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A Minor Project Report on

PHASE OUTAGE INTIMATION IN THREE PHASE SYSTEM

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BONAFIDE CERTIFICATE

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We affirm that the Minor Project report titled **"PHASE OUTAGE INTIMATION IN THREE PHASE SYSTEM"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering,** is the original work carried out by us.

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PSO3: Research oriented innovative ideas and methods: To apply the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information for arriving significant conclusion.

Abstract (Key Words)	Mapping of POs and PSOs
Power Conversion Phase Outage Intimation Textile Industry Compressor	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3.

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LIST OF ABBREVIATION

S No	ABBREVIATION	EXPANSION
1.	GSM	Global System for Mobile Communication.
2.	CT	Current Transformer
3.	PT	Potential Transformer
4.	IOT	Internet of Things
5.	ADC	Analog to Digital Converter
6.	AC	Alternate Current
7.	UART	Universal Asynchronous Receiver Transmitter
8.	USB	Universal Serial Bus
9.	SPI	Serial Peripheral Interface
10.	APL	Arduino Programming Language

ABSTRACT

The main idea of our project is to intimate the power conversion from three phase to single phase conversion which routinely happens in the agricultural areas our project function as a phase outage intimation system. There are some industries which was in agricultural areas to operate their machines in two phase supply, they are using inverter but especially in textile industry, they use compressor for cleaning purposes which will operate only in three phase supply, hence by intimating whether the supply was three phase or single phase through their android devices, it will help them to do their work efficiently. The Compressor's operating time was one to two hours only for a day and hence they (the textile industry persons) do not show interest in replacing inverters with the compressor by considering the cost. The main idea behind phase outage intimation in the textile industry is to detect and inform the concerned personnel or system about the power outage in any of the three phases (i.e., A, B, or C) of the electrical supply. This is important because the textile industry heavily relies on electrical power for various operations, and a sudden power outage can cause significant disruptions and financial losses. By using a phase outage intimation system, the textile industry can minimize the downtime caused by power outages and ensure the safety of its machinery and workers.

Key Words: Phase Outage Intimation System, Textile Industry, Compressor.

CHAPTER 1

INTRODUCTION

1.1 Introduction

In the agricultural areas to maintain the power demand or power required the electricity board will follow the timings as eight hours three phase and remaining hours as two phases including the peak hours. To intimate exact power conversion timing, our project was extremely helpful because it will send a message to the android device when power conversion takes place. Additionally, we are using current transformers and voltage transformers for measuring the current and voltage values which flows through each phase as a result it helps in detecting the fault analysis in three phase supply system. And in future, we are planned to make the units consumed calculations by the three-phase load and the values will be monitored using android devices. Phase outage intimation system is an advanced technology that can help the textile industry to prevent the loss of production due to power outages. In textile manufacturing, it is crucial to maintain uninterrupted power supply for the smooth running of various machines and equipment. The phase outage intimation system works by monitoring the power supply to the machines and immediately alerts the concerned personnel in case of any power outage. The system is designed to detect any phase imbalance, voltage fluctuations, or other issues that may cause a power outage. The implementation of a phase outage intimation system requires expertise in the field of electrical engineering and installation of appropriate sensors and monitoring equipment. It is important to ensure that the system is properly calibrated and tested before it is integrated into the textile manufacturing process. Overall, the phase outage intimation system is a valuable technology for the textile industry, which can help improve productivity, reduce downtime, and save costs in the long run.

1.2 Necessity

The phase outage intimation system is necessary for the textile industry for several reasons. Firstly, in textile manufacturing, uninterrupted power supply is critical to the smooth functioning of various machines and equipment. Power outages can result in production downtime, which can cause delays in meeting customer orders and ultimately result in lost revenue for the company. A phase outage intimation system can immediately detect any power outage and alert the concerned personnel, allowing them to take appropriate action to minimize the impact on production. Secondly, sudden power outages can cause damage to the machines, leading to costly repairs and maintenance. The phase outage intimation system can help prevent such damage by immediately notifying the personnel so that the machines can be turned off in a controlled manner. Thirdly, the phase outage intimation system can help reduce energy costs by detecting any phase imbalance or voltage fluctuations, which can cause inefficiencies in the manufacturing process. By monitoring the power supply and providing real-time feedback, the system can help identify and rectify such issues, leading to improved energy efficiency and cost savings. Finally, the implementation of a phase outage intimation system can help textile companies comply with safety regulations and standards. By detecting and notifying personnel of any potential safety hazards, the system can help prevent accidents and ensure a safe working environment for the employees. In summary, the phase outage intimation system is essential for the textile industry to ensure uninterrupted power supply, prevent machine damage, improve energy efficiency, and comply with safety regulations.

1.3 Scope of the work

The scope of work of a phase outage intimation system in the textile industry is quite vast. Some of the major areas where the system can be used are:

Power Monitoring: The system can monitor the power supply to various machines and equipment in the textile manufacturing process. It can detect any phase imbalance, voltage fluctuations, or other issues that can lead to a power outage. This helps in identifying and rectifying the problem before it causes any disruption to the production process.

Fault Detection: The system can detect any faults or anomalies in the power supply and immediately notify the concerned personnel. This can help prevent any damage to the machines and minimize the impact on production.

Maintenance: The system can help in the maintenance of the machines by monitoring their power supply and detecting any issues that may lead to wear and tear. This can help in scheduling maintenance and repair work in a timely manner, thereby reducing downtime.

Energy Management: The system can help in managing energy consumption by monitoring the power supply and providing real-time feedback on any inefficiencies in the process. This can help in identifying areas where energy can be saved and in reducing overall energy costs.

Safety: The system can help in ensuring the safety of the employees by detecting any potential safety hazards and notifying the personnel. This can help in preventing accidents and ensuring a safe working environment for the employees.

CHAPTER 2

LITERATURE SURVEY

V. Ravi et al. (2016) formulated the development of an intelligent power monitoring system for textile mills. The system is based on a phase outage intimation system that can detect any power outage and immediately notify the concerned personnel through email. The system is also equipped with energy management features that can help in identifying areas where energy can be saved. The proposed system was implemented in a textile mill in India, and the results showed a significant reduction in downtime and maintenance costs. Fault analysis was not implemented in this system which can be achieved using phase outage system itself.

N. Nithya et al. (2017) formulated the automated phase outage intimation system for the textile industry based on a microcontroller that can detect any power outage and immediately notify the concerned personnel through SMS. The system is also equipped with energy management features that can help in identifying areas where energy can be saved. The optimal solution for fault analysis in textile mills can be achieved using phase outage system that was not implemented in this system.

