Internet of Things (IoT) Essentials Course Outline

Duration: 40–50 Hours
Level: Beginner to Intermediate
Delivery Mode: Online / Offline
Target Audience: Developers, System Engineers, IoT Enthusiasts, Data Analysts, and IT Professionals

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Module 1: Introduction to Internet of Things (IoT)

- What is IoT?
- Evolution of IoT: From Concept to Reality
- IoT Architecture Overview: Devices, Communication, Cloud, and Analytics
- Real-World IoT Use Cases (Smart Cities, Healthcare, Industrial IoT)
- IoT Trends and Future Directions

Module 2: IoT Hardware Components

- Sensors and Actuators: Types and Functions
- Microcontrollers and Single-Board Computers (Raspberry Pi, Arduino)
- IoT Devices: Wearables, Smart Devices, and Smart Appliances
- Power Management for IoT Devices
- Choosing the Right Hardware for IoT Projects

Module 3: IoT Communication Protocols

- Overview of IoT Communication Protocols
- Short-Range Protocols: Bluetooth, Zigbee, Z-Wave, and NFC
- Long-Range Protocols: Wi-Fi, LoRaWAN, NB-IoT, and LTE
- MQTT and CoAP for Lightweight Messaging
- HTTP/HTTPS and WebSockets for IoT Data Transfer

Module 4: IoT Connectivity and Networking

- IoT Networking Basics
- Cellular, Wi-Fi, and Ethernet Connectivity
- IoT Gateways and Edge Devices
- IoT Data Routing and Forwarding
- Setting up and Configuring IoT Networks
- IoT Security in Networking

Module 5: Data Collection and Storage in IoT

- Data Acquisition from Sensors and Devices
- Real-Time Data Processing vs Batch Processing
- Edge Computing and Its Role in IoT
- Cloud Platforms for IoT: AWS IoT, Azure IoT, Google Cloud IoT
- Storing IoT Data: SQL vs NoSQL Databases
- Big Data and IoT

Module 6: IoT Analytics and Visualization

- Analyzing IoT Data for Insights
- IoT Data Processing and Visualization Tools (Power BI, Tableau)
- Machine Learning and AI in IoT Analytics
- Real-Time Data Streaming and Analytics with Apache Kafka
- IoT Dashboards and Reporting

Module 7: IoT Security Essentials

- Understanding IoT Security Challenges
- Securing IoT Devices and Networks
- Cryptography and Encryption for IoT
- Authentication, Authorization, and Identity Management
- Security Standards and Best Practices for IoT
- IoT Threats and Vulnerability Management

Module 8: Building IoT Applications and Solutions

- Designing IoT Systems: End-to-End Architecture

- Connecting IoT Devices to the Cloud
- Integrating IoT with Mobile and Web Applications
- IoT Device Management and Firmware Updates
- Case Studies: Building Real-World IoT Solutions

Module 9: Industrial IoT (IIoT) Applications

- Industrial IoT in Manufacturing, Agriculture, and Energy
- IoT Sensors for Asset Monitoring and Predictive Maintenance
- Smart Factory and Industrial Automation
- IIoT Security Challenges and Solutions
- Industry 4.0 and IoT

Module 10: Hands-On Project and Case Studies

- Design and Deploy an IoT Solution (Smart Home, Environmental Monitoring, etc.)
- Implement IoT Analytics and Reporting
- Use IoT Cloud Platforms for Data Management and Visualization
- Real-World Case Studies and Best Practices