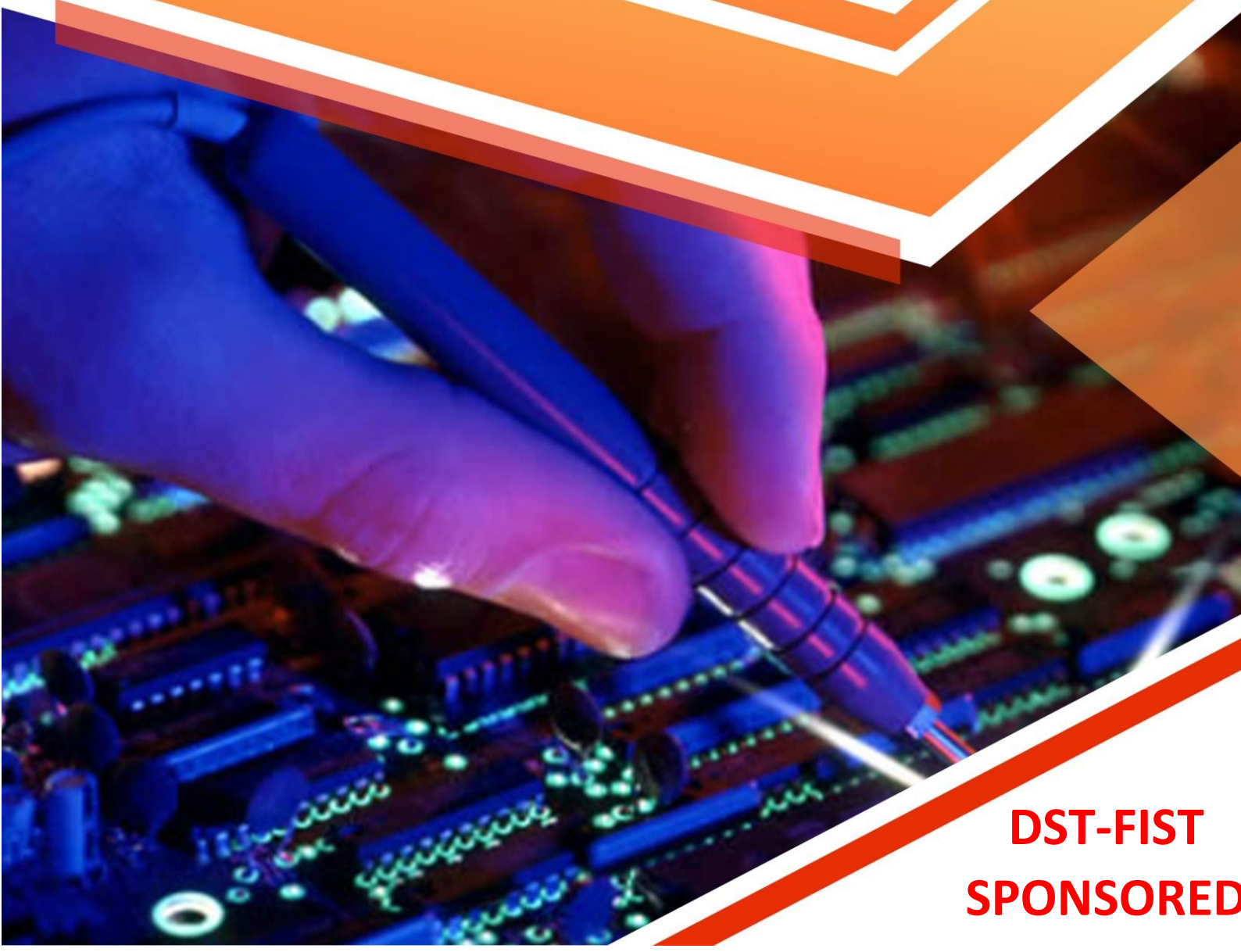
KALASALINGAM
ACADEMY OF RESEARCH AND EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956.
Anand Nagar, Krishnankoil - 626126. Srivilliputtur (Via), Virudhunagar (Dt), Tamil Nadu | info@kalasalingam.ac.in | www.kalasalingam.ac.in
SCHOOL OF ELECTRONICS, ELECTRICAL AND BIOMEDICAL TECHNOLOGY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SINCE 1993

