COURSE PROSPECTUS

Name of the Group: *VLSI DESIGN GROUP*

Name of the Course: *PG Diploma in Electronic System Design and Manufacturing*

Course Code: *ESDM100*

Starting Date: *Sept-7-2015*

Duration: *24 Weeks*

Preamble:

Electronics and Hardware Industry is increasingly finding applications in all sectors of the economy and thus is accepted as a key enabler in development of our country. The current growth trend and its existing contribution to the global electronics industry indicates that the share of IT Hardware and Electronics and Manufacturing in India, in terms of output and employment, has the potential to grow manifolds, driven by its emergence in the global electronics manufacturing value chain.

In order to create a conducive environment for manufacture of high technology, capital intensive semiconductors and other high tech electronic products, attract global investments as well as bridge the viability gap due to lack of adequate infrastructure and ecosystem, Government of India has announced number of initiatives in the country. To this aspect, there is also a need to ensure availability of trained human resources for this sector in order to sustain growth and to achieve the target set for this sector.

Objective of the Course:

It is proposed to offer PG Diploma in Electronics System Design and Manufacturing (ESDM) to enable new Electronics graduates/post graduates or working engineers in electronic industries to specify, design, develop and test electronic products. This is offered to bridge the major gap in competencies required to design, manufacture and market Indian state-of-the art electronic products.

The focus of the proposed program will be state-of-the-art electronic products that are likely to be manufactured in medium and large volumes for Indian and Global markets such as automotive, medical, consumer, industrial, entertainment, aerospace and defense. The program will not emphasize complex products produced in small numbers or very complex systems (main frame computers, telephone exchanges, data centers etc.). The representative product for consideration in this program include music systems, biomedical equipment, cell phones, laptops, PCs, tablets, set top boxes, TV sets, modems, instrumentation systems ,routers, controllers, RFID systems, smart card related equipment, UPS, power management systems. The program is also restricted to the design of products that are based on known technologies of manufacturing and available components.

Outcome of the Course:

On successful completion of the Course, the Participants shall get

- Exposure to Electronic Product Design process and Manufacturing
- *Exposure to Processor/FPGA based Embedded System design*
- Expertise in Embedded Software development/Digital Signal Processing/Power management/Communication Interface/IOT.

Course Structure:

This course consist of eight (Four Core and three Elective) modules including project. Out of three elective modules two modules should be from ESDM 105, ESDM 106 or ESDM 110 and one module from ESDM 107, ESDM 108 or ESDM 109. Students have an option to select those electives.

The modules are as follows:

ESDM 100	Module name	Duration
ESDM 101	Fundamentals of Electronics(core)	3 weeks
ESDM 102	Electronics System Packaging and Manufacturing (core)	2 weeks
ESDM 103	Industrial Electronic Product Design (core)	2 weeks
ESDM 104	Processor based System Design (core)	3 weeks
ESDM 105	FPGA based System Design (elective)	3 weeks
ESDM 106	Embedded Software Development (elective)	3 weeks
ESDM 107	Embedded Digital Signal Processing (elective)	2 weeks
ESDM 108	Power management of Electronics Products (elective)	2 weeks
ESDM 109	Communication interface of Electronics Products (elective)	2 weeks
ESDM 110	IOT (elective)	3 weeks
ESDM 111	Project	6 weeks

Other Contents

a. Course Fees :
   General Category applicants: *Rs 60000/- + Service Tax at Actual*

   SC/ST Category applicants : Tuition fees/Examination fees are waived for SC/STstudents admitted under SCSP/TSP. However they are required to remit an amount of Rs 6840/- as advanced deposit and this amount will be considered as caution/security deposit and will be refunded after successful completion of the

course. If the student fails to complete the course successfully this amount along with any other caution/security deposits by the student will be forfeited.

b. Course Fee Installment Structure:

1. Deposit at the time of Course Registration of Rs.1000/- will be considered as caution deposit on student joining the course.

2. Fee Installment structure for PG/Advanced Diploma programs is as follows:

Advance Deposit :
Rs.10,000/- for PG Diploma Programs.

Rs.5,000/- for Advanced Diploma Programs.

