

DESIGN AND IMPLEMENTATION OF HOME AUTOMATION

PROJECT REPORT

**SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE
AWARD OF
DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION**

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GOVERNMENT POLYTECHNIC NAGPUR
(An Autonomous Institute of Government of Maharashtra)
(2021-22)

GOVERNMENT POLYTECHNIC NAGPUR

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Design And Implementation OF Home Automation

during academic session 2021-2022 as a part of project work prescribed by Government Polytechnic, Nagpur for partial fulfilment for the Diploma in Electronics Telecommunication engineering. The project work is the record of students own work and is completed satisfactorily.

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CANDIDATE'S DECLARATION

We hereby certify that the work which is being presented in the project report entitled “IoT BASE HOME AUTOMATION” in partial fulfilment of requirements for the award of diploma in Electronics Telecommunication engineering submitted to the Department of Electronics Telecommunication is record of our own work carried out during EVEN 2021-22 guided by Prof. Sachin Kale

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THANK YOU

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Abstract

Home automation system achieved great popularity in the last decades and it increases the comfort and quality of life. Due to the rapid development in the field of the Automation industry, human life is becoming more advanced and better in all aspects. As you know the rapid growth in the number of consumers using the internet over the past years, the Internet has become an important part of life, and IoT is the newest and emerging internet technology. Internet of things plays an important role in human life as well as in the educational field because they are able to provide information and complete the given tasks while we are busy doing some other work. In this paper, a prototype and implementation of Smart Home Automation with Wi-Fi technology are exhibit. Nowadays most home automation systems consist of a smartphone and microcontroller. A smart phone application is used to control and monitor the home appliances using different type of communication techniques. The home automation is the one of the best Application for controlling home devices with ease with multiple users and one of the best method for an energy management system. This system is also expandable for controlling various appliances used at home and also for the security and safety purpose of the home through sensors as long as it exists on Wi-Fi network coverage. Moreover in this research work the survey of different home automation systems is discussed and their advantages and drawbacks are also highlighted.

Literature Survey

1. Home automation is the hottest new trend at your home improvement market with a greater number of technological advances. Home automation ways to literally run your property automatically.
2. This central computerized control of the home allows homeowners a planned out types of going about household duties.
3. An individual as you had to discover the clock for stuff that needed to be done at various times on the day.
4. It could be to make your home friendlier for any elderly or use the children, taking home security to the next level and to build home operations easier and then run them smoothly.

- **Bluetooth based home automation system using cell phones:**

In Bluetooth based home automation system the home appliances are connected to the Arduino BT board at input output ports using relay. The program of Arduino BT board is based on high level interactive C language of microcontrollers; the connection is made via Bluetooth. The password protection is provided so only authorized user is allowed to access the appliances. The Bluetooth connection is established between Arduino BT board and phone for wireless communication. One circuit is designed and implemented for receiving the feedback from the phone, which indicate the status of the device.

- **The proposed home automation system**



This system uses mobiles or computers to control basic home control and function automatically through internet from anywhere around the Globally, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The proposed system is a distributed home automation system, consists of server i.e. Bluetooth module, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). Automation System can be accessed from the web browser of any local PC using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP).

Challenges of Home Automation Systems

Home automation systems suffers four main challenges, these are poor manageability, inflexibility, difficulty in achieving security and high cost of ownership. The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

Present Work

1. Home automation is the building automation for a home, called a smart house.
2. A home automation system will monitor and control home attributes such as lighting, climate, entertainment systems, and appliances.
3. It may also include home security such as access control and alarm systems.
4. The most common applications of home automation are lighting control, HVAC, outdoor lawn irrigation, kitchen appliances, and security systems.

Objective

In the modern world or time the technology is improving day by day. In this time the people want to do work with less efforts and gain more profit. So, this can be achieve with the help of Home Automation Invention with it is the best and cheapest way. Security help, people that will enable them to control home appliances and alert them in critical situations.

CHAPTER 1

INTRODUCTION

1.1 Introduction of Home Automation

1. Technology is a never ending process
2. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community.
3. This is the Simple electronic project based on the home automation. In the modern world or time the technology is improving day by day.
4. You can see from a small things to large things the electronic is involved. In this time the people want to do work with less efforts. And this can be achieve with the help of electronics and this is the best and cheapest way.
5. By seeing the people lifestyle, our team developed a project which based on home automation. With the help of this project we can control the appliances connected with our home, office and other commercial area through our smartphone using Bluetooth. So due to this project we can save our time and also it give a smart look for our home.
6. Project we use IOT based home automation system which goal is to develop a home automation system that gives the user complete control over all remotely controllable our home.
7. The recent developments in technology which permit the use of wireless controlling environments like, Bluetooth and Wi-Fi that have enabled different devices to have capabilities of connecting with each other. IoTs technology is used to come in with innovative idea and great growth for smart homes to improve the living standards of life.
8. The main and very basic need of using home systems like light, fan, air conditioner, air heater by using different switches in different places. Therefore people, especially adult people need to put a lot of afford to switch all those components separately and with enough power to press.
9. In recent years home automation is gaining much popularity. The trend is also in favour of using home automation technology. If we look around residences, malls, offices, use of home automation systems will draw attention.
10. Aim of this project is to demonstrate an unostentatious home automation system that apprehends an outlying android controller and home machineries.

1.2 What is IOT?

1. It is the network of physical objects that are embedded with sensors and other technologies for the purpose of connecting the data with other devices and systems over the internet.
2. Due to this technology big data analytics and mobile technologies or physical things can share and collect data with minimal human intervention.
3. Over the past few years, IoT has become one of the most important technologies of the 21st century.
4. Now that we can connect everyday objects like Home appliances, In hospitals to the internet via embedded devices, the communication is possible between people and things.
5. By means of low-cost computing, the cloud, big data, analytics, and mobile technologies, physical things can share and collect data with minimal human intervention.
6. In this hyperconnected world, digital systems can record, monitor, and adjust each interaction between connected things.

CHAPTER 2

SYSTEM DESCRIPTION

2.1 Project Description

1. A home automation system is a technological solution that enables automating the bulk of electronic, electrical and technology-based tasks within a home.
2. The proposed system has two main parts hardware and software.
 - The hardware part consists of three main hardware components smartphone, Arduino board and Bluetooth module.
 - Software part consist of Arduino integrated development environment (IDE) and Bluetooth terminal smartphone application which is used for wireless communication between smartphone and Arduino board.
3. In addition to keeping your family safe and giving easy control of temperature, lighting, and music, home automation can be used for other cool tasks.

2.2 Block Diagram

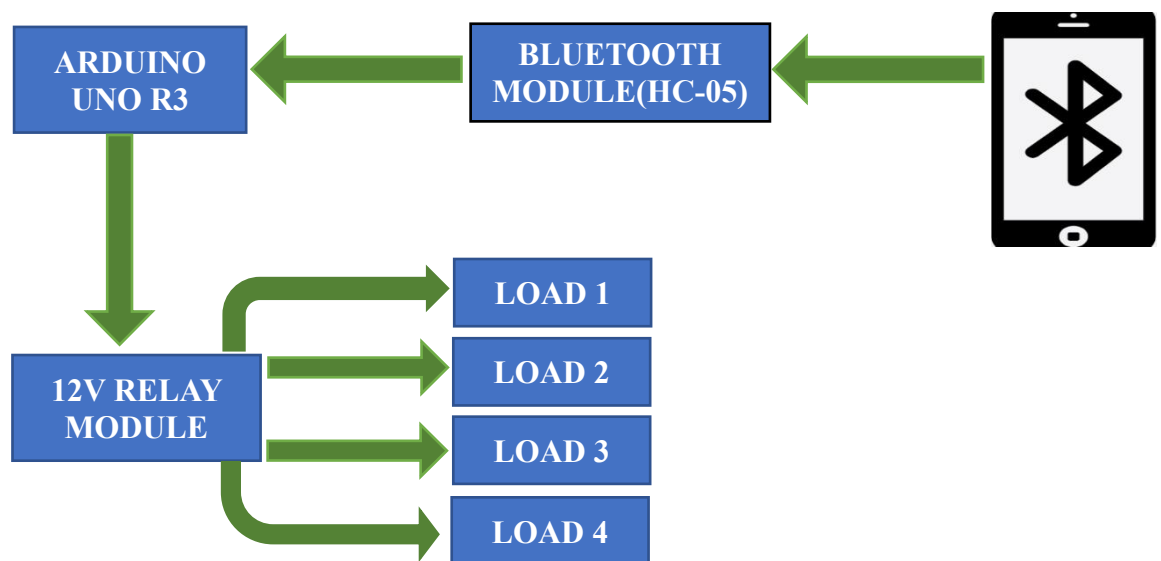


Fig 2.1 Block Diagram Home Automation

1. The project is built on Arduino UNO and is used to control LEDs and four home appliances connected to the Arduino through relays.
2. The Arduino board is interfaced to an HC-05 Bluetooth module to pair with the smart phone.
3. An app named “BT Voice Control for Android” is used on the smart phone which is capable of sending text strings to a paired device.
4. The BT Voice app takes voice commands in US English and transfers them as text strings to a paired device.
5. Either of the app will pair with the home automation system through HC-05 Bluetooth Module.

