

# “IoT based Automatic Street Light Fault Detection in BSIET Campus.”

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## Abstract :

Street lighting is a fundamental public utility, yet its maintenance often relies on manual inspection, leading to energy waste and safety risks. This paper presents an **IoT-based automatic fault detection system** specifically designed for the BSIET campus. By integrating an **ESP8266/ESP32** microcontroller with **LDR** and **ACS712 current sensors**, the system automates light operation and identifies electrical faults like lamp failure or open circuits in real-time. Data is transmitted to a cloud platform (Blynk/Firebase), enabling instant mobile alerts for maintenance teams. This solution enhances campus security, reduces downtime, and supports energy conservation.

## Key words :

IoT, LDR Sensor, IR Sensor, Arduino, Smart Street Light, Energy Saving.

## Introduction

In modern infrastructure, street lights ensure the safety of students and staff during night-time activities. Traditional systems are often inefficient, characterized by manual switching and delayed fault identification. To modernize this, the Internet of Things (IoT) provides a bridge between physical electrical components and digital monitoring. This project implements a smart monitoring framework on two campus poles to detect

failures—such as blown fuses or aging lamps—instantly. By using sensors to monitor current and light intensity, the system transforms a passive utility into an active, intelligent network.

## System Components and Functions

The architecture consists of several integrated hardware modules:

- Main Controller (Arduino Uno/ESP32):

Acts as the central processing unit, reading sensor inputs and executing control logic for the relay.

- LDR Sensor:

Monitors ambient light levels to determine if it is day or night, triggering the automatic ON/OFF sequence.

- Current Sensor (ACS712):

Measures the flow of electricity to the lamp. If the relay is “ON” but no current is detected, a lamp failure is identified.

- Relay Module:

Serves as the high-voltage switch that interfaces the microcontroller with the AC street lamp.

- GSM/Wi-Fi Module:

Handles the communication layer, sending SMS alerts or updating the cloud dashboard when an anomaly occurs.

## Purpose of Methodology

- The implementation follows a logical sequence:

**Data Acquisition:** The LDR tracks light intensity while the current sensor monitors the electrical load.

**Logic Processing:** The microcontroller compares the actual state (current flowing) with the intended state (relay active).

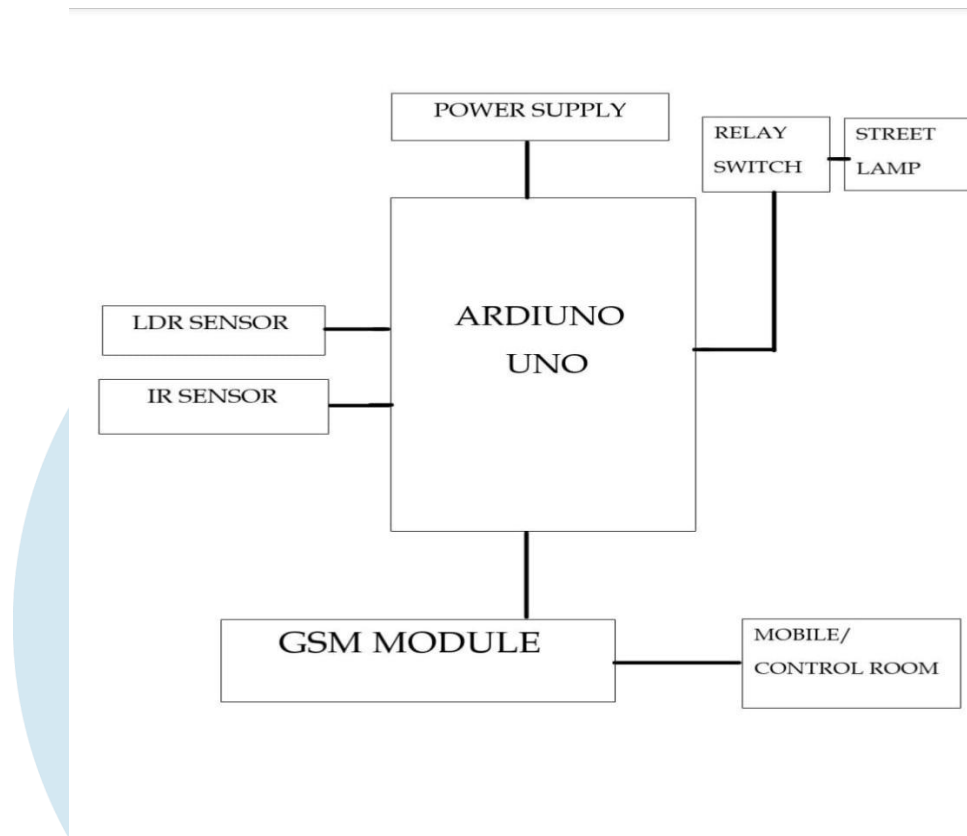
- Fault Classification:

