS

1. Can IoT be the main technology to find out power theft person?
2. Power efficiency can be improved by the system of power monitoring?
3. Detecting power theft is easy for technology?

1.5 INTEREST OF THE STUDY

To reduce energy lost by energy utilities in RWANDA and to get much information about the energy meter of consumers.

To reduce deviation of taxes through by purchasing cash power

1.6 SCOPE OF THE STUDY

The scope of this project is to design and implement power theft detection through

Energy meter with voltage rating of 220Voperating at 50Hz and interfaced with Adriano Uno and GSM module with a phone mobile features over SMS.

1.7 ORGANIZATION OF THE STUDY

This work is mainly composed by three chapters whereby:

Chapter 1: which is the general introduction to the project will briefly explain all about

Chapter 2: is the literature review this chapter is deal with the information about all components we used in our project.

Chapter 3: which is deals with the design and Implementation of power theft detection through energy meter

Chapter 4: is the conclusion and recommendation to our project

1.8 LIMITATION

-Budget of designing and implementation of this project will be high costly

This project will require qualified engineers

High cost of equipment as they all have to be imported from abroad

High cost of maintenance of the system

CHAPTER 2: LITERATURE REVIEW

2.0 INTRODUCTION

In this chapter, researcher revises different ideas from different authors whom their conduct research in relation to avoid electrical power theft by providing information through SMS notification

Electricity theft is a very communal problem in many developing countries was high percentage of demand on electricity. Electricity loss can be caused by Transmission losses and electricity theft. Major portion of power loss is due to power theft. According to Smith the electricity theft can be classified in the form of meter tampering, illegal connections, billing indiscretions, and unpaid bills.

Ministry of Power and Energy says a very increasing number of electricity thefts occur in every year across domestic electricity utility and industrial electricity supply, which leads to a huge amount of revenue losses of electricity companies.

Electricity Board Officials are forecasting to take in tough laws such as withdrawing electricity supplies to households who are engaged in the act of stealing electricity. The economic impacts of theft reduce the income from the sale of electricity and increase the necessity of overcharging to consumers. Merely generating more power is not enough to meet present day electricity requirements. Power consumption and losses have to be closely monitored so as to the generated power is utilized in an efficient manner this illegal electricity usage may indirectly affect the economic status of a country.

2.1 TYPES OF POWER THEFT

There are various types of electrical power theft, including Tapping a line or bypassing the energy meter. The various types of electrical power theft include: (Tom A Short,Senior Member,IEEE “Advance Metering for)

What is known as "Cable Hooking" is the most used method. The most of global power theft is by direct tapping from the line. The consumer taps into a power line from a point ahead of the energy meter. This energy consumption is unmeasured and procured with or without switches. In this method, the input terminal and output terminal of the energy meter is short-circuited, preventing the energy from registration in the energy meter.

2.2 INJECTING FOREIGN ELEMENT IN THE ENERGY METER

Meters are manipulated via a remote by installing a circuit inside the meter so that the meter can be slowed down at any time. This kind of modification can evade external inspection attempts because the meter is always correct unless the remote is turned on

2.3 PHYSICAL OBSTRUCTION

This type of tampering is done to electromechanical meters with a rotating element. Foreign material is placed inside the meter to obstruct the free movement of the disc. A slower rotating disk signals less energy consumption.

2.4 ESD ATTACK ON ELECTRONIC METER

This type of tampering is done on electronic meter to make it either latent damage or permanent damage. Detection can be done correctly in high end meters only.

2.5 CURRENT SENSOR

A current sensor is a device that produces a signal proportional to the electric current (AC or DC) sensed in a wire. The generated signal can be either analog or digital and the signal parameter can be either current or voltage. The measured current can be displayed in ammeter and is applied for controlling and protection purposes. Sometimes this data is used in data acquisition system for further energy management.

Figure.2. 1.Current sensor

2.5.1 PRINCIPLE OF OPERATION

Current sensor is a device which detects and converts current to get an output voltage, which is directly proportional to the current in the designed path. When current is passing through the circuit, a voltage drops across the path where the current is flowing. Also, a magnetic field is generated near the current carrying conductor. These above phenomena are used in the current sensor design technique.

2.6 RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

2.6.1. BASIC DESIGN AND OPERATION

When an electric current is passed through the coil it generates a magnetic field that activates the armature, and the consequent movement of the movable contact(s) either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position.

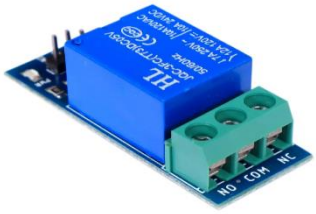


Figure.2. 2.Relay

2.7.ARDUINO UNO

2.7.1. INTRODUCTION

Arduino Uno is a microcontroller board developed by Arduino.cc which is an open-source electronics platform mainly based on AVR microcontroller Atmega328.First Arduino project was started in Interaction Design Institute Ivrea in 2003 by David Cuartielles and Massimo Banzi with the intention of providing a cheap and flexible way to students and professional for controlling a number of devices in the real world.

