

## **IoT and Smart Systems Roadmap (12 Weeks)**

---

### **Week 1: Introduction to IoT**

- What is IoT? History and evolution.
  - Key characteristics: connectivity, intelligence, sensing.
  - Applications: smart home, healthcare, agriculture, industry.
- 

### **Week 2: IoT Architecture and Components**

- 3-layer architecture: Perception, Network, Application.
  - Sensors, actuators, microcontrollers.
  - Communication protocols: MQTT, HTTP, CoAP.
- 

### **Week 3: Embedded Systems for IoT**

- Basics of embedded systems.
  - Microcontrollers: Arduino, ESP8266, ESP32, Raspberry Pi.
  - GPIOs, ADC/DAC, interrupts, timers.
- 

### **Week 4: Sensors and Actuators**

- Types of sensors: Temperature, Gas, Motion, Humidity, Proximity.
  - Actuators: Motors, buzzers, relays.
  - Interfacing with microcontrollers.
- 

### **Week 5: Wireless Communication Technologies**

- Wi-Fi, Bluetooth, ZigBee, LoRa, GSM, RFID.
  - Range, power, bandwidth comparison.
  - Choosing communication based on application.
- 

### **Week 6: IoT Protocols and Cloud Platforms**

- Protocols: MQTT, AMQP, HTTP/HTTPS.
- IoT cloud services: Blynk, Adafruit IO, Firebase, AWS IoT.

- Device-to-cloud integration and data visualization.
- 

#### **Week 7: Edge and Fog Computing**

- Need for edge/fog computing.
  - Architecture differences between cloud, fog, and edge.
  - Use cases in smart systems.
- 

#### **Week 8: Smart System Applications**

- Smart home: lights, security, energy monitoring.
  - Smart agriculture: soil moisture, irrigation control.
  - Smart healthcare: wearable sensors, health monitoring.
- 

#### **Week 9: Security in IoT Systems**

- Vulnerabilities in IoT devices.
  - Secure communication (SSL/TLS, encryption).
  - Authentication and data privacy.
- 

#### **Week 10: IoT Analytics and AI Integration**

- IoT data lifecycle.
  - Basics of data preprocessing and analytics.
  - Integrating AI/ML: predictive maintenance, anomaly detection.
- 

#### **Week 11: Designing Scalable IoT Systems**

- Scalability issues in sensor networks.
  - Device provisioning and management.
  - Power optimization and energy harvesting.
- 

#### **Week 12: Final Project / Case Study**

- Build a real-world project:
  - Smart weather station
  - Home automation with voice control

- Industrial monitoring system
- Use microcontrollers + sensors + cloud + app/dashboard.