

# NATIONAL INSTITUTE OF TECHNOLOGY



## EEIM AND MPMC LABORATORY PROJECT REPORT

### PROJECT TITLE - “ROOM LIGHT AUTOMATION SYSTEM”

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## **ACKNOWLEDGEMENT**

We would like to express our sincere gratitude to our Faculties for their valuable guidance, constant support, and encouragement throughout the development of our project titled “Room Light Automation System.” Their insights and technical suggestions helped us gain a deeper understanding of automation, sensors, and embedded systems, which significantly enhanced the quality of our work. We also thank the Department of EIE and the laboratory staff for providing us with the required facilities, resources, and a supportive environment to carry out this project successfully. We are equally thankful to our classmates and friends for their cooperation and constructive feedback during various stages of the project. Lastly, we are grateful for giving us the opportunity to undertake this project as part of our academic curriculum. Working on this project has strengthened our practical skills and broadened our technical knowledge.

## **ABSTRACT**

The Room Light Automation System is designed to automatically control the lighting of a room based on ambient light intensity and human presence, thereby improving energy efficiency and user convenience. The system utilizes an LDR (Light Dependent Resistor) to measure the surrounding light level and a PIR (Passive Infrared) sensor to detect motion. These inputs are processed by an Arduino microcontroller, which decides whether to switch the light ON or OFF. When the room is dark and motion is detected, the light automatically turns ON, and it turns OFF when no movement is present or sufficient natural light is available. This automation reduces manual effort, minimizes power wastage, and enhances smart home functionality. The project demonstrates the effective integration of sensors and microcontroller-based decision-making for realtime automation applications, making it suitable for homes, offices, and energy-conscious environments.

## **INTRODUCTION**

The Room Light Automation System is a smart and efficient project designed to automatically control the lighting of a room using sensors and an Arduino microcontroller. The main goal of this system is to minimize electricity wastage and make human life more convenient through automation. By integrating motion and light sensors, the system detects both the presence of a person and the brightness level in the surroundings to decide whether to switch the light ON or OFF automatically. This project is particularly useful in households, offices, classrooms, and corridors where people often forget to turn off the lights

## **Components Required:**

Arduino Uno R3

PIR sensor,

Light Bulb

Relay SPDT

Photoresistor

PIR sensor

10K ohm Resistor

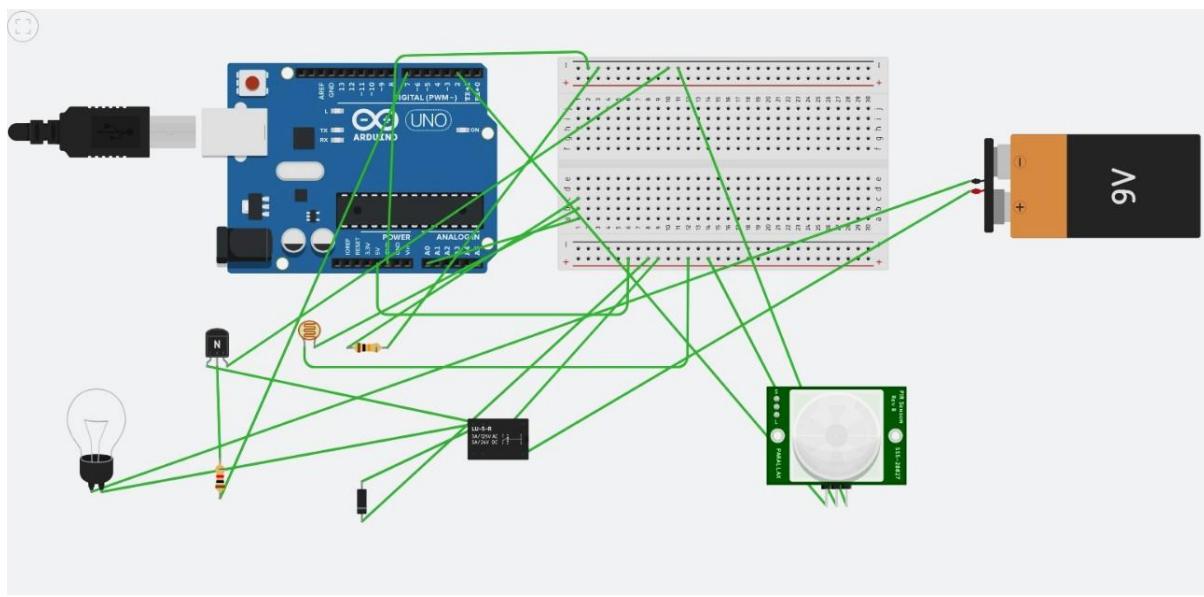
NPN Transistor(BJT)

