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सत्यमेव जयते



विश्वविद्यालय अनुदान आयोग
University Grants Commission
(शिक्षा मंत्रालय, भारत सरकार)
(Ministry of Education, Govt. of India)

D.O. No. 5-13/2023 (NSQF/NIELIT)

03 APR 2023
April, 2023

Subject: Skilled Manpower - Advanced Research and Training (SMART) facility set up at NIELIT, Calicut as part of Chip to Start-up (C2S) programme- Regarding.

Dear Madam/Sir,

As you may be aware, the National Institute of Electronics and Information Technology (NIELIT), Calicut center has set up a Skilled Manpower Advanced Research and Training (SMART) facility or Virtual Prototyping Lab as part of Chip to Start-up (C2S) programme of Ministry of Electronics and Information Technology for the proliferation of advanced VLSI and Embedded system design training, search and electronics systems development across the country.

- This facility at NIELIT, Calicut is on free of cost basis.
- The 'SMART' remote lab facility is available 24x7 and the students, researchers, and start-up industries can access the facility, anytime and anywhere.
- To learn electronics hardware and embedded system design concepts and to acquire design skills it is inevitable to practice laboratory experiments. The facility will enable the generation of skilled manpower as well as, Intellectual Property generation in VLSI, electronics hardware and embedded system design the EDA Tools, test & measuring equipment like logic analyzers, spectrum analyzers, digital storage oscilloscopes etc.
- As per the Semicon India Future skills Talent Committee Report Nov 2022, in India needs 3.3 lakh skilled manpower in electronic design by 2030 and 4.5 lakhs by 2032. The SMART lab facility at NIELIT Calicut will be an enabler for the talent roadmap.
- Through the SMART lab facility, NIELIT is offering MOOC Courses in VLSI and Embedded domain of 65 hours duration (3 credits) as well as 1-4 months academic projects and internships

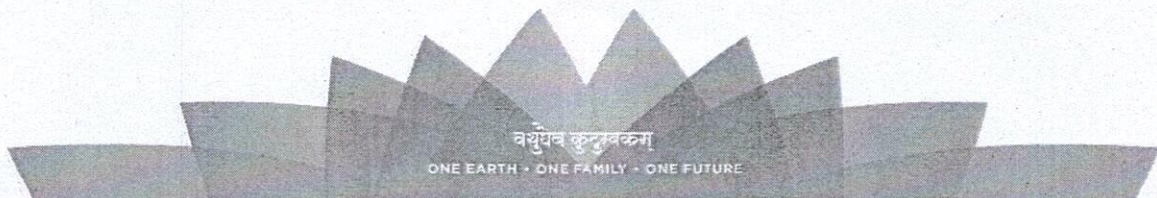
You are requested to encourage your students and faculties to utilize the SMART facility at NIELIT, Calicut on free of cost. A copy of brochure along with some important highlights of the SMART lab project is enclosed as **Annexure-I**.

Yours sincerely,

(Manish Joshi)

Encls.: As above

1. Vice-Chancellor of Identified Universities
2. Principal of Identified Colleges.



National Institute of Electronics and Information Technology

Virtual Prototyping Lab at NIELIT Calicut

Funded under the Chip-to Start-up project of the MeitY, Govt of India

Overview:

Skilled Manpower Advanced Research and Training (SMART) facility or Virtual Prototyping Lab is set up at NIELIT Calicut as part of Chip to Start-up (C2S) programme of MeitY for proliferation of advanced VLSI and Embedded system design training, research and electronics systems development across the country.

The 'SMART' remote lab facility is available 24x7 and the students, researchers, start-up industries can access the facility, anytime and anywhere.

To learn electronics hardware and embedded system design concepts, and to acquire the design skills it is inevitable to practice laboratory experiments. The facility will enable generation of skilled manpower as well as, Intellectual Property generation in VLSI, electronics hardware and embedded system design areas. The facility will also enable the remote electronics hardware bring up by enabling the EDA Tools, test & measuring equipment like logic analyzers, spectrum analyzers, digital storage oscilloscope, etc.

As per the SemiconIndia Future skills Talent Committee Report Nov 2022, in India we are in need of 3.3 lakhs skilled manpower in electronic design by 2030 and 4.5 lakhs by 2032. The SMART lab facility at NIELIT Calicut will be an enabler for the talent roadmap.