6. Every module has a unique MAC address and a password for pairing with other devices.
7. The Arduino board receives the user commands in the form of numbers from the smart phone through Bluetooth interface.
8. These numbers are assigned to the home appliances and the appliances are toggled either ON or OFF on receiving the numeric command.
9. The Arduino sketch looks for the numeric commands from the Bluetooth module and operates relays to switch appliances.

2.3 Circuit Diagram

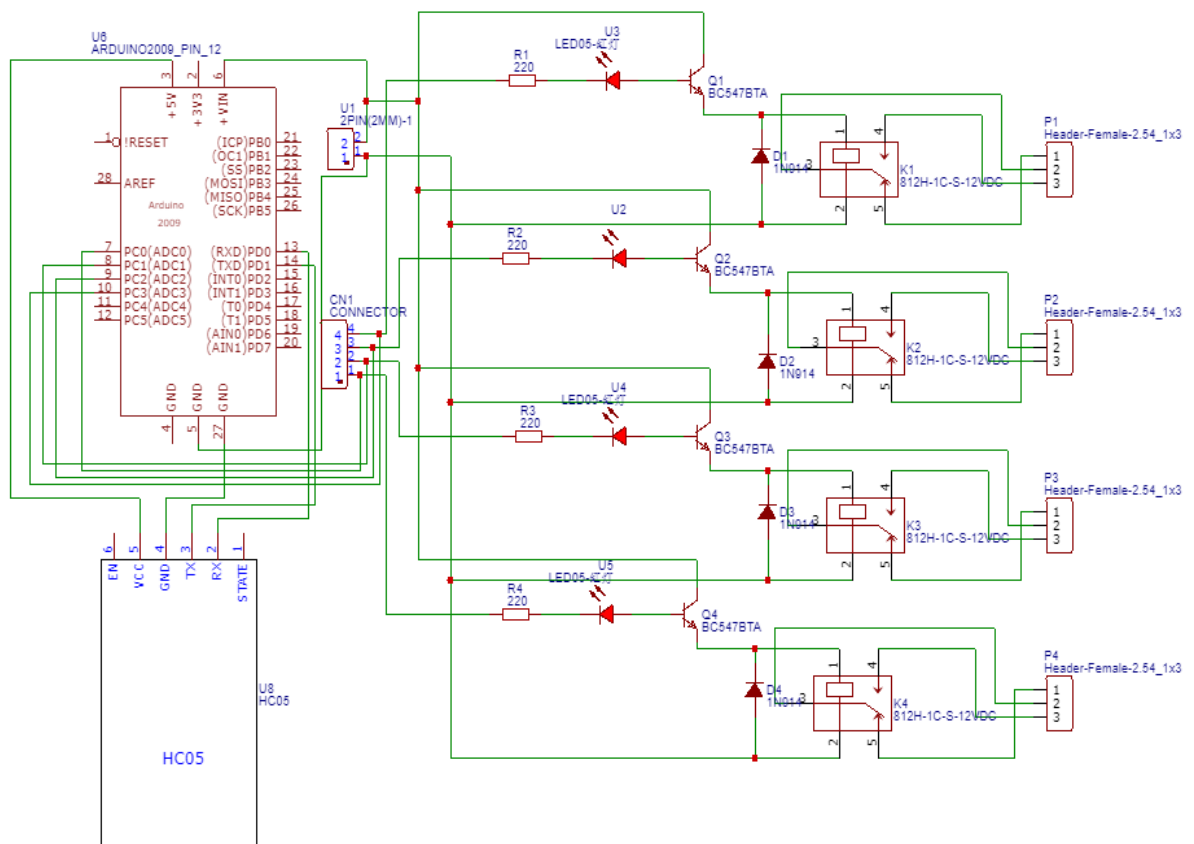


Fig. 2.2 Circuit Diagram Home Automation

1. 1st we see their relay connection:
COM: Common pin directly connected to the connector *i.s* female connector
 And coil1 and coil2 also connect same in female connector
2. **NO (Normally Open):** This pin is directly connected to the connector. And this connector is used for power supply purpose +vcc.
3. **NC (Normally connected):** This pin is connect some components like Diode, Transistor.
4. **Transistor:** The transistor have three terminals collector, base, emitter.
5. The Emitter terminal is connected to the Diode to NC terminal of relay.

6. Then their second terminal is that is collector is connected to the LED and this connected to the resistor.
7. In this way their all pin is combine and this is directly connected to different connector terminals

2.4 Working

1. A simple home automation project using Arduino UNO, Bluetooth module and a smartphone. The aim of this project is to control different home appliances using a smartphone.
2. When the power is turned on, the connection LED on the Bluetooth module starts blinking. We need to start the “Bluetooth Controller” app in our smartphone and get connected to the Bluetooth module. If the pairing is successful, the LED becomes stable.
3. Now, in the app, we need to set different keys for different loads and their corresponding value that must be transmitted when that key is pressed. The following image shows a set of keys to control 4 loads and an additional key to turn off all the loads.
4. Then we are ready to control the loads. When a key is pressed in the smartphone, the Bluetooth module receives the corresponding data and intern transmits that data to Arduino.
5. The android application is used to transmit the instruction, which carries the information about the operation to be performed. The transmitted instruction is received by the Bluetooth module which has been paired with the android smartphone beforehand.
6. When the signal port is at low level, the signal light will light up and the optocoupler 817c (it transforms electrical signals by light and can isolate input and output electrical signals) will conduct, and then the transistor will conduct, the relay coil will be electrified, and the normally open contact of the relay will be closed.
7. When the signal port is at high level, the normally closed contact of the relay will be closed. So you can connect and disconnect the load by controlling the level of the control signal port.

CHAPTER 3

HARDWARE

DESCRIPTION

3.1 List Of Components

<u>Sr No.</u>	<u>NAME OF COMPONENT</u>	<u>PRICE</u>
1.	Arduino UNO	850/-
2.	Bluetooth Module	300/-
3.	Relay Module	200/-
4.	PCB Hand Drill	100/-
5.	Lamp Load	150/-
6.	Adapter	100/-
7.	Connecting Wires	50/-
8.	Transistor	20/-
9.	Resistor	10/-
10.	Diode	10/-
11.	LED	10/-
	Total	1800 Rs.

Hardware Description

For Home Automation we required some components like ARDUINO UNO, BLUETOOTH MODULE HC05, 4 CHANNEL RELAY MODULE, JUMPER WIRE, CONNECTING WIRE, LAMP LOAD, SMARTPHONE, RELAY, HAND DRILLS, TRANSISTOR, RESISTOR, DIODE, LED, PCB BOARD

3.2 ARDUINO UNO

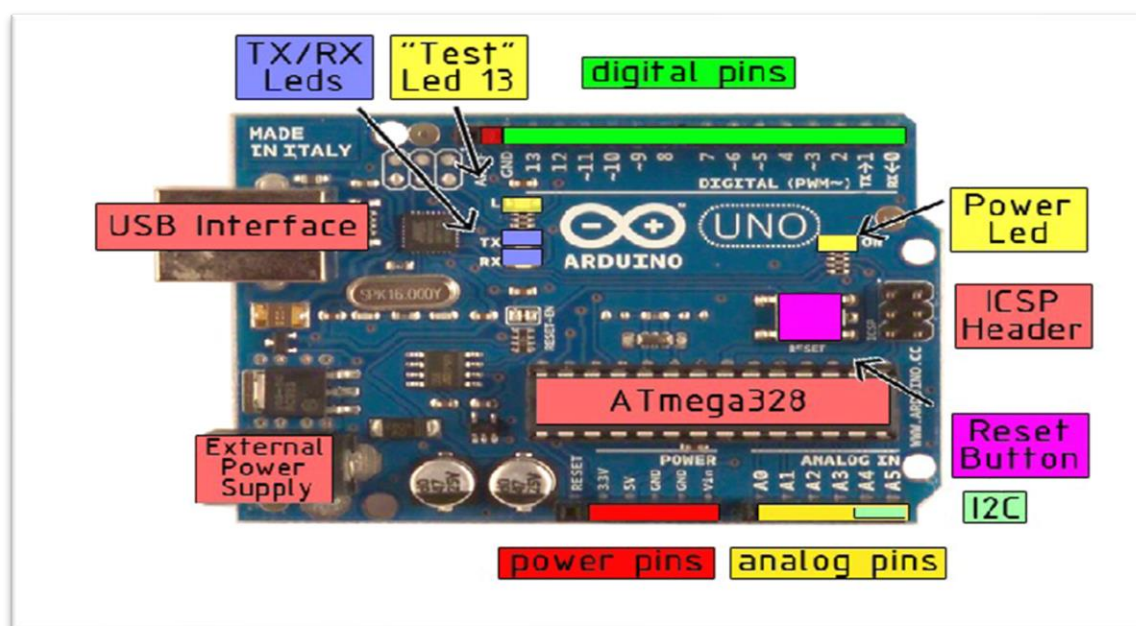


Fig. 3.1 Arduino Uno

1. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.
2. The board is equipped with sets of digital and Analog input/output pins that may be interfaced to various expansion boards and other circuits.
3. The board has 14 digital I/O pins (six capable of PWM output), 6 Analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B_USB cable.
4. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.
5. The word “uno” means “one” in Italian and was chosen to mark the initial release of Arduino Software.