(After publication of first selection list, the students in the first selection list have to pay the advance Deposit within one week to take the provisional admission. Students in the additional selection should pay both Advance and First installment fee together on or before counseling day)

First Installment:
50 % of Course fee (which includes advance deposit of Rs.10,000/- or Rs.5,000/- depending upon the type of course) + Service tax at actual. First installment should be paid on or before Counseling date.
Second Installment:
Remaining 50% of Course fee + Service tax at actual. Second Installment should be paid within two months after commencement of the course.

3. SC/ST Candidates should pay 10% of total fee as Advance deposit for taking provisional admission. This amount will be considered as caution/security deposit and will be refunded after successful completion of the course. If the student fails to complete the course successfully this amount along with any other caution/security deposits by the student will be forfeited, subject to approval of Director on case to case basis.

For PG Diploma in ESDM Course the fee payment structure is as follows

Advance Deposit : Rs.10,000/- only (Should be paid within one week of first selection list) 1st Installment on or before counseling Date : Rs.30,000/- Plus Service Tax* = Rs.34200/- [Rs.10,000/- already paid] Net Amount Payable = Rs.24200/- 2nd Installment : Rs.30,000/- Plus Service Tax* = Rs.34200/- SC/ST Candidates need to pay only Rs 6840/- as advanced deposit and this amount will be considered as caution/security deposit and will be refunded after successful completion of the course.

* Service Tax is presently 14.0 % and revised rates are applicable as per Govt of India Orders.

c. Eligibility:

B.E/ B.Tech/ B.Sc/ MSc/ Engineering Graduate/ PG in Electrical/ Electronics/ Electronics and Communication/ Bio-Medical Engineering/ Medical Electronics/ Electronics and Instrumentation/ Computer Science and allied branches.

d. Number of Seats : *40*

e. How to Apply :

Students are advised to apply in the prescribed Application Form available with the course brochure/course prospectus or downloaded from our website. Filled-in application forms along with a Demand Draft (or pay-in-slip) towards advance fee of Rs.1,000/- *drawn in favour of* Director, NIELIT, Calicut, *Payable at* State Bank of India, NIT Campus Branch (code: 2207), Chathamangalam should be sent to the **Training Officer, NIELIT, P. B. No. 5, NIT Campus Post, CALICUT – 673 601, Kerala**. **The Name of the Course Applied for should be super scribed on the top of the cover in which the application form is forwarded.**

Modes of Payment: The course fee can be paid by one of the following methods as per your convenient.

1	Demand Draft to be drawn in favor of Director, NIELIT, Payable at State Bank of India, Calicut NIT Branch (2207). The DD should reach here before the last date to apply.
2	Through any branch of SBI (where this format is accepted) using the pay in slip available in our web site. The **original counterfoil** should reach here before the last date to apply.

3	The fees can be paid directly into our account from any bank where core banking facility is available. The details required for direct payment are as given below. • Savings Account No: **31329537747** • Bank Name: SBI, NIT Chathamangalam • Bank Code: 2207 • IFSC No: SBIN0002207 • MICR : **673002012** The depositor should obtain the UTR Number/Journal No from the branch while depositing cash directly into our account. Depositor should also obtain the counterfoil duly filled up and signed by the staff with seal of the bank through which the amount was deposited. The following details should reach here before the last date to apply. 1. Name of the Depositor 2. Name of the Student 3. Date of Payment 4. Amount Deposited 5. Name of Bank/branch through which amount deposited 6. Purpose – Course ID – Advance Deposit/Hostel Rent/Installment Fee etc. 7. Proof of Deposit (counterfoil/acknowledgement **in original**) 8. UTR Number
4	The fees can be paid through the **SBI Collect** Payment Gateway as well: 1. Please click the SBI Collect hyper link to enter the payment gateway. 2. Select State of Corporate/Institution as *Kerala* 3. *Select* Type of Institution *Educational Institutions* and click on *Go* button 4. *Select* Educational Institutions Name as *NIELIT* and click *Submit* button 5. Select Payment Category as *Course Fee* 6. Enter all the fields including amount payable and follow the instructions The following details should reach here before the due dates. 1. Name of the Depositor 2. Name of the Student 3. Date of Payment 4. Amount Deposited 5. Purpose – Course Name: 6. UTR Number

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.

