

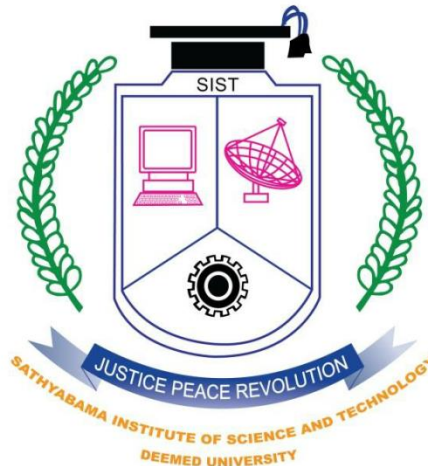
IOT BASED AUTO POWER SUPPLY CONTROL FROM FOUR DIFFERENT SOURCES

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in
Electrical and Electronics Engineering

by

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Deepa S (Register No. 37140021)



**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade “A” by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL 2021

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Chandraleka M** (Register No. 37140018) and **Deepa S** (Register No. 37140021) who carried out the project entitled "**IOT BASED AUTO POWER SUPPLY CONTROL FROM FOUR DIFFERENT SOURCES**" under our supervision from December 2020 to April 2021.



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We **Chandraleka M (Register No. 37140018)** and **Deepa S (Register No. 37140021)** hereby declare that the Project Report entitled **“IOT BASED AUTO POWER SUPPLY CONTROL FROM FOUR DIFFERENT SOURCES”** done by us under the guidance of is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Electrical and Electronics Engineering.

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ABSTRACT

The main purpose of this project is to provide continuous power supply to a load, by selecting the supply from any of the four sources namely solar, wind, battery and main power supply automatically in case one the source is absent. The need for electricity is increasing day by day and the frequent power cuts of electricity are causing many problems in different areas like banks, colleges/schools, hospitals, houses and industries. Thus, there is a requirement for an alternate arrangement of power supply. This arrangement can be designed by using an Arduino microcontroller and relays. When a source, say mains fails the supply automatically shifts to the next priority source generator and so on.

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CHAPTER -1

1.1 GENERAL INTRODUCTION:

The problems of environmental sustainability and energy saving are universal and common to all countries and regions worldwide. The interdependence of climatic and environmental factors is a reality that makes all countries and all citizens equally responsible for the present ecological problems, which will inevitably worsen if we are not all aware and supportive of their mitigation, if not prevention.

The first and possibly most effective measure for reversing the general trend is certainly the informing and mobilization of the public, and especially of the professionals, for a deeper understanding and accountability, leading to systematic interventions for the resolution of these problems.

The awareness of any problems affecting human society is surely proportional to the mobilization capacity of the media, the degree of literacy of the people, the cultural level of the information professionals, and, especially, of the education system's ability to frame and focus the education of the child, adolescent and adult, in this case, on the problems of sustainability and environmental balance.

All these capabilities are still in their infancy in Africa. Therefore, any threat to current life that is not objective, immediate and tangible tends to be perceived by most people as not requiring a short or even long-term change of attitude. The issues of sustainability and climate change are frequently considered as belonging to rich countries. The African continent, despite its low levels of industrialization and consumerism, is in a more vulnerable position than developed and highly industrialized countries. Hyper-consumerism should not be an aspiration for developing countries, which sometimes mistakenly adopt Western trends. There is a latent need not to follow the bad examples of the [industrialized world](#), and to preserve a quality that can be considered as intrinsic to the lack of financial wealth, which is the ability to recycle and take advantage of existing resources.

For a very long time, power outages, power interrupts and also unexpected routine power line maintenance is one of the major problems faced in industries, hospitals, offices, and homes all over the world. For that case, this project provides an automatic operation of electrical power distribution systems; the rapid and reliable transfer of the system from one power source to another during specific events such as power outages, power interrupts, routine power line maintenance, to achieve the reliability of such systems.

Electrical power supply is one of the primary essential needs of human life today, that is to say, without electrical power supply, most human works become stand still,

postponed and even cancelled since most human actions are dependent on the electrical power supply. Furthermore, the need for power supply through access to electricity by the masses of the population of any country, both developed and developing countries is very important to the development of the economy of that particular country. In other words, the power sector plays an essential role in the socio-economic development of any country.

We are implementing these proposed system with the combination of renewable energy , normally now a days were using standard solar only that is cost is high and efficiency also not enough , But in our system we were using hybrid energy sources to improve the efficiency and to provide a continuous power supply , this system will help us to overcome all the damages(Faultages) of power supply.



Fig 1.1 Combination of renewable energy sources

1.2 OBJECTIVES

The main objective of this project is to provide continuous and uninterrupted power supply.

For that we are using our system Solar, wind, battery and main supply.

1.3 MOTIVATION

- (i). To improve the efficiency of the power supply system by using the hybrid renewable energy sources.
- (ii). To avoid the power interrupt and power faults.
- (iii). To obtain the continuous power supply without interruption.

CHAPTER- 2

2.1 LITERATURE SURVEY

Abdurrahman Shuaibu Hassan and et.al (2008) is designed to automatically supply continuous power to a load through one of the four sources of supply in (2008) that are: solar, mains, thermal, and wind when any one of them is unavailable. The four switches represent the four causes. The switches are connected to an 8051 microcontroller of which they provide input signals. Whenever a switch is pressed, it shows the absence of that particular reference. A relay driver is used that receives microcontroller generated output and switches that specific relay to provide continuous power supply. A lamp or bulb is used as a load for demonstration purposes which draws power from main. When the primary fails to supply power, automatically the next available source is used like thermal. If thermal fails then the next one is used and so on. An LCD is used to show which power supply is on.