6. The ATmega328 on the board comes preprogramed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

GENERAL PIN FUNCTION

1. **LED:** There is a built-in LED driven by digital pin 13.
2. **VIN:** The input voltage to the Arduino board when it is using an external power source.
3. **5V:** This pin outputs a regulated 5V from the regulator on the board.
4. **3V:** A 3volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
5. **GND:** Ground pins.
6. **IOREF:** This pin on the Arduino board provides the voltage reference with which the microcontroller operates.

SPECIAL PIN FUNCTION

1. **Serial / UART:** pins 0 (RX) and 1 (TX), sed to receive (RX) and transmit (TX) TTL serial data.
2. **External interrupts:** pins 2 and 3, These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
3. **PWM (pulse-width modulation):** pins 3, 5, 6, 9, 10, and 11, Can provide 8-bit PWM output with the Analog write ().
4. **SPI (Serial Peripheral Interface):** pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These pins support SPI communication using the SPI library.
5. **TWI (two-wire interface):** pin SDA (A4) and pin SCL (A5). Support TWI communication using the Wire library.
6. **AREF (Analog reference):** Reference voltage for the analog inputs

3.3 BLUETOOTH MODULE

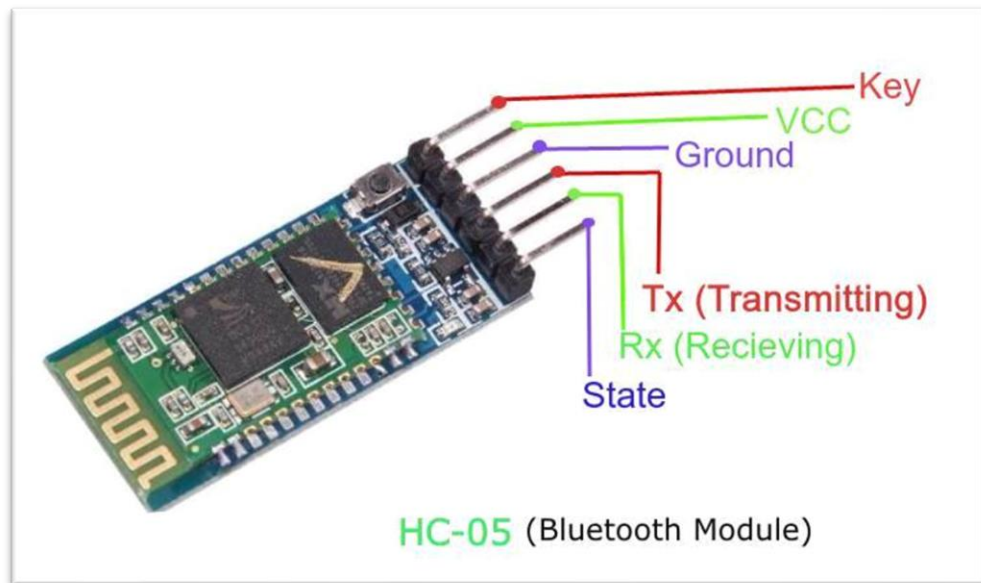


Fig. 3.2 Bluetooth Module

HC-05 Bluetooth Module

1. HC-05 is a Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.
2. Its communication is via serial communication which makes an easy way to interface with controller or PC.
3. HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration.

Pin Description



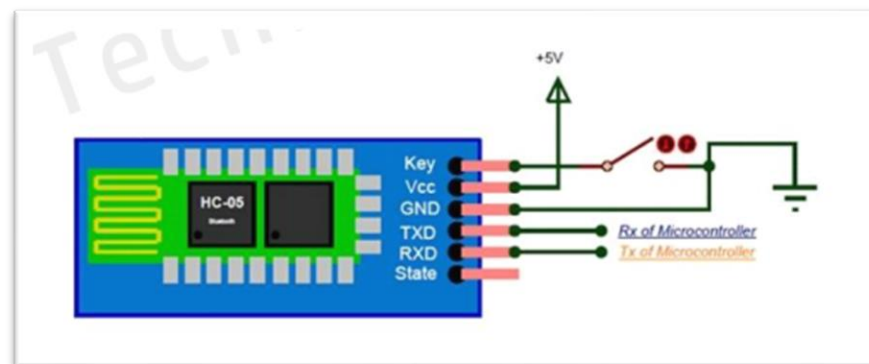
1. **EN:** It is used to bring Bluetooth module in AT commands mode. If EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode.
2. **VCC:** Connect 5 V or 3.3 V to this Pin.
3. **GND:** Ground Pin of module.
4. **TXD:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)
5. **RXD:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
6. **State:** It tells whether module is connected or not.

Range and control

This Bluetooth module covers 9 meters (30ft) of signals and works both as a master or as a slave. Approximately 9m range for Bluetooth module is suitable for controlling the mobile signal through Arduino.

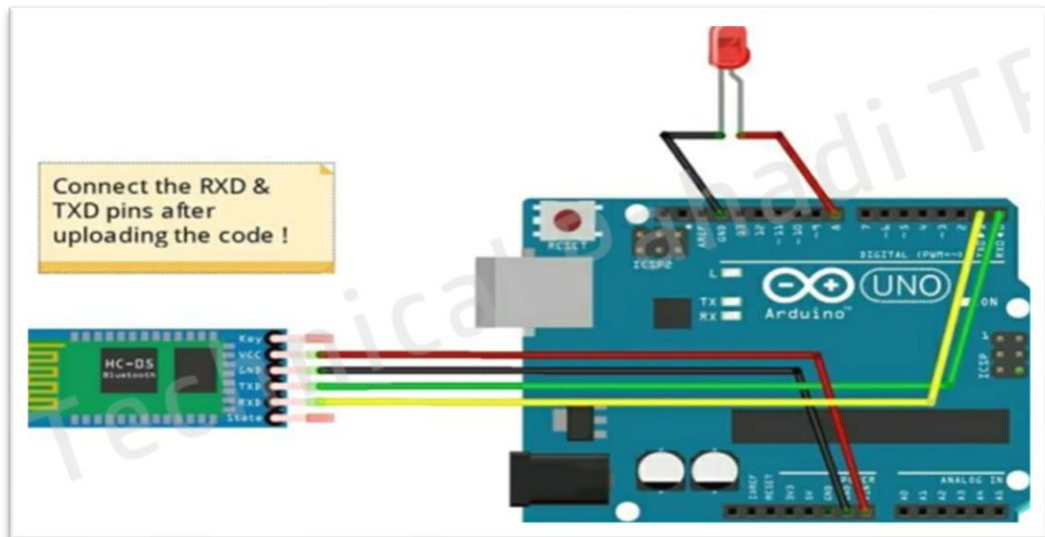
HC-05 Specifications

1. Operating Voltage: 4V to 6V (Typically +5V)
2. Operating Current: 30mA
3. Works with Serial communication (USART) and TTL compatible
4. Can operate in Master, Slave or Master/Slave mode
5. Can be easily interfaced with Laptop or Mobile phones with Bluetooth
6. Follows IEEE 802.15.1 standardized protocol



A manual switch is given in the HC05 Bluetooth module. Which is used to reset the value and connection of sender signal device.

How to Use the HC-05 Bluetooth module



1. The HC-05 has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed.
2. During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode.
3. As soon as the module is powered you should be able to discover the Bluetooth device as “HC-05” then connect with it using the default password 1234 and start communicating with it.
4. The name password and other default parameters can be changed by entering into the device.