The current version of Arduino Uno comes with USB interface, 6 analog input pins, 14 I/O digital ports that are used to connect with external electronic circuits. Out of 14 I/O ports, 6 pins can be used for PWM output, it allows the designers to control and sense the external electronic devices in the real world.

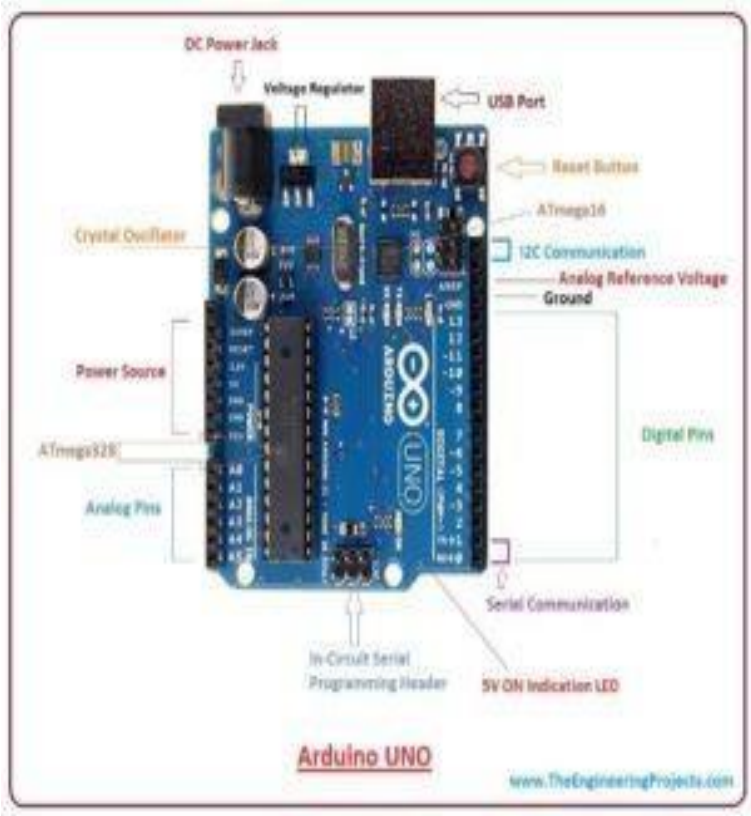


Figure.2. 3.Aruduino hardware

The Arduino UNO is an open-source microcontroller board based on the MicrochipATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9v battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo.

2.7.2. TECHNICAL SPECIFICATIONS

- Microcontroller: MicrochipATmega328P
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by boot loader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g

2.7.3. APPLICATIONS OF ARDUINO UNO ATMEGA328

The applications of Arduino Uno include the following.

- Arduino Uno is used in Do-it-Yourself projects prototyping.

- In developing projects based on code-based control
- Development of Automation System
- Designing of basic circuit designs.

Thus, this is all about Arduino Uno datasheet. From the above information finally, we can conclude that this is an 8-bit ATmega328P microcontroller. It has different components like serial communication, crystal oscillator, the voltage regulator for supporting the microcontroller. This board includes a USB connection, digital I/O pins-14, analog i/p pins-6, a power-barrel jack, a reset button, and an ICSP header.

2.7. INTERFACING SIM800L GSM MODULE WITH ARDUINO

Figure.2. 4.GSM SIM800L

Whether you want to listen to what happens in your house that's miles away from you or activate sprinkler system in your garden just with a silent call; Then SIM800L GSM/GPRS module serves as a solid launching point for you to get you started with IoT!

SIM800L GSM/GPRS module is a miniature GSM modem, which can be integrated into a great number of IoT projects. You can use this module to accomplish almost anything a normal cell phone can; SMS text messages, Make or receive phone calls, connecting to internet through GPRS, TCP/IP, and more! To top it off, the module supports quad-band GSM/GPRS network, meaning it works pretty much anywhere in the world.

2.8.1. HARDWARE OVERVIEW OF SIM800L GSM/GPRS MODULE

At the heart of the module is a SIM800L GSM cellular chip from SimCom. The operating voltage of the chip is from 3.4V to 4.4V, which makes it an ideal candidate for direct LiPo battery supply. This makes it a good choice for embedding into projects without a lot of space.

Figure.2. 5.GSM SIM800L hardware

All the necessary data pins of SIM800L GSM chip are broken out to 0.1″ pitch headers. This includes pins required for communication with a microcontroller over UART. The module supports baud rate from 1200bps to 115200bps with Auto-Baud detection.

The module needs an external antenna to connect to a network. The module usually comes with a Helical Antenna and solders directly to NET pin on PCB. The board also has a U. FL connector facility in case you want to keep the antenna away from the board

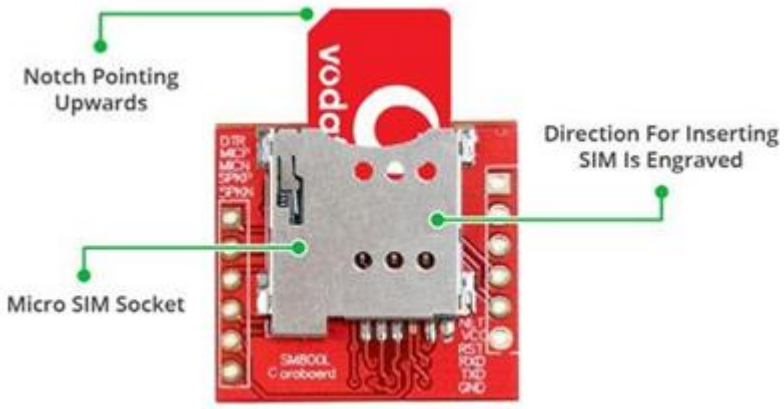


Figure.2. 6.GSM SIM800L SIM SOCKET

There's a SIM socket on the back! Any activated, 2G micro-SIM card would work perfectly. Correct direction for inserting SIM card is normally engraved on the surface of the SIM socket.