CENTRE FOR SIGNAL PROCESSING AND VLSI DESIGN



DST-FIST SPONSORED

VLSI AND SIGNAL PROCESSING RESEARCH CENTRE

The centre is established in the year 2013 with the fund of 42 lakhs received through DST FIST scheme.

Under this centre two research groups are working

1. VLSI design research groups

This group focuses on designing and developing cutting-edge integrated circuits and systems for various applications. Through collaborative efforts and state-of-the-art facilities, the VLSI Design research group explores novel design methodologies, circuit optimization techniques, and explores emerging technologies such as nano electronics and quantum computing. With a strong emphasis on both theoretical exploration and practical implementation, the group actively contributes to the advancement of VLSI technology, paving the way for new generations of high-performance and energy-efficient electronic devices. The objectives of a VLSI Design research group are:

1. Provide RTL development experience, preferably using Verilog and System Verilog and gain expertise in digital design flow tools for simulation, synthesis and timing analysis.

2. To model and simulate several semiconductor devices such as MOSFET, MBCFET, NCFET, HEMT and to work on various two-dimensional materials and heterostructures.

3. Explore the possibilities of building biosensors and power amplifiers by developing thin film transistors and other devices through numerical simulation.

4. Develop algorithms for image/video compression and also for optimizing VLSI Physical Design stages namely Routing and Developing RTL code in Verilog.

Dr. P. Sivakumar, Professor, ECE and Dean SEET

Thrust areas:
- RTL Design,
- Device / Design Optimization

Dr. J. Charles Pravin, Professor, ECE

Thrust areas:
- Semiconductor device modelling
- TCAD simulation
- Device design based on Different materials

Dr. Shashi Kant Dargar, Associate Professor, ECE

Thrust areas:
- VLSI Design
- Device Modelling
- Thin Film Transistors

Dr. B. Veerasamy, Associate Professor, ECE

Thrust areas:
- Low power VLSI design
- Hardware/ Software Codesign using FPGA

Dr. K. Pandiaraj, Associate Professor, ECE

Thrust areas:
- VLSI RTL Design
- VLSI Physical Design Optimization Algorithms

Dr. K. Jeyaprakash, Associate Professor, ECE

Thrust areas:
- VLSI RTL Design
- VLSI Physical Design Optimization Algorithms

Dr. Jenyfal Sampson, Associate Professor, ECE

Thrust areas:
- Device Modelling
- RTL Design

Dr. Abha Dargar, Assistant Professor, ECE

Thrust areas:
- VLSI Design,
- Device Modelling,
- Thin Film Transistors

2. Signal processing and AI research group

The Signal Processing and AI Research Group is a group of researchers dedicated to advancing the field of signal processing through innovative research and development. This group not only focuses on theoretical advancements but also places a strong emphasis on practical applications. They are ready to collaborate with industry partners, academia, and other stakeholders to identify real-world challenges and develop solutions that can be implemented in various domains such as telecommunications, healthcare, robotics, autonomous systems, and more. The objectives of a signal processing research group are:

1. Advance the state-of-the-art signal processing techniques by conducting innovative research in develop new algorithms for processing, analysis, and interpretation of signals across various diverse applications.

2. Exploring emerging technologies and trends in signal processing, such as deep learning, and edge computing etc to understand the potential applications and benefits.

3. Developing practical solutions and provide consultancy services to organizations seeking expertise in signal processing.

4. Contributing to the scientific community by publishing research findings in reputable conferences and journals by disseminating knowledge.

