

1. Smart Irrigation System

Problem Description: Water wastage in campus gardens is common due to manual or timer-based watering. Develop an automated irrigation system based on soil conditions. **Expected Outcome:** System using soil moisture sensor that activates a water pump/relay only when soil is dry, with visual indicators for soil status and watering activity.

2. Contactless Hand Sanitizer Dispenser

Problem Description: Manual sanitizer dispensers increase touchpoints and infection risks. Build an automatic, touchless sanitizer dispenser for public spaces. **Expected Outcome:** IR/ultrasonic sensor-triggered servo motor that dispenses sanitizer when hands are detected, with LED feedback and usage counter on display.

3. Smart Dustbin with Fill-Level Detection

Problem Description: Overflowing dustbins create unhygienic conditions and inefficient waste collection. Design a smart dustbin that monitors fill levels. **Expected Outcome:** Ultrasonic sensor-based system that measures waste level, displays percentage full, and triggers alert (buzzer/LED) when 80% capacity is reached.

4. Automatic Street Light Controller

Problem Description: Street lights running during daylight waste energy. Create an intelligent system that controls lights based on ambient light and motion. **Expected Outcome:** LDR and PIR sensor combination that turns lights ON only when dark AND motion is detected, demonstrating energy savings with LED simulation.

5. Smart Medicine Reminder System

Problem Description: Elderly patients often forget to take medications on time. Develop a programmable reminder system with visual and audio alerts. **Expected Outcome:** RTC-based device with multiple alarm settings, buzzer alerts, LED indicators, and push-button confirmation for medicine intake acknowledgment.

6. Fire Detection and Alert System

Problem Description: Early fire detection can save lives in hostels and labs. Build a multi-sensor fire detection system with immediate alerts. **Expected Outcome:** Flame sensor and

temperature sensor (DHT22) combination that triggers buzzer and sends alert notification when fire or abnormal heat is detected.

7. Smart Attendance System using RFID

Problem Description: Manual attendance is time-consuming and prone to proxy. Create an automated attendance logging system for classrooms. **Expected Outcome:** RFID reader that logs student entry/exit with timestamp, displays name on LCD, and maintains count of present students with data logging capability.

8. Water Level Monitoring for Overhead Tanks

Problem Description: Water overflow and dry-run of motors cause wastage and damage. Design a tank level monitoring system with automatic motor control. **Expected Outcome:** Ultrasonic sensor measuring water level, relay-controlled motor simulation (LED), automatic shutoff at full level, and alerts at low/empty conditions.

9. Intruder Detection System for Rooms

Problem Description: Unauthorized room access is a security concern in labs and offices. Create a motion-based intrusion detection system. **Expected Outcome:** PIR sensor detecting motion when system is armed, triggering buzzer alarm and notification, with manual arm/disarm functionality via push button.

10. Smart Plant Health Monitor

Problem Description: Plant health depends on multiple factors that are hard to track manually. Develop a comprehensive plant monitoring system. **Expected Outcome:** Multi-sensor device (soil moisture, temperature, humidity, light) displaying all parameters on screen with color-coded LEDs indicating plant health status.

11. Automatic Fan Speed Controller

Problem Description: Fixed-speed fans waste energy when cooling requirements are low. Build a temperature-responsive fan speed control system. **Expected Outcome:** DHT11 sensor measuring temperature, PWM-controlled DC motor/fan with speed varying based on temperature ranges, LCD showing temp and fan speed percentage.

12. Smart Noise Pollution Monitor

Problem Description: Excessive noise in libraries and study areas disrupts concentration. Create a noise level monitoring and alert system. **Expected Outcome:** Sound sensor detecting noise levels, LED indicators (Green/Yellow/Red) for different thresholds, buzzer alert when exceeding acceptable limits, with dB display.

13. Automated Greenhouse Controller

Problem Description: Greenhouse conditions need constant monitoring and adjustment. Design an automated climate control system. **Expected Outcome:** DHT22 + soil moisture sensors controlling ventilation (fan) and watering based on temperature and moisture, with LCD showing all parameters and control status.

14. Gas Leakage Detection for Kitchen Safety

Problem Description: LPG leaks in kitchens and labs can cause fires and health hazards. Develop an early warning gas detection system. **Expected Outcome:** MQ-2/MQ-5 gas sensor detecting LPG/smoke, triggering loud buzzer and LED alerts, with automatic exhaust fan activation (relay) and gas concentration display.

15. Smart Crash Detection System for Vehicles

Problem Description: Accident victims often cannot call for help immediately. Build a crash detection system that automatically sends alerts. **Expected Outcome:** Vibration/shock sensor (SW-420) or accelerometer detecting sudden impacts, triggering emergency buzzer, GPS location display, and alert notification with manual cancel option.

16. Flood Detection and Alert System

Problem Description: Basement and ground floor areas are vulnerable to flooding during heavy rains. Design an early flood warning system. **Expected Outcome:** Water level sensor detecting rising water, multi-level alerts (LEDs for warning/danger levels), loud buzzer at critical level, relay controlling drainage pump simulation.

17. Intelligent Multi-Zone HVAC Optimizer

Problem Description: Commercial buildings waste energy by uniformly cooling/heating all zones. Design a distributed sensor network that dynamically optimizes HVAC operation based on occupancy patterns and thermal comfort indices across multiple zones. **Expected Outcome:** Multi-node system using ESP8266/ESP32 with DHT22 sensors and PIR motion detectors, calculating PMV (Predicted Mean Vote) comfort index, mesh communication between nodes,

master controller adjusting fan speeds (PWM) for different zones, energy consumption estimation display.

18. Industrial Gas Leak Localization System

Problem Description: In industrial facilities, identifying the exact location of gas leaks quickly is critical. Develop a distributed sensor array that triangulates leak sources. **Expected Outcome:** Network of 4+ MQ-series sensors positioned strategically, concentration gradient analysis to estimate leak source location, ESP-NOW or I2C communication protocol, coordinate-based leak position display, evacuation zone calculation, timestamped leak detection logs

19. Seismic Activity Monitoring Network

Problem Description: Earthquake early warning requires distributed vibration detection. Build a networked seismic sensor system with P-wave detection capability. **Expected Outcome:** Multiple ADXL345 accelerometer nodes detecting ground motion, frequency analysis to distinguish seismic waves from ambient vibrations, node-to-node communication with time synchronization, epicenter distance estimation using P-S wave time difference, graduated alert levels based on intensity.

20. Wireless Power Transmission Monitor

Problem Description: Wireless charging systems need efficiency monitoring and safety features. Design a resonant inductive charging pad with performance analytics. **Expected Outcome:** Transmitter coil driven by H-bridge/relay switching, receiver coil with rectification, current/voltage sensors measuring input and output power, efficiency calculation (P_{out}/P_{in}), foreign object detection (FOD) using impedance changes, thermal monitoring preventing overheating, alignment optimization feedback, multi-device charging management.