3.4 RELAY MODULE (5v)

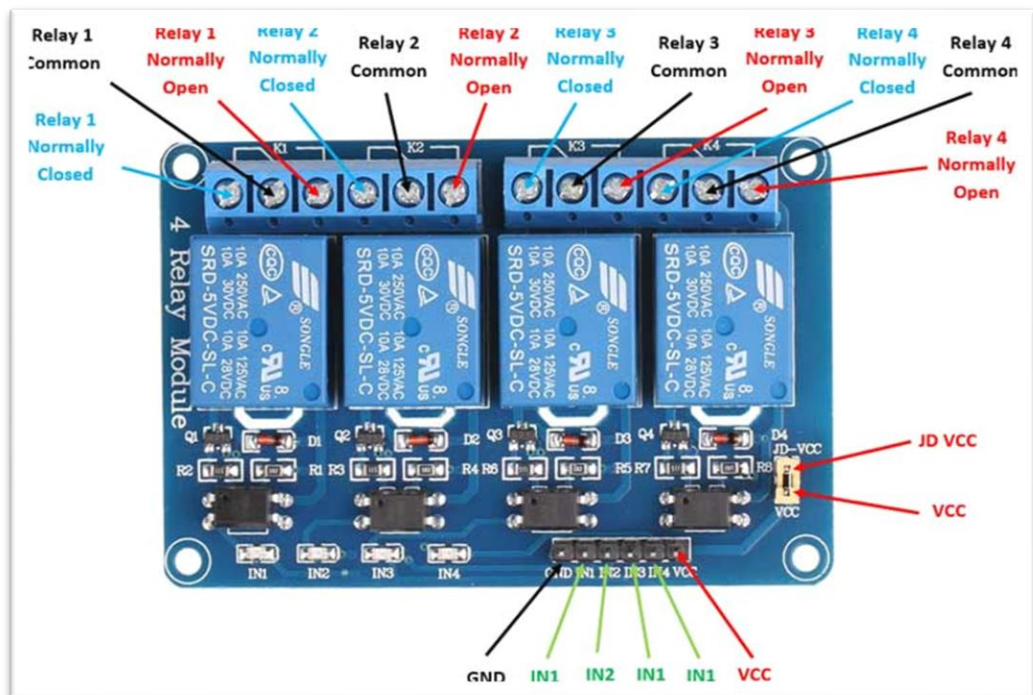


Fig. 3.3 Relay Module

1. 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.
2. A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal.
3. The input voltage of the relay signal ranges from 0 to 5V.
4. The relay module is a separate hardware device used for remote device switching.
5. With it you can remotely control devices over a network or the Internet.
6. Devices can be remotely powered on or off with commands coming from Clock Watch Enterprise delivered over a local or wide area network.
7. This is a 5V 4-channel relay interface board, and each channel needs a 15-20mA driver current.
8. It can be used to control various appliances and equipment with large current.
9. It has a standard interface that can be controlled directly by microcontroller.

Pin Configuration

Pin1 (End 1): It is used to activate the relay; usually this pin one end is connected to 5Volts whereas another end is connected to the ground.

Pin2 : This pin is used to activate the Relay.

Pin3 (Common (COM)): This pin is connected to the main terminal of the Load to make it active.

Pin4 (Normally Closed (NC)): This second terminal of the load is connected to either NC/ NO pins. If this pin is connected to the load then it will be ON before the switch.

Pin5 (Normally Open (NO)): If the second terminal of the load is allied to the NO pin, then the load will be turned off before the switch.

Features

1. Normal Voltage is 5V DC
2. Normal Current is 70mA
3. AC load current Max is 10A at 250VAC or 125V AC
4. DC load current Max is 10A at 30V DC or 28V DC
5. It includes 5-pins & designed with plastic material
6. Operating time is 10msec
7. Release time is 5msec
8. Maximum switching is 300 operating per minute

Connection

1. **Output Terminal:** The output terminal of the relay module is located at the left-hand side, used to fix an AC/DC load & AC/DC i/p power source. Every o/p connector's terminal is connected through NC, COM pins & NO of the relay.
2. **Status LED:** Status LED is connected by using a current limiting resistor that is located on the top right side of the relay module. So this LED illustrates the relay status by activating the relay & coil through a signal pin. The DC supplies throughout a relay coil.
3. **Power LED:** Power LED shows the condition of the power source that is connected through the single channel module. If we provide the above 5V source toward both the pins of the module like Vcc & GND, the LED will be damaged due to high voltage.
4. **Freewheeling Diode:** The connection of this diode can be done across the coil to keep away from the back EMF effect, so-called a flyback diode. The type of coil used in the relay is the inductive type. Once the current supplies throughout an inductive load, then it generates a back EMF voltage, which may harm the circuit. So, this diode is mainly used to keep away from this effect.
5. **Input Connector:** The input connector is located on the right side of the module. This connector is mainly used to supply a 5V power supply & input signal. In addition, it also supplies power supply toward the power LED, relay coil & status LED.
6. **Switching Transistor:** A switching transistor is used in this module is to strengthen the current to the requirement of the minimum current level of the relay coil. A switching transistor is used to control the 5V relay from the microcontroller's GPIO pin.

Specifications

1. Voltage supply ranges from 3.75V – 6V
2. Quiescent current is 2mA
3. Once the relay is active then the current is ~70mA
4. The maximum current is 10A

3.5 PCB Hand Drills



Fig. 3.4 PCB Hand Drill

1. A back drill PCB is a kind of drill designed to drill holes in a printed circuit board.
2. The holes are then used for soldering or inserting wires or component leads into the holes by hand, hence the name.
3. The PCB's surface is cut away with a blade, exposing the copper layer.
4. Handmade PCBs are common in electronics but drilling the component holes in PCB is essential and troublesome.
5. The drill supports a drilling **range from 0 - 3mm** which is adequate for almost all types of through hole components.

3.6 LAMPS



Fig. 3.5 Lamps

In this load diagram of home automation we are using 230 v ac power supply and relay module is used to control the load. There are four relay are used each of relay is controlling the one load. We are controlling four light points

3.7 ADAPTER (5V)



Fig. 3.6 Adapter

1. A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

2. We are using 230volt power supply and charger is used to convert ac to dc power supply (5 v 2 amp).
3. In charger circuit transformer is used to steps down the ac power supply.
4. And rectifier circuit to convert ac to dc power supply.

3.7 PCB

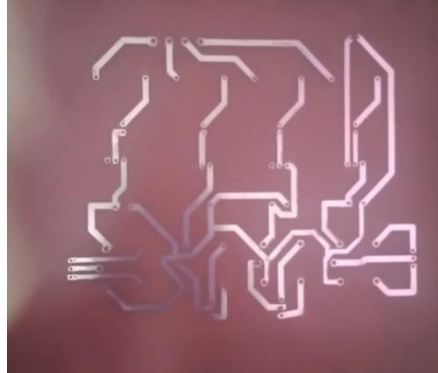
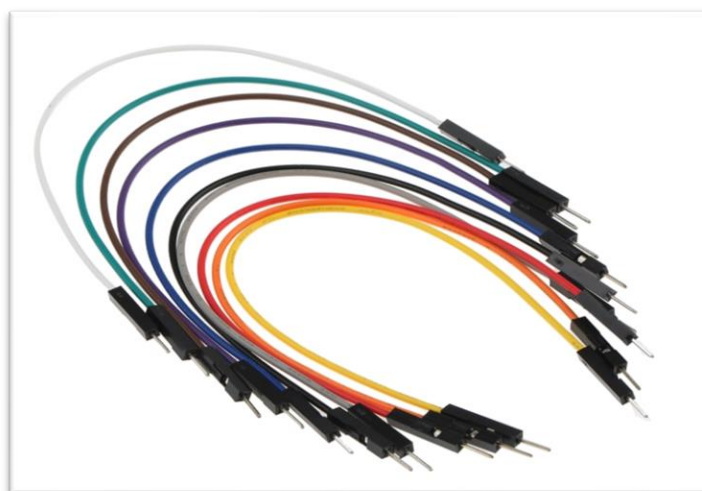


Fig. 3.7 PCB

1. A printed circuit board mechanically supports and electrically connects electronic components or electrical components using conductive tracks, pads and other features etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate.
2. A printed circuit board has pre-designed copper tracks on a conducting sheet.

3.8 BASIC COMPONENTS

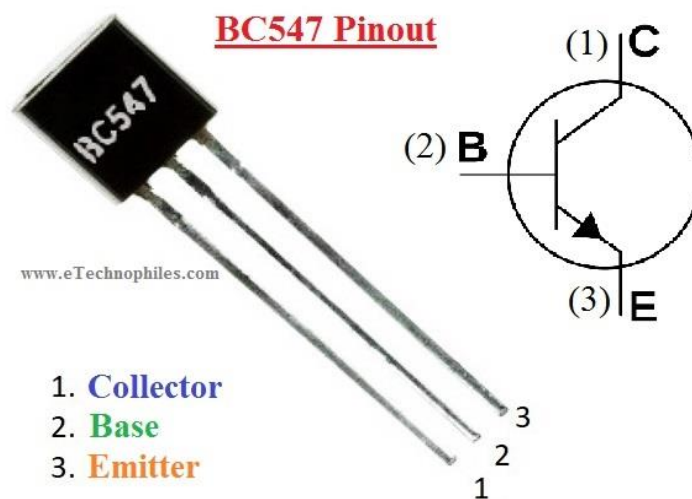
Connecting Wire



A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a bread board other prototype or test circuit, internally or with other equipment or components, without soldering.