This module measures only 1-inch² but packs a surprising number of features into its little frame. Some of them are listed below:

- Supports Quad-band: GSM850, EGSM900, DCS1800 and PCS1900
- Connect onto any global GSM network with any 2G SIM
- Make and receive voice calls using an external 8Ω speaker & electret microphone
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Scan and receive FM radio broadcasts
- Transmit Power:
- Class 4 (2W) for GSM850
- Class 1 (1W) for DCS1800
- Serial-based AT Command Set
- FL connectors for cell antennae

2.8.2. SIM800L GSM MODULE PINOUT

The SIM800L module has total 12 pins that interface it to the outside world. The connections are as follows:

NET is a pin where you can solder Helical Antenna provided along with the module.

VCC supplies power for the module. This can be anywhere from 3.4V to 4.4 volts. Remember connecting it to 5V pin will likely destroy your module! It doesn't even run on 3.3 V! An external power source like Li-Po battery or DC-DC buck converters rated 3.7V 2A would work.

RST (Reset) RST is a hard reset pin. If you absolutely got the module in a bad space, pull this pin low for 100ms to perform a hard reset.

RxD (Receiver) pin is used for serial communication.

Figure.2. 7.GSM Pinout

TxD (Transmiter) pin is used for serial communication.

GND is the Ground Pin and needs to be connected to GND pin on the Arduino.

RING pin acts as a Ring Indicator. It is basically the 'interrupt' out pin from the module. It is by default high and will pulse low for 120ms when a call is received. It can also be configured to pulse when an SMS is received.

DTR pin activates/deactivates sleep mode. Pulling it HIGH will put module in sleep mode, disabling serial communication. Pulling it LOW will wake the module up.

MIC± is a differential microphone input. The two microphone pins can be connected directly to these pins.

SPK± is a differential speaker interface. The two pins of a speaker can be tied directly to these two pins.

2.8.3. WIRING – CONNECTING SIM800L GSM MODULE TO ARDUINO UNO

Start by soldering/connecting the antenna, insert fully activated Micro SIM card in the socket. Now, connect Tx pin on module to digital pin#3 on Arduino as we'll be using software serial to talk to the module.

We cannot directly connect Rx pin on module to Arduino's digital pin as Arduino Uno uses 5V GPIO whereas the SIM800L module uses 3.3V level logic and is NOT 5V tolerant. This means the Tx signal coming from the Arduino Uno must be stepped down to 3.3V so as not to damage the SIM800L module. There are several ways to do this but the easiest way is to use a simple resistor divider. A 10K resistor between SIM800L Rx and Arduino D2, and 20K between SIM800L Rx and GND would work fine.

Now we are remaining with the pins that are used to supply power for the module.

As you have multiple choices for powering up the module, we have provided two example schematics. The one uses 1200mAh Li-Po battery and other one uses LM2596 DC-DC buck converter.