John Conscience Ehiabhili and et.al (2008) Over the past decade, there has been drastic improvement and advancement in consumer electronics and embedded systems. Various home appliances such as light bulbs, fans, television sets, CD players etc. are set to realize switching control using a coded smartphone. This has given rise to a home environment where appliances can be connected and controlled at a distance. This project demonstrates the design of an automated system to assist and provide support in order to fulfil the needs of the physically disabled and elderly ones in controlling electrical appliances in homes. The main control system implements wireless Bluetooth technology to provide remote access from our smartphones to a Bluetooth module and then to a control and switching unit. Bluetooth wireless connection enables the system to communicate with a java application on an Android smartphone without cable. The user can easily touch on the screen of the phone to control the home appliances. This portable method is able to assist the disabled, sick and elderly people who have difficulties with locomotion. This system is intended to control electrical appliances and devices in house with relatively low-cost design, user friendly interface and ease of installation.

Jonathan and et.al (2007) is designed to automatically supply continuous power to a load through one of the four sources of supply that are: solar, mains, thermal, and wind when any one of them is unavailable. The four switches represent the four causes. The switches are connected to an 8051 microcontroller of which they provide input signals. Whenever a switch is pressed, it shows the absence of that particular reference. A relay driver is used that receives microcontroller generated output and switches that specific relay to provide continuous power supply. A lamp or bulb is used as a load for demonstration purposes which draws power from the main. When the primary fails to supply power, automatically the next available source is used as thermal. If thermal fails then the next one is used and so on. An LCD is used to show which power supply is on.

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Potru Sai Krishna (2019) is to provide continuous power supply to a load, by selecting the supply. Power is the most important requirement for all of us. We know that due to large demand for electricity and due to the limited capacity of power plants at generating stations, power cut off is common for all us. Due to limited amount of power generation at power stations and due to shortage of nonrenewable continuous supply sources it brings a biggest challenge in the whole world. If you see all around us you will observe that due to discontinuity of power supply, many problems have been faced by people in their everyday use. This type of power failure creates problems for data centers, hospitals and some research work. This is the biggest reason that every country is researching the work to supply a continuous power with good efficiency and with good regulation. In this project we can combine the renewable and non-renewable energy sources to get the continuous power supply such as mains, solar, battery, adapter. The power cut of these sources can be manually done by switches. The continuous supply to load can be given by automatic operation of relay, relay driver IC with the help of Arduino microcontroller.

L.S. Eczema, B.U. Peter ,O.O. Harris (2019)This has adverse effects on the consumers of the electricity and the equipment that are operated from the mains sources of electricity supply in these parts of the world. In this, we provide an automatic switching mechanism that transfers the consumer loads to a power source from a generator in the case of power failure in the mains supply. It automatically detects when power has been restored to the mains supply and returns the loads to this source while turning off the power from the generator set. This mechanism has been tested and we recorded a great result. It thus holds an important key in the provision of a continuous power supply through a near seamless switching between the mains supply and an alternative standby source like the generator set.

CHAPTER - 3

3.1 EXISTING SYSTEM:

In the existing system, they used a microcontroller, relay driver and selection keys to demonstrate the corresponding failure of that power supply. By pressing any one of the switches, absence of that particular source can be found out. The switches are connected as input signals to the microcontroller. In this system 8051 microcontroller is used. From the microcontroller The relay driver IC collects output. Each source contains one relay to get access to which source is to be activated and which is active now. selection keys are used to change the sources.

This auto power supply control system works on the principle of auto function for switching over the load to other available sources without wasting any time or switching off the load. Here for the demonstration purposes they have used the selection keys to switch off any source of supply. In this system, the microcontroller which is a component of this system always keeps sensing the whole available sources. When any source is switched off through the selection keys then the microcontroller shifts the load to the other supply source by giving the signal to the relay driver IC then the relay driver IC switches on the appropriate load relay. The whole function is done by the microcontroller in microseconds and this shifted time can be changed during the programming of the microcontroller. Here 4 load relays are used which are connected in parallel with load and 4 sources of supplies are also connected in parallel with these load relays. These load relays consist of normally open and close contacts and are operated through the relay driver IC. We have checked this system by connecting the lamp at output side as a load when any interruption takes place during the shifted time then the lamp is blinking but here there is no any blinking taking place during the shifted time means there is no any interruption in supplying the power at output side.

3.2 DISADVANTAGES OF EXISTING SYSTEM:

The present working status of sources is not known to us.

- We have to change the switches by using selection keys. It consumes the manual power and takes too much time, if any one not in that place means we cannot access these systems.
- Availability of sources cannot be justified.
- Insufficient energy sources cannot be founded, which means we cannot find which source is active now and which does not have sufficient energy to give a supply.