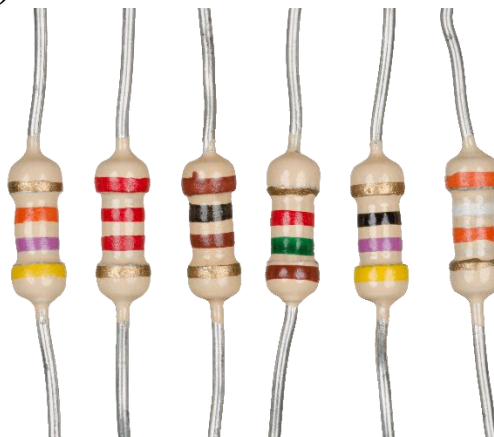
- Type of jumper wires
 1. Mail to Mail
 2. Mail to Femail
 3. Femail to Femail

BC547 Transistor



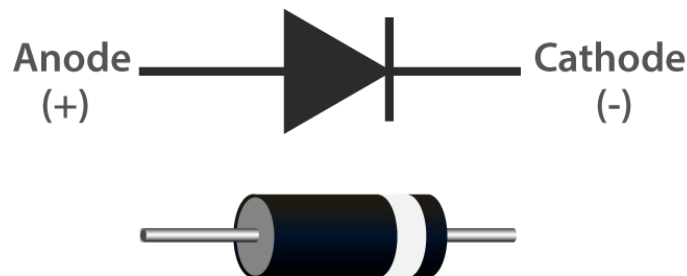
1. A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power.
2. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.
3. BC547 is usually used for current amplifier, quick switching and pulse-width modulation (PWM).
4. Therefore, if you need to control the speed of a motor or actuator in some of your projects.

Resistor (470ohm)



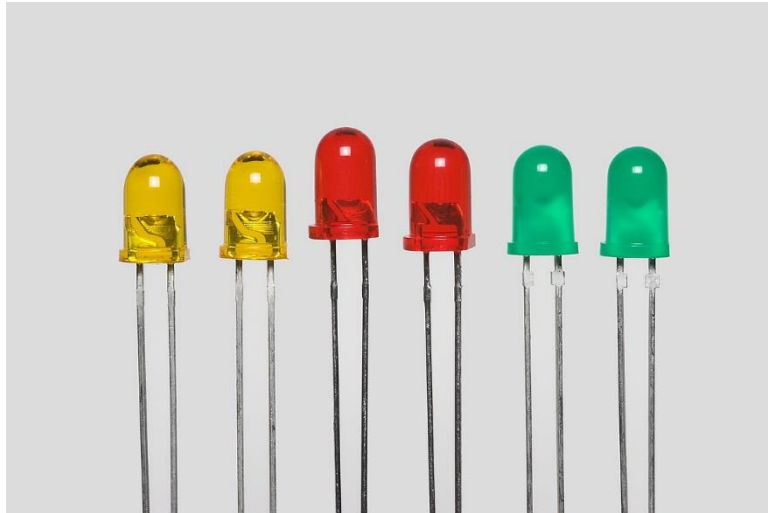
1. A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit.
2. This resistor will provide 470 Ohms of resistance wherever it is placed and will handle 1/4 watts.
3. Use these low value resistors for voltage dividers and where you need to keep the current flow as high as possible.
4. It is a passive two-terminal electrical component that implements electrical resistance as a circuit element.
5. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages and many more.
6. Resistors are made from materials like copper or carbon, which make it difficult for the electrical charges to flow through a circuit.

Diode (1N4077)



1. A diode is a two-terminal electronic component that conducts current primarily in one direction
2. 1N4007 is a rectifier diode, designed specifically for circuits that need to convert alternating current to direct current.
3. It can pass currents of up to 1 A, and have peak inverse voltage rating of 1,000 V.
4. These types of diodes allow only the flow of electrical current in one direction only.

LED (Light Emitting Diode)



1. A Light Emitting Diode (LED) is a semiconductor device, which can emit light when an electric current passes through it.
2. To do this, holes from p-type semiconductors recombine with electrons from n-type semiconductors to produce light.
3. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.
4. The colour of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.
5. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

CHAPTER 4

SOFTWARE

DEVELOPEMENT

Smart Phone APK Application

4.1 Arduino Bluetooth Control Device

1. Control home electrical system using smart phone with android application and Bluetooth Control Device.
2. Bluetooth Control Device outputs to directly drive loads like bulbs, Lamps, Sockets, Television, Fans etc.



How To Use This??

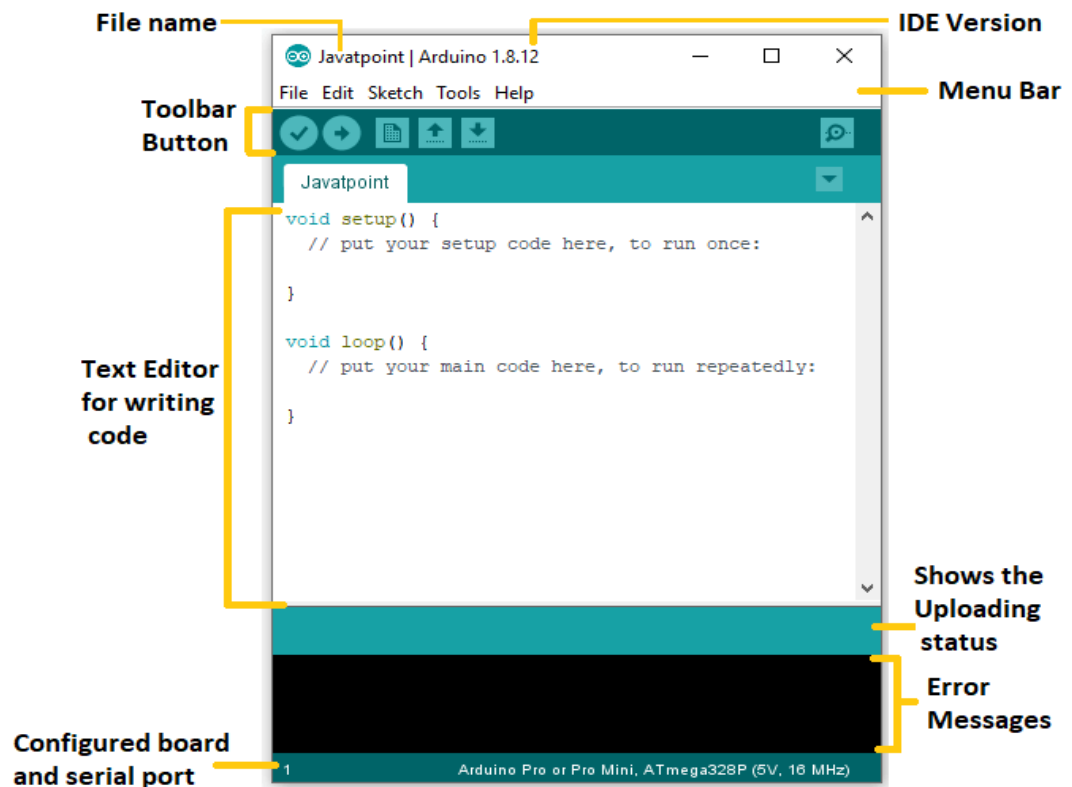
1. Load the web app on your laptop or android device in the Chrome browser.
2. Turn on Bluetooth on your smartphone or laptop.
3. Click on the connect button which will trigger device scanning.
4. After connecting, you can see the device's CPU information and will be able to toggle the LED on or off.

4.2 Arduino IDE

1. The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards.
2. The program or code written in the Arduino IDE is often called as sketching.
3. We need to connect the Arduino board with the IDE to upload the sketch written in the Arduino IDE software.



The Arduino IDE Appear As



Toolbar Button

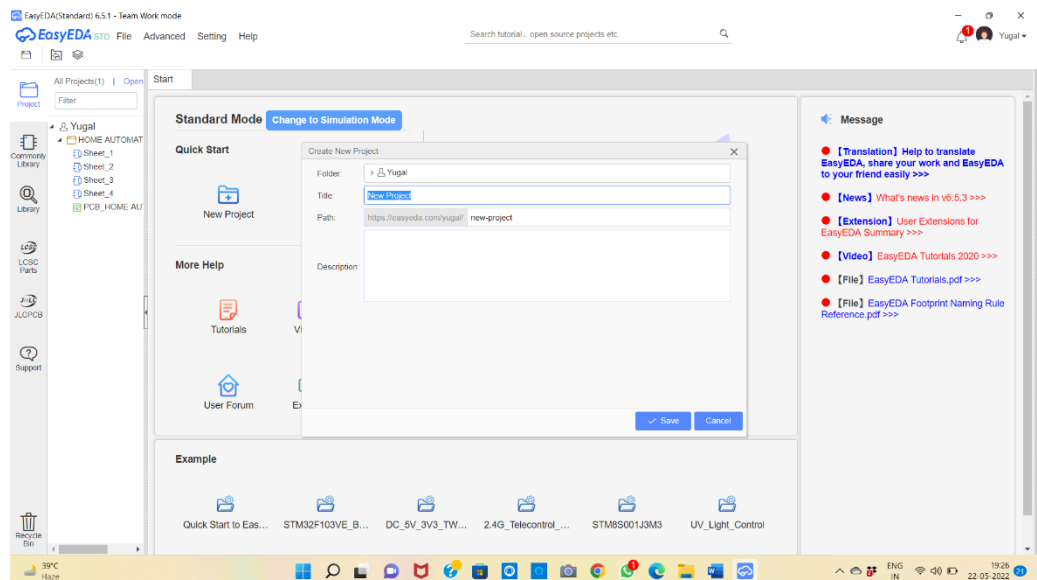
1. **Upload:** The Upload button compiles and runs our code written on the screen. It further uploads the code to the connected board. Before uploading the sketch, we need to make sure that the correct board and ports are selected.
2. **Open:** The Open button is used to open the already created file. The selected file will be opened in the current window.
3. **Save:** The save button is used to save the current sketch or code.
4. **New:** It is used to create a new sketch or opens a new window.
5. **Verify:** The Verify button is used to check the compilation error of the sketch or the written code.
6. **Serial Monitor:** When we connect the serial monitor, the board will reset on the operating system Windows. If we want to process the control characters in our sketch, we need to use an external terminal program. The terminal program should be connected to the COM port, which will be assigned when we connect the board to the computer.

