

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



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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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.



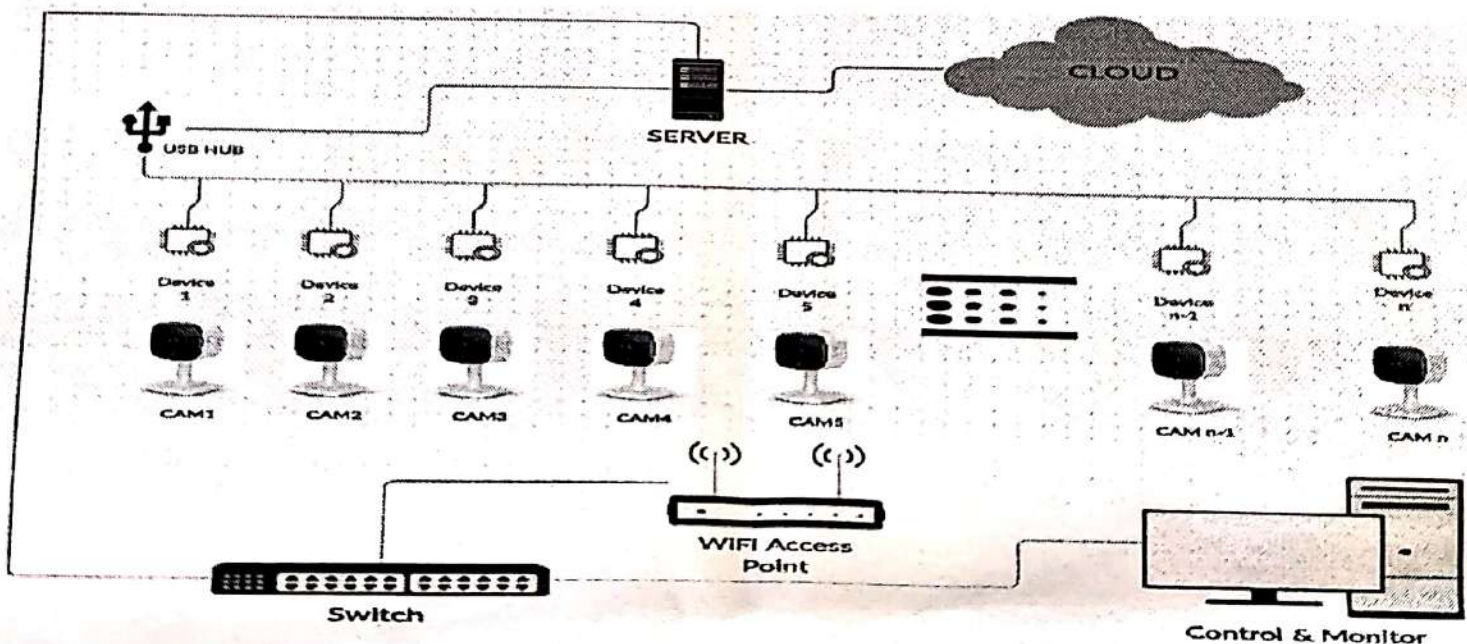
SMART Lab facility at NIELIT Calicut

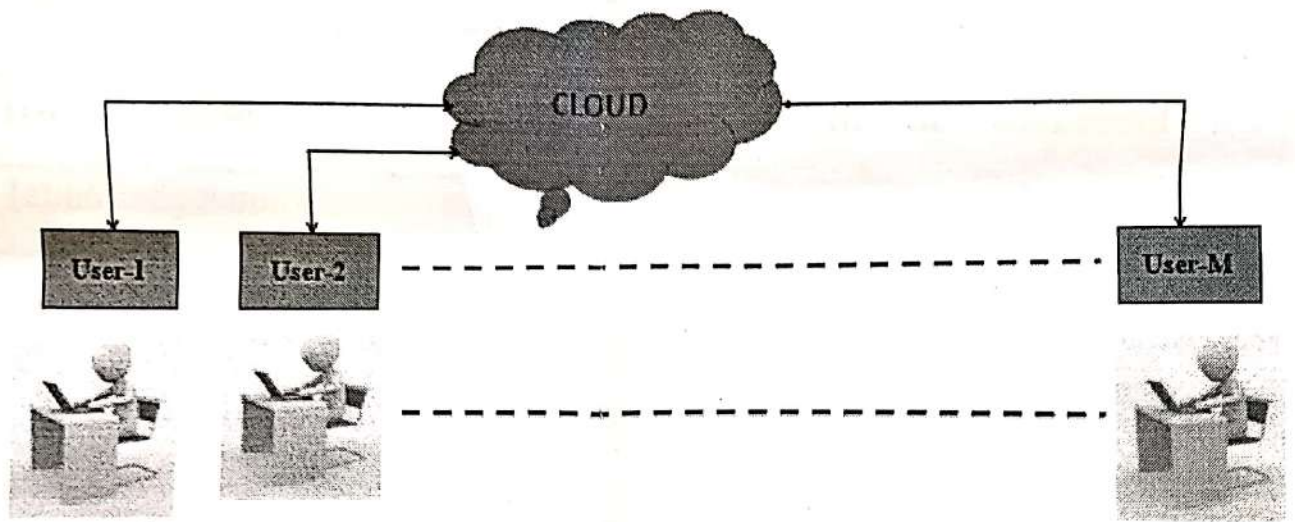
Project Highlights

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 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	