**Normal:** Night-time detected, Relay ON, Current flowing.

**Lamp Failure:** Night-time detected, Relay ON, No current flowing.

**Control Fault:** Daytime detected, Relay ON (Energy waste).

## Block Diagram



## Literature Review

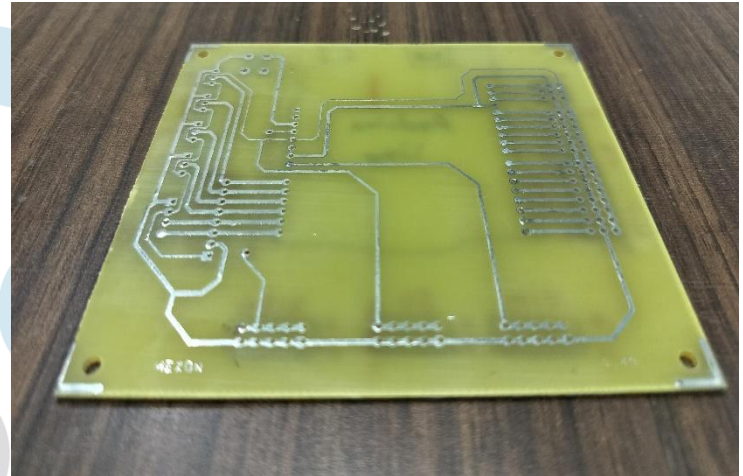
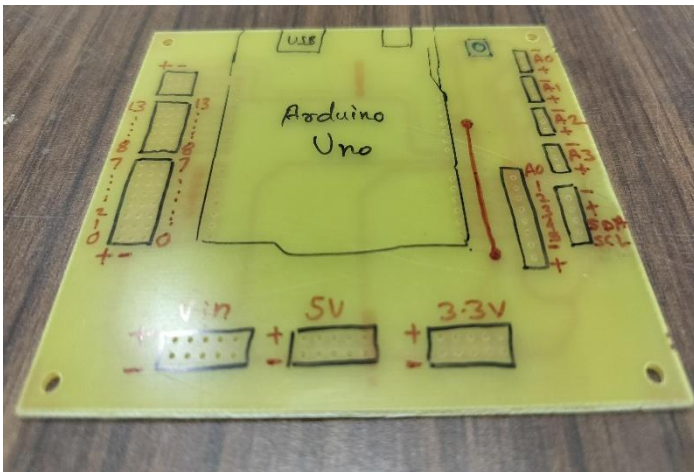
Recent research by **Singh et al. (2021)** and **Patel & Shah (2022)** confirms that sensor-integrated microcontrollers significantly outperform timer-based systems. Studies show that using IoT for street lighting can achieve up to **45% energy savings**. Furthermore, work by **Shaikh et al. (2021)** emphasizes that the ESP32's dual-core processing allows for more complex fault categorization, such as detecting partial LED strip failures, which this project aims to replicate on a campus scale.

## Objectives

- This project is highly relevant to Smart City and Digital India initiatives. Key objectives include:
- Developing a functional IoT prototype for campus-wide deployment.
- Reducing manual inspection labor through automated SMS/App alerts.
- Enhancing energy efficiency by ensuring lights are strictly active during dark hours.
- Providing a platform for electrical engineering students to apply embedded systems and cloud computing to real-world power problems.