4.3 Easy EDA

1. Easy EDA is a web-based EDA tool suite that enables hardware engineers to design, simulate and discuss schematics, simulations and printed circuit boards.
2. Other features include the creation of a bill of materials, Gerber files and pick and place files and documentary outputs in PDF, PNG and SVG formats.
3. Easy EDA allows the creation and editing of schematic diagrams, SPICE simulation of mixed analogue and digital circuits and the creation and editing of printed circuit board layouts and, optionally, the manufacture of printed circuit boards.

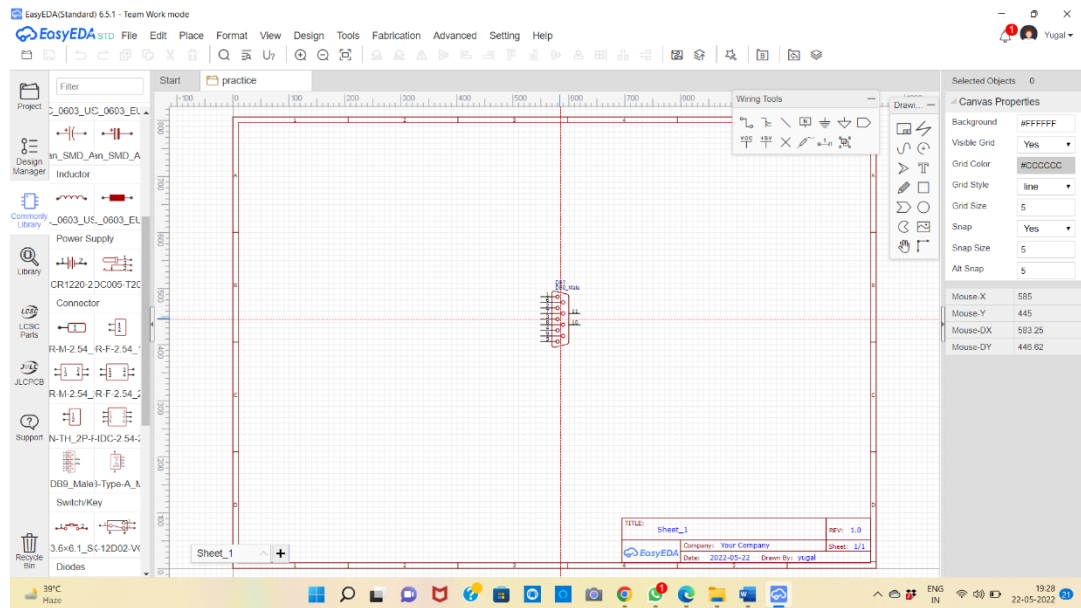


Step 1: Start a Project



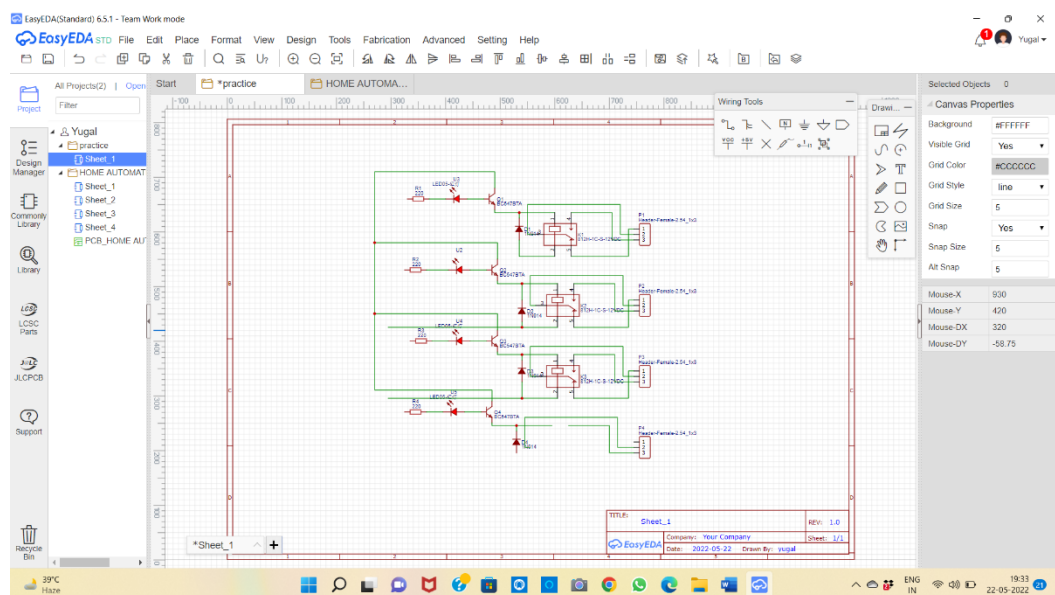
1. Once you open Easy EDA, it is time to begin working on your schematic, Start by initiating a new project
2. And then pick an option to begin working on a New Schematic:

Step 2: Placing Components



1. You will find a selection of components to place in your schema on the design.
2. Setting the symbol on the project involves clicking on it in the menu and then putting it on the project.
3. Feel free to browse the library with numerous components spread across various categories.
4. Users also have the option of searching for a particular element.
5. It is time to choose a resistor. Once you pick it from the library, add it to the project.

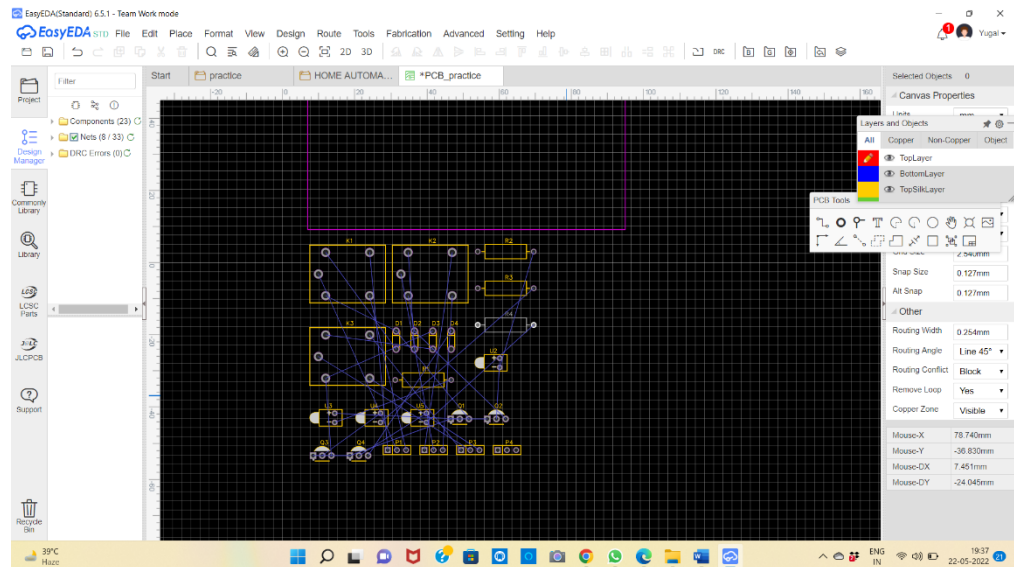
Step 3: Joining The Components



1. All that takes is to hit the “W” button on the keyboard. That will open a wiring tool, which will help you to join everything.

2. We have the schematic ready now, and we should convert it to a design layout of your printed circuit board. Take a look where you can find the Convert option below.

Step 4: Convert Into PCB



1. Click on Design menu and convert then into PCB.
2. Then Adjust there components as shown your circuit diagram.
3. Make sur there tracks is not overlapping each other.

CHAPTER 5

PCB MANUFACTURING

PROCESS

PCB Manufacturing Process

1. The printed circuit board (PCB) manufacturing process requires a complex procedure to ensure the performance of the finished product.
2. Though circuit boards can be single, double or multilayer, the fabrication processes used only differ after the first layer's production.
3. Due to differences in the structure of the PCBs, some may require 20 or more steps during manufacturing.
4. The number of steps required for producing printed circuit boards correlates to their complexity.
5. Skipping any step or cutting back on the procedure could negatively impact the performance of the circuit board.
6. However, when successfully completed, the PCBs should perform their tasks properly as key electronic components.

