

ADVANCED EMBEDDED SYSTEMS TRAINING

₹ 15,999/-

About Embedded Systems

- ❖ Introduction to Embedded Systems
- ❖ Applications of Embedded Systems
- ❖ Embedded Programming Languages
- ❖ Embedded Software Development Life Cycle
- ❖ Use of Compilers

Advanced C Programming

- ❖ Overview of C
- ❖ Features of C
- ❖ Basic C vs Embedded C
- ❖ C program Compilation and Run
- ❖ C Syntax Rules
- ❖ Variables, Keywords, and Identifiers
- ❖ Scope Rules
- ❖ Data Types
- ❖ Input/ Output Instructions
- ❖ Operators
- ❖ Macros and Preprocessors
- ❖ Conditional Statements
- ❖ Bitwise Operations
- ❖ Arrays
- ❖ Strings
- ❖ Loops
- ❖ Storage Classes
- ❖ Functions
- ❖ Pointers

- ❖ Function Pointers
- ❖ Enumeration, Structures & Unions
- ❖ Error Handling
- ❖ Memory Management
- ❖ File Handling
- ❖ Command line Arguments
- ❖ Introduction to MISRA C Guidelines

C++ Programming(OOPS)

- ❖ An Overview of Object-Oriented Programming
- ❖ C++ Fundamentals
- ❖ Classes and Objects
- ❖ Constructor and Destructor
- ❖ Arrays and Vectors
- ❖ Pointers and References
- ❖ Dynamic Allocation Operators.
- ❖ Dynamic Memory Management
- ❖ Function Overloading
- ❖ Copy Constructors and Default Arguments
- ❖ Operator Overloading
- ❖ Inheritance
- ❖ Virtual Functions and Polymorphism
- ❖ Templates
- ❖ Exception Handling
- ❖ File I/O
- ❖ Run-Time Type ID and the Casting Operators
- ❖ Namespaces, Conversion Functions.

C++11/14 Features:

- ❖ Function objects
- ❖ Function Pointers
- ❖ Automatic type deduction and decltype
- ❖ Smart Pointers
- ❖ Lambda expressions
- ❖ Initializer lists
- ❖ Nullptr

- ❖ Constexpr
- ❖ Delegating constructors
- ❖ Range-based for loops
- ❖ Deleted and Defaulted Functions
- ❖ Noexcept
- ❖ Override identifier
- ❖ Introduction to Design Patterns

Data Structures using C and C++

- ❖ Stack
- ❖ Queue
- ❖ Linked List
- ❖ Sorting Techniques
- ❖ Searching and Hashing
- ❖ The Trees
- ❖ Graphs
- ❖ Recursion

ARM CORTEX M4 Processor(STM32)

- ❖ ARM Architecture Overview
- ❖ ARM Cortex-M4 Core Overview
- ❖ Tools Overview for ARM
- ❖ Register/Instruction Set

Peripherals & Protocols:

- ❖ General Purpose Input / Output (GPIO)
- ❖ Watch Dog Timer (WDT)
- ❖ Real Time Clock (RTC)
- ❖ Timers/Counters
- ❖ Interrupts
- ❖ Pulse Width Modulation (PWM)
- ❖ Analog to Digital Converter (ADC)
- ❖ Digital to Analog Converter (DAC)
- ❖ Universal Asynchronous Receiver/Transmitter (UART)
- ❖ Inter-Integrated Circuit (I²C)
- ❖ Serial Peripheral Interface (SPI)
- ❖ Universal Serial Bus (USB)

- ❖ Controller Area Network (CAN)

Interfacing Modules

Digital Interfacing:

- ❖ LED's, Switches
- ❖ LCD & Keypad
- ❖ Seven Segment Display
- ❖ DC Motor
- ❖ Stepper Motor
- ❖ Relay
- ❖ EEPROM
- ❖ FLASH

Sensors Interfacing:

- ❖ PIR Sensor
- ❖ Vibration Sensor
- ❖ Soil Moisture
- ❖ Ultrasonic Sensor
- ❖ IR Sensor
- ❖ Temperature and Humidity Sensor (ADC)
- ❖ Acceleration and Gyroscope Sensor
- ❖ IR Remote Control

Communication Modules:

- ❖ GSM
- ❖ GPS
- ❖ RFID
- ❖ BLUETOOTH
- ❖ XBEE MODULE (ZIGBEE PROTOCOL)
- ❖ FINGER PRINT SENSOR
- ❖ Wi-Fi
- ❖ LoRa

Lab Session:

- ❖ Mini-Project

- ❖ Major Project

Real Time Operating System (RTOS)

- ❖ RTOS Fundamental Concepts
- ❖ Scheduler and Scheduling Policies
- ❖ Introduction to Free RTOS
- ❖ Porting Free RTOS on ARM Cortex M4 Board
- ❖ Task Management
- ❖ Task Priorities
- ❖ Queue Management
- ❖ Software Timers
- ❖ Semaphores
- ❖ Mutual Exclusion (Mutex)
- ❖ Event Groups
- ❖ Interrupt Management
- ❖ Debugging FreeRTOS
- ❖ Soft Real-Time OS vs Hard Real-Time OS

Lab Session:

- ❖ Mini-Project
- ❖ Major Project

Raspberry Pi Board

- ❖ Introduction to Raspberry Pi 3
- ❖ Raspberry Pi 3 Operating System
- ❖ Powering Up and Running
- ❖ Raspberry Pi Programming (Python)

Python Language

- ❖ Basic Syntax
- ❖ Variable Types
- ❖ Operators
- ❖ Decision Making
- ❖ Loops
- ❖ Numbers, Strings

- ❖ Casting
- ❖ Lists, Tuples, Sets, Dictionaries
- ❖ Date & Time
- ❖ Functions
- ❖ Modules
- ❖ Exceptions
- ❖ Arrays
- ❖ File Handling
- ❖ Lambda
- ❖ Classes/Objects
- ❖ Iterators
- ❖ Reg Expressions

Internet of Things (IoT)

- ❖ IoT Introduction
- ❖ Communication Protocols on IoT (HTTP, MQTT)
- ❖ Device Control and Sensor data acquisition using Python
- ❖ Web server Implementation
- ❖ Cloud Integration

Lab Session:

- ❖ HTTP Protocol Based Project
- ❖ MQTT Protocol Based Project

Linux Operating System

Command Line and Shell Scripting:

- ❖ Start with Shell Scripting
- ❖ Working with Variables
- ❖ Loops and Sleep Command
- ❖ Subroutines
- ❖ Interactive Scripts
- ❖ Working with Files
- ❖ Functions
- ❖ Automating Tasks with Scripts
- ❖ wget and curl
- ❖ Permissions

- ❖ Debugging Scripts
- ❖ Cross-Compiler

System Programming:

- ❖ File I/O
- ❖ Processes Management
- ❖ POSIX Threads
- ❖ Signals
- ❖ Inter Process Communication(IPC)
- ❖ Scheduling
- ❖ Semaphores
- ❖ Shared Memory
- ❖ Message Queues
- ❖ Debugging with GDB
- ❖ Time system
- ❖ LINUX system calls

Socket (Network) Programming:

- ❖ What is socket programming?
- ❖ What is TCP/IP?
- ❖ Internet Services and Their Port Numbers
- ❖ The Client Server Model
- ❖ TCP vs UDP
- ❖ TCP/IP Programming

Lab Session:

- ❖ TCP/IP Project Implementation

Debugging Tools and Techniques

- ❖ Software Debugging
- ❖ Hardware Debugging (JTAG)
- ❖ GDB
- ❖ Unit Testing

Version Control

- ❖ GIT Version Control System