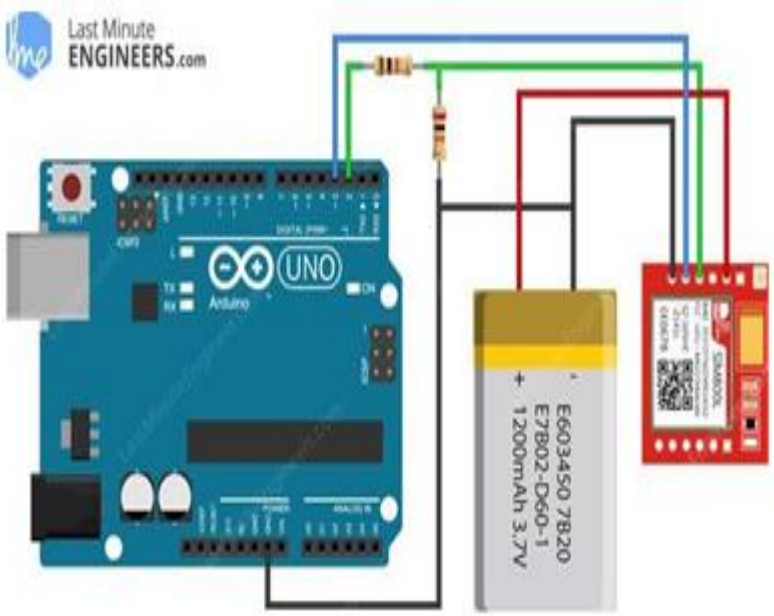


Figure.2. 8.Wiring of Arduino UNO and GSM SIM800L

2.8.4. WIRING SIM800L GSM GPRS MODULE WITH ARDUINO UN0

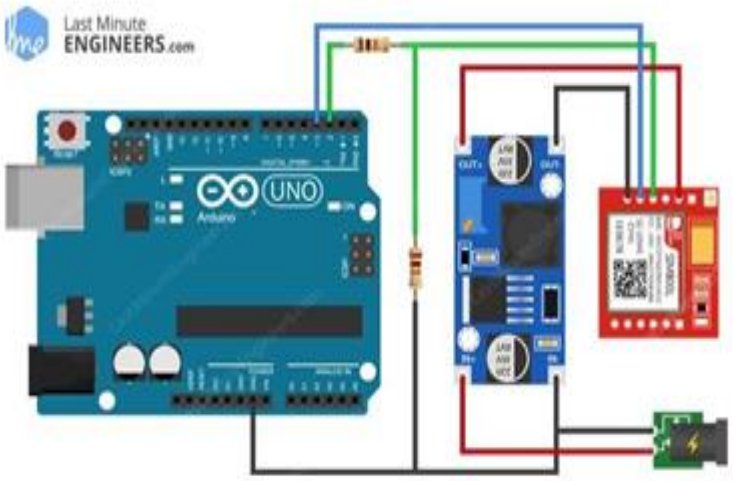


Figure.2. 9.Wiring GSM GPRS module with Arduino UNO

2.8. BUZZER

Buzzer is a kind of voice device that converts audio model into sound signal it is mainly used to prompt or alarm. According to different design and application. It can produce music sound, flute sound, buzzer alarm sound, electric bell and other different sounds `Typical applications includesiren, alarm device, fire alarm, air defense alarm, burglar alarm, timer, etc. it is widely used in household appliances, alarm system, automatic production line, low-voltage electrical equipment, electronic toys, game machines and other products and industries

Figure.2. 10. Buzzer

2.9.1. How Buzzer works

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.

sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application. This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

CHAPTER 3. RESEARCH METHODOLOGY

3.0. INTRODUCTION

This chapter explains well the methods that have been used to collect information during this research called design and implementation of automatic power thief detector. It describes the steps involved and it plays an important role during research period such as research design, source of data collection result will be detailed here.

- **Data collection techniques**

The use of multiple data collection techniques and sources of outcomes and enables different interpretations and meanings to be included in data analysis. That help to get an information about my research.

- **Interview**

During the conversations with the power thief users and according to the responds of some questions provides the information that help in design and what can be automatic power thief as for improving way to detector people steal electricity.

- **Observation**

The observations show that is possible to assembly some components in order to get our goals about our design and provide will comfortability of automatic power thief detector. According to the observations, the conclusions show that is possible and helpful.

- **Documentation**

Conducting data via documentations this research conducts the data during documents from institutions websites like electrical power theft detection and wireless meter reading and referred to other researchers document. The documentation provides the information about other researchers design and the results found.

- **RESEARCH DESGN**

Table 1.1. Bills of material

Number	NAME OF MATERIALS	QUANTITY	PRICE
1	PCB BOARD	1	5’000
2	CURRENT Sensors	2	14’000
3	MICRO CONTROLLER	1	15’000
4	GSM module for notification	1	12’000
5	Cover	1	5’000
6	RELAY	1	2’000
7	Lamp	1	1’000
8	Lamp holder	1	15’00
9	Socket outlet	1	1’000
10	Electrical wire connector	2	5’00
11	Connector plug	1	1’000
12	Supply power cable	1	2’000
13	Buzzer	1	2’000
14	WIRES	2m	2’000
15	Goulotte Cable	2m	3’000
TOTAL			67’000

CHAPTER 4: DESIGN SYSTEM ANALYSIS AND IMPLEMENTATION

4.0.INTRODUCTION

The circuit diagram in figure was designed in software called proteus. The IDE programming language was used to make our system automatic without the interaction of human to switch on and off the device connected on the Microcontroller.

The project called power theft detection and indication of energy meter information through SMS

