



## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

### 18EEP301L-MINOR PROJECT – III

#### FINAL REVIEW

# SAFETY HELMET FOR MINING WORKERS USING IOT

**YEAR/ SEMESTER – III/V**

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## PROBLEM STATEMENT

This project develops an IoT-based safety helmet for miners, equipped with temperature and gas sensors to monitor hazardous conditions. It detects high temperatures and toxic gases like methane or carbon monoxide, sending real-time alerts via wireless communication to ensure quick response and enhance worker safety.



## OBJECTIVE

To design an IoT-enabled safety helmet for mining workers that monitors temperature and gas levels in real-time, providing instant alerts via wireless communication when dangerous conditions like high temperature or toxic gases (e.g., methane, carbon monoxide) are detected, thereby improving safety and reducing risks of accidents.



## ABSTRACT

This project introduces a smart IoT-based safety helmet for miners, equipped with temperature and gas sensors to detect high heat and toxic gases like methane. It sends real-time alerts via wireless communication when hazardous conditions arise, ensuring faster response and enhancing worker safety in mines.



## EXISTING SYSTEM

Existing systems use fixed sensors and manual checks for monitoring gas and temperature levels in mines, but they lack personal protection and real-time alerts for individual workers. Standard helmets do not provide active environmental monitoring, making miners vulnerable to sudden gas leaks and temperature changes, leading to delayed responses and increased risks.



## PROPOSED SYSTEM

The proposed system is an IoT-enabled safety helmet for miners, integrating temperature and gas sensors to detect hazardous conditions. It sends real-time alerts via wireless communication to a monitoring system or smartphone, ensuring quick responses and improving worker safety.





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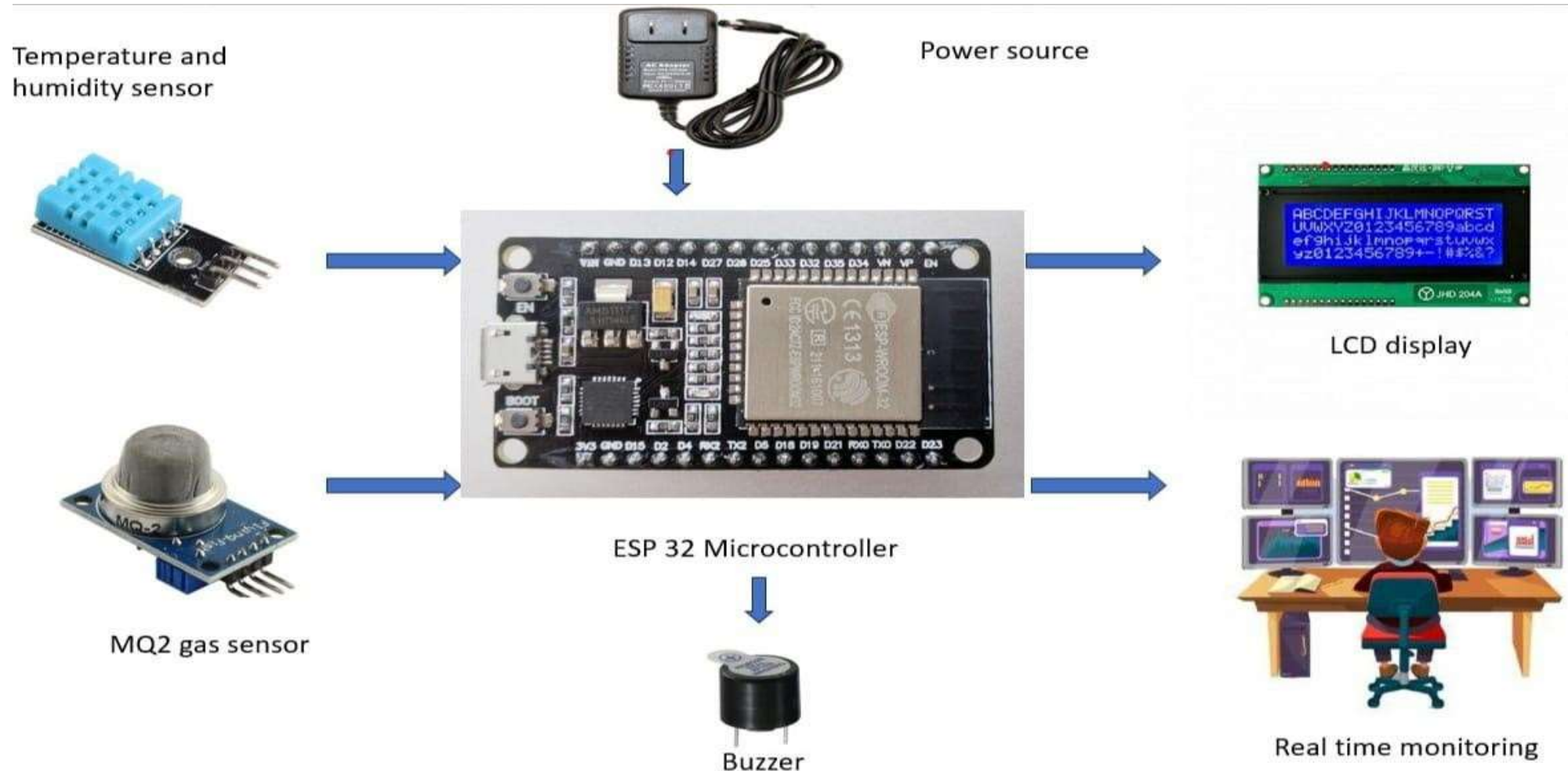
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# BLOCK DIAGRAM







