

# **Ahsanullah University of Science and Technology**

Department of Electrical and Electronic Engineering

**4<sup>th</sup> Year 1<sup>st</sup> Semester**

## **PROJECT REPORT**

Course No. : EEE-4154

Course Title : Power System -II Lab

Submitted By,

Group-01		
SL No.	Student Name	Student ID
01	Md. Mamunar Rahoman Roton	20200105196

Submitted To,

Mr. Ata-E-Rabbi Assistant Professor Department of Electrical and Electronic Engineering Ahsanullah University of Science and Technology
Mr. Abdullah Saleh Lecturer Grade-II Department of Electrical and Electronic Engineering Ahsanullah University of Science and Technology

**Project Name** : Project on Over Voltage-Under Voltage and overload protection system of power system.

**Objective** : The objective of this project is to design and implement a comprehensive protection system for power systems, focusing on safeguarding against over voltage, under voltage, and overload conditions. The primary goal is to ensure the reliable and stable operation of electrical systems by detecting and mitigating potential threats to the equipment and the overall power network.

**Scope** : The project will encompass the development of a sophisticated protection system capable of monitoring voltage levels and load conditions in real-time. The system will be designed to respond swiftly to deviations from normal operating parameters, triggering appropriate protective measures to prevent damage to sensitive equipment and maintain the integrity of the power distribution network.

**Voltage Monitoring** :

- Implement sensors and measurement devices to continuously monitor voltage levels in the power system.
- Develop algorithms to analyze and interpret voltage data in real-time.

**Over Voltage Protection** :

- Design a protective mechanism to detect and respond to over voltage conditions promptly.
- Integrate a relay system to disconnect or isolate the affected equipment during over voltage events.
- Implement visual and audible alarms to alert operators to the occurrence of over voltage situations.

**Under Voltage Protection** :

- Develop a system to identify under voltage conditions and initiate corrective actions.
- Incorporate automatic load shedding capabilities to prevent system collapse during prolonged under voltage situations.
- Integrate alarms and notifications for timely response and intervention.

**Overload Protection** :

- Implement load monitoring devices to detect excessive currents and overloads.
- Design a control system to shed non-essential loads or initiate load balancing mechanisms during overload events.
- Integrate protective relays to isolate the affected sections of the power system.

## Block Diagram :

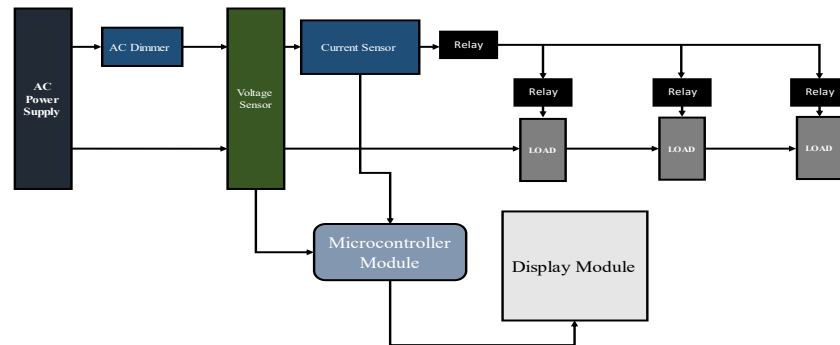


Figure : Block Diagram for project Implementation.

**Working Principle** : A voltage monitoring voltage sensor detects voltage changes and trips a switch to shut off power to the affected circuit. The relay resets after a set time delay, restoring power to the circuit. Under and Over Voltage Protection Circuit Uses Comparators. This voltage protection circuit is designed to develop a low-voltage and high-voltage tripping mechanism to protect a load from any damage. With the help of a current measuring sensor the current is measured, and if the load side current exceeds the reference current, the protective relays trip one by one, preventing a blackout in the power system.

## Project Component and Approximation Cost :

SL No.	Component Name	Quantity	P.P Unit(Tk)	Price(Tk)
01	Node MCU Mega WI-FI R3 Atmega 2560	1	1890	1890
02	3.5 inch LCD Display	1	1680	1680
03	ACS712 Current Sensor	1	219	219
04	ZMPT101B Voltage Sensor	1	270	270
05	4 Channel Relay Module	1	290	290
06	Phase indicator	1	45	45
07	Filament Bulb(40W)	3	20	60
Total				4454