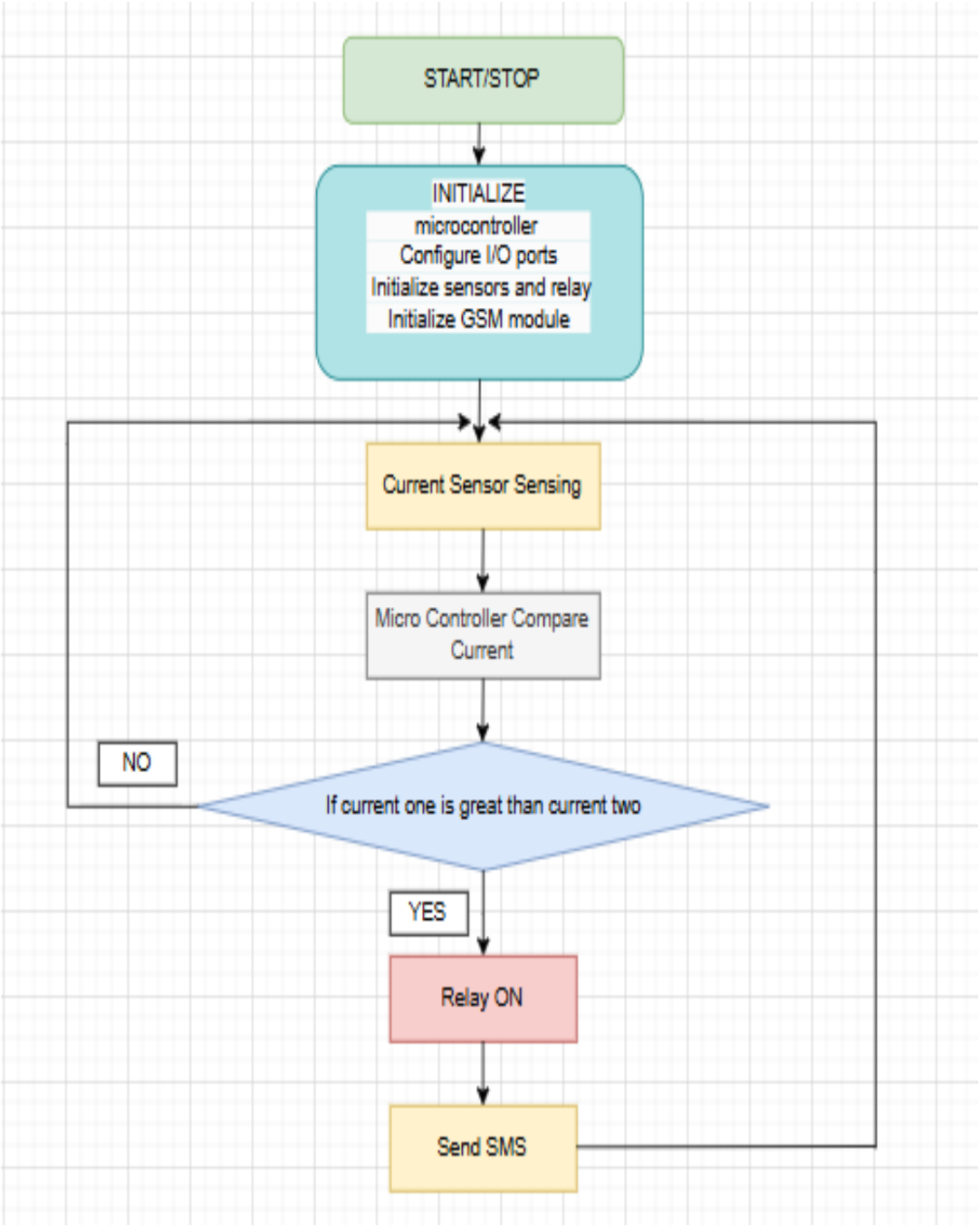
and out power cut off is briefly explained as, firstly we start to connecting the two current sensors for using purposes to compare current one and current two will be connected after the energy meter which is basically the actual sensing and second one will be connected before the energy meter which is basically the theft sensing.

we would again connect the actual load by its switch and then after if a relay can't break the circuit is working with no theft. here, both current sensors are sensing the same value and no message will be sent to the mobile phone by GSM Modem, when this is ok then, we would be on the load which is after the energy meter during this the system would be work normally.

When on this load then the system power off the whole supply of energy meter. During this time the system send the electricity theft intimation message to the mobile phone. This is basically the warn message, that someone is stealing the electricity.

This message is sent by the microcontroller through the GSM Modem. Here, current sensors are not sensing the same values because current sensor before the energy meter is sensing current which is being consumed by theft load and by actual load at the same time. at this time, ATmega328 microcontroller will compare unequal currents and cause the relay to break whole circuit by program inside the microcontroller.

4.1. FLAWCHAT


START/STOP
INITIALIZE
microcontroller
Configure I/O ports
Initialize sensors and relay
Initialize GSM module
Current Sensor Sensing
Micro Controller Compare Current
NO
If current one is great than current two
YES
Relay ON
Send SMS