5.1 PARTS OF PCB

1. **Substrate:** The first, and most important, is the substrate, usually made of fiberglass. Fiberglass is used because it provides a core strength to the PCB and helps resist breakage. Think of the substrate as the PCB's "skeleton".
2. **Copper Layer:** Depending on the board type, this layer can either be copper foil or a full-on copper coating. Regardless of which approach is used, the point of the copper is still the same — to carry electrical signals to and from the PCB, much like your nervous system carries signals between your brain and your muscles.
3. **Solder Mask:** The third piece of the PCB is the solder mask, which is a layer of polymer that helps protect the copper so that it doesn't short-circuit from coming into contact with the environment. In this way, the solder mask acts as the PCB's "skin".
4. **Silkscreen:** The final part of the circuit board is the silkscreen. The silkscreen is usually on the component side of the board used to show part numbers, logos, symbols switch settings, component reference and test points. The silkscreen can also be known as legend or nomenclature.

5.2 Steps of Making PCB

Step1: Creating PCB Layout

1. This is usually done by converting your circuit's schematic diagram into a PCB layout using PCB layout software.
2. There are many open source software packages for PCB layout creation and design. In my project I used EasyEDA Software.



Step2: Material Required

Required materials	
	Magazines or advertising brochures (More on this later).
	Laser printer Alternately, a photocopier should work
	Household clothes iron
	Copper clad laminate
	Etching solution
	Kitchen scrubs
	Thinner (e.g. acetone)
	Plastic coated wire

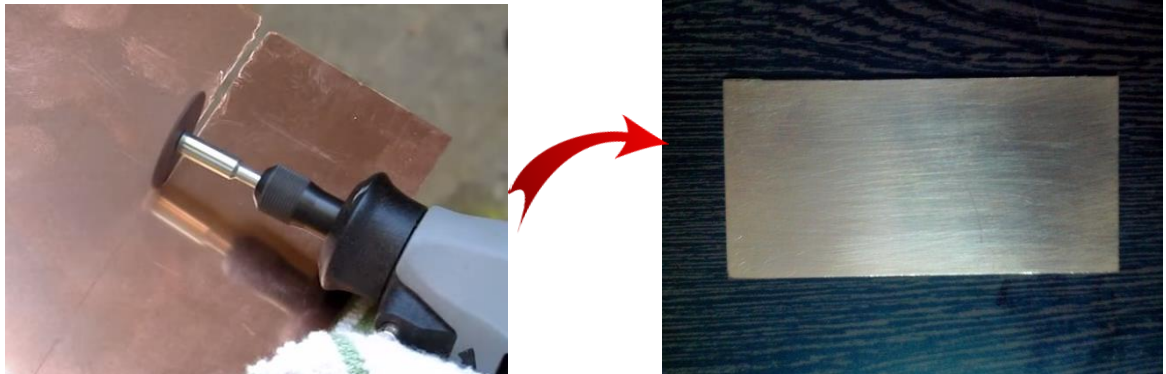
Step3: Take PCB Of PCB Layout



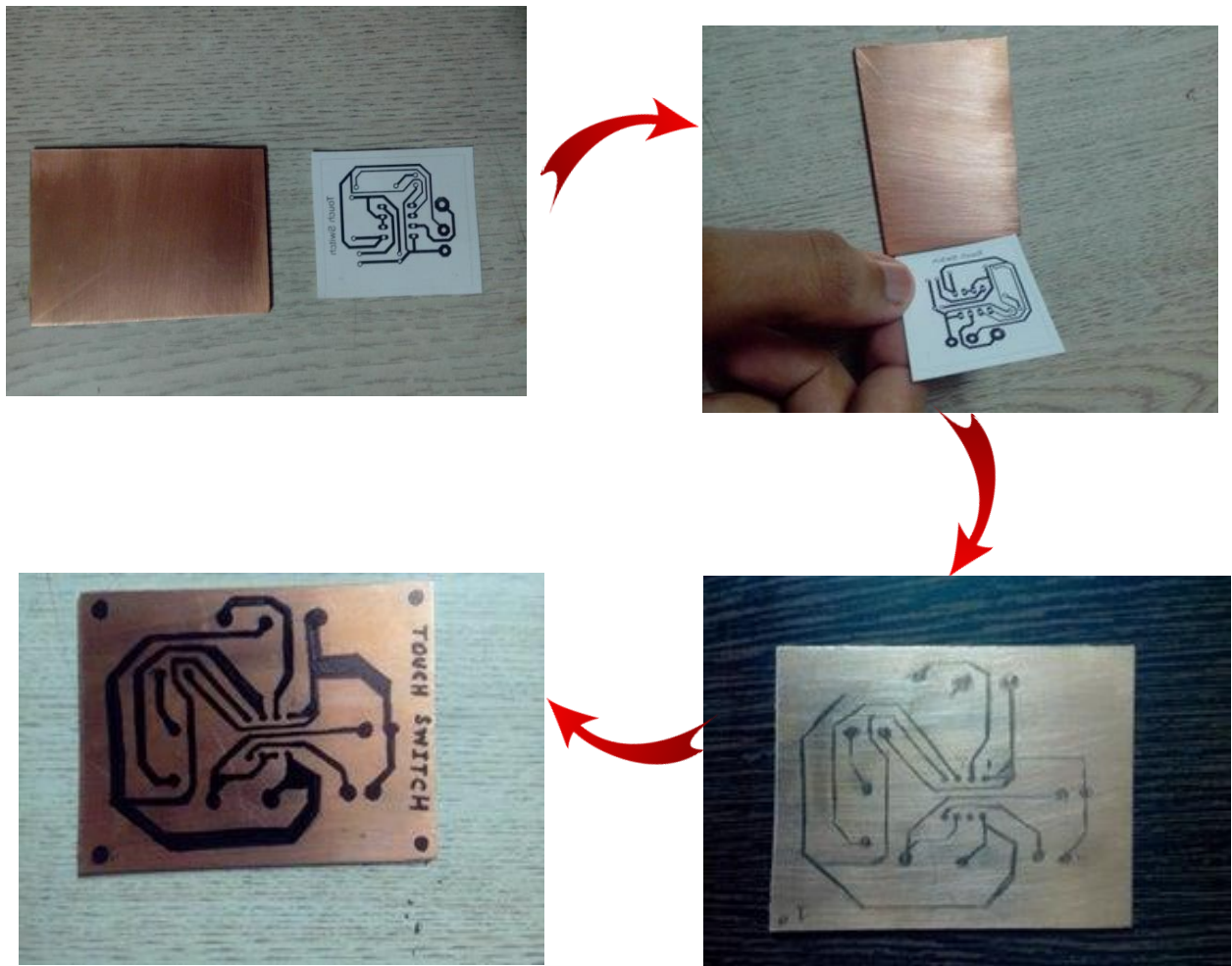
Take a print out of your PCB layout using the laser printer and the A4 photo paper/glossy paper. Keep in mind the following points:

1. You should take the mirror print out
2. Select the output in black both from the PCB design software and printer driver settings

Step 4: Cutting The Copper Clad

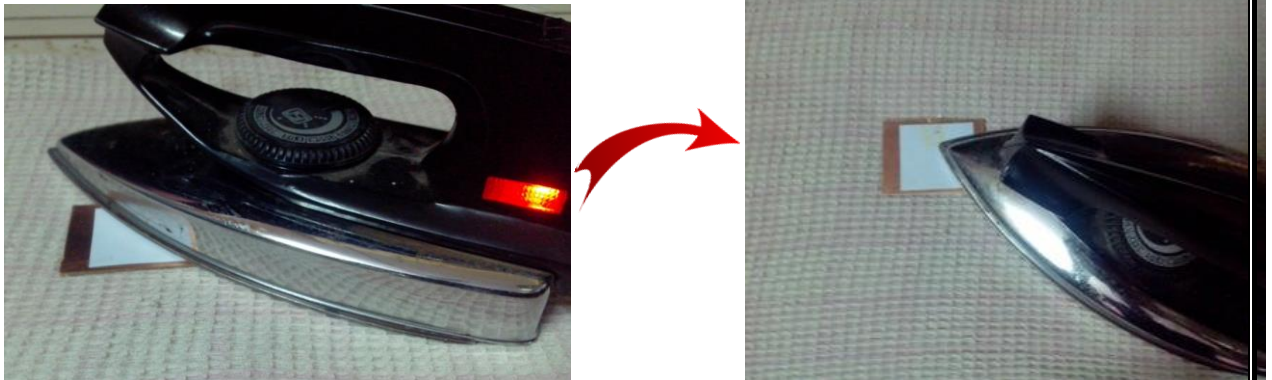


Step5: Methods



1. Transfer the printed image from the photo paper to the board.
2. Put the copper surface of the board on the printed layout.
3. Put tape along the two sides of the board non-copper side.
4. This will help to hold the board and the printed layout in position.