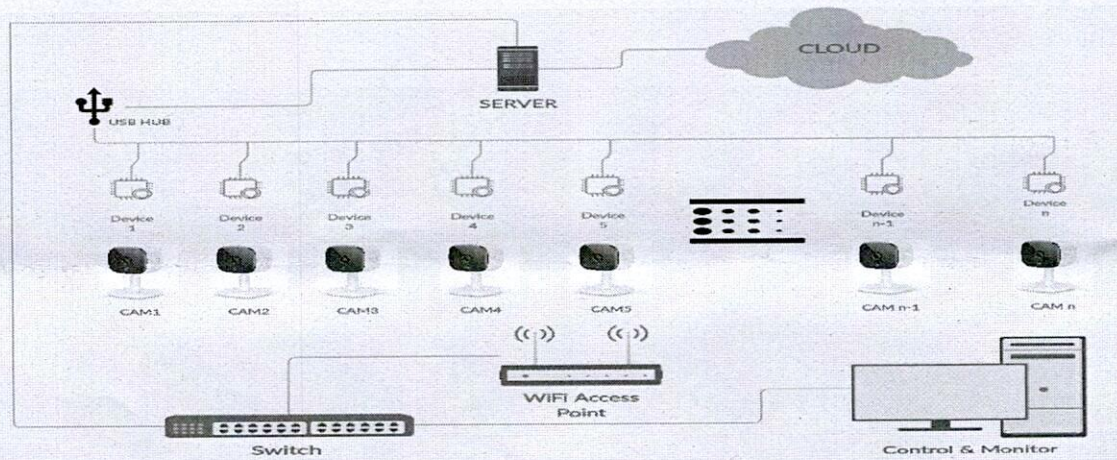
SMART Lab facility at NIELIT Calicut

Project Highlights

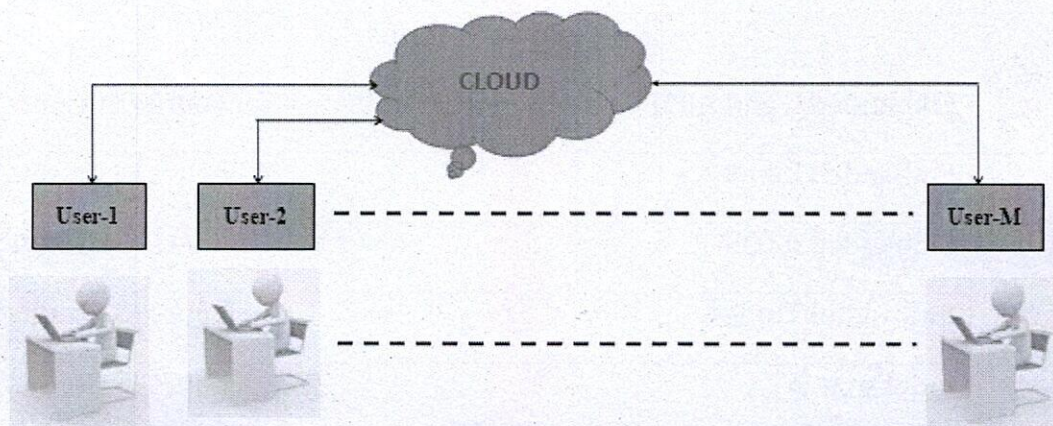
1. A unique national facility for Remote VLSI/Embedded System/Electronic product design advanced skill development programs.
2. Skilling of 1 Lakh candidates over a period of 5 years in VLSI, Embedded Systems and electronic product design.
3. Virtual prototyping lab facility to hand hold start-ups.
4. Facility for researches and industries to remotely access high end electronic hardware, diagnostic equipment and EDA tools
5. 300 remote accessible & configurable hardware and flexible systems.

Operational model:

The functional view of the SMART Remote Lab Setup is depicted below. The hardware set up wired along with Internet Protocol (IP) Camera is connected to a server to enable remote hardware access. The PC attached to the set up performs the control and monitoring functions of the remote hardware lab. The entire toolchain necessary to use the hardware setup is installed in the server and the server is connected to the cloud network. The Server and the PC is connected via the Ethernet switch and function in a synchronized manner for the faithful operation of the multiple hardware set up. The remote hardware access by the end users is also depicted below. Users can use a laptop/PC with internet connectivity to access the remote hardware lab. The users can login into the server via the Virtual Private Network (VPN) and can access the hardware for hands on training.



SMART Lab functional view.



SMART access by remote end users.