f. Selection of candidates : *Selection is based on the marks in qualifying degree.*

g. Test/Interview (if applicable) : *Not Applicable*

h. Counseling/Admission : on 07 Sept 2015

i. Spot Admission : If spot admission is open, spot admission will close within 15 days of Counseling/Admission of a particular course. On spot admission students should provide an undertaking saying that he/she is fully aware that he/she missed so much days of class and will not ask for further extension of course.

j. Admission Procedure :
Students who have been selected for test/interview/counseling/admission are required to report to the Institute on the prescribed day by 9:30 hrs along with the following
1. Attested Copies of Proof of Age, Qualifications, etc
2. Original Certificate of the above
3. Two copies of photograph and one stamp size photograph for identity card.
4. SC/ST Certificate (if applicable)
5. Income Certificate (if applicable)
The students on reaching the Institute are required to meet the Front Office Councilor (FOC). The FOC then directs the student to the Course Coordinator. The student gets the enrollment form verified by the Course Coordinator and then meets the FOC who shall direct the student to the Accounts for payment of fees. A student is thus admitted.

k. Discontinuing the course: No fees under any circumstances shall be refunded in the event of a student discontinuing the course. A student can however, be eligible for module certificates (applicable only for courses which provide for modular admission) which he has successfully completed provided he has paid the entire course fees.

l. Course Timings :
This program is a practical oriented one and hence there shall be more lab than theory classes. The classes and labs are from 9.30 am to 12.45 pm and 1.30 pm to 5.00 pm Monday to Friday. During project work, the timings are from 9.15 am to 5.15 pm. The theory to lab proportion is 30:70.

m. Location and how to reach :
NIELIT Calicut is located very close to NIT campus and is about 22Kms from the Calicut (Kozhikode) city. A number of buses (Buses to NIT via Kunnamangalam) are available from "Palayam Bus Stand and KSRTC Bus Stand". The bus stop at our Institute is called "Panthrand" and is one stop before NIT. The bus fare is around `.*15/-* from Calicut City to NIELIT.

Calicut (Kozhikode) is well connected by Rail, Road and Air form different parts of the country. The maximum and minimum temperatures range between 35^0C and 20^oC.

n. 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).

o. Important Dates (if applicable) :

Last date for receiving completed application forms	First selection list will be prepared based on the applications received on or before 27th July 2015. The additional selection list will be prepared based on the applications received on or before 10th Aug 2015, and excluding the applicants, included in the first selection list.
Publication of first selection list in the Website http://calicut.nielit.gov.in/	27th July 2015
Last date for taking provisional admission by paying Advance Deposit (Rs 10000/-), for applicants in the first selection list	3rd Aug 2015
Publication of additional selection list in our website (if there are vacant seats)	10th Aug 2015
Counseling date	7th Sept 2015
Class Commencement date	8th Sept 2015
Payment of Advance Deposit for applicants in first selection list	On or before 3rd Aug 2015
Payment of first installment fees	On or before 7th Sept 2015
Payment of second installment fees	On or before 09th Nov 2015

p. Placement :

We have a placement cell, which provides placement assistance to students who qualify our courses. The course improves the knowledge and skill of the students as it deals with the latest technologies and tools used in industries. This helps the student in getting a placement by

    a. Campus placement
    b. Placement by companies for whom we send the students bio data and they conduct interviews at their site.
    c. Students themselves attend interview at different companies and the course helps in the interview.

q. Hostel facilities :

Hostel accommodation is available for boys and girls on daily or monthly chargeable basis. *The hostel fee varies from Rs.850/- to Rs.1,300/- (for boys) per month and Rs.1,000/- to Rs.1,400/- (for Girls) per month depending on the location of accommodation.* However, students are required to pay the hostel fees for the duration of the course for which they are seeking admission at the time of joining the course.

r. Canteen facilities :
  The Institute has a canteen functioning at the main campus and food at reasonable   rates is available for breakfast, lunch, and dinner

s. Lab Facilities
  Full-fledged labs with latest Embedded and VLSI Design Tools, High-end FPGA based embedded development boards, Digital Storage Oscilloscopes, SMD soldering station, High Precision Digital Multimeters, Xilinx, Altera and Mentor Graphics FPGA & PLD design tools, FPGA & PLD based Demo boards, PCB design tools such as OrCAD Capture, OrCAD PCB Layout Plus, OrCAD Digital Simulator, etc.

t. Course Contents :