N. Karthikeyan et al. (2018) formulated the design and development of a phase outage monitoring system for textile mills that can detect any phase imbalance, voltage fluctuations and other issues that can lead to a power outage. This system uses current transformers and voltage transformers for measuring current and voltage values and it results in high accuracy towards phase outages. The optimal solution for phase outages was given by this paper. But additionally in this paper we are planning to implement the unit calculation system which helps in power management.

M.A. Rashid et al. (2019) formulated the smart power management system for textile mills based on phase outage intimation system that can detect the power outage and immediately notify the concerned personnel and technologies like Internet of Things (IoT), wireless sensor networks and cloud computing for smart power management. This system used to show the power outages by 30%. The extended solution for the phase outage that particularly happens in agricultural areas was not implemented. In this paper we have implemented the phase outage system which intimates the timings of single phase and three phase.

CHAPTER 3

SYSTEM MODEL

3.1 Introduction

A system model for a phase outage intimation system in the textile industry is designed to alert operators in the event of a power outage or phase failure in the power supply to critical machinery or equipment. The system model typically involves the use of sensors and communication devices to detect and transmit information about the power status of the machines or equipment. This information is then processed by a central monitoring system that is responsible for analyzing the data and determining whether an outage has occurred. Overall, the system model for a phase outage intimation system is a critical component of maintaining uninterrupted operations in the textile industry.

3.2 EXISTING BLOCK DIAGRAM

The figure 3.1 shows the existing system of Phase outage system in three phase system:

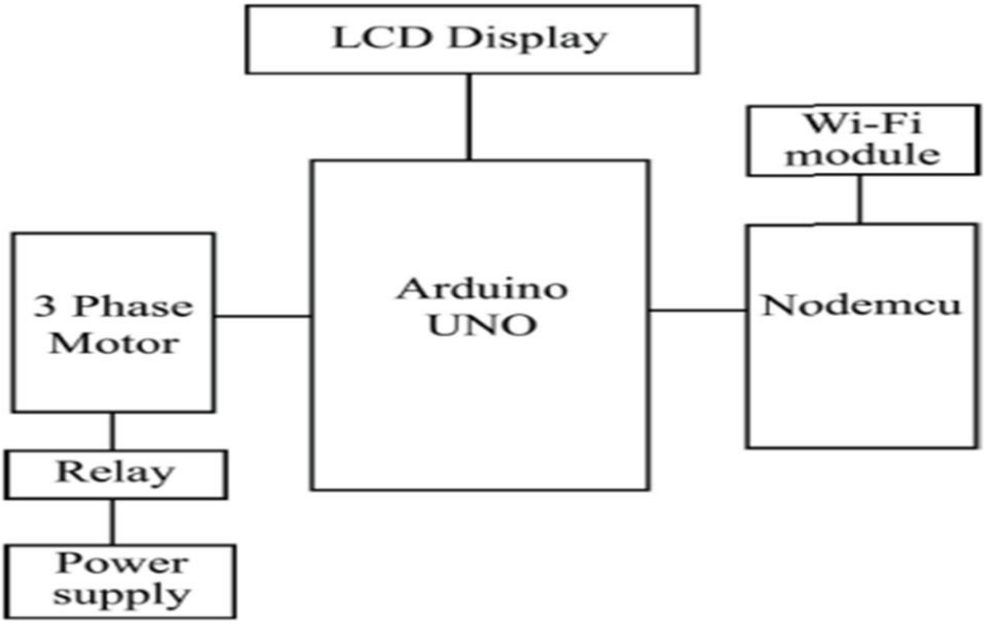

Figure 3.1 Existing Block Diagram of the System

3.3 PROBLEM STATEMENT

The existing system has Arduino UNO (microcontroller) and Nodemcu (for communication purpose) which makes the system expensive and to reduce the cost of the system in proposed system Bluetooth module (HC 05) has been used.

Figure 3.2 shows the problem identified in the system regarding cost:

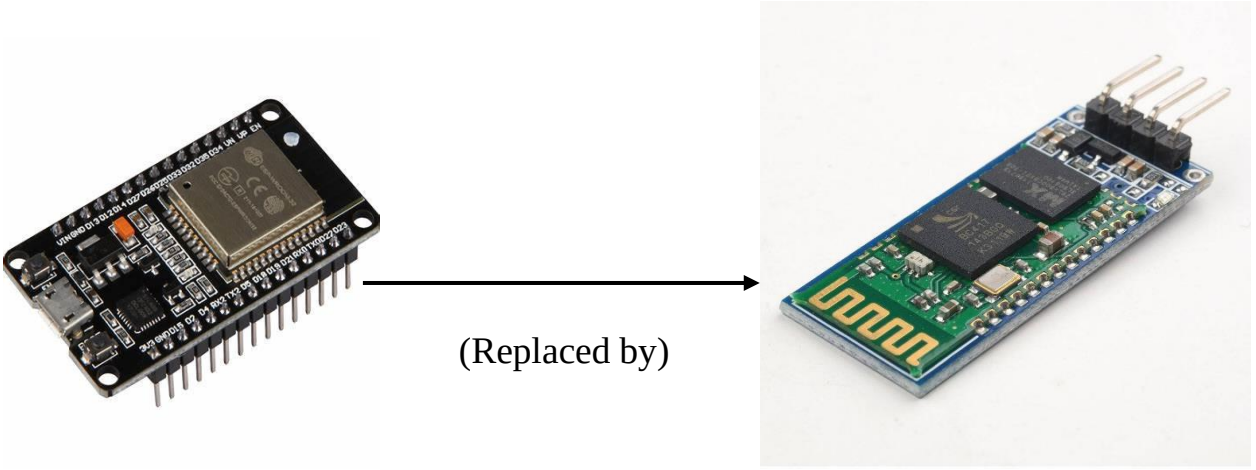

Figure 3.2 Problem Identification - 1

In case of phase outage, existing system cut off the supply at the load side by using relay. There will be no intimation process in the existing system and hence the load has been directly connected to UNO board but in proposed system, main power source has been directly connected to the UNO board to achieve the intimation process by collecting the data (voltage value in each phase) using sensors.