Suggested skilling programs via SMART Lab:

| List of MOOC Courses in VLSI and Embedded Domain | | |
|--|--|----------------------|
| VLSI | | |
| Sl No | Name of the Course | Duration |
| 1 | VLSI Fundamentals | 65 hours (3 Credits) |
| 2 | VLSI Verification Fundamentals | 65 hours (3 Credits) |
| 3 | Hardware Modelling using Verilog HDL | 65 hours (3 Credits) |
| 4 | FPGA Architecture and Programming | 65 hours (3 Credits) |
| 5 | ARM-based SoC Design | 65 hours (3 Credits) |
| 6 | Advanced ARM Processors based SoC Design | 65 hours (3 Credits) |
| 7 | SoC Verification | 65 hours (3 Credits) |
| 8 | Static Timing analysis | 65 hours (3 Credits) |
| 9 | VLSI Design for Testability | 65 hours (3 Credits) |
| 10 | High Speed Digital Design | 65 hours (3 Credits) |

| Embedded Systems | | |
|-------------------------|--|----------------------|
| 1 | Embedded C and ARM Cortex Microcontrollers | 65 hours (3 Credits) |
| 2 | Embedded Linux | 65 hours (3 Credits) |
| 3 | Embedded RTOS | 65 hours (3 Credits) |
| 4 | Internet of Things | 65 hours (3 Credits) |
| 5 | Industrial IoT | 65 hours (3 Credits) |
| 6 | Industrial Electronic Product Design | 65 hours (3 Credits) |
| 7 | Advanced ARM Processors and OS Porting | 65 hours (3 Credits) |

| Academic Projects and Internships | | |
|--|---------------------------|-------------|
| Sl. No | Stream | Duration |
| 1 | VLSI Design | 1-4 Months |
| 2 | Embedded Systems | 1-4 Months |
| 3 | Electronic Product Design | 1-4 Months |
| 4 | Reconfigurable computing | 1-4 Months |
| 5 | Ai/ML algorithms on FPGA | 1-4 Months. |

Facilities Available

Development Kits:

| VLSI/FPGA | | |
|------------------|-----------------------------|----------|
| Sl. No | Development Boards | Quantity |
| 1 | Arty 100T FPGA Boards | 75 |
| 2 | Xilinx Kintex-7 FPGA Boards | 2 |
| 3 | Xilinx Virtex-7 FPGA Boards | 2 |

| | | |
|---|-------------------------------------|----|
| 4 | Xilinx ZYNQ FPGA Development Boards | 10 |
| 5 | Xilinx PNYQ Development boards | 10 |
| 6 | VLSI Design Tools | |

| Embedded Systems | | Quantity |
|------------------|---|----------|
| 1. | ARM Cortex M0 Development board | 150 |
| 2. | ARM Cortex M3 Development boards | 50 |
| 3. | ARM Cortex M4 Development boards | 50 |
| 4. | ARM Cortex M7 Development boards | 50 |
| 5. | ARM Cortex M33 Development boards | 150 |
| 6. | ARM Cortex Ax based / RPi 3 & 4 Development boards | 50 |
| 7. | LoRaWAN gateway | 10 |
| 8. | Custom IoT development boards (ESP32 based) | 50 |
| 9. | Custom IoT development boards (Adriano UNO & ESP-01 based) | 50 |
| 10. | Zigbee development board | 50 |
| 11. | BLE development board | 10 |
| 12. | Bluetooth / BLE/thread/6lowPAN/Sub1GHz supported development board for WSN applications | 10 |
| 13. | ARM11 development boards | 10 |
| 14. | ARM9 development boards | 10 |
| 15. | Arduino UNO | 150 |
| 16. | Arduino Mega | 100 |
| 17. | PIC/8051 microcontroller development boards | 50 |

| | | |
|-----|---|----|
| 18. | Wireless mote | 10 |
| 19. | Sensors – Temperature, Humidity, Light, Flow, Gas, Proximity, distance, sound, moisture | |
| 20. | Actuator – Motor control, Relay, Pneumatic | |

Step 1:

The screenshot shows the NIELIT Calicut website. At the top, there is a logo with the text 'न.इ.ल.टी.कै.' and 'NIELIT Calicut'. Below the logo, the text 'NIELIT Calicut Web site' is displayed. A central menu lists several services: 'Courses', 'Course Registration', 'Course Registration Status', 'Candidatewise Selection Status', 'MTech Registration', 'NIC Recruitment', 'CERT Recruitment', and 'Registration for Virtual Prototyping Lab'. At the bottom, the address 'NIELIT Calicut, P.O. Box 10, Kuttanadu, Calicut - 673 015, Kerala' is provided, along with contact details for the Director, including a phone number and email address.