3.3 BLOCK DIAGRAM OF EXISTING SYSTEM:

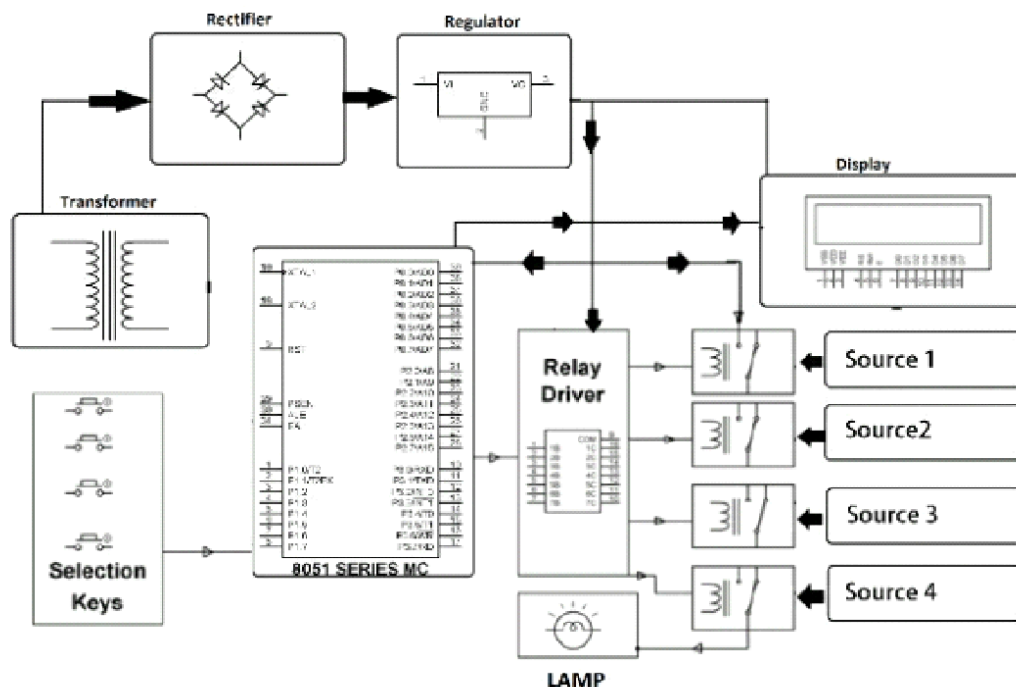


Fig 3.1 Block diagram of existing system

Fig 3.1 Represents the block diagram of the existing system, which contains Microcontroller, Selection keys ,Relay drivers, LCD Display , Transformer , Rectifier and the four sources .

When the main supply fails other sources give the supply to the load. When supply fails, we have to select the selection keys which source is to give power to the load, Selection keys gives the information to the microcontroller and then it gives to the Relay driver from the relay drivers each sources have a one relay which is used to select which source is to give a power and then give the power to the load and then LCD will display the result which source is active now.

3.4 COMPONENTS USED IN EXISTING SYSTEM:

- Microcontroller
- Relay drivers
- Selection keys
- Load
- Solar Panel
- Adapter
- Battery
- Relays

3.5 PROPOSED SYSTEM:

In this proposed system, we made use of IOT technology, which helps in operating the system from different places. This IOT technology is the latest technology, which is used to collect the information about the different sources either the switch is ON or OFF. In this system, we made use of an Arduino Microcontroller, Relay drivers, IOT technology, Lcd, and Load. The output of arduino microcontroller is connected with the relay drivers. Through the relay drivers the correct sources are going to be activated and supplied to the load. In this system we are using four different sources solar, wind, battery and mains. At the absence of mains the next source is activated automatically by using arduino code and the load is fed power. Likewise we can use this to get an uninterrupted power supply. We can also change the sources by using cloud mobile apps. The continuous supply to load can be given by automatic operation of relay, relay driver IC with the help of Arduino microcontroller.

This system is designed for giving continuous power supply automatically. By changing automatically when the main supply fails. On failure of the mains supply the load gets supply from the next available source, battery backup. If the battery backup also fails it switches over to the next available source and so on. The current status, as to which source supplies the load is also displayed on an LCD or in a mobile application. All the operations controlled by the Microcontroller unit or Arduino module. The system can be designed in two modes: 1) Automatic: System operates automatically as the given commands. 2) Manual: Users can control the system by a mobile application or by switches also. In this project, cloud is used for control or access to the data or information about the system at any place, which means the authorized person can control all the process through mobile application also. The system can be designed in two modes: 1) Automatic: System operates automatically as the given commands. 2) Manual: Users can control the system by a mobile application or by switches also. In this project, cloud is used for control or access to the data or information about the system at any place, which means the authorized person can control all the process through mobile application also.

3.6 BLOCK DIAGRAM OF PROPOSED SYSTEM:

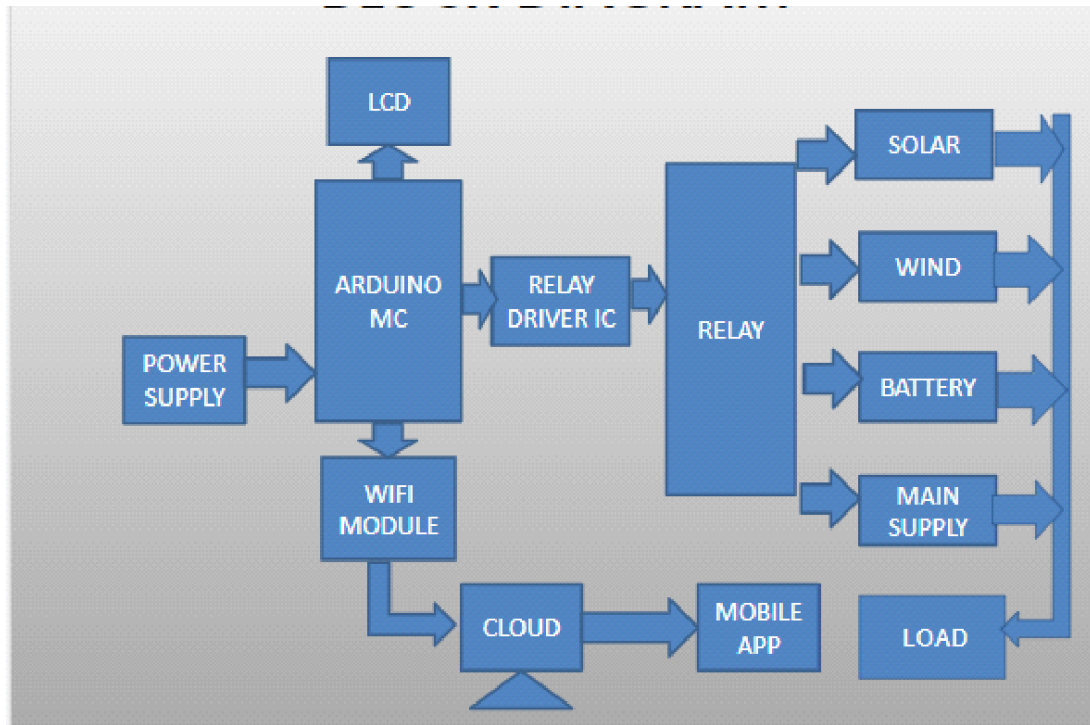


Fig 3.2 Block diagram of proposed system.

