Project One

Due Date: 23/5/2025 Over ITC

This project requires students to simulate a realistic, research-based IoT system using MATLAB. Each group (2 students) will select an application domain (e.g., Smart City, Industry, Agriculture, etc.) and develop a system that integrates sensor data, communication logic, energy awareness, and optimization strategies. The design must reflect an actual use case based on at least one scientific or technical reference.

The simulation and report must include the following components:

1. Realistic Sensor Integration

- Select at least two appropriate sensors based on a scientific paper or technical reference.
- Justify the selection using citation from sources such as IEEE Xplore, ScienceDirect, or ResearchGate.

2. Communication Protocol Simulation

- Simulate communication logic using one of the following models:
  - MQTT (Publish/Subscribe)
  - CoAP (Request/Response)
  - REST API Simulation (HTTP-based logic)
- Represent message flow, delays, or retries using MATLAB scripts/functions.
- Include estimated power cost for communication activities.

3. IoT Level Architecture

- Clearly define whether the system simulates IoT Level 4, 5, or 6.
- Reflect how data is processed (locally, distributed, or using intelligent decision-making).

4. Power Consumption Modeling

- Estimate power consumption based on sensing, communication, processing, and sleep cycles.
- Use simple mathematical formulas to model energy usage over time.
- Provide power consumption plots.

5. Energy Optimization Strategy

- Propose at least one method to improve power efficiency.
- For example: using a single aggregator node for communication, batching transmissions, duty cycling, or sensor fusion.
- Simulate before and after applying the method, and compare power usage results.

What to Submit

Each group must submit the following:

- A written report (maximum 8 pages) that includes:
  - Description of the domain and system architecture
  - Sensor selection and scientific justification
  - Communication protocol logic and assumptions
  - Power modeling and energy optimization strategy
  - Plots and results of simulation
  - Discussion of findings and challenges
- MATLAB code implementing the full simulation with clear documentation
- References (APA or IEEE style) for sensor and system design choices