Figure 3.3 shows the problem identified in the system regarding supply:

Figure 3.3 Problem Identification – 2

CHAPTER 4

HARDWARE DESCRIPTION

4.1 Introduction

Phase outage intimation in the textile industry is a critical aspect of ensuring uninterrupted production and safeguarding the machinery from damage. Hardware description of phase outage intimation refers to the technology used to detect power outages in the textile industry and provide real-time alerts to prevent any negative impacts on the manufacturing process. The hardware involved in phase outage intimation typically includes sensors or monitors that can detect changes in the electrical current and voltage levels. These sensors are connected to a controller that processes the signals and generates alerts in the event of a power outage. The controller may also be connected to a backup power supply, such as a generator or battery, to ensure continuous operation even during power interruptions. The system can be configured to alert the operators through visual or audible alarms or to trigger automatic shut-off mechanisms to prevent machinery damage or other safety hazards. Some systems may also include remote monitoring capabilities, allowing operators to receive alerts and manage the system from a central location.

4.2 PROPOSED BLOCK DIAGRAM

Figure 4.1 shows the Proposed Block Diagram of the system:

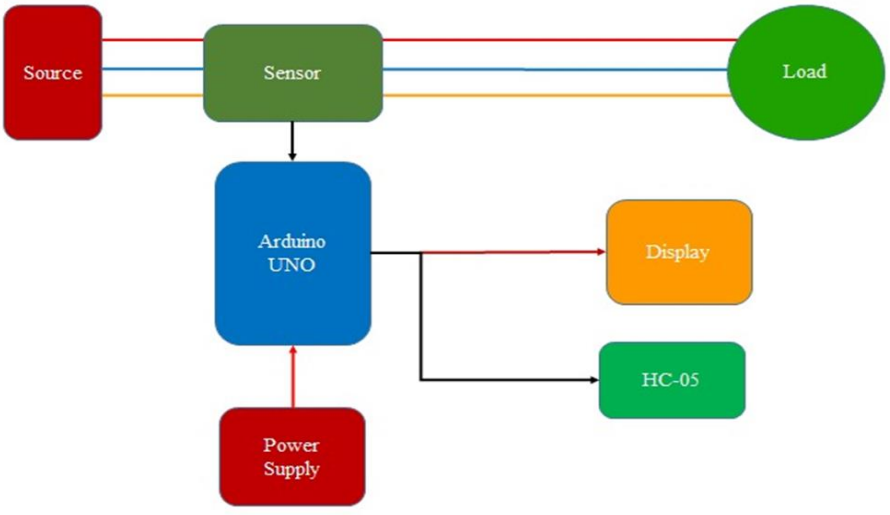

Figure 4.1 Proposed Block Diagram of the System

Description of various blocks

Arduino Mother Board

Arduino is an open-source electronics platform accompanied with a hardware and software to design, develop and test complex electronics prototypes and products. The hardware consists of a microcontroller with other electronic components which can be programmed using the software to do almost any task. The simplicity of the Arduino language makes it very easy for almost everyone who has an interest in electronics to write programs without the understanding of complex algorithms or codes.

Voltage Sensor

ZMPT101B is a voltage sensor module that is used to measure the AC voltage in a circuit. The module has a built-in transformer that converts the high voltage AC signal into a low voltage AC signal that can be measured by a microcontroller or an analog-to-digital converter (ADC). The ZMPT101B module has two output pins: one for the AC voltage signal and one for the ground. The AC voltage signal is proportional to the input AC voltage, with a scaling factor of 1:1.414. For example, if the input voltage is 220V AC, the output voltage signal will be around 156V AC. The module operates on a supply voltage of 5V DC and consumes very low power. It is easy to use and can be interfaced with any microcontroller or ADC that has an analog input. The module is commonly used in applications that require monitoring of AC voltage levels, such as power supply units, industrial automation, and home automation systems.

Power Plug

AC power plugs and sockets connect electric equipment to the alternating current (AC) mains electricity power supply in buildings and at other sites. Electrical plugs and sockets differ from one another in voltage and current rating, shape, size,and connector type.

Bluetooth Module

The Bluetooth HC-05 is a commonly used Bluetooth module for wireless communication. It is a slave-only device that can be easily integrated into a variety of electronic projects. The module supports the Bluetooth 2.0+EDR standard and has a range of up to 10 meters. The HC-05 module operates at 3.3 volts and can be easily interfaced with a microcontroller. It has a built-in antenna and can communicate at a baud rate of up to 115,200 bits per second. The module supports a variety of communication modes, including UART, USB, and SPI.

LCD Display

The LCD display 16x2 consists of a glass panel with a series of electrodes and a layer of liquid crystal material. The electrodes apply an electric field to the liquid crystal, which changes the polarization of the material and allows light to pass through or block it, resulting in the display of characters on the screen. To interface with the display, you typically need to connect it to a microcontroller or other device that can send commands and data to the display. The most common protocol used for communication is the HD44780 protocol, which defines a set of commands for controlling the display.

4.3 CIRCUIT DIAGRAM

Figure 4.2 shows the circuit diagram of the system:

