National Institute of Electronics and Information Technology, Chennai

COURSE PROSPECTUS

Name of the Group:	Embedded Systems
Name of the Course:	**Online** Certificate course on **Embedded RTOS**
Course Code:	ED603
Starting Date:	4th May 2022
Duration:	2 Weeks
Course Coordinator:	Mr. Ripunjay Singh (Scientist-'D')
Last date of Registration:	2nd May 2022

Preamble:

An operating system (OS) is responsible for managing the hardware resources of a computer and hosting applications that run on the computer. An Real Time- operating system (RTOS) performs these tasks, but is also specially designed to run applications with very precise timing and a high degree of reliability. This can be especially important in measurement and automation systems where downtime is costly or a program delay could cause a safety hazard.

To be considered "real-time", an operating system must have a known maximum time for each of the critical operations that it performs (or at least be able to guarantee that maximum most of the time). Some of these operations include OS calls and interrupt handling. Operating systems that can absolutely guarantee a maximum time for these operations are commonly referred to as "hard real-time", while operating systems that can only guarantee a maximum most of the time are referred to as "soft real-time".

In the RTOS market, FreeRTOS held a dominant embedded software market share in 2018 as it supports many different architectures and compiler tool chains and is designed to be small, simple, and easy to use. The OS is highly-configurable by design. It can be built as a single CPU to support only a few tasks or as a high-level multi-core system with a file system, TCP/IP, and USB.

In the today marketplace, many companies still build their own Real Time Operating System in their embedded products and the present available academic curriculum is not much enough to fulfil the requirement of Skills needed to build RTOS based systems. Because of lack of hands-on experience among professionals, there is a huge demand in providing skill-based training in Embedded RTOS which will bridge the skill-gap among engineering graduates.

Objective of the Course:

The objective of the course is to provide the students with an understanding of RTOS concepts and to build real-time embedded systems using FreeRTOS.

Outcome of the Course: After successful completion of this Course, Students can:

1. Gain Hands-on Training on RTOS concepts with FreeRTOS Programming and Debugging
2. Port FreeRTOS to ARM Processor
3. Build Real-time applications with FreeRTOS
4. Understand concepts like Scheduling policies, Synchronizing, Resource Management with Examples
5. Acquire knowledge in Timing Analysis of RTOS application

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Course Syllabus:

- ✓ RTOS Introduction
  - Setting Up the Environment-Downloading and Installing RTOS
- ✓ Creating RTOS based project for STM32 MCUs
- ✓ RTOS Task Creation
- ✓ Exercise: RTOS Hello World App and Testing on hardware
- ✓ RTOS app debugging using SEGGER System View Tools
- ✓ IDLE Task and Timer Svc Task of RTOS
- ✓ RTOS Scheduler
- ✓ Context switching
- ✓ RTOS Task Notification
- ✓ Overview of RTOS Memory manage, STACK and Synchronization services
- ✓ RTOS Kernel Coding Style
- ✓ RTOS Task Deletion
- ✓ ARM Cortex M Interrupt Priority and RTOS Task Priority
- ✓ Interrupt safe APIs and Task yielding
- ✓ RTOS Task States
- ✓ RTOS : Delay APIs and its Significance
- ✓ RTOS Hook Functions
- ✓ RTOS Scheduling Policies
- ✓ RTOS Queue Management
- ✓ Semaphore for Synchronization, mutual exclusion and Interrupt Management
- ✓ Mutual exclusion

Other Details:

Course Fees: Rs. 4,050/- (Including GST) (Non-Refundable)

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 paid in one instalment as given below.

Instalment No.	Last Date for Payment	Amount (in Rs.)
1.	02-05-2022	Rs.4,050/-

Pre-requisite: Knowledge in Embedded 'C' & Microcontroller Architectures.

Eligibility: Students and Graduates of B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control /Computer Science/Information Technology /M.Sc.(Electronics)/AMIE in Electronics/ Electronics & Communication

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Number of Seats: 30

How to apply:

Candidates can apply online in our website https://reg.nielitchennai.edu.in/ .Payment towards Course fee can be paid through any one of the following modes:

- ✓ Online transaction: **Beneficiary Name: NIELIT CHENNAI, Account No: 31185720641, Branch: Kottur (Chennai), IFSC Code: SBIN0001669**.
- ✓ Pay through Unified Payment Interface (UPI) payment methods eg: Google Pay, Paytm, BHIM, Phone Pe
- ✓ DD drawn from a nationalized bank (preferably SBI) in favor of ―NIELIT Chennai‖ payable at Chennai.

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: 2nd May 2022

Selection of candidates: First Come First Serve basis

Admission Procedure:

All interested candidates are required to fill the Registration form with the Course fees before **2nd May 2022** with all the necessary following documents.

- Self-attested copy of Govt. issued photo ID card.
- Candidates have to submit the proof of qualification.

Note: Working days are from Monday to Friday.

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

Course Duration: 2 Weeks/20Hrs.(Monday-Friday)

Course Timings: 10.30 AM to 12.30 PM

Mode of Training: Online

Certification:

Certificate will be issued to the participants based on the marks scored in the examination conducted after the completion of training. The grading pattern will be as below:

Grade	S	A	B	C	D	Fail
Marks Range (in %)	85 to 100	75 to 84	65 to 74	55 to 64	50 to 54	Below 50

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

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ISTE Complex, No. 25, Gandhi Mandapam Road, Chennai – 600025
E-mail: ripunjay@nielit.gov.in / Phone: 044-24421445
Contact Person: Mr. Ripunjay Singh (Scientist-'D'), Mobile: 9445220125

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.