Members

Dr. M. Pallikonda Rajasekaran, Professor and Director (R&D)

Thrust areas:

- Artificial Intelligence and Machine Learning
- Biomedical Image and Signal Processing
- Processing/Analysing Diagnostic Images for early disease prediction.

Dr. Hima Deepthi Vankayalapati, Professor, ECE

Thrust areas:

- Artificial Intelligence, Machine Learning/Deep Learning
- Image and Signal Processing/ Pattern recognition
- Autonomous Driving/ Vehicles

Dr. A. Muthukumar, Professor & Head, ECE

Thrust areas:

- Signal and Image Processing
- Machine Learning and Pattern Recognition
- Biometric-based cryptosystem

Dr. V. Muneeswaran, Associate Professor, ECE

Thrust areas:

- Biomedical Image and Signal Processing/ Pattern Classification and optimization of Neural Network
- Crime analysis

Dr. Josephine Selle Jeyanathan, Associate Professor, ECE

Thrust areas:

- Artificial Intelligence and Machine Learning
- Biomedical Image and Signal Processing
- Processing/Analysing Thermographic Images for early disease prediction.

Dr. J. Bennilo Fernandes, Assistant Professor, ECE

Thrust areas:

- Artificial Intelligence, Machine Learning, Deep Learning
- Emotional Speech Recognition/ Pattern Classification.

Funding Received:

S. No.	Funding organization	Title of the project	Principal investigator	Duration of the project	Amount (in rs)	Lab
1.	DST	Non-invasive sonometer along with clinically practiced dexa images for estimating bone mineral density for osteoporosis detection in elderly women	Dr. M.Pallikonda Rajasekaran Dr.Vishnuvarthanan Dr. V.Muneeswaran	2 years (ongoing)	28,40,200	DSP lab
2.	Tagore Technology, USA	GaN based Device Design	Dr. J. Charles Pravin	3 years (ongoing)	21,00,000	VLSI Research Lab
3.	DATAINT software Technologies	Preliminary study on Text based IOT and AI platform integration for automation solution provider for the telecom industry	Dr. Shashi Kant Dargar	6 months (ongoing)	45000	VLSI Research Lab
4.	SEED Money Project	Real-time Implementation of attendance monitoring in a firm based on face recognition using SIFT and LBP algorithm with Raspberry Pi	Dr. A. Muthukamar Dr. V. Muneeswaran	1 year (on-going)	4,70,000	DSP Lab
5.	SEEED Money Project	An IoT based Ambient assistive technology grading system for diabetic foot ulcer patients using hybrid machine learning techniques.	Dr. Josephine Selle Jeyanathan Dr. P. Nagaraj Dr. B. Veerasamy	1 Year (on-going)	2,00,000	DSP Lab
6.	DST-FIST	Centre for Signal Processing and VLSI Design	Dr. M.Pallikonda Rajasekaran	5 years (completed)	42,00,000	VLSI Research Lab,DSP lab
7	Sri Ramakrishna health and educational trust	Video on demand server-side web platform for the on-the-go infotainment system with internetless auto-synchronization using single-board computing.	Dr. Shashi Kant Dagar	8 months (completed)	1,97,000	VLSI Research Lab

Ph.D Scholars:

