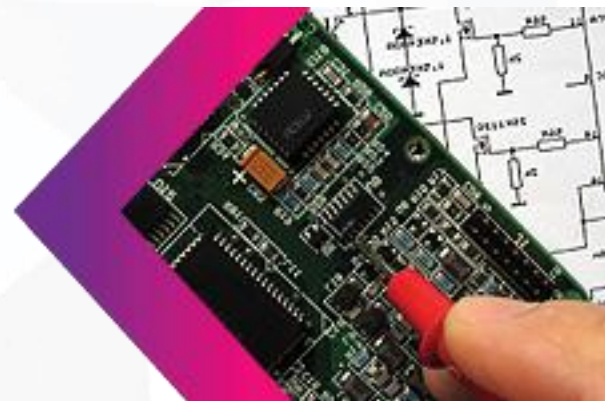


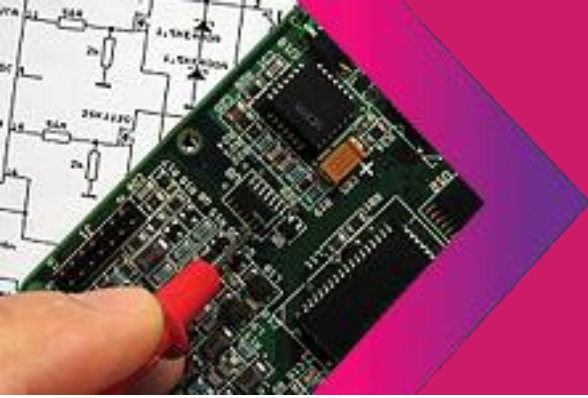


"Here to take you beyond"



Emertxe Certified IoT Programmer (ECIP) Course Syllabus





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Emertxe Certified IoT Programmer (ECIP) Module (1/8)

Module Name: Overview of IoT and High level Architecture

• Objectives:

- ✓ To walk through technology timeline(brief history) and evolution of IoT
- ✓ Gain knowledge about IoT applications across various segments
- ✓ Understand IoT architecture and its building blocks
- ✓ Introduction to various IoT platforms
- ✓ Understand the technology and skills required in building and IoT product.

• Detailed course contents:

- ✓ What Is the Internet of Things (IoT)?
- ✓ Brief History and evolution of IoT
- ✓ IoT Architecture
- ✓ Trends in the Adoption of IoT
- ✓ IoT Is Powerful and Pervasive
- ✓ Societal Benefits of IoT
- ✓ Risks, Privacy, and Security

Module (2/8)

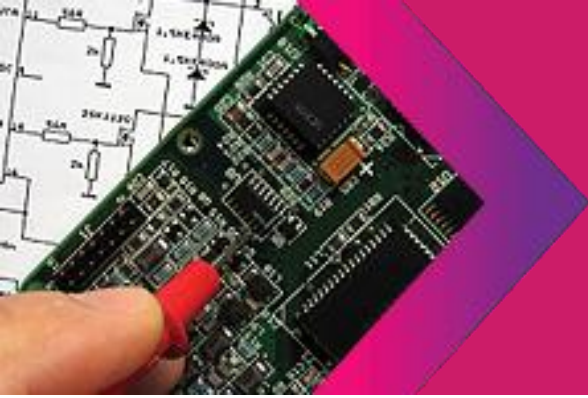
Module Name: Setting up IoT Workflow

• Objectives:

- ✓ Setup IoT platforms, by understanding the knowledge gained in the previous module
- ✓ Become familiar with the building blocks in IoT architecture
- ✓ Implement IoT use cases using various IoT platforms

• Detailed course contents:

- ✓ Setup IoT Platform1 (Opensource IoT Platform on local machine)
- ✓ Setup IoT Platform2 (Amazon IoT platform)
- ✓ IoT Use case-1 Implementation on two platforms
 - Opensource IoT platform
 - Amazon IoT cloud)
- ✓ IoT Usecase-2 Implementation
 - Opensource IoT platform
 - Amazon IoT cloud



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Module (3/8)

Module Name: Advanced / Embedded C Programming

- **Objectives:**

- ✓ Clearly understand concepts of C language
- ✓ To obtain good quality and style in programming
- ✓ Gear you up for programming in Embedded environment
- ✓ To induce confidence in you!