## Components used :

- Aurdino uno microcontroller board (PCB)

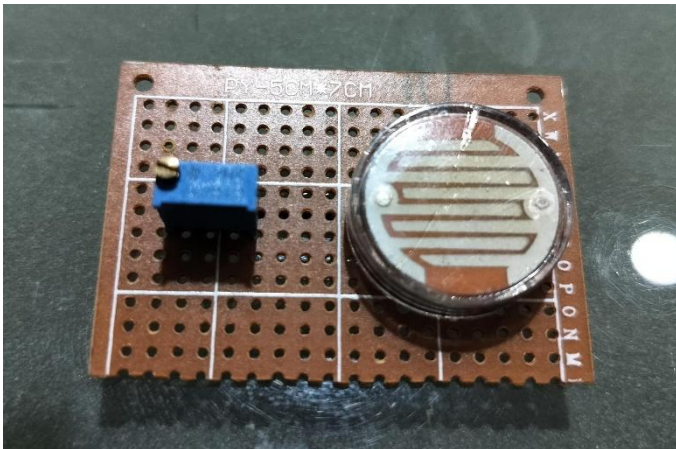


- Aurdino uno module

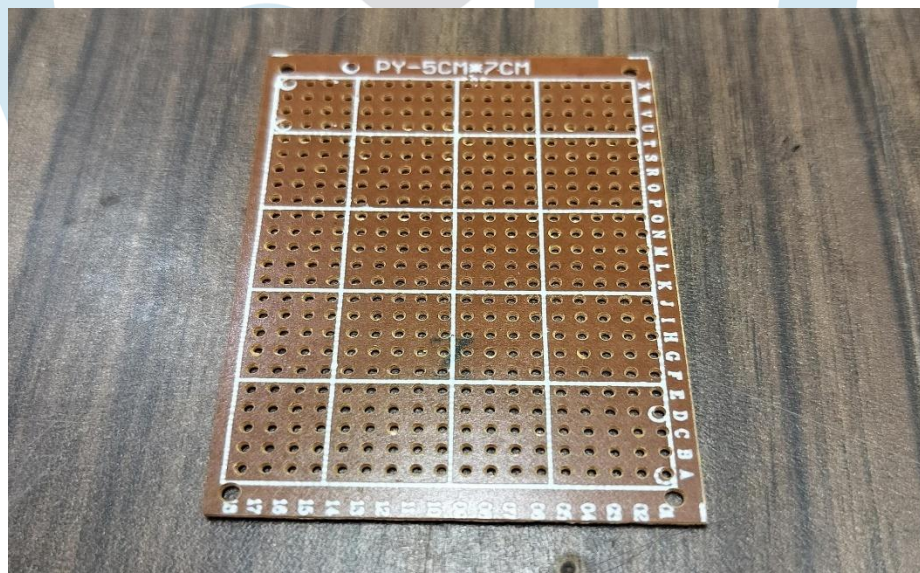


- LDR sensor

- IR sensor



- Circuit assembly board (PCB)



### Arduino Uno Microcontroller Board (PCB)

This is the physical printed circuit board that houses the microcontroller chip and all necessary supporting circuits. It provides the mounting points, power regulation, and input/output pins required to connect your sensors and relays securely in a permanent setup.

### Arduino Uno Module

This refers to the pre-assembled development unit that acts as the “brain” of your project. It contains the ATmega328P chip which executes the programmed code, processes data from the LDR and IR sensors, and sends commands to the street light relay.

### LDR Sensor (Light Dependent Resistor)

Its primary function is to measure ambient light intensity. It acts as a light-sensitive switch that tells the Arduino whether it is day or night, allowing the system to turn the street lights ON at sunset and OFF at sunrise automatically.

## IR Sensor (Infrared Sensor)

This sensor is used for proximity or motion detection. In a smart street light system, it detects the presence of vehicles or pedestrians, allowing the Arduino to increase brightness or activate specific lights only when movement is sensed, further saving energy.

## Circuit Assembly Board (PCB)

This is the custom or general-purpose board where all individual components (resistors, capacitors, and connectors) are soldered together. It ensures a stable, vibration-resistant electrical connection between the sensors, the Arduino, and the power supply, which is essential for outdoor campus installations.

## Conclusion

The IoT-based street light fault detection system at BSIET offers a scalable, cost-effective solution for modernizing campus infrastructure. By automating the detection of electrical failures and light control, the system minimizes maintenance costs and maximizes safety. This project demonstrates how small-scale IoT implementations can lead to significant improvements in public utility management and sustainability.

## References

- Singh, A. K., et al. (2021). "IoT Based Smart Street Light Fault Monitoring System." ICOSSEC.
- Patel, M. R., & Shah, N. (2022). "Automatic Street Light Control and Fault Detection Using IoT." ICCCT.
- Shaikh, S. L., et al. (2021). "Smart Street Lighting System Using ESP32 and IoT." IEEE Access.
- Jadhav, R., et al. (2023). "An Intelligent Street Light System with Fault Reporting Feature." RAEE.