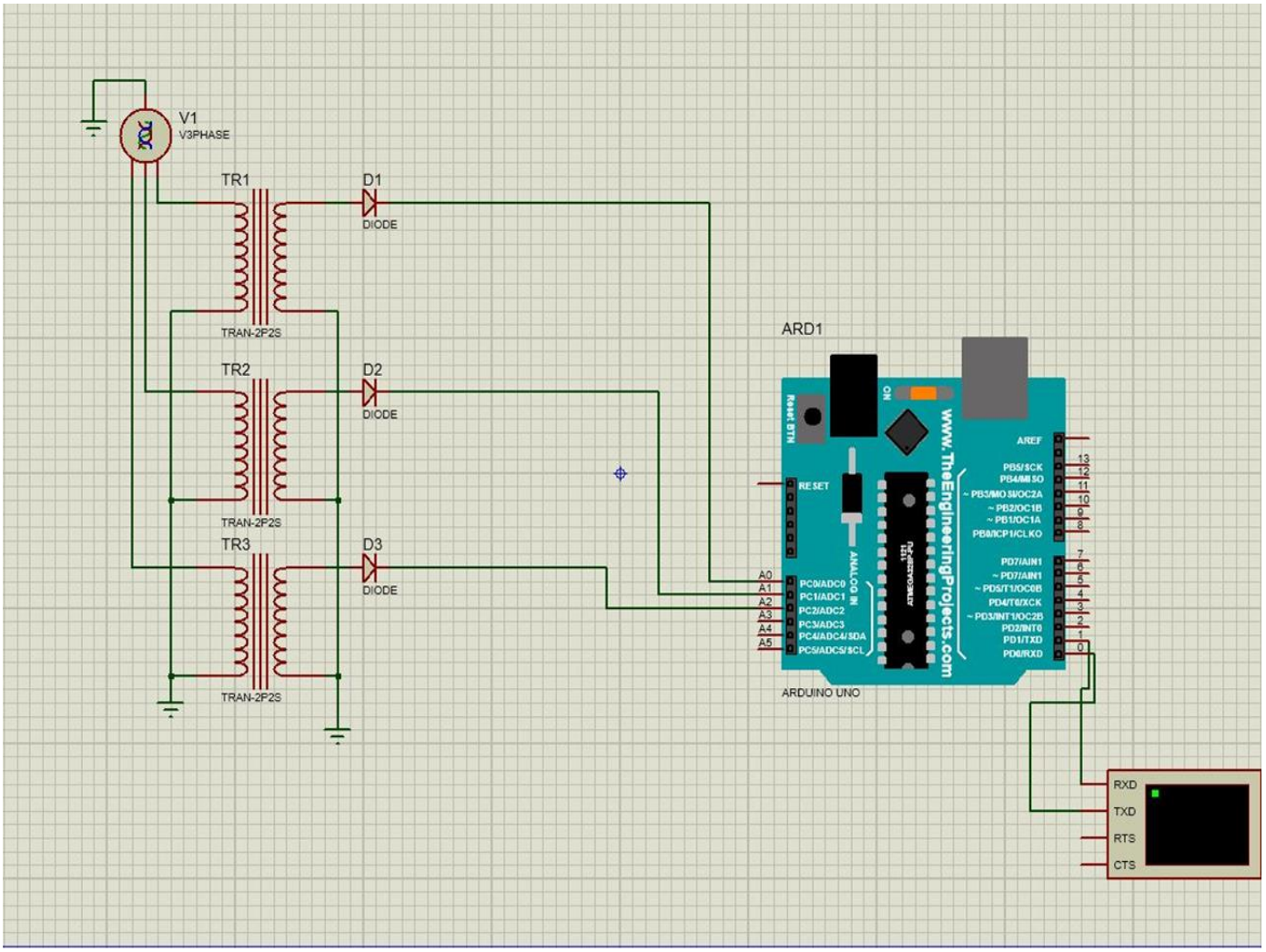

Figure 4.2 Circuit Diagram of the System

Circuit Diagram Description

The main electrical parameters (voltage and current values) can be seen by this Virtual Terminal (acts as a Bluetooth Module) and it will display an intimation message in case of phase outage. Virtual terminal was connected in between the Bluetooth Module and Arduino UNO (the receiver and transmitter pins of UNO was connected to the transmitter and receiver pins of Bluetooth module). In the diagram V1(v3 phase) indicates the three-phase power source and each phase was connected with transformer with star connection for measuring the voltage values at each phases. In order to convert the three phase alternate parameter values to equivalent direct parameter values, the diode was connected in between the transformer and the microcontroller. The voltage values at each phase will be measured continuously by transformers (sensors) and the data should be send to the microcontroller for further processing. In case of sudden deviation in the voltage values, the intimation message will be displayed by sending signal to the virtual terminal (Bluetooth module) with the help of microcontroller.

4.4 HARDWARE COMPONENTS

S.NO	COMPONENTS	SPECIFICATION	QUANTITY	COST in Rs.
1	Arduino	UNO	1	1000
2	Voltage Sensors	ZMPT101B	3	850
3	Bluetooth Module	HC 05	1	250
4	Power Source	12V DC	1	100
			Total = 2200	

Table 4.1 Hardware and its Components

4.5 HARDWARE MODEL

The hardware model of a phase outage intimation system in the textile industry typically consists of several components, including sensors, data acquisition devices, controllers, and communication devices. These components work together to monitor the power grid and provide early warning of potential power outages.

Sensors: The sensors used in a phase outage intimation system are typically current transformers (CTs) or voltage transformers (VTs) that are placed on each phase of the power grid to monitor the current flow and voltage. These sensors are connected to data acquisition devices, such as microcontrollers or data loggers, that process the data and send it to the controllers for analysis.

Data acquisition devices: The data acquisition devices used in a phase outage intimation system are responsible for collecting data from the sensors and sending it to the controllers for analysis. These devices can be simple microcontrollers or more complex data loggers that can store and transmit data wirelessly.

Controllers: The controllers used in a phase outage intimation system are responsible for analyzing the data collected from the sensors and determining whether there is a potential power outage. These controllers can be simple microcontrollers or more complex devices that utilize machine learning algorithms to analyze the data.

Communication devices: The communication devices used in a phase outage intimation system are responsible for transmitting the data from the controllers to the end-users. These devices can be wired or wireless and can utilize a variety of communication protocols, such as Ethernet, Wi-Fi, or cellular.

The hardware model of a phase outage intimation system can vary depending on the specific needs of the textile industry. For example, some systems may utilize more advanced sensors and controllers to provide more accurate and timely information about potential power outages. Additionally, some systems may utilize cloud-based data storage and analysis to enable real-time monitoring and analysis of the power grid. Overall, the hardware model of a phase outage intimation system in the textile industry is designed to provide early warning of potential power outages and enable preventive actions to be taken to minimize the impact on textile production.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Hardware Implementation

The Figure 5.1 shows the Hardware Test Setup of the system:

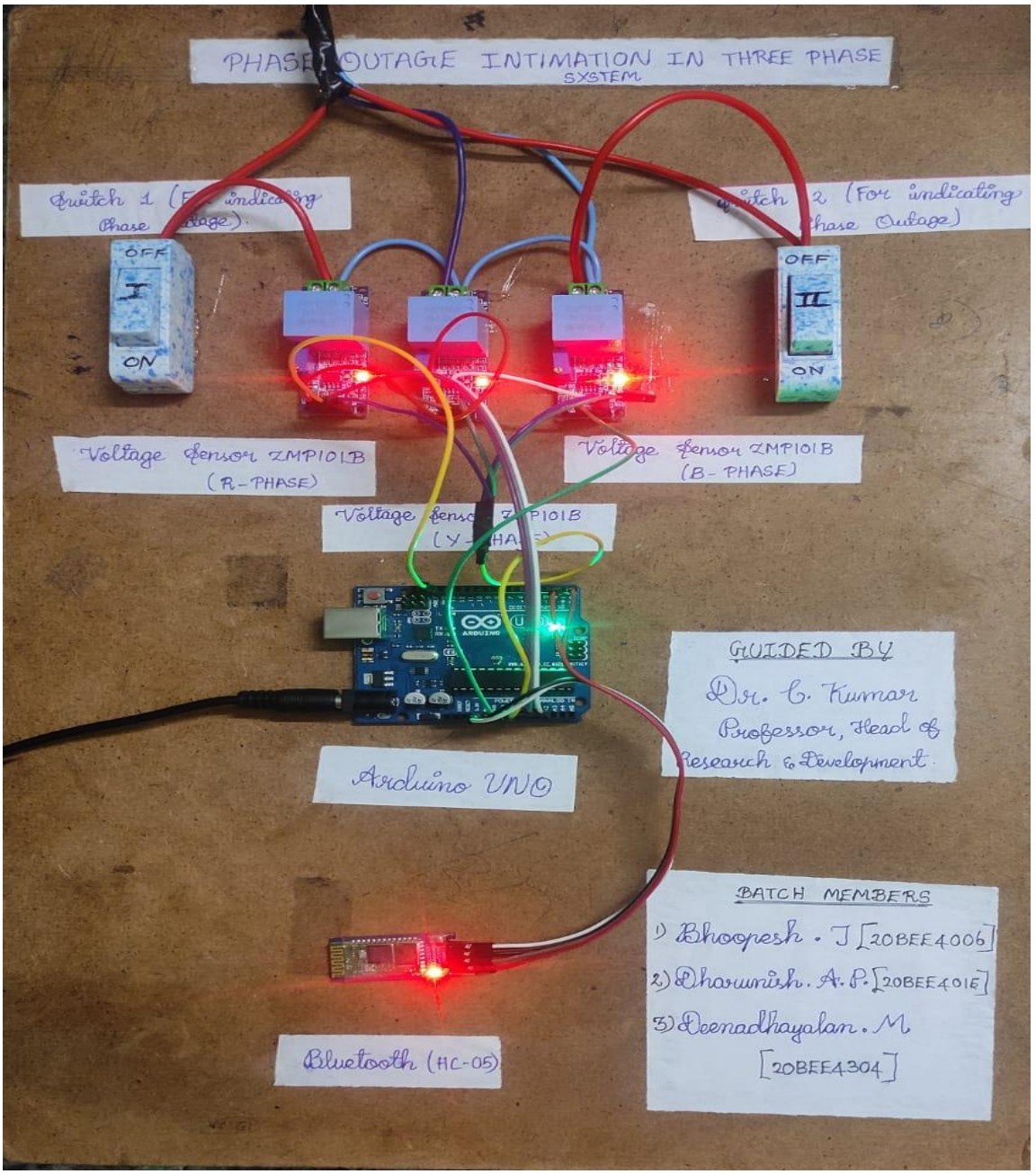

Figure 5.1 Demonstration test setup of Phase Outage Intimation in Three phase system

Working of the Project Model

A Phase outage intimation system in the textile industry is designed to detect and alert the users of a power outage in one or more phases of a three-phase power supply system. Such systems typically consist of sensors, controllers, and notification devices.

Here is how a typical Phase outage intimation system works in the textile industry:

Sensors: The system uses sensors to detect the status of each phase of the power supply. Typically, these sensors are placed at various points in the power distribution system, including at the main incoming supply panel and at various subpanels throughout the facility.

Controllers: The sensor data is transmitted to a central controller, which monitors the status of each phase of the power supply. The controller can be programmed to detect a range of faults, including phase loss, phase imbalance, and overvoltage/undervoltage conditions.

Notification Devices: When a fault is detected, the controller sends an alert to the notification devices, which can include audible alarms, visual indicators, and automated messaging systems. These devices can be located in key areas throughout the facility, including the control room, production areas, and maintenance areas.

Response: When the alert is received, the operators or maintenance personnel can take appropriate action, such as shutting down equipment, resetting breakers, or contacting the utility provider to report the outage.

In summary, a Phase outage intimation system in the textile industry is an essential component of the power distribution system that helps prevent damage to equipment, reduce downtime, and ensure worker safety. By quickly detecting and alerting users to power outages, these systems can help minimize the impact of power failures on production and avoid potential hazards.

BEFORE PHASE OUTAGE

The Figure 5.2 shows the voltage values of each phases before phase outage happens

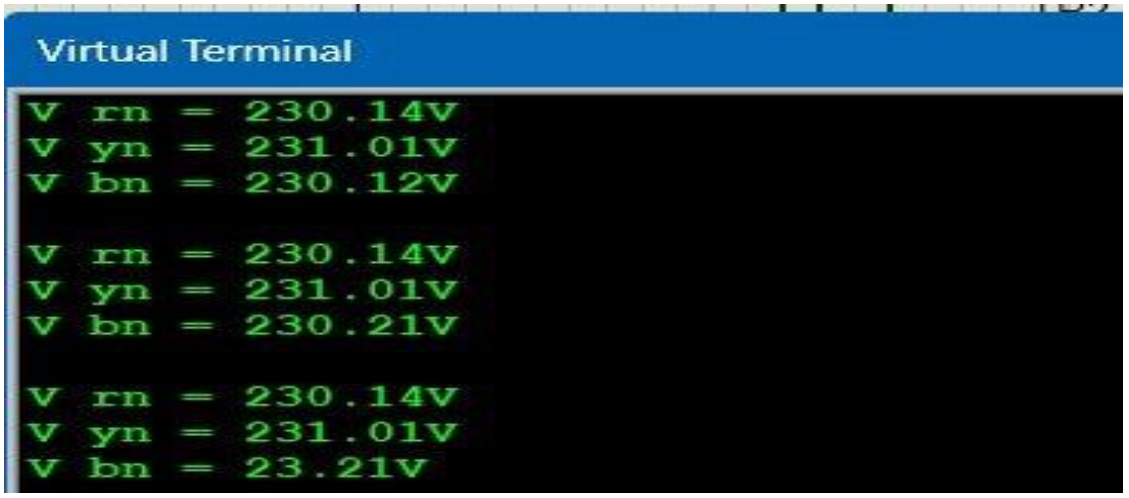

Figure 5.2 Virtual Terminal (Before Outage)

AFTER PHASE OUTAGE

The Figure 5.3 shows the voltage values of each phases after phase outage happens

Figure 5.3 Virtual Terminal (After Outage)

HARDWARE REQUIREMENTS

- Arduino Board
- Voltage sensor
- Bluetooth Module

ARDUINO BOARD

Arduino

I was surprised to see a twelve-year-old boy giving life to his electronic gadgets. He was trying his hands on building his own creative toys which involved hard electronics and software skills. My zeal was on its peak to know the magical power inside the young chap. How did he understand the concepts of electronics so early? How did he develop the software? Anxiously I went down and asked him about the magic he was doing. The answer was“ARDUINO”.