## Circuit Diagram :

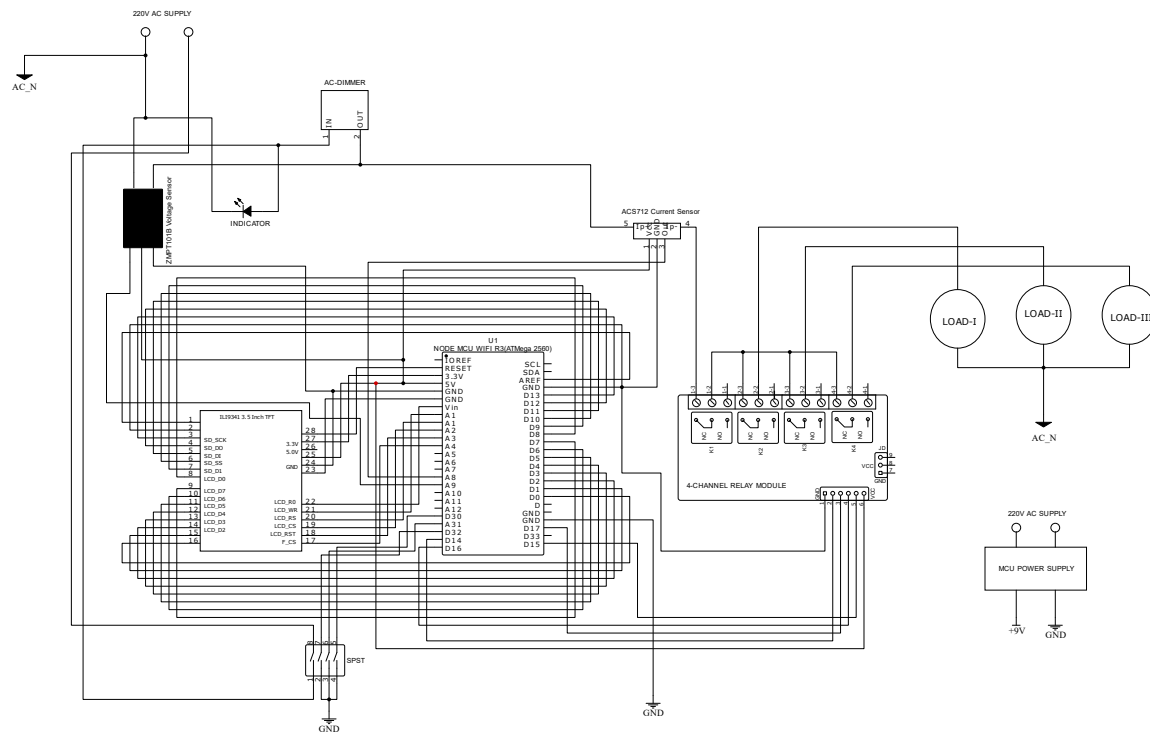


Figure : Complete Circuit diagram for OV,UV and OL protection project

DESIGNED BY MAMUNAR RAHMAN

**Working Principle :** A voltage monitoring voltage sensor detects voltage changes and trips a switch to shut off power to the affected circuit. The relay resets after a set time delay, restoring power to the circuit. Under and Over Voltage Protection Circuit Uses Comparators. This voltage protection circuit is designed to develop a low-voltage and high-voltage tripping mechanism to protect a load from any damage. With the help of a current measuring sensor the current is measured, and if the load side current exceeds the reference current, the protective relays trip one by one, preventing a blackout in the power system

**Advantages of This Project :** Implementing over-voltage, under-voltage, and over-load protection in a project or system provides several advantages, enhancing the overall reliability, safety, and performance. Here are the key advantages of incorporating such protection mechanisms:-

- Over-Voltage Protection Safeguards electronic devices from excessive voltage levels, preventing damage to sensitive components and extending the lifespan of equipment.
- Under-Voltage Protection Prevents equipment malfunction or damage caused by insufficient voltage levels, ensuring stable operation and preventing unexpected shutdowns.
- Ensures the stable and reliable operation of electrical systems by preventing voltage fluctuations that could lead to malfunctions or failures.
- Reduces the risk of downtime and the associated costs of repairs or replacements.
- Enhances safety for both equipment and personnel by avoiding potentially hazardous situations associated with over-voltage or over-load conditions.
- Minimizes the risk of electrical fires or other safety hazards caused by excessive voltage or current.

- Protects electrical devices from overloads, helping to maintain optimal operating conditions and improving energy efficiency.
- Prevents unnecessary power consumption and potential energy waste during over-voltage or over-load events
- Overload protection prevents electrical equipment from being subjected to excessive current, which can lead to overheating and damage. This is crucial for extending the lifespan of the equipment.
- By limiting the current flowing through the system to safe levels, overload protection contributes to the stability and reliability of the entire electrical system.

**Disadvantages of This Project** : While over voltage, under voltage, and over load protection projects are essential for safeguarding electrical systems, they also come with certain disadvantages. Here are some potential drawbacks:-

- Protection systems may sometimes trigger false alarms or trips due to transient spikes or momentary fluctuations that are not necessarily harmful.
- Some protection circuits may have a delay in their response time. In critical applications, a delayed response could lead to damage before the protection system activates.
- Protection devices may dissipate some power, leading to energy losses in the system.
- As the load switch are operating using electromechanical switch or relay there will have a extra power consuming term which is inductor inside the electromechanical switch.
- In this project we used ATmega 2560 Microcontroller which clock frequency is 16MHz, this clock frequency is not sufficient for broad level of project. That's why we will observe some delay in this project.

**Conclusion** : As the load effect on the Power system is dynamic rather than static or continuous, it can be described as follows. This is the cause of the voltage fluctuation, which can seriously damage any loads attached to the bus bar. Additionally, there is an unwanted thunder impact on the transmission line that can destroy the entire power system in less than three milliseconds. For this reason, we must safeguard the power system against voltage fluctuations and instant high voltage impact. However, if there is an excessive amount of load linked to the load side during peak hour, a generation fault will eventually arise, and if we don't take action, a blackout will ensue. Thus, we must preserve our system.