IoT Development with Raspberry

Course Description:

In this course, you will learn how to use Raspberry Pi, a popular single-board computer, to develop and implement IoT projects. Raspberry Pi is an affordable and versatile platform that is widely used in the IoT industry for prototyping and developing IoT solutions.

Audience

This course is suitable for beginners who are interested in learning about IoT hardware and programming. No prior experience with electronics or programming is required

Hardware Requirements:

Students will need access to a Raspberry Pi board (preferably Raspberry Pi 3 or 4), MicroSD Card, Power Supply, HDMI Cable, USB Keyboard, and Mouse, Ethernet Cable or Wi-Fi dongle, Sensors and Actuators, and breadboard Jumper Wires

Pre-requisite Knowledge/Skills

No prior knowledge of electronics or programming is required for this course. However, students should have a basic understanding of computer usage and be comfortable with installing software.

Course Objectives

Upon completing this course, students will be able to:

1. To comprehensively understand IoT concepts and how they relate to the Raspberry Pi platform.
2. To familiarize students with the Raspberry Pi hardware, software, and development environment.
3. To teach students how to interface with sensors and actuators using the Raspberry Pi GPIO pins.
4. To provide hands-on experience in collecting and processing sensor data, and how to interface with cloud platforms.
5. To teach students how to develop IoT applications using Python programming language.
6. To provide students with knowledge of the best practices for designing and implementing secure and scalable IoT systems.
7. To enable students to work on real-world IoT projects using Raspberry Pi, and develop the skills required to solve problems and troubleshoot issues that may arise.

Module 1: Introduction to IoT and Raspberry Pi

- Introduction to IoT
- Overview of Raspberry Pi
- Setting up Raspberry Pi environment
- Setting up Raspberry Pi environment

Module 2: Raspberry Pi GPIO programming

- Basics of GPIO
- Understanding pin numbering schemes
- Controlling LEDs and other components using GPIO
- Interfacing with other components
- Writing Python code to control GPIO

Module 3: Interfacing Sensors and Actuators with Raspberry Pi

- Understanding different types of sensors and actuators
- Connecting sensors and actuators to Raspberry Pi GPIO pins
- Collecting and processing sensor data
- Controlling actuators using Raspberry Pi
- Developing IoT applications using sensors and actuators

Module 4: IoT Communication Protocols and Cloud Platforms

- Introduction to IoT communication protocols
- Using MQTT for IoT communication
- Introduction to cloud platforms
- Setting up cloud platforms for IoT applications
- Integrating Raspberry Pi with cloud platforms

Module 5: Developing IoT Applications with Python

- Introduction to IoT application development
- Developing IoT applications with Python
- Developing real-world IoT applications
- Testing and debugging IoT applications
- Deploying IoT applications

Module 6: Security and Privacy Considerations in IoT

- Understanding IoT security and privacy challenges
- Best practices for securing IoT devices
- Best practices for securing IoT communication
- Privacy Considerations in IoT

- Best practices for privacy in IoT

Module 7: Deployment and Management of IoT Systems

- Introduction to IoT system deployment and management
- Device management in IoT
- Data management in IoT
- System monitoring in IoT
- Deployment and management of real-world IoT systems