Fig 3.2 Represents the block diagram of the auto power supply control system from 4 different sources using an Arduino microcontroller with all the essential components. The Block Diagram of the auto power supply control system from 4 different sources using an Arduino microcontroller. In this diagram we used different sources namely solar and wind, battery and main supply. For each source is connected with a relay. The four switches represent the four causes. These switches are connected to an Arduino microcontroller of which they provide input signals. A relay driver is used that receives microcontroller generated output and switches that specific relay to provide continuous power supply. When solar energy fails, automatically wind energy is activated and the main supply so on. Here we are using a wifi module which is connected to an Arduino microcontroller. Here we are using a mobile app. Also, by this mobile application, a user can select the mode of operation of the system. If he selects the Manual mode, then a user will be able to control any resources by self that means if a user wants to switch the resources any time then they can do so. The mobile application has a different type of buttons and indicators. The buttons are used for manual control; these buttons are available in only manual mode.

3.7 COMPONENTS REQUIREMENT

HARDWARE REQUIREMENTS:

- **Arduino microcontroller**
- **Lcd**
- **Load**
- **Realy**
- **Solar panel**
- **Battery**
- **Wi-fi module**

3.8 SOFTWARE REQUIREMENTS:

- **Arduino IDE**
- **Embedded C**
- **Proteus**

3.9 ADVANTAGES OF PROPOSED SYSTEM.

- Providing continuous power supply from different sources without any interruption.
- Using iot technology and the arduino system will automatically change the source when the main fails; it doesn't need any man power to operate.
- Anyone can operate a system by using a mobile application , it is very easy to use.
- Using the Mobile app can we find which type of source is currently using.. Power supply controlled from four different sources.
- This system could be used in places where we have different sources of supply such as solar, main and wind.
- This system could be used in industries for supplying the uninterruptible power supply to the industrial machines.
- This system is more compact and reliable as compared to the electrical ATS panels.
- This system is less costly as compared to the other power control systems.

3.10 APPLICATION OF PROPOSED SYSTEM:

- The proposed system is used to supply uninterruptible power to the essential services.
- This system could be used in educational institutes and hospitals for supplying the uninterruptible power supply to the hospital or educational equipment.

CHAPTER - 4

4.1 SIMULATION RESULTS OF PROPOSED SYSTEM:

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. Before starting any project, it is a good practice to simulate it and virtually verify that it works. Proteus is a simulation based software. By using this software Arduino can be simulated.

4.1.1 Simulation of Proposed System

Fig 4.1 Represents the simulation result of the proposed system when the system is on LCD will display IOT Based Auto power Control, which means the system is ready and giving a supply.

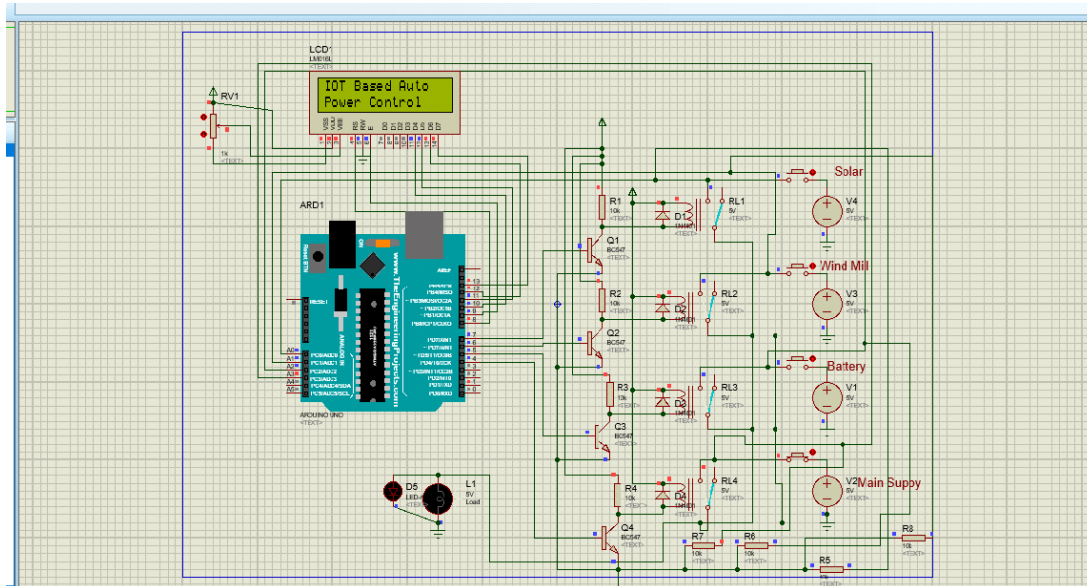


Fig 4.1 Simulation result of proposed system when the system is ON.

4.1.2 The Load Is Supplied by Mains

Fig 4.2 Represents when the main supply is ON and gives to the load and the load is in active, Then LCD is displaying the result which source is active now (Running On Mains).

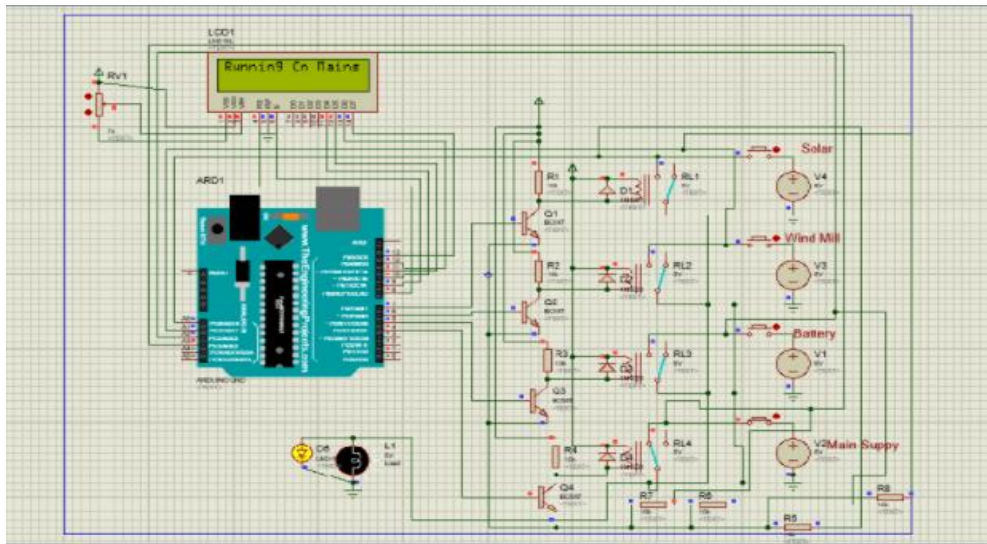


Fig 4.2 Simulation Result when the system is running on Mains

4.1.3 The Load is Supplied by Battery

Fig 4.3 Represents the software simulation result when mains failure it will automatically change to the next source which will have a high energy and then supply is given to the load(Lamp) , Load will Glow and the LCD displaying the message which source is active and which is giving supply to the load.Now the load is running on Battery.