4.2.Circuit Diagram

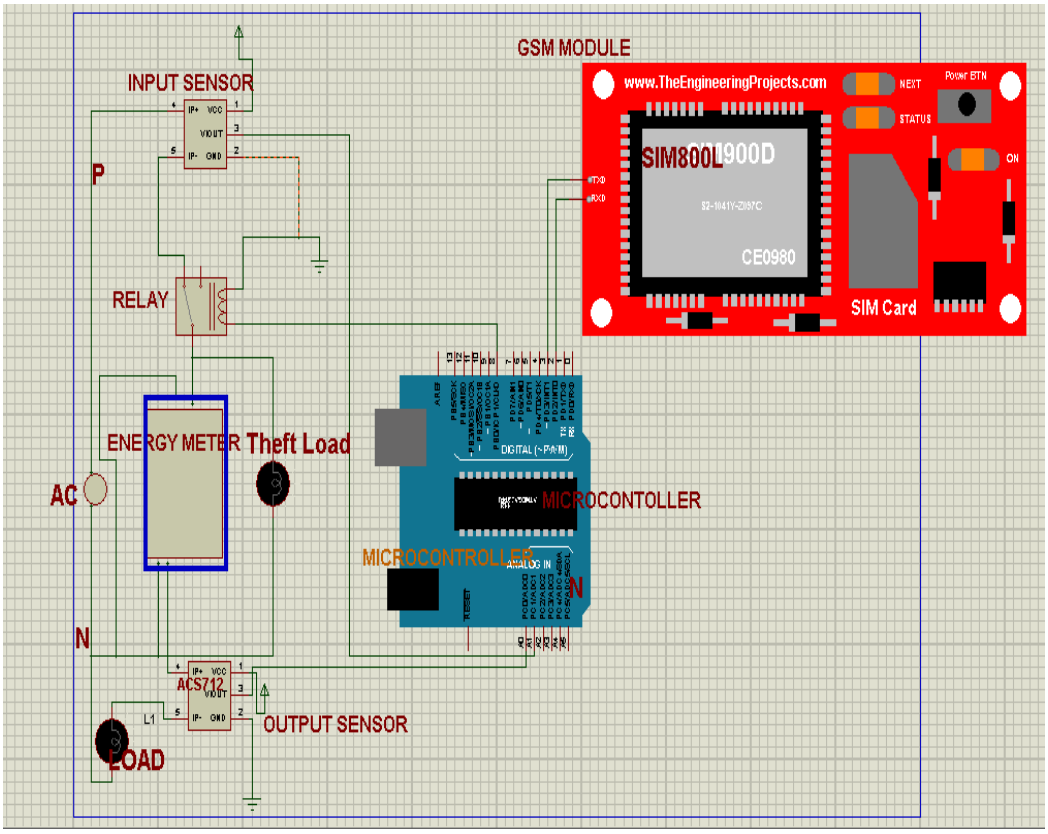


Figure.4. 1.Circuit Diagram

4.3.WORKING PRINCIPLE

The working principle of this electric energy theft intimation project is briefly explained as follows. Here I would be explaining this with a simple example. For understanding this, I will be connecting the two loads first one will be connected after the energy meter which is basically the actual load and second one will be connected before the energy meter which is basically the theft load.

Firstly,[6]I would check if the power supply that I will be using is well organized both AC for loads and DC for our system, we would again connect the actual load by its switch and then after if a relay can't break the circuit is working with no theft.

Here, both current sensors are sensing the same value and no message will be sent to the mobile phone by GSM Modem, when this is ok then, we would be on the load which is after the energy meter during this the system would be work normally.

Secondly, after this we would be on the load which is before the energy meter. When on this load then the system power off the whole supply of energy meter. During this time the system send the electricity theft intimation message to the mobile phone. This is basically

the warn message, that someone is stealing the electricity.

This message is sent by the microcontroller through the GSM Modem. Here, current sensors are not sensing the same values because current sensor before the energy meter is sensing current which is being consumed by theft load and by actual load at the same time. At this time, ATmega328 microcontroller will compare unequal currents and cause the relay to break whole circuit by program inside the microcontroller. By above brief explanation you can understand the working of our system.

Signal of theft on telephone

This message is sent by the microcontroller through the GSM Modem shown when there is thief of electricity. This message sent to utility company

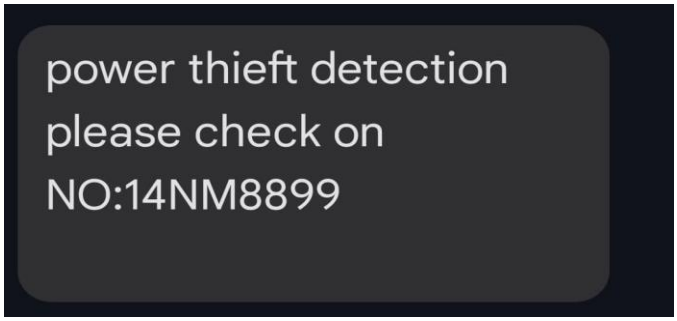


Figure.4. 2.Message sent by GSM modem to utility company

This message is sent to customer for warn him that there is fault in the system

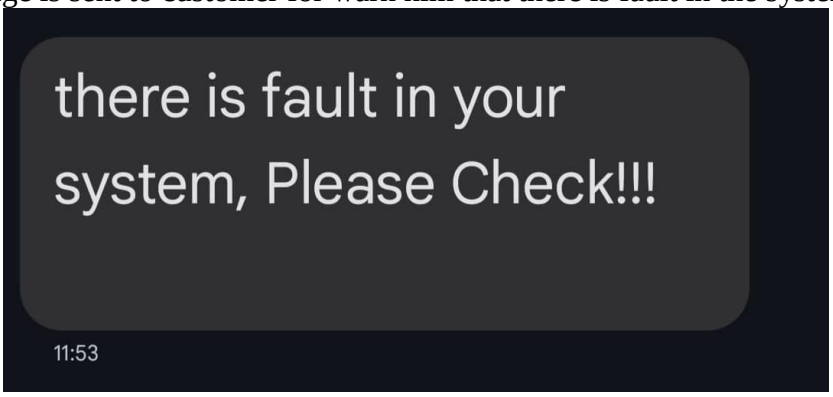


Figure.4. 3.Message sent by GSM Modem to customer

The utility company has sent a message to the customer's system to restart or reset the system they do it remotely

Figure.4. 4.Message sent by utility company to reset the customer system

After resetting the system, when the Theft is still in the system the circuit will be immediately off and the utility company will receive this message.