- **Detailed course contents:**

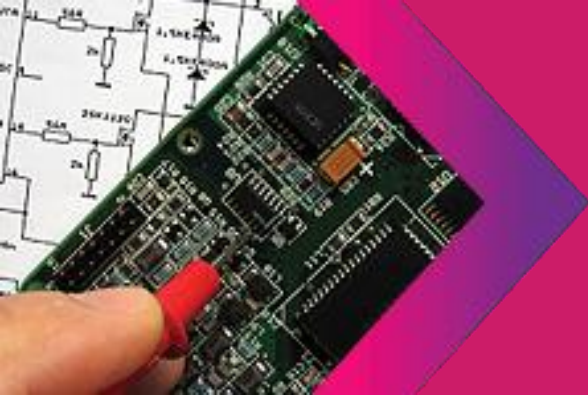
- ✓ Basics of C:
 - Operators
 - Conditionals
 - Arrays
 - Functions
- ✓ Advanced C programming:
 - Structures
 - Unions
 - Files
 - Deep dive into pointers
 - Pre-processor directives
 - Recursion
- ✓ Project environment - Creating & Building a project, Makefiles
- ✓ Deep dive - Logic to program translation, Creating your own library, Dry-run
- ✓ Introduction to Data Structures

Module (4/8)

Module Name: Micro-controller programming using Arduino platform

- **Objectives:**

- ✓ Understand Embedded Systems and its components
- ✓ Learn how to build embedded applications using Arduino Platform
- ✓ Become familiar with hardware interfacing using Arduino
- ✓ Should be able to read device datasheets and board schematics
- ✓ Learn basic communication protocols and communicate using Arduino Libraries
- ✓ Build IoT applications using wired and wireless protocols (ex: Bluetooth, Wifi)
- ✓ Debug applications using Arduino IDE



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- **Detailed course contents:**

- ✓ Overview of Embedded Systems
- ✓ Components of Embedded Systems
- ✓ Micro-controller Architecture and Properties
- ✓ Installing and Setting up the Arduino development environment
- ✓ Blinky Sketch - A walk through
- ✓ Arduino Sketches
- ✓ Classes
- ✓ Sketch Structure
- ✓ Pins
- ✓ Arduino Shields
- ✓ Hands-on working with GPIOs, Analog I/Os, Memory usage
- ✓ Micro controller peripherals usage - Timers, Counters, Interrupts and its sources
- ✓ Communication protocols I - UART, SPI, I2C, CAN
- ✓ Interfacing IoT sensors and Actuators
- ✓ Debug applications using Arduino IDE
- ✓ Communication protocols II - Wired and Wireless communication
 - Ethernet Client Server Implementation
 - Build WiFi Application
 - Build Bluetooth Application

Module (5/8)

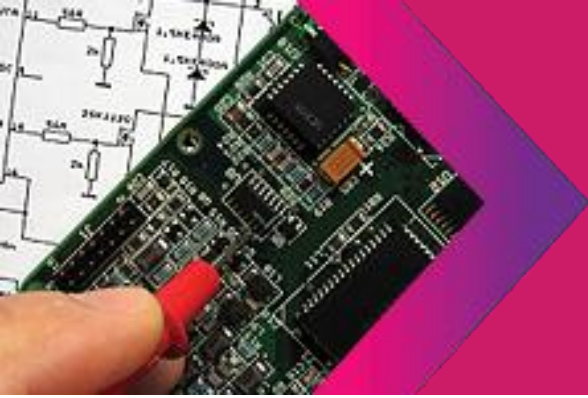
Module Name: Programming with Python

- **Objectives:**

- ✓ Become a professional python programmer
- ✓ Learn basic to advanced features of Python programming language
- ✓ Build object oriented programs using python
- ✓ Work with file streams, access csv files
- ✓ Create packages, Implement exception handles and learn to debug python application
- ✓ Learn basics of regular expressions

- **Detailed course contents:**

- ✓ Overview of Programming with Python
- ✓ Native Datatypes and Operators
- ✓ Python Statements and Conditionals
- ✓ Functions
- ✓ Strings
- ✓ Object oriented programming with Python
- ✓ Errors and Exception Handling
- ✓ File handing
- ✓ Regular expression
- ✓ Modules and Packages



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Module (6/8)

