National Institute of Electronics and Information Technology, Chennai

COURSE PROSPECTUS

Name of the Group:	VLSI-Embedded-AE Group
Name of the Course:	Certificate Course in Embedded C Programming
Course Code:	ED 102
Starting Date:	18/03/2019
Duration:	80 Hrs
Course Coordinator:	Bharath P
Last date of Registration:	15/03/2019

Preamble:

In today's world, embedded systems are all over, homes, offices, cars, factories, hospitals and consumer electronics. The inherent value of embedded systems lies in its pervasiveness. They are literally embedded in all electronic products, from consumer electronics to office automation, automotive, medical devices and communications. As time progressed, use of microprocessor-specific assembly-only as the programming language reduced and embedded systems moved onto C as the **embedded programming language** of choice. C is the most widely used programming language for embedded processors/controllers. Assembly is also used but mainly to implement those portions of the code where very high timing accuracy, code size efficiency, etc. are prime requirements. As assembly language programs are specific to a processor, assembly language didn't offer portability across systems. To overcome this disadvantage, several high level languages, including C, came up. Some other languages like PLM, Modula-2, Pascal, etc. also came but couldn't find wide acceptance. Amongst those, C got wide acceptance for not only embedded systems, but also for desktop applications. Due to the wide acceptance of **C in the embedded systems**, various kinds of support tools like compilers & cross-compilers, ICE, etc. came up and all this facilitated development of **embedded systems using C**.

Objective of the Course:

To make the candidates becoming familiar in Embedded C programming language.

Outcome of the Course:

At the end of this module, the successful students will be able to:

1. Understand the basic components of a computer, C language programs that perform I/O functions and implement simple data structures, manipulate numbers in multiple formats, and understand how software uses global memory to store permanent information.
2. Understand how the computer stores and manipulates data (characters, integers, and fixed-point numbers) and how basic arithmetic and logical operations are performed.

Course Structure: *This course contains total eight modules.*

S.no	Module Name	Duration
1	Introduction to Embedded C Language	2 Hrs
2	Variables and Data types	4 Hrs
3	Operators and Expressions	4 Hrs
4	Flow Control	6 Hrs
5	Arrays	10 Hrs
6	Functions	10 Hrs
7	Declarations & Storage Class	10 Hrs
8	Pointers & Dynamic Memory Allocation	12 Hrs
9	Structures, Unions & Bit field	10 Hrs
10	C Pre-processor	6 Hrs
11	File Input / Output (Optional)	6 Hrs

Other details:

Course Fees:

For General Candidates: Rs.3,500/-(Including GST)

SC/ST Candidates

However they are required to remit an amount of Rs.1, 000/- as advance security deposit. This amount will be considered as security deposit and will be refunded after completion of the course. If the student fails to complete the course successfully this amount along with any other security deposits will be forfeited.

Registration Fee: Non-refundable

SC/ST: No registration fee

Others: Rs.500/-. (Incl. of GST)

However the above registration fee shall be refunded on few special cases as given below

1. If course postponed and new date is not convenient for the student.
2. If course cancelled.

Payment schedule: The Fee is to be paid in one instalment as given below.

Instalment No.	**Last Date for Payment**	**Amount (in Rs.)**
1.	15/03/ 2019	4000/-

Eligibility

B.E/B.Tech, M.Tech, M.Sc (IT/Electronics branches), Pursuing Students also.

Number of Seats: 30

National Institute of Electronics and Information Technology, Chennai

How to apply:

Candidates are advised to download the Registration form from our website www.nielit.gov.in/chennai. After filing the form with all documents and fees, it can be submitted to NIELIT Chennai office in person or through post before staring of the course. Payment towards non-refundable Registration and Course fee can be paid through any one of the following modes:

- DD drawn from a nationalized bank (preferably SBI) in favor of "NIELIT Chennai" payable at Chennai.
- Online transaction: Account No: 32558810978 Branch: Kottur (Chennai), IFSE Code: SBIN0001669.
- Pay through nationalized bank Debit card (Service charges applicable)

Note: The Institute will not be responsible for any mistakes done by either the bank concerned or by the depositor while remitting the amount into our account.

Last date of Registration is 15th March, 2019

Selection of candidates: First cum First Serve basis

Admission Procedure:

All interested candidates are required to fill the Registration form with the fees (Registration and Course fees) before **15th March, 2019** with all the necessary following documents.

- Original and self-attested Copies of Proof of Age, Qualifications, etc.
- One passport size photograph
- Self-attested copy of Govt. issued photo ID card
- Self-attested copy of community certificate (if availing SC/ST fee concession)

Note: Working days are from Monday to Friday. Admission timings are from 9.30 am to 4.00 pm.

Discontinuing the course: No fees under any circumstances shall be refunded in the event of a student discontinuing the course. No certificate shall be issued if discontinued.

Course Timings: 9:00 AM to 5:30 PM (Monday to Friday)

Location and how to reach: NIELIT Chennai is located at Gandhi Mandapam Road, Kotturpuram, Chennai (Landmark: Opp. To Anna Centenary Library)

Address:
National Institute of Electronics and Information Technology Chennai Centre,
ISTE Complex, No. 25, Gandhi Mandapam Road, Chennai – 600025
E-mail: trng.chennai@nielit.gov.in
Phone: 044-24421445/9940668667

Course enquiries: Students can enquire about the various courses either on telephone Or by personal contact between 9.15 A.M. to 5.15 P.M. (Lunch time 1.00 PM to 1.30 PM) Monday to Friday.

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Annexure

Detailed Syllabus of the Course

Module 1: **INTRODUCTION TO EMBEDDED C LANGUAGE**
- C Language Overview
- History of C Language
- Why C in Embedded
- Difference b/w C & Embedded C Language
- Structure of an embedded C Program
- Compilation, Linking & Debugging

Module 2: **VARIABLES AND DATA TYPES**
- Keywords & Identifier
- Variables & Constants
- C Data Types
- Memory Usage
- C Input /Output
- Basic Examples

Module 3: **OPERATORS AND EXPRESSIONS**
- Expressions and Arithmetic Operators
- Relational and Logical Operators
- Bitwise Operators

Module 4: **Loops & Control Flow**
- If Statement
- if...else
- Switch Statement
- for Loop
- while Loop
- do while Loop
- break and continue
- Unconditional Branching using goto statement
- Decision Examples

Module 5: **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

Module 6: **FUNCTIONS**
- Functions Introduction
- User-defined Function
- Function Types
- Recursion in C
- Variable Scope
- Pass by value / reference
- Function Examples
- Implications on Stack

Module 7: **DECLARATIONS & STORAGE CLASS**
- Scope and Life
- Storage Class Specifiers
- Automatic, Static, External, Register
- Memory (CPU / RAM)

Module 8: **POINTERS**
- The purpose of pointers
- Defining pointers
- Pointer Assignment
- Pointer Arithmetic
- Multiple indirections
- 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

Module 9: **STRUCTURES, UNIONS & BIT FIELD**
- 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
- Typedef for portability
- Enumerated Data Type
- Unions
- Bit Field

Module 10: **C PRE-PROCESSOR**
- Understanding Pre-Processor directives
- Macros Expansion
- Conditional Compilation
- Header Files and Project

Module 11: **FILE INPUT / OUTPUT (OPTIONAL)**
- File Handling
- Data Organization
- File Operation:
  - Creating New file,
  - Opening an existing file,
  - Reading from a file,
  - Writing to file, Closing file
- File Opening Mode