Step6: Iron



1. After printing on glossy paper we iron it image side down to copper side. Heat up the Electric iron to the maximum temperature.
2. Put the board and photo paper arrangement on a clean wooden table and clothes with the back of the photo paper facing you.
3. Hold one end of it by the Towel and put the hot iron on the other end for about 1 Minutes. Now, iron the photo paper all along using the tip and applying little pressure for about 15 To 25 mins.

Step 7: Peeling



1. After ironing, place printed plate in Luke warm water for around 15 minutes.
2. Paper will dissolve and remove paper gently. Remove the Paper off at low angle & traces.

Step8: Etching



- First put rubber or plastic gloves.
- Place some newspaper so that etching solution do not spoil floor.

1. Take a plastic box and fill it up with some water.
2. Dip the PCB into the Etching solution (Ferric chloride solution) for approximately 1 Hours.
3. After reacts with the unmasked copper and removes the unwanted copper from the PCB.

CHAPTER 6

PROGRAMING

6.1 Program Code

```
String inputs;
#define relay1 2 //Connect relay1 to pin 9
#define relay2 3 //Connect relay2 to pin 8
#define relay3 4 //Connect relay3 to pin 7
#define relay4 5 //Connect relay4 to pin 6
void setup()
{
  Serial.begin(9600);          //Set rate for communicating with phone
  pinMode(relay1, OUTPUT); //Set relay1 as an output
  pinMode(relay2, OUTPUT); //Set relay2 as an output
  pinMode(relay3, OUTPUT); //Set relay1 as an output
  pinMode(relay4, OUTPUT); //Set relay2 as an output
  digitalWrite(relay1, LOW); //Switch relay1 off
  digitalWrite(relay2, LOW) //Switich relay2 off
  digitalWrite(relay3, LOW); //Switch relay1 off
  digitalWrite(relay4, LOW); //Switich relay2 off
}
void loop()
{
  while(Serial.available()) //Check if there are available bytes to read
  {
    delay(10); //Delay to make it stable
    char c = Serial.read(); //Conduct a serial read
    if (c == '#'){
      break; //Stop the loop once # is detected after a word
    }
    inputs += c; //Means inputs = inputs + c
  }
  if (inputs.length() >0)
  {
    Serial.println(inputs);

    if(inputs == "A")
    {
      digitalWrite(relay1, LOW);
    }
    else if(inputs == "a")
    {
      digitalWrite(relay1, HIGH);
    }
    else if(inputs == "B")
    {
      digitalWrite(relay2, LOW);
    }
    else if(inputs == "b")
    {
      digitalWrite(relay2, HIGH);
    }
  }
}
```

```
else if(inputs == "C")
{
digitalWrite(relay3, LOW);
}
else if(inputs == "c")
{
digitalWrite(relay3, HIGH);
}
else if(inputs == "D")
{
digitalWrite(relay4, LOW);
}
else if(inputs == "d")
{
digitalWrite(relay4, HIGH);
}
inputs="";
}
}
```

CHAPTER 7

ADVANTAGES

AND

DISADVANTAGES

7.1 ADVANTAGES

1. Home automation using Bluetooth and Arduino can prove to be very useful for Handicapped people.
2. A single android smartphone can control multiple devices.
3. Flexibility for new devices and appliances.
4. Maximizing home security.
5. Remote control of home functions.
6. Increased energy efficiency.
7. Improved appliance functionality.
8. Any android phone can be used, no internet required once the app is downloaded.
9. You can control all kind of appliances and devices.
10. There is no need for extra training of that person who is using it.
11. All the control would be in your hands by using this home automation system.
12. There is no time delay for turn on or turn off the connected device.

7.2 DISADVANTAGES

1. Bluetooth is used in this home automation system, which have a range of 10 to 20 meters so the control cannot be achieved from outside this range.
2. Application is disconnected after disconnect of the Bluetooth.
3. When the new users want to connect, first download application software and then configuration must be done.
4. High power consumption because of bluetooth connectivity.

CHAPTER 8

APPICATIONS

AND

FUTURE SCOPE

8.1 APPLICATIONS

1. In the IoT home automation ecosystem, you can control your devices like light, fan, TV, etc.
2. There are more devices connected to the internet than the world's human population.
3. As more things become internet-ready, the demand for best home automation systems also grows.

8.2 FUTURE SCOPE

1. Arduino based device control using Bluetooth on Smartphone project can be enhanced to control the speed of the fan or volume of the buzzer etc.
2. Home automation and Device controlling can be done using Internet of Things – IOT technology.
3. We can replace Bluetooth by GSM modem so that we can achieve device controlling by sending SMS using GSM modem.

CHAPTER 9

CONCLUSION

AND

REFERENCES

9.1 CONCLUSION

From the above Report paper, it is concluded that all the home automation system techniques uses wireless technology.

Thus our objective to develop IoT based Home Automation system is fulfilled and our project is working efficiently.

It can also be developed with the help of GSM module it has one drawback multiple users share the same bandwidth and it may cause interference. But such drawbacks can be overcome by IoT and giving better results. As it is era of Automation, we can use this concept in various fields including agriculture etc to reduce our efforts.

Android based home automation techniques have been implemented in order to provide ease to the people to control their home appliances. Different home automation techniques using, Android are given with their design, implementation and flowcharts which gives the successful layout of their strengths and weaknesses.

Main purpose of home automation system is to provide ease to people to control different home appliances with the help of the android application present in their mobile phones and to save electricity, time and money. This system also helps the user to protect their homes from burglars when they are away from the home by using alarm as the alarm will start ringing whenever a burglar tries to enter the house and the person will receive a message on his mobile phone whenever some other person will try to enter the owner's house.

9.2 REFERENCES

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<https://www.ijert.org/bluetooth-based-home-automation-using-arduino>

<https://techatronic.com/home-automation-using-arduino-and-bluetooth/>

<https://www.engineersgarage.com/bluetooth-controlled-home-automation-system/>

CHAPTER 10

PROJECT FINAL VIEW

10.1 PROJECT PROFILE

1.	Project Topic	HOME AUTOMATION USING IOT BASE
2.	Team Members	FIVE
3.	College	Gov. Polytechnic, Nagpur
4.	Guide	<i>PROF. SACHIN KALE</i>
5.	Software Used	1. Arduino Bluetooth Control Device 2. Arduino IDE 3. Easy EDA
6.	External Hardware Used	
7.	Total Cost	3000/-
8.	Date Of Start	
9.	Date Of Completion	
10.	Weight	1kg

10.3 FINAL PROJECT VIEW

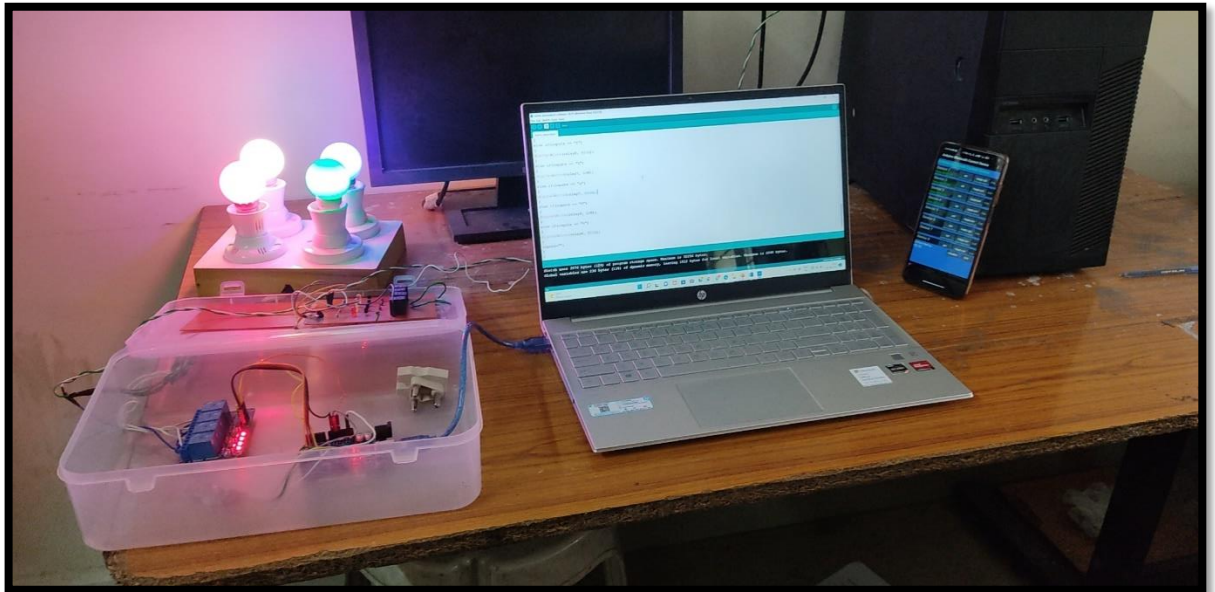


Fig. 10.1 Project View

10.2 PROJECT GROUP MEMBERS



Fig. 10.2 Group Members