### **Project Proposal: Traffic Light Simulation using Arduino**

**Project Title:**Traffic Light Simulation System with Arduino

**Project Objective:**The objective of this project is to design and implement a basic traffic light control system using an Arduino. The system will simulate the operation of traffic lights, with LEDs representing red, yellow, and green lights, which will follow the standard timing sequence seen at intersections.

**Project Scope:**This project will serve as a beginner-friendly introduction to microcontroller programming, circuit design, and the control of digital outputs. It is suitable for demonstrating how timing and sequencing work in real-life applications, such as traffic management systems.

### **1. Introduction:**

The Traffic Light Simulation project aims to mimic the functionality of a real traffic light system using an Arduino. This project will consist of three LEDs (red, yellow, green) that will light up in a sequence to simulate a real-world traffic control system. The system will be programmed with defined intervals to switch between lights, representing stop, caution, and go phases.

### **2. Objectives:**

* To simulate a simple traffic light system using Arduino.
* To understand the basic functioning of digital outputs and timed sequences in Arduino.
* To apply practical knowledge of circuit building and microcontroller programming.

### **3. Components Needed:**

* **Arduino Uno (or any compatible board)** – 1x
* **Red LED** – 1x
* **Yellow LED** – 1x
* **Green LED** – 1x
* **Resistors (220Ω)** – 3x (to protect LEDs)
* **Breadboard** – 1x
* **Jumper wires** – Several (for connecting components)
* **USB cable** – 1x (for programming the Arduino)

### **4. Technical Approach:**

* **Phase 1:** Hardware Setup
  + Assemble the circuit by connecting the LEDs (red, yellow, and green) to specific digital pins of the Arduino via resistors.
  + The positive leg of each LED will be connected to the Arduino, and the negative leg will be connected to the ground (GND) pin.
* **Phase 2:** Software Design (Arduino Code)
  + Write an Arduino program to control the switching of the LEDs.
  + Define time intervals for each LED to be ON or OFF, simulating real traffic light phases:
    - Red LED (Stop) – 5 seconds
    - Yellow LED (Caution) – 2 seconds
    - Green LED (Go) – 5 seconds
* **Phase 3:** Testing and Calibration
  + Upload the code to the Arduino and observe the behavior of the LEDs.
  + Ensure the LEDs light up in the correct order and maintain the specified timing for each phase.

### **5. Functional Description:**

* **Red Light Phase:** The red LED will light up, indicating a stop signal. This phase will last for 5 seconds.
* **Yellow Light Phase:** The yellow LED will light up for 2 seconds, warning that the light is about to change.
* **Green Light Phase:** The green LED will light up for 5 seconds, indicating it is safe to go.

The system will loop continuously, simulating an uninterrupted traffic light cycle.