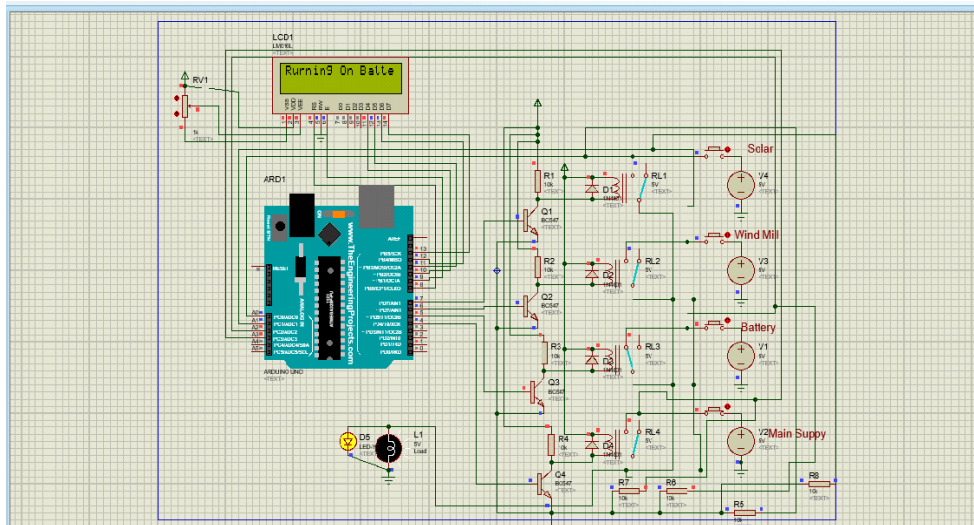


Fig 4.3 Result of software simulation system running on Battery

4.1.4 The Load Is Supplied by Wind

Fig 4.4 Represents the software simulation result when mains failure it will automatically change to the next source which will have a high energy and then supply is given to the load (Lamp), Load will Glow and the LCD displaying the message which source is active and which is giving supply to the load. Now, the Load is running on Wind.

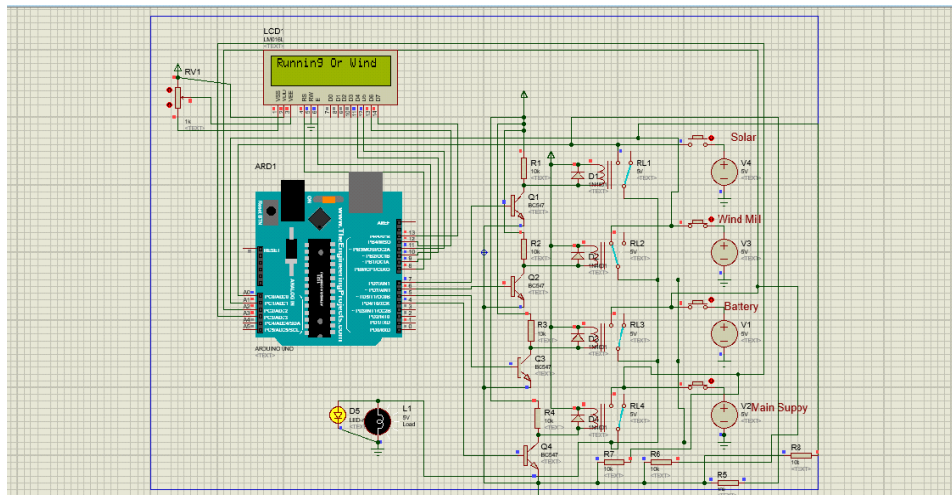


Fig 4.4 Simulation result of system when the load is running on Wind

4.1.5 The Load is Supplied by Solar

Fig4.5 Represents the software simulation result when mains failure it will automatically change to the next source which will have a high energy and then supply is given to the load (Lamp), Load will Glow and the LCD displaying the message which source is active and which is giving supply to the load. Now the Load is running on Wind.

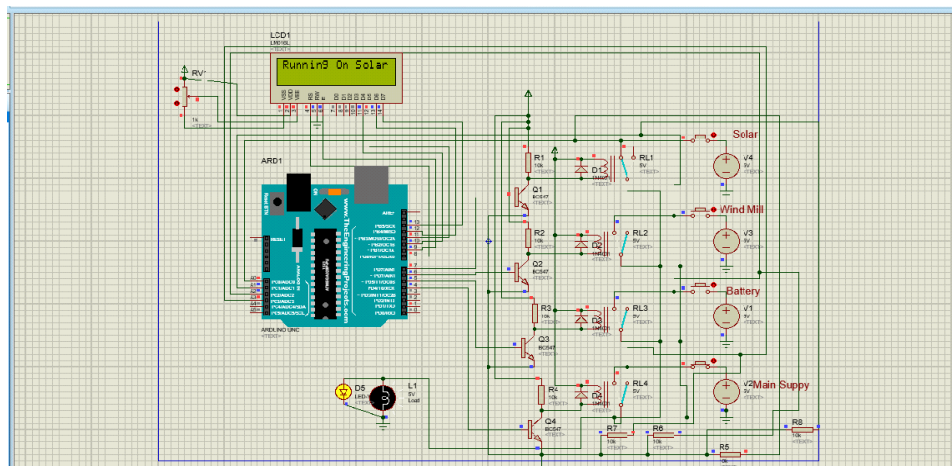


Fig 4.5 Simulation result of system when the load is running on Solar

4.2 CONTROLLING THE FOUR ACTIVE SOURCES USING IOT

In this we are using iot cloud data to control the four different sources by pressing the switch on and off. In that there are four switches for solar, battery, wind and mains. We can also get information from that about which source is active now and which is on failure that will be stored in that software.