Syllabus
Core Modules
Module-1 (Foundation for Electronics System Design)
Electronics Fundamentals
  Material classification based on conductivity, basic Semi-conductor, Diodes, Characteristics of Diodes, Classification of Diodes, Transistors, Classification of Transistors, BJT characteristics, JFET & MOSFET Characteristics, Transistor Amplification Circuits, OP Amp, Basic Characteristics of OP Amp, Feedback circuits, Introductions to Digital circuits.
Fundamentals of circuit design
  Basic circuit laws , Current & voltage division Rules, Introduction to Linear and Non-linear elements, Classification of sources, Equivalent Impedance Calculations in series & parallel circuits, Basic Network Theorems, Current, voltage and Power calculations in a circuit, Diode applications,Clipping and Clamping Circuits with Diodes, Rectifier Circuits, Transistors, Selection and analysis of Components, sensing devices and display devices.

Module-2 (Electronic System Packaging and Manufacturing)

  Evolution and Classification of Printed Circuit Boards, Challenges in Modern PCB Design and Manufacture, PCB fabrication methodologies(SSB, DSB and multilayer board), PCB design considerations/ design rules for analog, digital and power applications, Electromagnetic interference in electronic systems and its impact. Analysis of electronic circuit from noise emission point of view (both conducted and radiated emission) cross talk and reflection behavior of the circuit in time domain, Thermal management of electronic devices and systems.

  Semiconductor Packages: Single chip packages or modules. (SCM) Commonly used packages and advanced packages; Materials in packages, Current trends in Packaging, Multichip modules (MCM)-types; System-in package (SIP); Packaging roadmaps; Hybrid circuits.

Module-3 (Industrial Electronic Product Design)

Development Process, Product Planning & Conceptualization, Product Architecture and Industrial Design, Product Manufacturing & Prototyping, Economic Analysis & Managing Projects. Introduction to 3-D printing and Rapid Prototyping.

Module-4 (Processor based System Design)

Introduction to ARM Processor architecture and programmer's model, Overview of Cortex Architecture, Cortex M3 Register Set and Modes, Cortex M3 Processor Core, Data Path and Instruction Decoding, ARM Cortex M3 Development Environment, Assembler and Compiler, Linkers and Debuggers, ARM, Thumb & Thumb2 instructions, Mixing ARM & Thumb Instructions, Memory hierarchy, Memory Mapping, Cache.

Programming Concepts: - High level and low level languages, Compiler, Linker & Cross compilers, running, debugging and testing of programs, Measures of program performance, Program optimization techniques.

Programming using Assembly language, C Programming: Introduction, Data Types and storage classes, Controlling program flow, Arrays, Functions, Pointers, Arrays and Pointers, Pointer to Functions and advanced topics on Pointers, Structures and Unions, Preprocessor directives, File operations, bitwise operations, Typecasting.

Cortex M3 based controller architecture, Memory mapping, Cortex M3 Peripherals – RCC, GPIO, Timer, System timer, UARTs, LCD, ADC, Cortex M3 interrupt handling – NVIC. Application development on Cortex M3 controllers.

Elective Modules
Module-5 (FPGA based System Design)

Introduction to FPGA, HDL Refresher, Introduction to modeling & Writing Simple Test Benches, FPGA Devices, Design Flows, Principles of Combinational Circuit Design, Principles of Sequential Circuit Design, Principles of FSM Design, Principles of RTL Design, Mixing Design Styles, HDL Coding for Synthesis, Designing Memories, Modeling of Microprocessors, Designing SoC based system, Designing Bus based systems, Interfacing peripherals with the SoC, Interrupt Mechanisms with Processor.

Module-6(Embedded Software Development)
Operating System Concepts for Embedded Systems

Basic Operating System Concepts: Linux as Embedded OS, Comparison of Embedded OS, Embedded OS Tools and development, Discussion on Embedded OS Applications and products, System Calls, Linux Compiler options, Make. Internals of Linux OS: Process, Multithreading and Synchronization. Inter Process Communication: Pipe and FIFOs, Shared memory, Sockets.

Getting Linux on a device and Driver Development

Introduction to Linux Kernel source tree and compilation, Linux boot sequence, Building Kernel, Building Boot image, Linux Kernel modules and module programming, Linux Device drivers

RTOS Concepts

Introduction to Real-time systems and Embedded Real-time Systems, Discussion and Comparison of popular RTOS, Design Goals for Real-time software, Discussion on Embedded Real-time applications, Considerations for real-time programming, Task/Thread Creation and management, Inter Task/Process Communication Mechanisms, Semaphores, Message Passing, Pipes, Interrupts, Development Tools.