Figure 5.4 shows the Arduino UNO microcontroller

Figure 5.4 Arduino UNO Microcontroller

Arduino is an open-source electronics platform accompanied with a hardware and software to design, develop and test complex electronics prototypes and products. The hardware consists of a microcontroller with other electronic components which can be programmed using the software to do almost any task. The simplicity of the Arduino language makes it very easy for almost everyone who has an interest in electronics to write

programs without the understanding of complex algorithms or codes. Arduino is intended for an artist, tinker, designer, or anyone, interested in playing with electronics without the knowhow of complex electronics and programming skills. Arduino is an excellent designed open-source platform. It has specially designed boards which can be programmed using the Arduino Programming Language (APL). The presence of Arduino is not only spreading between hobbyists, but it has also expanded its roots in industries and used by experts for making prototypes of commercial products. Arduino takes off the efforts required in complex coding and designing hardware. The open-source nature of Arduino has been the main reason for its rapid horizontal growth. Since it is an Open-Source project, all the files related to hardware and software is available for personal or commercial use. The development cost of the hardware is very small as against the costly similar proprietary products by the industrial giants. The open-source nature does not require any licenses to develop, use, redistribute or even sell the product. But the Arduino name is trade mark protected (Arduino™) i.e., you are free to sell the Arduino board under any other name however in order to sell it under the name "Arduino" you need to take permission from the founders and follow their quality terms. The Software files which include all the source code library are also open sourced. A user can modify them to make the project more versatile and improve its capabilities**.**

Hardware

The Figure 5.5 shows the Pin configuration of Arduino UNO:

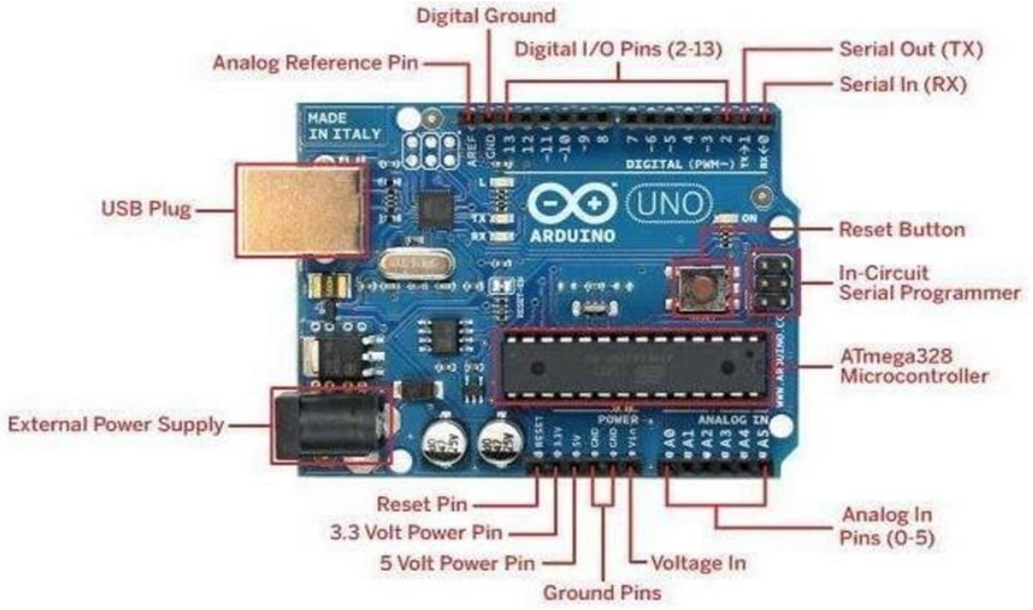

Figure 5.5 Pin configuration of Arduino UNO

This board is designed around the ATmega328 AVR microcontroller. It is an 8 bit microcontroller with 32KB of flash, 2KB of SRAM, 1KB of EEPROM, timers, ADC, I2C, SPI, and UART peripherals. Arduino Uno is based on ATmega328P Atmel AVR family microcontroller (MCU). This MCU has 32KB of flash, 2KB of SRAM and 1 KB of EEPROM. It has 14 digital IO pins (PORTD – 8pins, PORTC – 6 pins, PORTB – 5pins), 6 Analogue input pins, which can be sampled using on-chip ADC. It also has 6 PWM outputs multiplexed on to the digital IO pins. A 16 MHz crystal is installed on the board. Arduino Uno Pinout

External Power Supply - allows the Arduino to run when it's not connected plugged into a USB port for power. It accepts between 7V- 12V of voltage.

USB Plug - This powers the Arduino without needing to use an external power supply and is what you use to upload sketches (program) to the microcontroller, and to communicate with your Arduino sketch (via Serial, println(), etc).

Pin Functions:

Power Pins (3.3 V, 5 V, GND) - Use these pins to connect to circuitry at 3.3 V, 5V, or GND. Make sure that whatever you power doesn't draw more than a few milliamps.

Serial Out (TX) and Serial In (RX) - Pins (0-1) are RX and TX respectively and used for sending and receiving serial data. This port can be used to send and receive data from a GPS module, Bluetooth modules, WIFI modules, etc.

Digital I/O Pins (2-13) - Accept 0 to 5 V input or output. Utilizing tristate logic Arduino makes it easy to change between inputs and outputs in software. You can use this pin as an output where it spits out 5V for a digital 1, or 0 V for a digital 0. You can also configure it to expect a voltage on the pin and that voltage could be interpreted as a 1 or a 0. These pins are used with digitalRead(), digitalWrite (). Analog Write() works only on pins with PWM symbol.

External Interrupts - Pins 2 and 3 can be configured to trigger an interrupt on low value, a rising or falling edge, or a change in value.

PWM Pins - any pins with ~ in front of them can be used to generate pulse modulated square waves. Pins 3, 5, 6, 9, 10, and 11 provide 8-bit PWM output with the analog Write() function. **Pin 13** - drives the built in LED, that is used by Arduino to receive power and useful for debugging. When pin is HIGH value, the LED is on, when pin is LOW value, it is off.

Analog In Pins - Pins A0 through A5 provide 10 bits of resolution. Accepts 0 to 5 V inputs and is used to measure continuous voltages anywhere from 0 V to 5 V. It is possible to change the upper end of their range using the AREF pin and the analog Ref () function.

Reset Pin - bring this Phase low to reset the microcontroller. Typically used to add a reset buttonto shields that block the one on the board.

Analog Reference Pin (AREF) - input pin used optionally if you want external voltage reference for ADC rather than internal Vref. You can configure using an internal register.