In iot cloud data four logs there we are getting information from the digital input and output.

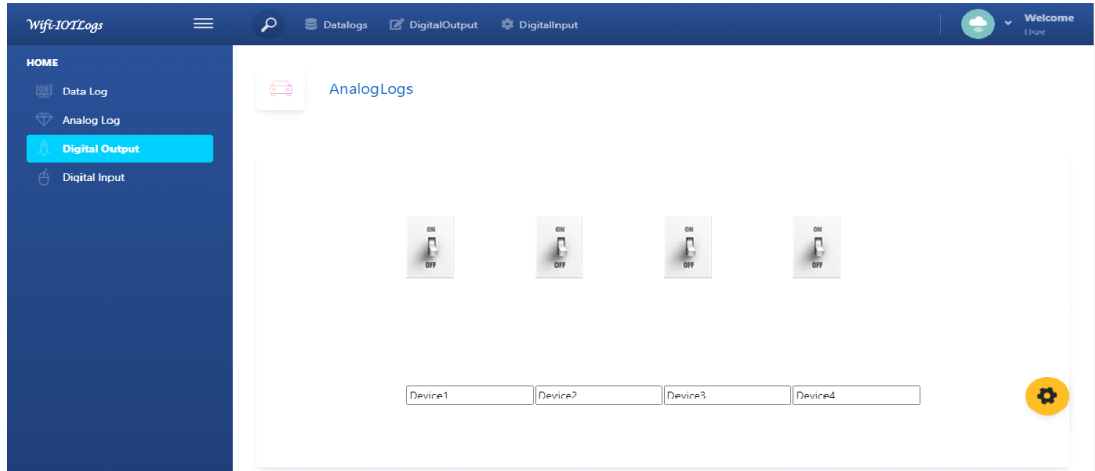


Fig 4.6 Software tool to operate the four Sources using Switches

From the diagram 4.6 represent, here we using four devices. when the devices 1 is turned on the mains will active and supply the power to load and remaining three sources are in rest. As like as when devices 2 is turned on battery will active, and devices 3 and 4 solar and wind will active.

4.2.1 Active and Failure Mode Indication of Sources

LogID	DATA	Logdate	LogTime
1	Running_On_Solar_Mains_Failur	03/02/2021	18:22:41
2	Running_On_Solar_Mains_Failur	03/02/2021	18:22:57
3	Mains_Failure_Battery_Failure	03/02/2021	18:23:02
4	Running_On_Solar_Mains_Failur	03/02/2021	18:23:09
5	Running_On_Solar_Mains_Failur	03/02/2021	18:23:13
6	Mains_Failure_Battery_Failure	03/02/2021	18:23:19
7	Mains_Failure_Battery_Failure	03/02/2021	18:23:25
8	Battery_Failure_Windmil_Fail	03/02/2021	18:23:29
9	Running On Solar Mains Failure	03/02/2021	18:23:33

Fig 4.7 Active and failure mode indication of sources

Fig4.7 Represents, we assume, Data log gives the information about which source is active and which one is failure. It also calculates the time duration of each source when it's working.

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CHAPTER- 5

5.1 HARDWARE REQUIREMENTS:

5.1.1 Arduino microcontroller

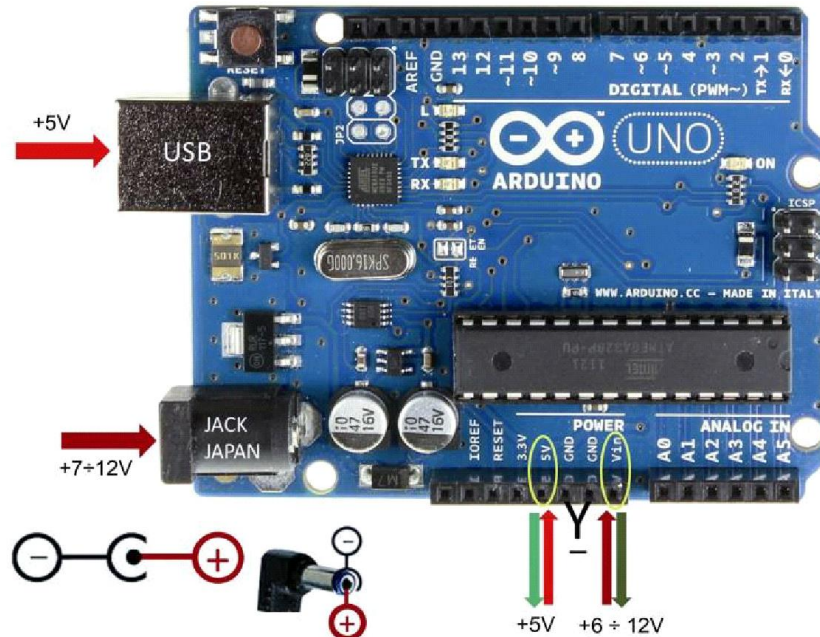


Fig 5.1 Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P 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.

5.1.2 LCD

In this project, LCD helps by displaying which sources are active.

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. A display is made up of millions of pixels. The quality of a display commonly refers to the number of pixels; for example, a 4K display is made up of 3840 x 2160 or 4096 x 2160 pixels. A pixel is made up of three subpixels; a red, blue and green—commonly called RGB. When the subpixels in a pixel change color combinations, a different color can be produced. With all the pixels on a display working together, the display can make millions of different colors. When the pixels are rapidly switched on and off, a picture is created.