S. No.	Name	Name of the supervisor	Year of completion	Lab
1.	Dr. K. Pandiaraj	Dr. P. Sivakumar	2021	VLSI-R
2.	Dr. R. Radeep Krishna	Dr. P. Sivakumar	2021	VLSI-R
3.	Dr. R. Sridevi	Dr. J. Charles Pravin	2021	VLSI-R
4.	Dr. G. Karthy	Dr. P. Sivakumar	2021	VLSI-R
5.	Dr. S. Ashok Kumar	Dr. J. Charles Pravin	2021	VLSI-R
6.	Dr. V. Sandeep	Dr. J. Charles Pravin	2021	VLSI-R
7.	Dr. K. Jeyaprakash	Dr. P. Sivakumar	2022	VLSI-R
8.	Dr. Jenyfal Sampson	Dr. P. Sivakumar	2023	VLSI-R
9.	Dr. A. Santham Bharathy	Dr. M. Kalpana	2021	DSP
10.	Dr. M. Sakthimohan	Dr. J. Deny	2022	DSP
11.	Dr. R. Alaguselvi	Dr. M. Kalpana	2022	DSP
12.	Dr. S. Murugeswari	Dr. M. Kalpana	2023	DSP
13.	Mrs. N. Bhuvaneswary	Dr. J. Deny	2023	DSP
14.	Mrs. N.R. Saritha	Dr. J. Charles Pravin	In progress	VLSI-R
15.	Mrs. U. Malu	Dr. J. Charles Pravin	In progress	VLSI-R
16.	Mr. B. Mohan	Dr. J. Charles Pravin	In progress	VLSI-R
17.	Mr. P. Harikrishnan	Dr. P. Sivakumar	In progress	VLSI-R

*VLSI-R – VLSI Research Lab

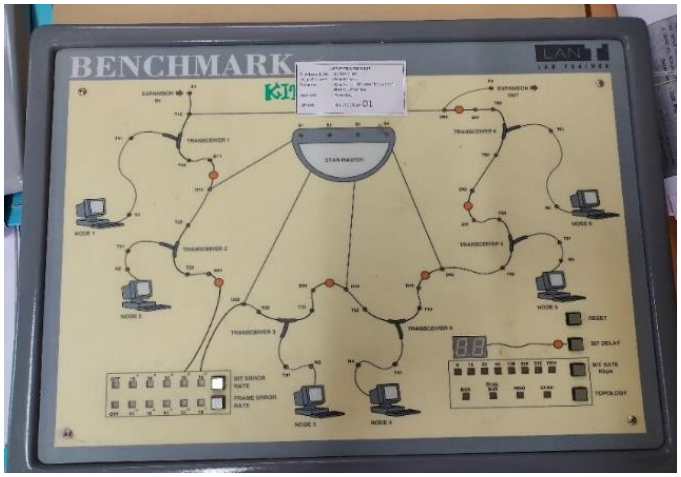
Equipment & Cost:

S. No.	Laboratory Equipment Details	Quantity	Cost(in rs)
1.	HP Printer 1020Laser Printer/CNCH 530497	1	7,100
2.	MEF Laser Printer (HP 1005NH&J244RY, NHSJ243VR)	2	35,398
3.	DESKTOP COMPUTER; Gate Way Lenovo HP	 12 16 4	10,00,500
4.	PANDA B0ARD-TI OMAP 4460 Processor,	2	53,508
5.	XT1OM PROLIVE MOTIN Controller Dual Camera 3D VISION Capture Analysis,	1	12,495
6.	Code Composer Studio IDE 5.0	10 users	1,31,875
7.	OMAPL-138/6748 DSP Starter Kit,	6	1,29,765
8.	DM6437 Digital Video Development Kit With Emulator CSS And Camera	6	2,43,706
9.	Multicore DSP Evaluation Module (6678)	1	45,365
10.	OMAP 3730 Evaluation Module	1	2,05,725
11.	Beagle Bone Black (CORTEX-A8) Beard	1	4,431
12.	Lenove Thinksystem server	1	2,49,500
13.	Synopsys Sentaurus TCAD University bundle (renewed)	3 Licenses	7,98,000
14.	Synopsys VLSI Backend tools	15	9,45,000

