National Institute of Electronics and Information Technology, Chennai

COURSE PROSPECTUS

Name of the Group:	EPDPT
Name of the Course:	Embedded System Design using ARM Cortex M4
Course Code:	ED100
Starting Date:	19/09/2018
Duration:	120hrs
Course Coordinator:	Raghuraman.V
Last date of Registration:	14th September, 2018

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. They make the products smart, connected and are responsible for differentiating the products in the market.
Embedded systems are normally built around Microcontrollers and ARM Processor based SOCs. This Embedded System Design course focuses on the architecture and programming of embedded processors, development of applications using Embedded/Real-Time Operating Systems and porting the applications on ARM.

Objective of the Course:

1. To provide hands on training in Embedded System Design using ARM.
2. To make students familiar with the basic concepts and terminology of the target area, the embedded systems.
3. Making students to write their own programs for their product or project.
4. Understand the role of embedded systems in industry.

Outcome of the Course:

1. Understand what a microcontroller is & embedded system.
2. Understand different components of a micro-controller and their interactions.
3. Become familiar with programming environment used to develop embedded systems
4. Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices
5. Learn debugging techniques for an embedded system

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

S.no	Module Name	Duration
ED101	Introduction to ARM Cortex M4	04 Hrs
ED102	GPIO	04 Hrs
ED103	Display Devices	12 Hrs
ED104	ADC	12 Hrs
ED105	Timer	06 Hrs
ED106	Actuators	06 Hrs
ED107	Serial Communication Protocols	48 Hrs
ED108	Wireless Communication Protocols	28 Hrs

Other details:

Course Fees
For General Candidates: Course fee is Rs.4, 000/-(Including GST)

SC/ST Candidates

Tuition Fees are waived for eligible SC/ST students under the reservation policy (SC: 15%, ST: 7.5% of total seats). However they are required to remit an amount of Rs.1, 000/- as advance caution/security deposit. This amount will be considered as caution/security deposit and will be refunded after completion of the course with no interest. If the student fails to complete the course successfully this amount along with any other caution/security deposits will be forfeited. Any other SC/ST candidates admitted over and above the reservation policy have to pay complete fee.

Registration Fee: Rs.500/-(non-refundable)

SC/ST: No registration fee

Others: Rs.500/-.

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

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

Course Fee Instalment Structure: Not applicable for this course

Eligibility

Bachelor of Science/Diploma /Engineering and above, Pursuing BE/ BE Tech

Number of Seats: 25

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 14th September, 2018

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 14th September, 2018 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: 9:30 AM to 1:30 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
Contact Person: Raguram, Mobile: 8939708290

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 ED101 – INTRODUCTION TO ARM CORTEX M4 (4hrs):

1. Introduction to Microcontrollers.
2. Explanation about Architecture of TM4C123GH6PM microcontroller.
3. Introduction to Code Composer Studio(IDE)

Module ED102 – GPIO (4hrs):

1. Explanation about Programmable General Purpose Input and Output Registers.
2. Exercises on controlling LED and push button switches.

Module ED103 – DISPLAY DEVICES (12hrs):

Single Seven Segment:

1. Seven Segment display internal diagram, pin configuration & working principle etc will be discussed.
2. Interfacing Seven Segment Display with Tiva-C controller will be discussed.
3. Programming with CCS to creating numbers (0 to 9) and incrementing the count from 0 to 9 in a loop.

Dual Seven Segment:

1. Visual perception & controlling more than one Seven Segment Display unit using same number of ports as that of single seven segment exercise.
2. Exercise on one running numbers from 00 to 99.

Liquid Crystal Display:

1. Liquid Crystal Display Working Principle.
2. Liquid Crystal Display pin configuration
3. Interfacing LCD to Tiva-C controller.
4. Programming in CCS to display characters, numbers, string, Welcome note, running display etc.

Module ED104 - ADC (12hrs):

Working with ADC modules

1. ADC Block diagram explanation from Tiva User guide.
2. ADC Registers overview.
3. ADC Programming using CCS for internal temperature reading of TM4c123gh6pm microcontroller.
4. ADC programming using CCS for external analog inputs.
5. Interfacing LCD to Tiva-C controller and showing Temperature and voltage readings in LCD display.

Module ED105 – TIMER (6hrs):

Working with timer Modules

1. Timer Block diagram explanation from Tiva user guide.
2. Timer Register overview.
3. Timer Programming using CCS for Periodic, One-shot and PWM times.

Module ED106 - ACTUATORS (6hrs):

Interfacing Actuators:

Servo:

1. Servo principles of operation.
2. Concepts of Pulse Width Modulation and micro servo SG90 functioning.
3. Servo Programming using CCS for various actuator movements.

Stepper:

1. Stepper motor principles of operation.
2. Stepper motor programming using CCS for CW and CCW with speed variation.

Module ED107 – SERIAL COMMUNICATION PROTOCOLS(48hrs):

Communication protocols:

UART:

1. Fundamentals of Universal Asynchronous Receiver Transmitter.
2. Serial and Parallel data transferring methods and conversions.
3. Baud rate calculations
4. UART Programming using CCS to transfer data from single Tiva-C board to computer and visualizing the data in serial monitors like Terminal and Teraterm.
5. UART Programming using CCS to transfer data from one Tiva-C board to another (Chat Window).

SPI:

1. Fundamentals of Serial Peripheral Interface.
2. Master Slave Communication methods and device communication.
3. SPI Programming using CCS to control a LED DOT Matrix.

I2C:

1. Fundamentals of Inter Integrated Circuit.
2. Multi Master & Multi Slave concepts.
3. Arbitration & Clock Stretching concepts.
4. I2C Programming using CCS between Two Tiva boards.

Module ED108 – WIRELESS COMMUNICATION PROTOCOLS(28hrs):

Wireless Communication Protocols

GSM:

1. Fundamentals of GSM.
2. GSM programming using CCS to control a device from mobile.

Bluetooth:

1. Fundamentals of Bluetooth.
2. Bluetooth Programming using CCS to establish communication between Two Bluetooth devices.

Zigbee:

1. Fundamentals of Zigbee.
2. Working with Zigbee editing software XCTU to edit Zigbee devices.
3. Zigbee programming using CCS to establish communication Two Zigbee devices.