IoT Course

Capstone Project   
Action Plan

For students (instructor’s review required)

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| Course | SmartGuardian |
| Team Name | SmartGuardian |
| Team Leader/  Members | Hà Trung Thành /  Phạm Thu Hà, Nguyễn Tuấn Kiệt, Nguyễn Duy Phúc |
| Project Title | IoT-Based Environmental Monitoring and Fire-Gas Alert System Using ESP8266 |
| Goal |  |
| * To build a real-time environmental monitoring system using ESP8266 and sensors to detect temperature, humidity, gas, and fire. * To visualize data using Node-RED and store it with InfluxDB. * To trigger alerts via buzzer and provide on-site LCD display when thresholds are exceeded. | |
| Abstract |  |
| This project aims to implement an IoT-based system that monitors environmental factors such as temperature, humidity, gas levels, and fire presence using ESP8266 and sensors. The data will be transmitted via MQTT to Node-RED for visualization and stored in InfluxDB. Alerts will be triggered both locally (via buzzer and LCD) and remotely (via dashboard or notification), contributing to early fire/gas leak detection. | |
| Method |  |
| * Use ESP8266 NodeMCU to collect data from DHT22 (temperature and humidity), MQ-2 (gas), and a flame sensor. * Process data on the ESP8266 and display basic values on an I2C LCD. * When thresholds are breached, activate a buzzer for immediate alerts. * Transmit data via MQTT to a broker. * Node-RED subscribes to MQTT topics to process, visualize, and forward data. * Store all time-series data in InfluxDB for future analysis and trends. | |

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| Data |  |
| * Data is collected in real-time from physical sensors (DHT22, MQ-2, Flame Sensor) connected to ESP8266. * Data includes temperature (°C), humidity (%), gas concentration (analog value), and flame detection (boolean). * This data is formatted as JSON and sent via MQTT to a local broker. * Node-RED will log this data in InfluxDB and display it on a web-based dashboard. | |
| Expected  Outcome |  |
| * A fully functional prototype capable of monitoring environmental factors in real-time. * Immediate buzzer alerts and visual dashboard warnings in case of fire or gas leaks. * A working dashboard that displays historical and real-time sensor data. * The system can be deployed in small-scale environments (e.g., homes, labs) for early hazard detection. | |
| Role by  Member |  |
| |  |  | | --- | --- | | Thành (Leader) | Circuit design, ESP8266 programming, system integration |  |  |  | | --- | --- | | Hà | MQTT & Node-RED setup, dashboard design |  |  |  | | --- | --- | | Kiệt | InfluxDB integration, data formatting and analytics |  |  |  | | --- | --- | | Phúc | Documentation, LCD display, buzzer control, testing | | |

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| Schedule  Summary |  |
| |  |  | | --- | --- | | Week 1 | Research, hardware selection, sensor testing, and ESP8266 setup |  |  |  | | --- | --- | | Week 2 | Integrate DHT22, MQ-2, and flame sensor with ESP8266; develop data reading logic |  |  |  | | --- | --- | | Week 3 | Set up MQTT communication, Node-RED flows, and LCD + buzzer control |  |  |  | | --- | --- | | Week 4 | Connect to InfluxDB, build and test Node-RED dashboard, and implement alert logic |  |  |  |  | | --- | --- | --- | | Week 5 |  | System testing, debugging, report writing, and final presentation preparation | | |
| Comment &  Assessment |  |
| <Comment and assessment **by the instructor.**> | |