15.	Hp System hp TFT Monitor	1	19,750
16.	MATLAB Software	10	5,81,895
17.	Protocol Development Under Layered Architecture Software	10	95,000
18.	CADENCE Software	1	1,80,000
19.	TMS320C50 Based DSP Trainer kit	2	15,682
20.	TMS320C50 Based DSP Trainer kit with FG	6	1,12,625
21.	CDMA DSSS Trainer Kit (Scientech ST 2131) 2 Channel CDMA DSSS Trainer Kit	1	1,41,712
22.	CDMA DSSS Trainer Kit with (Bit Error rate)	1	1,76,000
23.	2 Channel CDMA DSSS Trainer Kit	1	1,23,760
24.	DSP Starter Kit (TMS320C6713)	6	1,45,200
25.	DSP Starter Kit (TMS320C6713)	6	1,43,100
26.	Lan Trainer Kit	2	1,57,890
27.	OHP (actis Esquire)	1	9,500
28.	CRO 20Mhz	3	55,500
29.	10/100 MBPS 24 port Fast Switch (D-Link Make)	2	20,241
30.	Laser Printer	1	6,100
31.	Acer system I5, 12Gen, 16 GB RAM, 512 GB SSD, 19” monitor, USD keyboard and USB mouse.	60	21,94,800

FACILITIES CREATED IN THE CENTRE

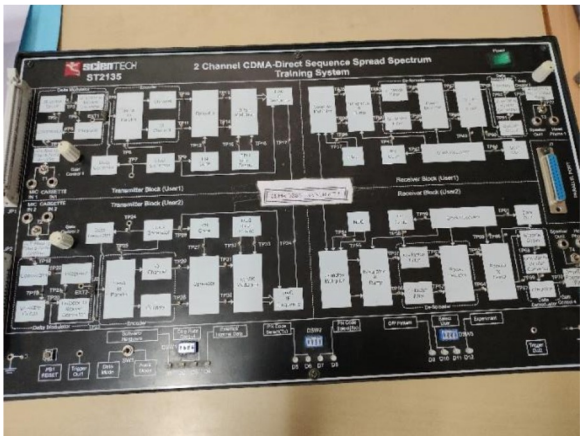
LAN TRAINER KIT:



TMS320C50 BASED DSP TRAINER KIT

TMS320C50 BASED DSP TRAINER KIT WITH FG:

2 CHANNEL CDMA DSSS TRAINER KIT:

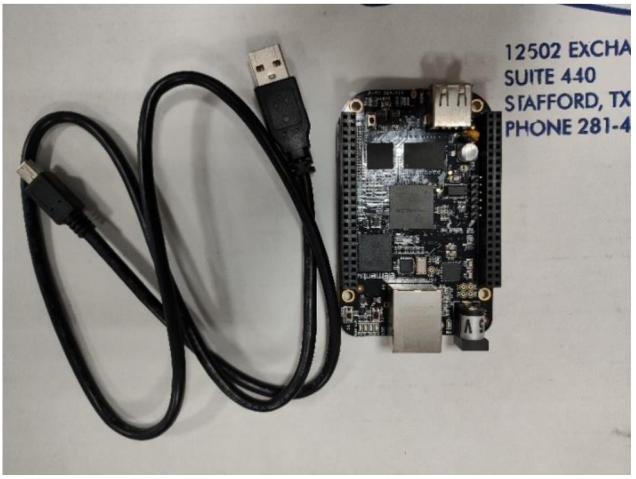


CDMA DSSS TRAINER KIT:

CDMA DSSS TRAINER KIT (WITH BIT ERROR)

PANDABOARD.ORG

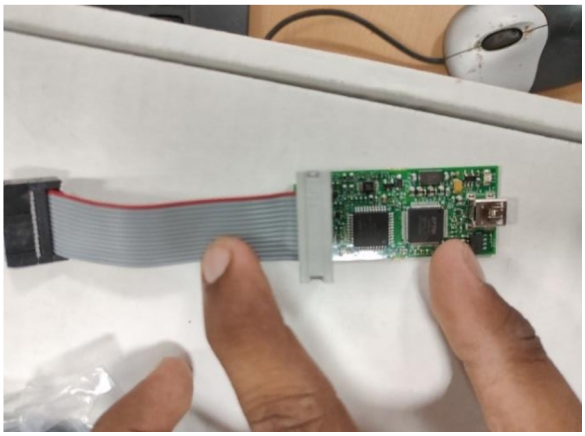
BEEGLE BONE BLACK BEARD BOARD:



DSP STATER KIT:

DSP STARTER KIT (TMS320C6713):

LINUX TRAINER KIT:



Usage

Internal:

1. Full time Ph. D scholars for research purposes, producing publications.
2. Curriculum purposes, conducting a laboratory class – Process and Device Simulation using TCAD.