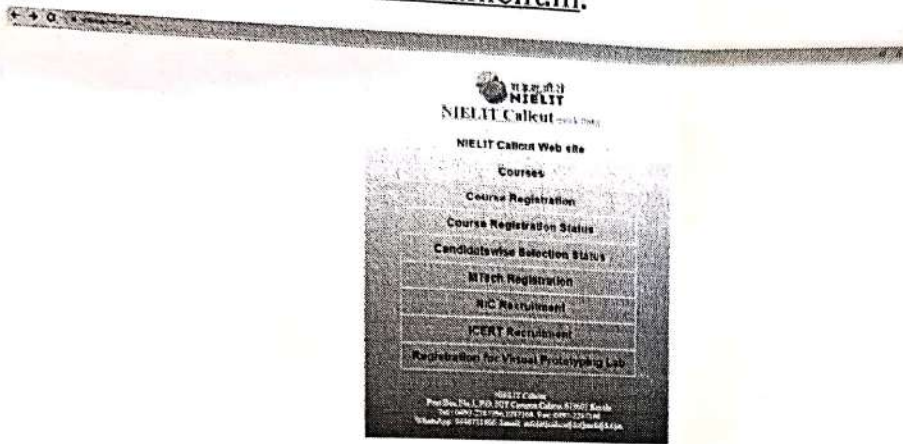
Embedded Systems		Quantity
1.	ARM Cortex M0 Development board	150
2.	ARM Cortex M3 Development boards	50
3.	ARM Cortex M4 Development boards	50
4.	ARM Cortex M7 Development boards	50
5.	ARM Cortex M33 Development boards	150
6.	ARM Cortex Ax based / RPi 3 & 4 Development boards	50
7.	LoRaWAN gateway	10
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	

Virtual Prototyping Lab Access Registration procedure

Step 1:

Participants who want to access the remote hardware lab can register their details on our online portal at www.calicut.nielit.in.

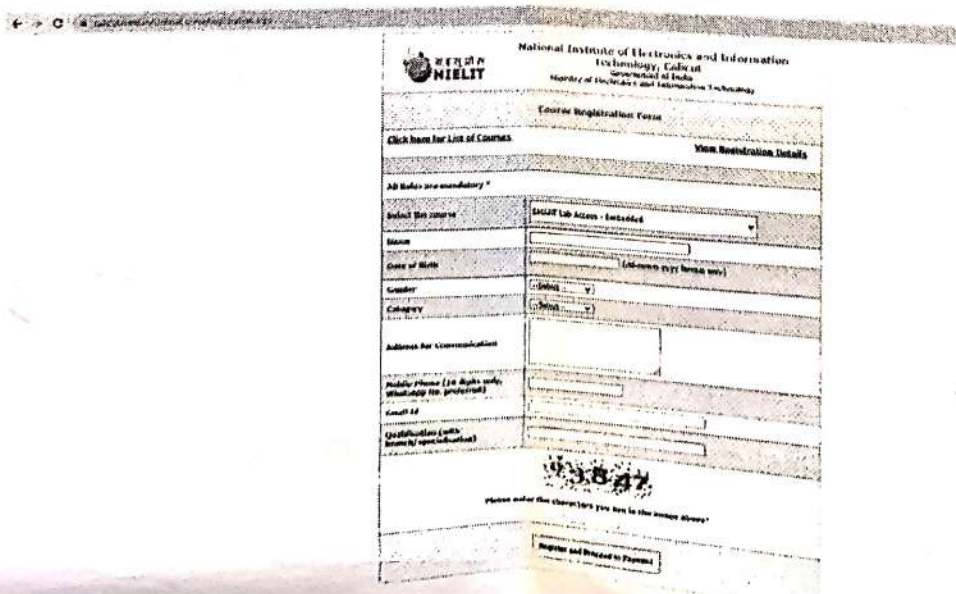


Step 2:

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.

Currently Two Remote hardware access Lab options available select any one lab access option:

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



National Institute of Electronics and Information Technology
 Ministry of Electronics and Information Technology
 Central Registration Form

Check here for Link of Courses: View Registration Details:

All fields are mandatory *

Select the course:

Name:

Date of Birth:

Gender:

Education:

Address for Correspondence:

Mobile Number (10-Digits only, without the leading 0):

Email ID:

Double check fields for any misspellings:

9.8.17

Number of the character you see in the image above:

Register and Proceed to Payment

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:

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