Porting

Building root file system, Kernel Compilation for ARM, Porting of Embedded OS on ARM.

Module-7 (Embedded Digital Signal Processing)

Introduction to Digital Signal Processing

Discrete-time signals, Signal classification, Discrete-time systems, Sequences, Representation of signals on orthogonal basis, Sampling and reconstruction of signals. Time-Domain, Frequency Domain, Differential equation and Difference equation. MATLAB based examples

Z-Transform, Analysis of LTI systems, Frequency analysis, Inverse Systems, Discrete FourierTransform (DFT), Fast Fourier Transform (FFT) algorithm, Implementation of DiscreteTime Systems. MATLAB based examples, demonstrations and exercises on real sensor data. Different implementation techniques for real time systems.

Digital Filter Design

Design of FIR Digital Filters (windows, frequency sampling, Remez algorithm and least meansquare error methods), Design of IIR Filters (Butterworth, Chebyshev and Elliptic Approxi-mations; Lowpass, Bandpass, Bandstop and High pass Filters). Effect of finite register lengthin FIR Filter design. Introduction to multi rate signal processing. Adaptive Filter design. Different implementation techniques for real time systems. Optimization methods for real time implementation on embedded platform.

DSP System Design and Realization techniques

DSP System Design and Realization Techniques, Arithmetic issues, pipelining, memory hierarchy, Harvard architecture and parallel processor realizations, digital signal processors, porting issues of signal processing algorithms on embedded DSP platform, Optimization techniques:Memory optimization for embedded application, Run Time Optimization. Fixed point implementation for different DSP algorithms

Module-8 (Power management of Electronic Products)

Introduction to low power design techniques and methodologies**.** Introduction to various types of power supplies.

Estimation of power supply requirements and power loss in electronic products. Selection of appropriate power supplies for the given primary power sources. (220 VAC/Battery) Design of power scheduler, power management unit of an electronic product.

Module-9 (Communication interface of Electronic Products)

Introduction to serial (wired and wireless) and parallel communication. Familiarization of Serial communication protocols: I2C, SPI Ethernet, USB, PCI and PCIe. TCP/IP communications model and functional properties of each one of the layers. Packet and file transfer using embedded web server which supports FTP/HTTP/ SMTP/ SNMP protocols.

Module-10 (Internet of Things (IOT) Technology for Electronic Products)

Fundamentals of Wireless Technologies

Evolution of Wireless Communication, RF fundamentals, Overview of Cellular Systems, 1st, 2nd, 3rd and 4th Generation Cellular Systems.

Network Devices and the Internet of Things:

Computer networking overview: TCP/IP, IPV6, Networking devices, topologies. IoT Wireless Technologies: IoT Wireless standards, Wireless LANs: 802.11,802.11a/b/g/n, Wireless Personal Area Networks, Bluetooth, IEEE 802.15 standards, Zigbee, Sensor Networks.

IoT overview: IoT Entities, IoT standards, IoT application development with Embedded hardware (Intel Galileo & ARM Cortex Controllers)

Course Structure

This course consists of seven (Four Core and Three Elective) modules followed by Project. Out of six elective modules students have an option to select Three modules. Out of Three electives students have to select 2 modules from ESDM 105, ESDM 106 and ESDM 100 and one module from ESDM 107, ESDM 108 and ESDM 109. The modules are as follows:

ESDM 100	Module Name	Duration
ESDM 101	Fundamentals of Electronics	3 weeks
ESDM 102	Electronic System Packaging and Manufacturing	2 weeks
ESDM 103	Industrial Electronic Product Design	2 weeks
ESDM 104	Processor based System Design	3 weeks
ESDM 105	FPGA based System Design	3 weeks
ESDM 106	Embedded Software Development	3 weeks
ESDM 107	Embedded Digital Signal Processing	2 weeks
ESDM 108	Power management of Electronic Products	2 weeks
ESDM 109	Communication interface of Electronic Products	2 weeks
ESDM 100	IOT Technology for Electronic Products	3 weeks
ESDM 111	Project	6 weeks