**KRISTU JYOTI COLLEGE OF MANAGEMENT AND TECHNOLOGY**

**Changanassery, Kottayam, Kerala**

**MINI PROJECT REPORT ON**

**Smart - Fire, Smoke, and LPG Detection System**

Group no. :

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**Smart - Fire, Smoke, and LPG Detection System**

# Overview

The Smart Fire, Smoke, and LPG Detection System is a web-integrated IoT solution developed using ESP32 microcontrollers, PHP, and MySQL, aimed at enhancing safety in indoor environments such as college laboratories, libraries, and offices. Each node (device) independently monitors LPG concentration, smoke levels, temperature, humidity, and fire presence in real time. Data is sent over Wi-Fi to a central web server, where authorized users can monitor sensor activity, receive alerts, and review system health. This project emphasizes automation, proactive alerting, and centralized visibility across multiple locations.

# User Roles

The system defines two role-based access levels:

* **Admin**
* Manages all registered sensor nodes.
* Adds new locations, configures alert thresholds.
* Assigns users and monitors full system status.
* Accesses system-wide statistics and alert logs.
* **2. User**
* Manages and monitors specific node(s) assigned by Admin.
* Receives real-time alerts for their designated area(s).
* Views sensor readings, acknowledges alerts.
* Cannot modify user or global configurations.

# Core Functions

* **Node Communication & Monitoring**

Each ESP32 node reads sensor values and sends updates via HTTP POST to the PHP backend. Includes MQ-2 (LPG/smoke), flame sensor, DHT11/22 (temp/humidity), and buzzer. Devices push data periodically and include self-status ('heartbeat').

* **Alerting System**

Automatic detection of unsafe conditions (e.g., LPG leaks, flames, overheating). Email and SMS alerts are sent using integrated APIs (e.g., PHPMailer, Twilio). Buzzer activation at the device level for local warnings.

* **Real-Time Dashboard**

Central dashboard built with HTML/CSS/JS displays live sensor data. Node status indicators (Online/Offline) based on last received update. Interactive graphs (via Chart.js) show historical trends. Alerts dashboard with timestamps, sensor type, and acknowledgment option.

* **Data Management**

All readings are stored in MySQL with timestamps. Admins can filter data by sensor, time, or location. Alert history and sensor logs are retained for analysis.

* **Security and Access Control**

Role-based authentication with session handling. Password encryption and protected routes for each user level. Admins can only view and manage assigned nodes.

# Technology Stack

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| Layer | Technology |
| Microcontroller | ESP32 (Arduino IDE + HTTP Client) |
| Backend | PHP (XAMPP stack) |
| Database | MySQL |
| Frontend | HTML, CSS, JavaScript, Chart.js |
| Alerting | PHPMailer (Email), SMS API (Optional) |
| Security | Password hashing, session management |

# Expected Outcome

This project will deliver a cost-effective and scalable fire-safety solution tailored for institutional settings. It aims to minimize fire risks, enable real-time monitoring, and reduce response times through instant alerts. The separation of user roles ensures security and accountability, while the dashboard allows decision-makers to proactively manage safety across multiple physical environments. The modular design supports future expansion by simply adding more nodes with minimal setup.