

# Embedded Systems Using C

Duration: 4 days

## Introduction to C

- Characteristics of Embedded Systems • C Language Overview • Structure of a C Program • Identifiers • Name Spaces and Scope • Compilation & Linking • MCU Boot Process • C Best Practices for Embedded Systems

## Variables, Types and Debugging

- MCU Architecture • Program Execution • Variables • Representing Numbers • Types • Casting • Debugging Embedded Systems

## Operators and Hardware Manipulation

- Understanding Register Maps • Operators • Bit Manipulation • Modulus and Shifting • Memory Addressing • Sizeof • Ternary Operator • Precedence Rules • Best Practices for Embedded Systems

## Basic Program Flow Control

- Software Design Cycle • Software Architecture • UML • Flowcharts • Round Robin Scheduling • Statements • For and While Loops • If and Switch statements • Infinite Loops • Best Practices for Embedded Systems

## Advanced Flow Control

- Introduction to Real-time Concepts • Interrupt Basics • Interrupt Vector Tables • Nesting and Priorities • Software Interrupts • Volatile keyword • Shared Data Problems and Solutions • RMA Analysis • Interrupts Best Practice

## Advanced Types, Constants and Expressions

- Enumerations • Derived Types • Literals • Expressions and Evaluation • State Machines • State Charts • Software Architecture Concepts

## Arrays and Pointer Basics

- Arrays • Multidimensional Arrays • Strings • String Conversion • Pointer Types • Pointers and Arrays • Pointers Operations • Best Practices for Embedded Systems

## More Pointers and Strings

- Pointers to Pointers • Pointers to Constants • Constant Pointers • String Libraries • Manipulating Memory • Best Practices for Embedded Systems

## **Functions**

- Syntax • Variable Scope • Recursion • Inline Functions • Software Metrics • Static Code Analysis • Testing Techniques • Best Practices for Embedded Systems

## **Structures and Unions**

- Overview of Structures • Unions • Driver Design • Defining APIs • Driver Models • GPIO Driver Example

## **Scheduling Techniques**

- Arrays of Pointers to Functions • Function Queue Scheduling • Cooperative Scheduling • Scheduler Design • Energy Profiling • Low Power Software Design

## **Declarations**

- Syntax • Storage Class Specifiers • Global Variables • Type Qualifiers • Linkage Identifiers • Best Practice for Embedded Systems

## **Preprocessor**

- #define • Macros • Precedence • Conditional Compilation • Warnings • #pragma • Predefined Macros