LCDs are made with either a passive matrix or an active-matrix display grid. The active-matrix LCD is also known as a thin film transistor (TFT) display. The passive matrix LCD has a grid of conductors with pixels located at each intersection in the grid. A current is sent across two conductors on the grid to control the light for any pixel. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel. For this reason, the current in an active-matrix display can be switched on and off more frequently, improving the screen refresh time.

Some passive matrix LCDs have dual scanning, meaning that they scan the grid twice with current in the same time that it took for one scan in the original technology. However, active matrix is still a superior technology out of the two.



Fig 5.2 LCD DISPLAY RUNNING MAINS

At the diagram 5.2 represents the LCD display, when the system is working under mains. It will active by when the corresponding relay is tripped at this part so the main will connected to the system and the supply to the load (LED).



Fig 5.3 LCD DISPLAY RUNNING ON SOLAR

At the daigram 5.3 represents the LCD display, when the system is working under solar. It will active by when the corresponding relay is tripped at this part so the solar will connected to the system and the supply to the load (LED).



Fig 5.4 LCD DISPLAY RUNNING ON BATTERY

At the diagram 5.4 represents the LCD display, when the system is working under mains. It will active by when the corresponding relay is tripped at this part so the battery will connected to the system and the supply to the load (LED).



Fig 5.5 LCD DISPLAY RUNNING ON MAINS

At the diagram 5.5 represents the LCD display, when the system is working under wind. It will active by when the corresponding relay is tripped at this part so the wind will be connected to the system and the supply to the load (LED). Finally, the led will glow.

5.1.3 Load

In this proposed system we are using LED as a load. The range of our load is 5V. When the system fails the main supply, the other source is giving the supply to the load.

An electrical load is an electrical component or portion of a circuit that consumes (active) electric power, such as electrical appliances and lights inside the home. The term may also refer to the power consumed by a circuit. This is opposed to a power source, such as a battery or generator, which produces power.

The term is used more broadly in electronics for a device connected to a signal source, whether or not it consumes power. If an electric circuit has an output port, a pair of terminals that produces an electrical signal, the circuit connected to this terminal (or its input impedance) is the load. For example, if a CD player is connected to an amplifier, the CD player is the source and the amplifier is the load.

Load affects the performance of circuits with respect to output voltages or currents, such as in sensors, voltage sources, and amplifiers. Mains power outlets provide an easy example: they supply power at constant voltage, with electrical appliances connected to the power circuit collectively making up the load. When a high-power appliance switches on, it dramatically reduces the load impedance.

If the load impedance is not very much higher than the power supply impedance, the voltages will drop. In a domestic environment, switching on a heating appliance may cause incandescent lights to dim noticeably.

5.1.4 Relay

In this project we used a 12v relay for each source. Each source is connected with different relays. In this project we are using four relays. Each relays drive the specific source and then gives the supply to load.

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. 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.

Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

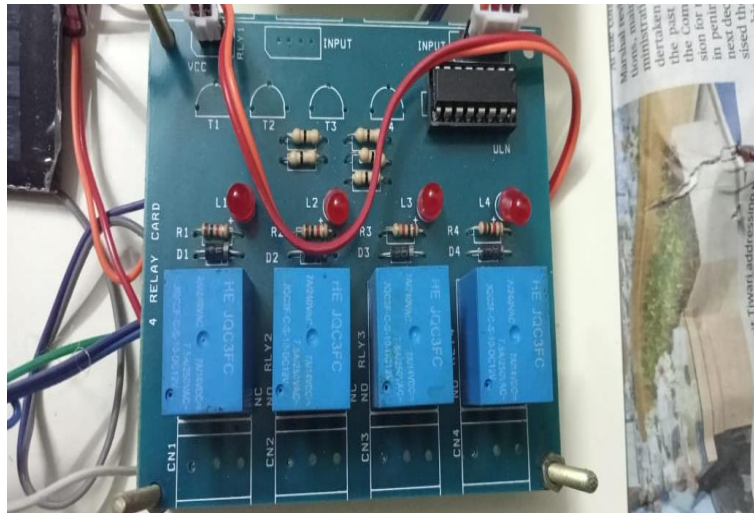


Fig 5.6 Relay unit

Main Feature

- RW Series Relay covers switching capacity by 10A in spite of miniature size to comply with the user's wide selection.
- RWH is an approved C-UL & TÜV safety standard.
- The employment of suitable plastic materials is applied under high temperature conditions and various chemical solutions.
- Complete protective construction is designed for dust and soldering flux. If required, plastic sealed type is available for washing procedure.
- 12A at 120VAC for RW & 12A at 240VAC for RWH are UL approved.

5.1.5 Solar Panel

Here we use a 12v solar panel. When sunlight falls on the solar panel it generates a power and is stored in the battery. When the other 3 sources are deactivated, the solar gets active automatically and it gives power to the load.

The term solar panel is used colloquially for a photo-voltaic (PV) module.

A PV module is an assembly of photo-voltaic cells mounted in a framework for installation. Photo-voltaic cells use sunlight as a source of energy and generate direct current electricity. A collection of PV modules is called a PV Panel, and a system of Panels is an Array. Arrays of a photovoltaic system supply solar electricity to electrical equipment. photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. Most modules use wafer-based crystalline

silicon cells or thin-film cells. The structural (load carrying) member of a module can be either the top layer or the back layer. Cells must be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones based on thin-film cells are also available. The cells are connected electrically in series, one to another to the desired voltage, and then in parallel to increase amperage. The wattage of the module is the mathematical product of the voltage and the amperage of the module. The manufacture specifications on solar panels are obtained under standard condition which is not the real operating condition the solar panels are exposed to on the installation site.

A PV junction box is attached to the back of the solar panel and functions as its output interface. External connections for most photovoltaic modules use MC4 connectors to facilitate easy weatherproof connections to the rest of the system. A USB power interface can also be used.

