IOT ROBOTICS AND EMBEDDED SYSTEMS

curriculum

EDXcellence

1st Year – Training

Basic Level:-

1...Introduction to IoT and Embedded Systems

- Overview of IoT and Embedded Systems
- Components of IoT: Sensors, Actuators, Microcontrollers
- IoT Architecture: Device, Gateway, Cloud
- Introduction to Embedded Systems and Microcontrollers

2...Microcontrollers Basics

- Introduction to Microcontrollers (e.g., Arduino,ESP8266)
- Digital and Analog I/O Operations
- Interfacing LEDs, Buttons, and Buzzers
- Programming Microcontrollers using C/C++ or Python

3...Sensors and Actuators

- Types of Sensors (Temperature, Humidity, Light, etc.)
- Interfacing Sensors with Microcontrollers
- Reading Sensor Data
- Control of Actuators (Motors, Relays)

4...Communication Protocols

- Introduction to MQTT Protocol
- Basics of Wireless Communication: Wi-Fi, Bluetooth
- Introduction to UART, SPI, and I2C

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5...Basic IoT Projects

- Blinking LED over Wi-Fi
- Reading and Displaying Sensor Data on a Serial Monitor
- Simple Home Automation (e.g., controlling light with a button)

Intermediate Level:-

1...Advanced Microcontroller Programming

- Low-Power Modes and Power Management
- Timers, Interrupts, and Real-Time Clocks
- Serial Communication and Data Logging

2...Embedded Operating Systems

- Introduction to Real-Time Operating Systems(RTOS)
- FreeRTOS: Tasks, Queues, and Semaphores
- Working with RTOS on Microcontrollers

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3...IoT Network and Communication

- TCP/IP Protocols and Networking Basics
- Introduction to LoRaWAN and Zigbee
- Building IoT Networks using MQTT, HTTP/HTTPS
- Cloud Integration: Sending Data to Cloud (AWS, Azure)

4...Data Handling and Storage

- Introduction to Databases: SQL and NoSQL
- Storing Data Locally (e.g., SD Card)
- Data Visualization Tools (Grafana, Power BI)

5...Intermediate IoT Projects

- Environmental Monitoring System (Temperature, Humidity)
- Remote Monitoring and Control via Smartphone App
- IoT-based Weather Station

1st Year – Training

Advanced Level:-

1...Embedded Linux

- Introduction to Embedded Linux
- Setting Up a Linux Development Environment (Raspberry Pi, BeagleBone)
- Cross-compiling and Bootloaders
- Device Drivers and Kernel Modules

2...Advanced Communication Protocols

- AMQTT (QoS Levels, Retained Messages)
- CoAP (Constrained Application Protocol)
- REST and RESTful Services in IoT
- Secure Communication (SSL/TLS)

3....Edge Computing and AI

- Introduction to Edge Computing
- Running Machine Learning Models on Microcontrollers
- TensorFlow Lite for Microcontrollers
- AI-based IoT Projects (e.g., Image Recognition)

1st Year – Training

4...Security in IoT

- IoT Security Challenges
- Implementing Encryption and Secure Boot
- Secure Firmware Updates and OTA
- Authentication and Authorization in IoT Systems

5...Advanced IoT Projects

- Smart Grid Management System
- Industrial IoT (IIoT) Applications
- Smart Healthcare Monitoring System
- Autonomous Drones with Embedded AI

- This curriculum is designed to build a strong foundation in IoT and Embedded Systems, progressing from basic concepts to advanced applications. Each level includes theoretical knowledge and practical projects to reinforce learning.

2nd Year – Project

- Automatic Room Temperature Controller
- Voice Control Home Automation
- Obstacle Avoidance Robot using Ultrasonic Sensor
- IOT based Smart Factory System

3rd Year – Internship

- **Guaranteed internship opportunity to gain practical exposure.**

- **Task: - Working on the internship Project.**

  Building a Smart Building with Blynk

  Project Overview

- Let's create a smart building system that can be controlled remotely using the Blynk app. This system will incorporate various sensors and actuators to monitor and control different aspects of the building, such as lighting, temperature, and security.

4th Year – Placement

- Automated resume
- aptitude training
- mock exams
- mock interviews
- career counselling
- continuous support

- This roadmap should provide a solid foundation in IOT EMBEDDED SYSTEMS , covering the essential topics and preparing you for more advanced studies or real-world applications.