Memory - The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required.

Microcontroller	**ATmega328**
Operating Voltage	5V
Input Voltage	7-9V
Input Voltage (limits)	6-20V
Digital I/O Pins	14

Table 5.1 Specifications of Arduino UNO

VOLTAGE SENSOR

The ZMPT101B voltage sensor is an AC voltage sensor module that is used to measure the voltage of an AC power Phase. It is commonly used in applications such as home automation, power management, and robotics. The ZMPT101B module consists of a voltage transformer, a rectifier circuit, and a voltage regulator circuit. The voltage transformer is used to step down the voltage of the AC power Phase to a level that can be measured by the rectifier circuit. The rectifier circuit then converts the AC voltage to a DC voltage, which is proportional to the AC voltage. Finally, the voltage regulator circuit stabilizes the DC voltage output, making it suitable for use by microcontrollers or other digital circuits. The ZMPT101B module has a rated input voltage of 220V AC, and its output voltage is proportional to the input voltage. The module has a Phasear output, which means that the output voltage is directly proportional to the input voltage, and it can be calibrated using a potentiometer to adjust the output voltage. One of the advantages of the ZMPT101B voltage sensor is its compact size, which makes it easy to integrate into small electronic projects. It also has a high accuracy, with a voltage measurement range of 0-250V AC and an accuracy of ±0.5%. Overall, the ZMPT101B voltage sensor is a useful module for measuring AC voltages in various electronic projects. The ZMP101B voltage sensor is a compact and precise sensor that is designed to measure voltage levels in various applications. Its construction includes the following key components:

1. **Input Voltage Divider:** The input voltage divider is composed of two resistors that are used to divide the input voltage in proportion to the voltage being measured. This voltage is then applied to the internal voltage reference.

2. **Voltage Reference:** The voltage reference is an internal component that provides a precise reference voltage for the sensor. It is used as a basis for calculating the output voltage based on the input voltage.

3. **Output Amplifier:** The output amplifier is responsible for amplifying the voltage signal from the voltage reference and the input voltage divider. It is designed to provide a high-accuracy and low-noise output signal.

4. **Output Load Resistor:** The output load resistor is an external resistor that is connected between the output of the sensor and ground. It is used to determine the output voltage of the sensor and must be carefully selected to match the requirements of the application.

5. Power Supply Regulator: The power supply regulator is an internal component that provides a stable voltage to the sensor. It ensures that the sensor operates within the specified voltage range and provides a reliable and accurate output signal.

The ZMP101B is a voltage sensor designed for use in a variety of applications, including battery monitoring, power management, and other voltage monitoring applications. It is a compact and accurate sensor that can measure voltage levels from 0V to 5V with a high degree of precision. The following is a pin description for the ZMP101B voltage sensor:

Vcc: This pin is used to supply power to the sensor. It requires a voltage between 3.3V and 5V.

GND: This pin is used as the ground connection for the sensor.

Vout: This pin is the output of the sensor and provides a voltage proportional to the input voltage. The output voltage ranges from 0V to Vcc.

N/C: This pin is not connected and should be left unconnected.

It's important to note that the ZMP101B requires an external load resistor to be connected between the Vout pin and ground to determine the output voltage. The output voltage can be calculated using the following formula: Vout = (Vin / Vcc) * 5V, where Vin is the voltage being measured and Vcc is the voltage supplied to the sensor.

The Figure 5.6 shows the Voltage Sensor of the model ZMP101B

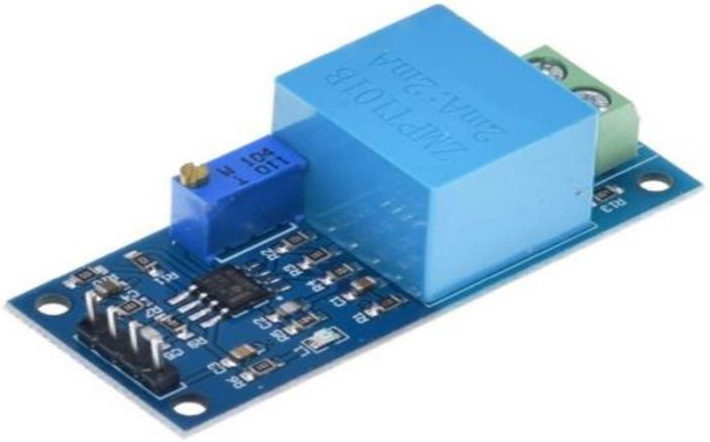

Figure 5.6 Voltage Sensor

BLUETOOTH MODULE

The HC-05 Bluetooth module is a popular wireless communication module that allows electronic devices to communicate wirelessly over short distances. It uses Bluetooth technology to create a wireless serial communication link between devices, allowing them to exchange data and control signals. The HC-05 module consists of a Bluetooth radio transceiver and a microcontroller, which handles the communication protocol and interfaces with the user's electronic device. The module operates in the 2.4GHz ISM (Industrial, Scientific, and Medical) frequency band and has a range of up to 10 meters. The HC-05 module can operate in two modes: master and slave. In master mode, the module can initiate a connection to another Bluetooth device and act as the primary controller of the connection. In slave mode, the module can only respond to connection requests from other Bluetooth devices. The working principle of the HC-05 module is relatively simple. When the module is powered on, it enters into a default configuration mode where it can be configured using AT commands. Once configured, the module can be used to establish a wireless serial communication link between two devices. To use the HC-05 module, the user needs to establish a connection between the module and their electronic device. This is done by sending a connection request to the HC-05 module from the user's device. Once the connection is established, the module can exchange data and control signals with the user's device over the wireless link. Overall, the HC-05 Bluetooth module is a useful and versatile module for wireless communication between electronic devices. Its compact size, ease of use, and low power consumption make it a popular choice for hobbyists and professionals alike. The HC-05 Bluetooth module is constructed using surface mount technology (SMT) and is enclosed in a small rectangular plastic housing with six pins for connections. The internal components of the module include a Bluetooth radio transceiver chip, a microcontroller, and other supporting components such as resistors, capacitors, and voltage regulators. The Bluetooth radio transceiver chip is the core component of the module and is responsible for transmitting and receiving data wirelessly over the Bluetooth protocol. It supports the Bluetooth 2.0+EDR (Enhanced Data Rate) standard and has a range of up to 10 meters. The microcontroller in the HC-05 module is responsible for handling the Bluetooth communication protocol, data processing, and control signals. It is programmed with firmware that allows the module to be configured and controlled using AT commands. The supporting components such as resistors, capacitors, and voltage regulators are used to regulate the voltage, filter out noise, and provide stable power to the module. The plastic housing is designed to protect the internal components of the module and provide a convenient platform for connecting the

module to other devices. Overall, the HC-05 Bluetooth module is a well-designed and compact module that is built using modern SMT technology. Its internal components work together to provide reliable wireless communication and control signals between devices over the Bluetooth protocol. The HC-05 Bluetooth module has six pins that serve different purposes in the operation of the module. Here is a brief description of each pin:

VCC - This pin is used to supply power to the module. The recommended voltage range for the VCC pin is 3.6V to 6V DC.