Select the “**Registration for Virtual Prototyping Lab**” options from the menu and this redirects to our online course registration form that asks for the following details: student name, email, mobile number, etc. Participants also need to select the SMART Lab access courses from the Select the course drop down menu.

1. SMART Lab Access – Embedded
2. SMART Lab Access – VLSI


National Institute of Electronics and Information Technology, Calicut
 Ministry of Electronics and Information Technology

Course Registration Form

[Click here for List of Courses](#)
[View Registration Details](#)

All fields are mandatory *

Select the course:

Name:

Date of Birth:

Gender:

Category:

Address for Communication:

Mobile Number (10 digits, min. 90491-9999999999, max. 9999999999999999):

Email id:

Qualification Level (graduate/postgraduate):



Please enter the characters you see in the image above!

Step 3:

After successful registration, the participant will receive the VPN connectivity credentials and other basic information needed to access the remote hardware facility, his available time slot from the Lab coordinator by email.

Step 4:

On completion of above steps, the candidate will receive the remote lab access URL along with a username and password to their registered email before their scheduled slot time.

Step 5:

Upon successful connection, the participant can access the remote hardware lab through the URL and view the hardware and peripherals, along with the desktop view of the remote platform, through which they can access various software tools and IDEs. They can download the code to the target hardware and see the output in real-time. The supported smart GUI will allow the user to give necessary input signals to the target hardware to conduct their experiments.

Step 6:

Every participant will receive a notification before the closing time of their slot to save their work before the stipulated slot time.

For any query, the concerned can reach out at the following:

Name: Shri Sreejeesh S G

Designation: Senior Technical Officer

e-mail: sreejeesh@nielit.gov.in

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Mobile: +91-9447769756

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SMART LAB

SKILLED MANPOWER ADVANCED RESEARCH AND TRAINING

(Facility Under Chip to Start up Programme of MeitY)



1. A unique first of its kind National facility for Remote VLSI / Embedded Systems / IOT / Electronic Product Design advanced skill development programs.
2. Skilling of 1 Lakh candidates over a period of 5 years in VLSI, Embedded Systems, IOT and Electronic Product Design.
3. Hand-holding of startups by enabling Remote Hardware / system bring up.
4. Facility for researches and industries to remotely access high end electronic hardware, diagnostic equipment and EDA tools
5. 200+ remote accessible & configurable hardware and flexible systems.



SMART LAB facility at NIELIT Calicut

National Institute of Electronics & Information Technology, Calicut

Ministry of Electronics and Information Technology, Government of India

SMART LAB SUPPORTED TRAINING PROGRAMS

| Sl No | Track - 1 VLSI | Track - 2 Embedded / IoT | Duration | Credits |
|------------------------|---|--|----------|---------|
| LAB WORKSHOPS * | | | | |
| 1 | Embedded C and ARM Cortex Microcontrollers | Embedded C and ARM Cortex Microcontrollers | 65 hours | 3 |
| 2 | VLSI Fundamentals | Internet of Things | 65 hours | 3 |
| 3 | FPGA Architecture and Programming using Verilog HDL | Embedded Linux | 65 hours | 3 |
| 4 | ARM based SoC Design | Embedded RTOS | 65 hours | 3 |
| 5 | Advanced ARM SoCs and OS Porting | Industrial IoT | 65 hours | 3 |
| 6 | SoC Verification | Industrial Product Design | 65 hours | 3 |

* Participants successfully completing all the lab workshops and a project is eligible to earn Post Graduate Diploma in the respective tracks.

MOOC COURSES

Approved by KTU for **M-TECH PROGRAMS**

| Sl No | Name of the Program | Duration | Credits |
|-------|---|----------|---------|
| 1 | ARM based SoC Design | 65 hours | 3 |
| 2 | Digital India RISC-V (DIR-V) processor based Embedded System Design | 65 hours | 3 |
| 3 | Fundamentals of VLSI Verification | 65 hours | 3 |
| 4 | FPGA Architecture and Programming | 65 hours | 3 |
| 5 | Industrial Electronic Product Design | 65 hours | 3 |



APPLY NOW



www.nielit.gov.in/calicut/content/C2S



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NIELIT

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Information Technology, Calicut**

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