1K ohm Resistor

Diode

9V Battery

## Circuit Diagram



## CIRCUIT EXPLANATION

The circuit explanation is simple and straightforward. The PIR sensor has three pins— VCC, GND, and OUT. The VCC pin is connected to the 5V pin of the Arduino, GND to ground, and OUT to a digital input pin (such as pin 7). The LDR is connected in a voltage divider configuration with a resistor and connected to an analog pin (like A0) of the Arduino to sense varying light intensity. The LED is connected to one of the digital output pins (for example, pin 13) through a current-limiting resistor. When the Arduino receives the input signals from both sensors, it determines whether to turn the LED ON or OFF. The breadboard helps in assembling the circuit neatly and allows easy connections.

## WORKING PRINCIPLE

The working principle of this project is based on the combined operation of the PIR and LDR sensors. The PIR sensor detects infrared radiation emitted by the human body and produces a HIGH signal when motion is detected. The LDR senses the light level of the environment—its resistance decreases in bright light and increases in darkness. When a person enters the room and the light level is low (as detected by the LDR), the Arduino turns ON the LED light. If the room is bright enough, the light remains OFF even if motion is detected. Similarly, when there is no movement for a certain period, the Arduino switches OFF the light automatically. This coordination ensures that the light only functions when necessary, thus conserving power.

## Arduino Code

```
cpp Copy code

// Pin assignments
const int LDR_PIN = A0;      // LDR voltage divider output
const int PIR_PIN = 2;        // PIR output
const int RELAY_PIN = 7;      // Relay control pin (to transistor base)

int lightValue = 0;
int threshold = 600;          // Adjust based on your LDR readings
bool isDark = false;

void setup() {
  Serial.begin(9600);

  pinMode(PIR_PIN, INPUT);
  pinMode(RELAY_PIN, OUTPUT);

  digitalWrite(RELAY_PIN, LOW); // Relay OFF at start

  Serial.println("System Started...");
}
```

```

void loop() {
    // 1) Read LDR
    lightValue = analogRead(LDR_PIN);

    // Check if dark
    isDark = (lightValue < threshold);

    // 2) Read PIR
    int pirState = digitalRead(PIR_PIN);

    // ---- Debug prints ----
    Serial.print("LDR = ");
    Serial.print(lightValue);
    Serial.print(" | Darkness = ");
    Serial.print(isDark);
    Serial.print(" | PIR = ");
    Serial.println(pirState);

    // 3) Logic for light control
    if (isDark && pirState == HIGH) {
        // Dark + Motion → Turn relay ON
        digitalWrite(RELAY_PIN, HIGH);
        Serial.println("Motion detected in dark + Light ON!");
    }
    else {
        // Either daytime OR no motion → light OFF
        digitalWrite(RELAY_PIN, LOW);
        Serial.println("Light OFF");
    }

    delay(200); // Small delay for stability
}

```

## ADVANTAGES

The advantages of this system include significant energy conservation, automatic operation without manual intervention, cost-effectiveness, and easy installation using simple components. It also enhances convenience by automatically managing room lighting, especially in places like hallways or washrooms. Additionally, it increases the lifespan of electrical components by preventing unnecessary usage.

## **CONCLUSION**

In conclusion, the Room Light Automation System is an innovative and practical application of sensors and microcontroller technology aimed at smart energy management. It demonstrates how automation can make daily life more convenient and environmentally friendly. This project highlights the importance of combining simple electronic components with intelligent control to create efficient systems that contribute to sustainable living.

**THANK YOU**