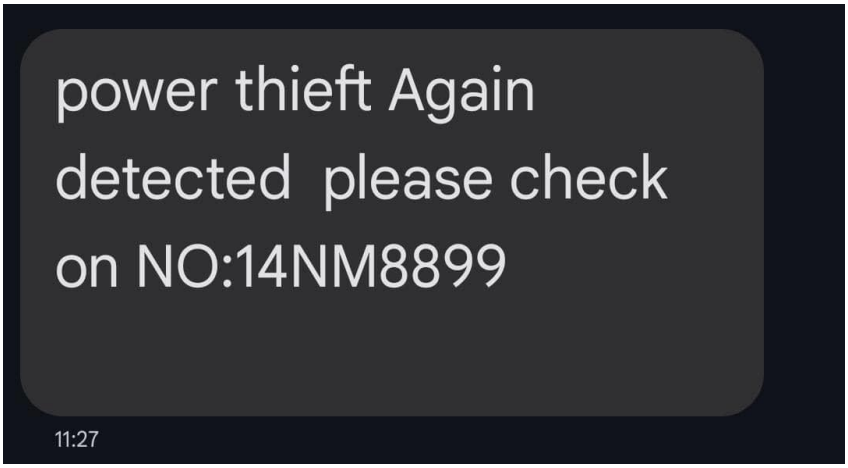


Figure.4. 5.Second message sent by GSM Modem to utility company

The circuit is running normally without anyone steal the power, this white light is normal load of customer

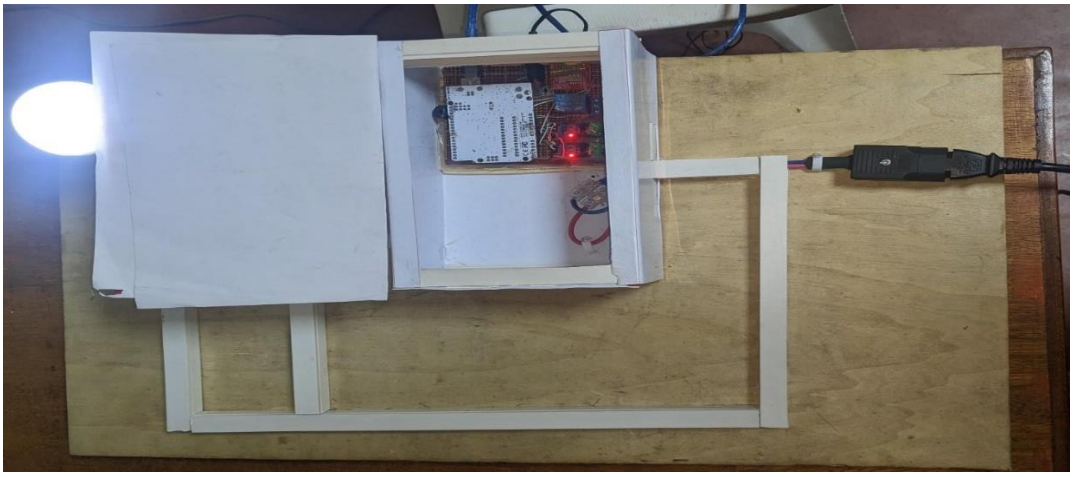


Figure.4. 6.circuit run normal without thief

This black patch cable plugged in the socket is thief load and the system it detect this thief and then it be off automatically