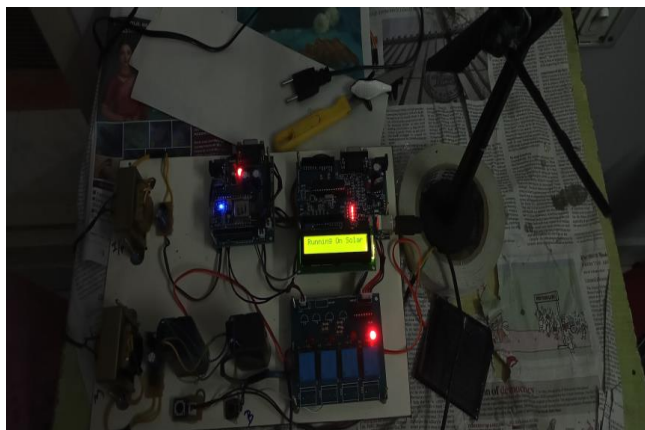


Fig 5.7 Relay unit used in hardware

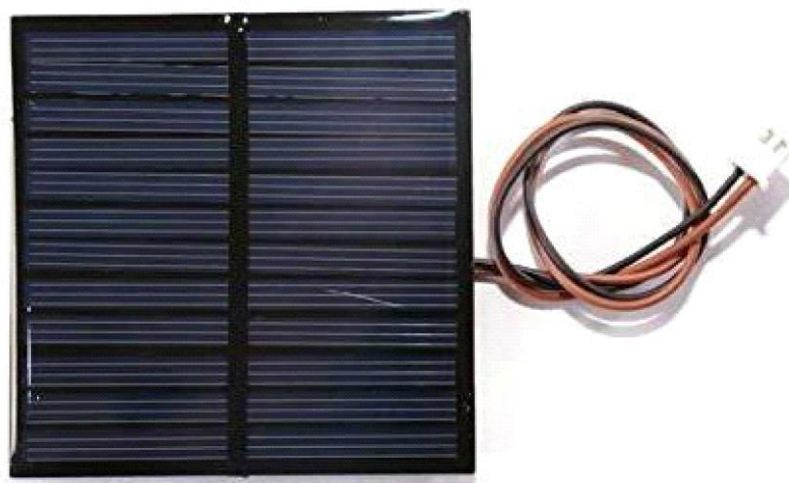


Fig 5.8 Solar Energy

5.1.6 Wind Energy

Wind turbine blades rotate when hit by the wind. And this doesn't have to be a strong wind, either: the blades of most turbines will start turning at a wind speed of 3-5 meters per second, which is a gentle breeze.

It's this spinning motion that turns a shaft in the nacelle – which is the box-like structure at the top of a wind turbine. A generator built into the nacelle then converts the kinetic energy of the turning shaft into electrical energy. This then passes through a transformer, which steps up the voltage so it can be transported on the National Grid or used by a local site.

From micro-turbines for an individual house right up to enormous, off-shore wind farms, all wind turbines use the same mechanics to generate electricity.

We are using another source as a wind turbine to provide power to the load, when another source fails, if the power in the Wind it will automatically give the supply to the load.

5.1.7 Battery

Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to small, thin cells used in smartphones, to large lead acid batteries or lithium-ion batteries in vehicles, and at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centres.

Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting electrical energy to mechanical work, compared to combustion engines.



Fig 5.9 Battery

5.1.8 WI-FI MODULE

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth coexistence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transform this module into an IoT (Internet of Things) solution.

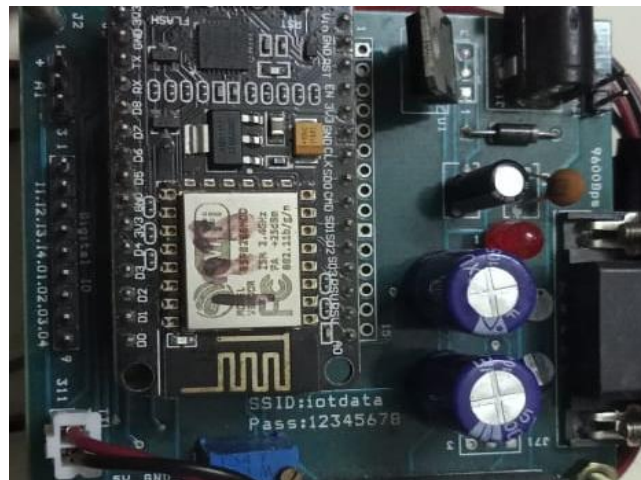


Fig 5.10 WIFI Module

5.2 SOFTWARE EQUIPMENTS

5.2.1 ARDUINO IDE – 1.8.5

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

CHAPTER - 6

6.1 CONCLUSION

In this Project, we have successfully implemented the IOT base Auto power control from four different sources. The Proposed system can be applied to industries which need a continuous power supply like hospital , Laboratories. The Normal power shutdown is alsominimised by this system. The power demand of essential services can be met by this proposed system.Demand for energy worldwide grows rapidly, because energy generation is low but energy consumption is on a high rate. Electricity companies cannot satisfy the demand and must use non-conventional energy systems. Use of renewable energy along with the non-conventional sources not only increases the reliability of the system but also allows higher power demands to be fed. Prioritizing the various available sources makes the selection and utilization economic. The priorities may be decided according to the availability of source, usage cost, its effects on the operation of other equipment (noise due to generators, smokes etc). The selection algorithm can be coded into a microcontroller which will automatically shift between different sources using relays through the relay driver. The project involves four different sources with different parameters to allow the microcontroller to judge the selection of the best available source to use.

These experimental results for various conditions are considered and monitored. The same model applicable for the future development also.This project presents more advantage into future developments .

6.2 FUTURE SCOPE

The future work primarily focuses on increasing the number of sources to increase the reliability of the system and provide uninterrupted power supply to the load at all times. The new sources will be selected according to their cost of implementation and availability during a particular season. More automation via microcontroller can be provided to minimize noise issues and sparking in changeover from one source to another. The future scope of this paper is in large application like standalone hybrid micro grid systems.

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