## WORKING EXPLANATION

The IoT-based safety helmet uses a temperature sensor to detect heat and a gas sensor to monitor harmful gases like methane and carbon monoxide. The data is processed by a microcontroller, and if dangerous levels are detected, an alert is triggered. This alert is wirelessly sent via Bluetooth or Wi-Fi to a monitoring system or smartphone app, ensuring real-time notifications. The system is powered by a battery, providing continuous monitoring to enhance miner safety.



## FUTURE SCOPE

The future scope of the IoT-based safety helmet includes improving sensor accuracy, extending battery life with better power management, enhancing wireless communication for reliable underground connectivity, and integrating data into a centralized safety system for real-time monitoring and quicker hazard response.

## COMPONENTS DESCRIPTION

### **MICROCONTROLLER:**

A microcontroller in a safety helmet for mining workers enhances safety by monitoring environmental conditions, such as hazardous gases and temperature. It processes data from sensors, triggers alarms in case of danger, controls integrated lights, and communicates wirelessly for real-time monitoring. This technology improves hazard detection and overall safety in mining operations.

### **HUMIDITY SENSOR:**

A humidity sensor in a mining safety helmet monitors moisture levels and alerts workers when humidity becomes unsafe, helping prevent heat stress and dehydration. This enhances safety and comfort in challenging environments.



## COMPONENTS DESCRIPTION

### TEMPERATURE SENSOR:

A temperature sensor in a safety helmet for mining workers monitors ambient temperature to ensure safety. It detects overheating conditions that may indicate equipment malfunction or extreme heat exposure. By providing real-time readings, the sensor can trigger alerts if temperatures exceed safe thresholds, helping to prevent heat stress and enhance overall safety in challenging mining environments.



## COMPONENTS DESCRIPTION

### **GAS SENSOR:**

A gas sensor in a safety helmet for mining workers detects harmful gases like methane or carbon monoxide. It provides real-time alerts to the wearer and monitoring systems, preventing exposure to toxic or explosive gases and enhancing safety in hazardous mining environments.



## COMPONENETS USED

COMPONENTS	PRICE
ESP 32 Microcontroller	500
Gas Sensor	340
Temperature and Humidity Sensor(DHT11)	250
Buzzer	40
LCD Display	150
TOTAL	1280



## REFERENCE

- 1.MSHA Personal Protective Equipment Guidelines:** Provides regulations for helmet use in mining.
- 2.ISO 3873:1977:** Specifies requirements and testing methods for industrial safety helmets.
- 3.NIOSH Safety Helmet Performance Report:** Evaluates helmet effectiveness in mining environments.





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