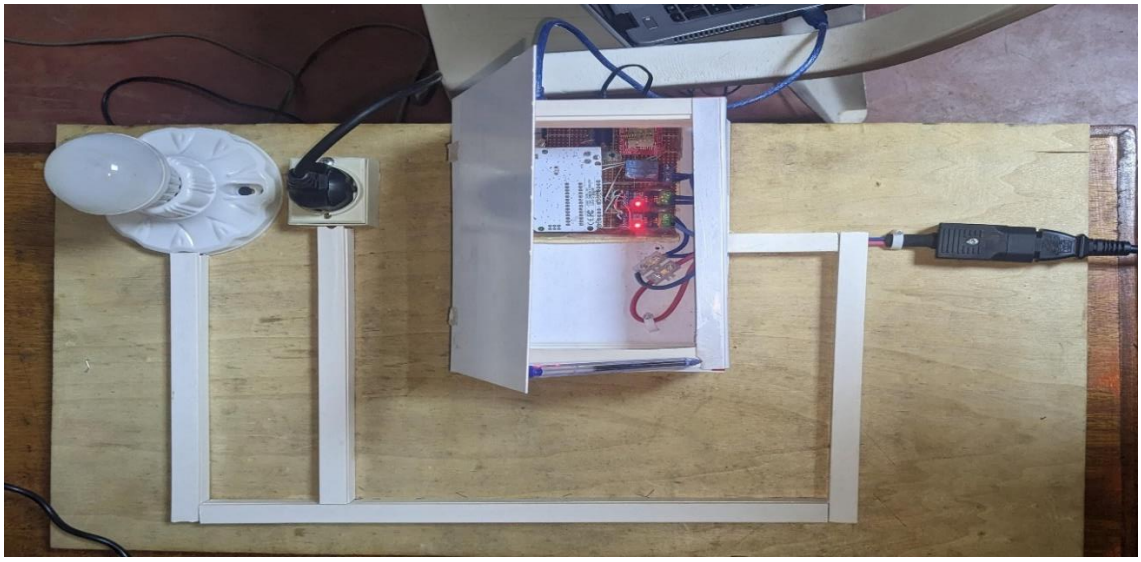


Figure.4. 7.When thief detected

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

In developing countries electricity theft is common practice especially in remote areas, involves tampering with meters to distort the billing information or direct connections to the power system. The electricity losses are nearly impossible to measure using traditional power system analysis tools. To solve these problems governments must think of an idea to provide help in terms of subsidy to manage this issue. The project model proposed in this paper was tested in a simulated environment and the results shows that the system helps to identify electricity theft. Furthermore, the metering microcontroller system ensures the accurate and reliable measurement of power consumed. Also, it reduces the manual manipulation works.

5.2. RECOMMENDATION

- Increase the frequency of the field training course through exploration studies (visits) This will make the students to become competent of Labor market after their studies.
- To facilitates students to make a visit relating to their given project during designing
- To provider all required materials to the students for their projects

REFERENCES

1. Siddarameswara H.N. “GSM based electricity theft identification in houses and in industryst

sector”, ICEE-21 june 2014,ISBN-978-93-81693-6603-03.

2. P. Rakesh Malhotra et al. / IJET “automatic meter reading and theft control system by using GSM”, 2013.

3. Abhinandan Jain, Dilip Kumar, Jyoti Kedia, “Design and Development of GSM based Energy Meter”, in IJERT, 2012.

4. Bharath, P.; ananth, N.; Vijetha, S.; Prakash,K.V.J.; “Wireless automated digital energy meter”.

In sustainable energy technologies, ICSET 2008.

5. Abdollahi, A. Dehghani, M. Zamanzadeh,“SMS-based Reconfigurable automatic meter reading system” in control applications,2007.

6. “GSM Based Electricity Theft Identification in Distribution Systems”, International

7. Journal of Engineering Trends and Technology (IJETT) – Volume 8 Number 10- Feb 2014

8. “ELECTRICAL POWER THEFT DETECTION AND WIRELESS METER READING”,

International Journal of Innovative Research in Science, Engineering and Technology Vol. 2, Issue 4, April 2013

9. “Wireless power meter monitoring with power theft detection and intimation system using GSM and Zigbee networks”, IOSR Journal of Electronics and Communication Engineering (IOSR- JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 9, Issue 6, Ver. I (Nov - Dec. 2014), PP

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10. International Journal of Computer Technology and Electronics Engineering (IJCTEE) Volume 2, Issue 2

APPENDIX

```
#include <SoftwareSerial.h>
SoftwareSerial my Serial(10,
11);//tx,rx int relay=9;
int buzzer=8;
const int sensorIn = A0;
int mVperAmp = 100; // use 100 for 20A Module and 66 for 30A
Module double Voltage = 0;
double VRMS
= 0; double
Amps MS = 0;
void setup()
{
 mySerial.begin(9600);// Setting the baud rate of GSM
Module Â Serial. Begin(9600);// Setting the baud rate of
Serial Monitor (Arduino) pin Mode(relay, OUTPUT);
pin Mode(buzzer,
OUTPUT);
delay(100);
digitalWrite(relay,
LOW);} void
loop()
{

 if (Amps
   MS>0.15){
   digitalWrite(buzz
   er, HIGH);
  }
  Voltage = getVPP();
 VRMS = (Voltage/2.0) *0.707;
```

```
Amps MS = (VRMS *
1000)/mVperAmp;                Serial.
Print(Amps MS);
 Serial.println("
  Amps RMS"); if
  (Amps MS>0.20){
    digitalWrite(rel
ay, HIGH); if
(Serial.
Available()>0)
Send Message();
 if  (mySerial.available()>0)
Serial.
Write(mySerial.read());
 } }
float getVPP()
{float result;
  int read Value;          //value read from
  the sensor int maxValue = 0;          //
  store max value here
  int minValue = 1024;       // store min
   value here uint32_t start_time =
   millis();
   while((millis()-start_time) < 1000) //sample for 1 Sec
   { read Value = analog Read(sensorIn);
      // see if you have a new
      maxValue  if  (read
      Value> maxValue) {
         /*record the maximum sensor
         value*/ maxValue = read
         Value; }
      if (read Value< minValue) {
```

```
        /*record the maximum sensor
        value*/     minValue  =  read
        Value;} }
    // Subtract min from max

   result  =  ((maxValue  -  minValue)  *
   5.0)/1024.0; return result;}
void Send Message()
{
 mySerial.println("AT+CMGF=1");  //Sets the GSM Module in Text Mode
  delay(1000);  //  Delay  of  1000  milli  seconds  or  1  second
  mySerial.println("AT+CMGS=\"0733494777\"\r");  //  Replace  x  with
  mobile number delay(1000);
 mySerial.println("power theft detected");// The SMS text you want to send delay(100);
  mySerial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);
```