Embedded Design with IoT - 1 Month Course

Course Title: Embedded Design with IoT

Duration: 1 Month (4 Weeks)

Prerequisites: Basic knowledge of programming and electronics is recommended.

Week 1: Introduction to Embedded Systems and IoT

- Day 1: Introduction to Embedded Systems

  Overview of embedded systems and their applications in IoT.

- Day 2: Setting Up the Development Environment

  Installing and configuring tools like Arduino IDE and embedded C compilers.

- Day 3: Basics of Microcontrollers

  Understanding microcontrollers, GPIOs, and pin configurations.

- Day 4: Introduction to Sensors and Actuators

  Overview of commonly used sensors (temperature, light) and actuators (motors, relays).

- Day 5: Digital and Analog I/O

  Interfacing sensors and actuators with microcontrollers.

- Day 6: Communication Protocols Basics

  Introduction to UART, SPI, and I2C communication protocols.

- Day 7: Project: Basic Weather Monitoring System

  Build a system to measure temperature and humidity using sensors.

Week 2: IoT Basics and Networking

- Day 8: Introduction to IoT

  Understanding IoT architecture and its components.

- Day 9: Wireless Communication Basics

  Overview of Wi-Fi, Bluetooth, and Zigbee protocols.

- Day 10: Setting Up IoT Modules

  Interfacing ESP8266 or ESP32 modules with microcontrollers.

- Day 11: Cloud Platforms for IoT

  Introduction to IoT platforms like ThingSpeak, Blynk, and AWS IoT.

- Day 12: Sending Data to the Cloud

  Writing programs to send sensor data to an IoT platform.

- Day 13: Controlling Devices Remotely

Build a system to control devices via the cloud or mobile app.

- Day 14: Project: IoT-Based Home Automation

Create a system to control appliances using a smartphone.

Week 3: Advanced IoT Features

- Day 15: Introduction to Real-Time Operating Systems (RTOS)

Basics of RTOS and its role in IoT applications.

- Day 16: Power Management in IoT Devices

Techniques to optimize power consumption for IoT devices.

- Day 17: Data Logging and Storage

Logging sensor data to SD cards or cloud storage.

- Day 18: Security in IoT

Understanding encryption, authentication, and secure communication protocols.

- Day 19: Edge Computing Basics

Processing data locally on the IoT device before sending it to the cloud.

- Day 20: Integration with Voice Assistants

Connecting IoT devices to platforms like Alexa or Google Assistant.

- Day 21: Project: IoT-Based Security System

  Build a system with motion detection and alert notifications.

Week 4: Final Projects and Deployment

- Day 22: End-to-End IoT System Design

  Designing a complete IoT system from sensor to cloud.

- Day 23: Testing and Debugging IoT Systems

  Tools and techniques for debugging embedded and IoT applications.

- Day 24: Introduction to IoT Analytics

  Visualizing and analyzing IoT data on dashboards.

- Day 25: Deployment Strategies for IoT

  Deploying IoT solutions in real-world scenarios.

- Day 26: Building a Custom IoT Device

  Combine all learned components into a unique IoT device.

- Day 27: Final Project Workday

  Build and finalize the IoT project for presentation.

- Day 28: Final Project Showcase and Feedback

  Present the final IoT solution and receive feedback for improvement.

Outcome: By the end of this course, participants will understand embedded system design and IoT principles. They will gain hands-on experience in developing IoT-enabled embedded systems, including sensor integration, cloud communication, and device control.