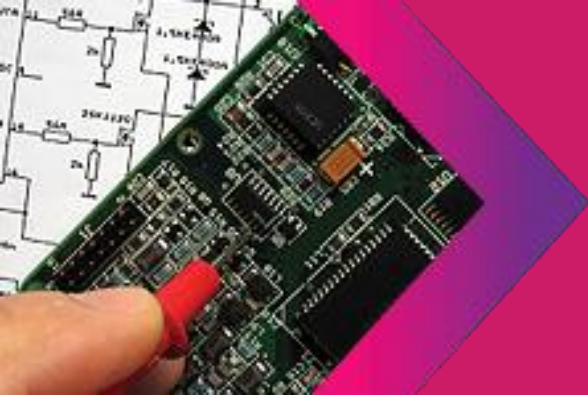
Module Name: Building IoT Applications using Raspberry Pi

• Objectives:

- ✓ Become familiar with Raspberry Pi (Rpi) hardware
- ✓ Setup and Install Raspbian OS on Rpi
- ✓ Understand how Rpi can be leveraged as an IoT gateway
- ✓ Become familiar with Linux OS
- ✓ Setup Rpi as an IoT gateway
- ✓ Using Python Interface with Arduino using Serial Port Interface
- ✓ Build Socket applications to communicate to Arduino device using Ethernet, Wifi and Bluetooth interfaces
- ✓ Build IoT applications using HTTP and MQTT protocols
- ✓ Learn to use Node Red programming tool

• Detailed course contents:

- ✓ Overview of Raspberry Pi (RPi) hardware platform
- ✓ Peripherals on Rpi
- ✓ Setup and Install Raspbian OS on Rpi
- ✓ Overview of Linux OS and its sub-systems
 - Process
 - Memory Mangement
 - Multi-Threading
 - IPC
- ✓ Linux CLI and important commands
- ✓ Linux File System
 - Everything is a file concept in Linux
 - Device Access using system calls
- ✓ Install packages on Raspbian OS
- ✓ Setting up Raspbian as an IoT gateway
- ✓ Write Python program to interface with Arduino using serial libraries
- ✓ IoT Communication Models and Protocols
 - Request-Response, Publish-Subscribe, Push-Pull, Exclusive Pair
 - Application Protocols: HTTP, CoAP, MQTT, AMQP
 - Communication APIs: REST-based, WebSocket-based
 - Network Layer: IPv4, IPv6, 6LoWPAN
- ✓ Building python based programs to communicate to cloud server using various application protocols
- ✓ Develop a complete python based application IoT application
- ✓ Rpi as a device
- ✓ Interfacing with sensors and actuators using GPIO pins
- ✓ Interfacing with camera on Rpi



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Module (7/8)

Module Name: IoT Cloud Infrastructure

- **Objectives:**

- ✓ To understand IoT cloud infrastructure blocks
- ✓ Making right IoT platform choice by understanding various popular platforms
- ✓ Configuring IoT platforms to get required analytics
- ✓ Learn integration elements (ex: REST APIs) for devices

- **Detailed course contents:**

- ✓ IoT cloud building blocks
- ✓ Using the platform specific dashboards
- ✓ Device configuration and addressing
- ✓ IoT Platforms in detail
- ✓ MQTT Server
- ✓ Injection Engine
- ✓ Time Series database
- ✓ Rules Engine
- ✓ Data monitoring, visualization and IoT Analytics
- ✓ Rest API interface
- ✓ Device Management
- ✓ Application Service

Module (8/8)

Module Name: Performance and Security in IoT

- **Objectives:**

- ✓ Learn how to benchmark IoT applications and platforms
- ✓ Understand the security risks in IoT, counter measures and design consideration
- ✓ Get an understanding of using cryptography in IoT

- **Detailed course contents:**

- ✓ Benchmarking IoT applications and Platforms
- ✓ MQTT vs HTTP performance
- ✓ Security considerations
- ✓ Firmware updates
- ✓ Cryptography basics
- ✓ Cryptography in IoT
- ✓ Privacy considerations and design guidelines



Emertxe Information Technologies Private Ltd
#83, 1st Floor,
Farah Towers,
MG road,
Bangalore - 560001

T: +91 809 555 7 333 (M), +91 80 4128 9576 (L)
E: training@emertxe.com

www.emertxe.com