Annexure – I

NIELIT CHENNAI

Program Details

"ADVANCED COURSE IN EMBEDDED C"

Objective of the Course:

C Programming for Embedded Systems is a hands-on course aimed at software, firmware, and hardware engineers who need to learn the practical skills necessary to program embedded microcontrollers in C. It is suitable both for people who do not know C and for people who have used C in other contexts but have had little or no exposure to embedded programming in C.

Target Audience: Diploma / B.Tech / B. E in ECE/EEE/IE/CS/IT/ME

Batch Size: 30

Topics Covered:

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

Introduction to Tools

- Development Tools and Environment
- Industry Coding Standards
- Object / Executable File Format
- Debugger

Practical C

- Why C in Embedded
- ANSI Standard
- Fundamentals of C
- Datatypes and Constants
- Simple & Formatted I/O
- Memory Usage
- Operators & Expressions
- Flow Control
- Loops

Functions

- Role of Functions
- Pass by value / reference
- Returning values from Functions
- Recursive Functions
- Call Back Functions
- Implications on Stack
- Library Vs User defined function
- Passing variable number of arguments

Arrays

- Defining, initializing and using arrays
- Multi Dimensional Arrays
- Arrays of Characters and Strings
- Arrays and Pointers
- Passing arrays to functions
- String handling with and without library functions

Storage Classes

- Scope and Life
- Automatic, Static, External, Register
- Memory(CPU / RAM)

Structures & Unions

- What structures are for
- Declaration, initialization
- Accessing like objects
- Nested Structures
- Array of Structures
- Passing structures through functions
- Allocation of memory and holes
- Structure Comparison
- Structure bit operation
- Typedef for portability
- Unions
- Overlapping members

Enumerated data types

- Enum, Indexing, enum Vs #define

Bit Operations

- AND (&), OR (|), XOR (^)
- Compliment (~)
- Left-Shift (<<), Right Shift (>>)
- Masking, Setting, Clearing and Testing of Bit / Bits

Pointers

- The purpose of pointers

- Defining pointers
- The & and * operators
- Pointer Assignment
- Pointer Arithmetic
- Multiple indirections
- Advanced pointer types
- Generic and Null Pointer
- Function Pointers
- Pointers to Arrays and Strings
- Array of Pointers
- Pointers to Structure and Union
- Pointers to Dynamic memory
- Far, Near and Huge Pointers
- Pointer Type Casting

Dynamic Memory Allocation

- Malloc(), Calloc(), Realloc(), Free()
- Farmalloc(), Farcalloc()

File Handling Concepts

- Concept of a FILE data type
- Inode, FILE structure
- File pointer
- Character handling routines
- Formatted Data Routines
- Raw data Routines
- Random Access to FILE

Command line Arguments

- Argc, argv
- Variable Inputs to the main

Compiler in Practical

- Pre-processor Directives
- Compiler, Assembler, Linker
- Conditional Compilation
- Multiple File Compilation
- Code Optimization techniques
- Volatile, #pragma

Data Structures

- Linear & non-linear
- Homogeneous & non-homogeneous
- Static & Dynamic
- Single, Double & Circular Linked Lists
- Stacks & Queues
- Binary Trees

Concepts and Real-time Exposure

- Software Concurrency

- Tasks and States
- Task Synchronization •
- Mutexes, Semaphores & Queues
- GPOS vs RTOS

Duration: 80 hrs.

Timing: 09:00 AM to 05:00 PM (Starting Date: 01-05-2018)

Venue & lab: NIELIT Chennai Centre

Course fee: Rs.4, 000/- (Fours Thousand only)

- Registration fee is non-refundable
- Full tuition fee is waived for limited no. of SC/ST candidates

Course in-charge: Ripunjay Singh, Scientist D
Email ID: ripunjay@nielit.gov.in
Phone: 044-24421445
For special/weekend batches, contact course in-charge

How to apply:

- Registration needs to be done at our Centre before starting the course. To get the admission, fill the Registration form and bringing the following:
    1. Duly filled in registration form
    2. Course fees - in the form of DD or Online Transaction (Please see the Mode of payment details)
    3. Self-attested copy Minimum Qualification certificate
    4. Self-attested copy of identity proof
    5. Self-attested copy of community certificate (if availing SC/ST fee concession)

Mode of payment:

- Course fee may be paid by any one of the following modes:
    1. DD drawn from a nationalized bank (preferably SBI) in favor of "NIELIT Chennai" payable at Chennai.
    2. Online transaction: Account No: 31185720641 Branch: Kottur (Chennai), IFS Code: SBIN0001669.
    3. Pay through nationalized bank Debit card (Service charges applicable)