e-Niyama Labs
Engineering the rules of learning

Embedded Systems for IoT (Internet of Things)

Fundamentals of IoT and Embedded Integration

- Introduction to IoT and its relation to Embedded Systems
- IoT Architecture: Device, Edge, Cloud, and Application Layers
- Embedded Platforms for IoT Applications
- Industry Use Cases: Smart Home and Health Monitoring Systems

Embedded Hardware for IoT

- Overview of IoT Hardware Platforms: STM32, and Raspberry Pi
- Microcontroller Architecture and Peripherals for IoT Applications
- Interfacing Sensors and Actuators with Embedded Boards
- GPIO, UART, I2C, and SPI Communication in IoT

Sensor Interfacing and Data Acquisition

- Classification of Sensors (Analog, Digital, Smart Sensors)
- Interfacing Common IoT Sensors (Temperature, Humidity, Motion, Light, etc.)
- Data Sampling, Signal Conditioning, and Calibration
- Real-Time Data Logging and Visualization

Communication Protocols and Connectivity

- Embedded Communication Interfaces: UART, I2C, SPI
- Wireless Protocols: Wi-Fi, BT and LoRa
- IoT Data Communication: MQTT and HTTP
- Edge Device Networking and Gateway Concepts

Embedded Software for IoT

- Programming Embedded Devices using Embedded C and MicroPython
- Development using STM32CubeIDE
- Real-Time Data Processing and Task Scheduling
- Power Management and Energy Optimization in IoT Devices

IoT Cloud Platforms and Data Management

- Connecting Embedded Devices to Cloud Platforms
- Hands-on with AWS IoT Core
- Real-Time Dashboards and Remote Device Control
- Data Storage, Analytics, and Visualization

IoT Security and Reliability

- Embedded Security Fundamentals
- Data Encryption, Device Authentication, and Secure Communication
- Firmware Updates and Over-the-Air (OTA) Mechanisms
- Fault Tolerance and Reliability in IoT Devices