GND - This pin is connected to the ground of the circuit.

TXD - This pin is the serial transmit pin of the module. It is used to transmit data from the HC-05 module to the microcontroller or other devices that are connected to it.

RXD - This pin is the serial receive pin of the module. It is used to receive data from the microcontroller or other devices that are connected to the HC-05 module.

STATE - This pin is used to indicate the status of the module. The module can be set up to send different signals on this pin to indicate different states such as pairing mode, connection established, etc.

KEY - This pin is used to enter the AT command mode of the module. By pulling this pin high or low during power-up, the module can be put into AT command mode, which allows the user to configure various settings of the module. Overall, these pins play an important role in the operation and control of the HC-05 Bluetooth module, and their correct use and configuration are essential for proper functioning of the module. There are several advantages of using the HC-05 Bluetooth module for wireless communication between devices, including:

Low cost: The HC-05 is a relatively inexpensive module compared to other wireless communication technologies such as Wi-Fi or Zigbee. This makes it an attractive option for hobbyists and makers who want to experiment with wireless communication without investing a lot of money.

Easy to use: The HC-05 module is easy to use and does not require complex configuration or setup. The module can be easily paired with other Bluetooth devices, and data transfer can begin almost immediately.

Versatility: The HC-05 module can operate in both master and slave modes, allowing it to be used in a variety of applications such as wireless serial communication, wireless control of devices, and wireless data logging.

Low power consumption: The HC-05 module has a low power consumption, making it suitable for battery-powered devices. The module also has a power-saving mode that reduces power consumption when it is not in use.

Compatibility: The HC-05 module is compatible with a wide range of microcontrollers, including Arduino, Raspberry Pi, and other popular development boards. This allows users to easily integrate the module into their projects.

The Figure 5.7 shows the Bluetooth Module of the model HC 05

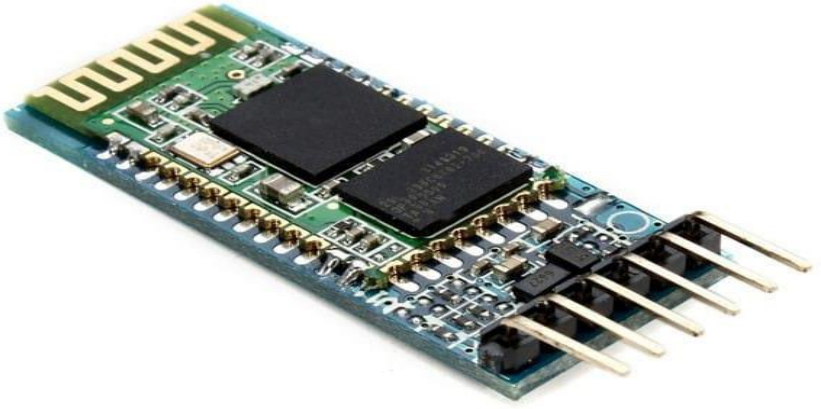

Figure 5.7 Bluetooth Module

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1

6.1 Conclusion

In conclusion, implementing a Phase outage intimation system in the textile industry can greatly improve production efficiency and minimize downtime. By using a real-time monitoring system, textile manufacturers can identify and address Phase outages promptly, preventing delays and reducing waste. Additionally, the system can provide valuable data for identifying patterns and trends in production issues, allowing for continuous improvement and optimization. Overall, a Phase outage intimation system is a valuable investment for any textile manufacturer looking to increase productivity and reduce costs.

6.2 Future Scope

The future scope of a Phase outage intimation system in the textile industry is vast and promising. As technology advances, the system can become more sophisticated and provide more accurate and detailed information about production issues. Here are some potential future developments and applications of the system:

Integration with Artificial Intelligence (AI) and Machine Learning (ML) algorithms to analyze production data and identify patterns and trends that could predict potential Phase outages before they occur.

Integration with Internet of Things (IoT) devices, such as sensors and smart machines, to create a smart factory that can detect and respond to production issues automatically.

Development of a mobile application that allows production managers to monitor production status remotely, receive real-time notifications of Phase outages, and act quickly.

Integration with a predictive maintenance system that can monitor equipment conditions and predict when maintenance is needed, reducing downtime caused by unexpected equipment failures.

Integration with a supply chain management system that can track raw materials and finished products throughout the production process, providing valuable insights into production issues and improving supply chain efficiency.

Overall, the future scope of a Phase outage intimation system in the textile industry is vast, and with ongoing technological advancements, the system has the potential to become an essential component of smart textile manufacturing.

6.3 Applications

A Phase outage intimation system has several applications in various industries, including:

Textile Industry: As mentioned earlier, in the textile industry, the system can be used to monitor machines and equipment to prevent Phase outages, reduce downtime, and improve productivity.

Manufacturing Industry: The system can be used to monitor production Phases, identify potential issues and reduce downtime, improving overall efficiency.

Power Industry: The system can be used to monitor power grids and alert operators of any Phase outages or faults, allowing for prompt repairs and minimizing the impact on customers.

Telecommunications Industry: The system can be used to monitor telecommunication networks and alert operators of any Phase outages or faults, allowing for prompt repairs and minimizing downtime.

Transportation Industry: The system can be used to monitor transportation networks, including railways and highways, to identify potential issues and improve the overall efficiency of transportation systems.

In general, a Phase outage intimation system can be applied to any industry where real-time monitoring and notification of Phase outages can improve productivity, reduce downtime, and minimize costs.

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LIST OF PUBLICATIONS

Dr C Kumar, A P Dharunish, T Bhoopesh, M Deenadhayalan of M. Kumarasamy College of Engineering is presented the research paper entitled "Phase Outage Intimation in Three Phase System" in the International Conference on Recent Advancements in Engineering and Technology (ICRAET'23) held at M.KUMARASAMY COLLEGE OF ENGINEERING, Karur, Tamil Nadu, India during 31st March 2023.

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