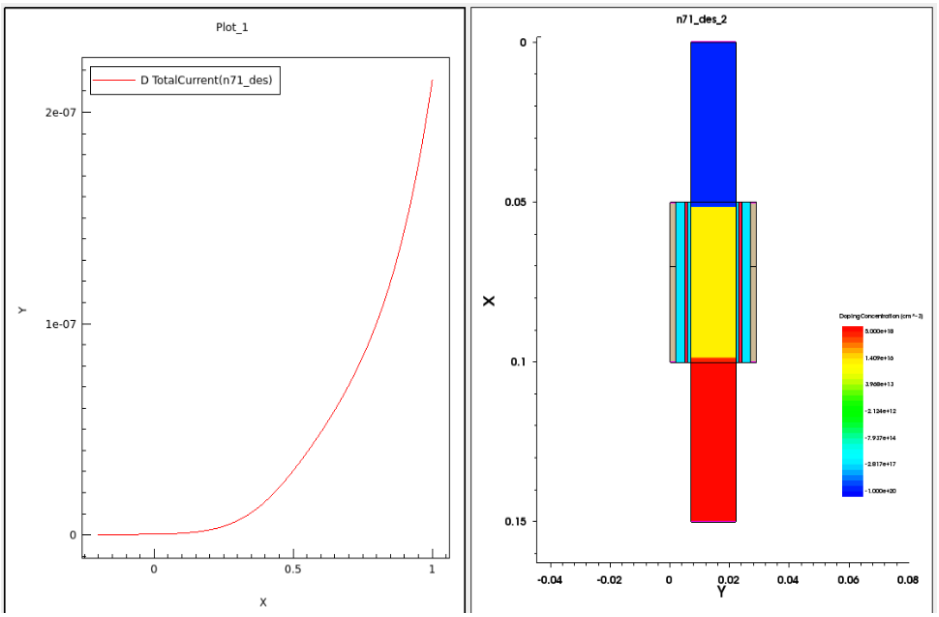
External:

1. Two research scholars from outside colleges performed research work using Sentaurus TCAD tool (VLSI Research Lab).

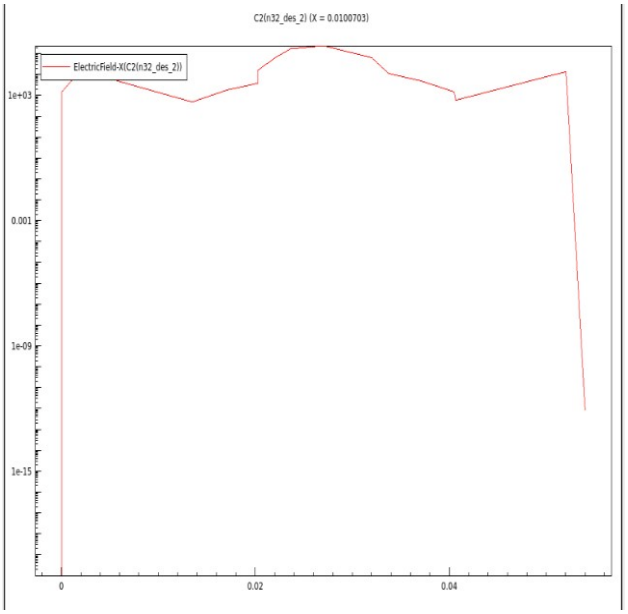
Outcomes of each student:

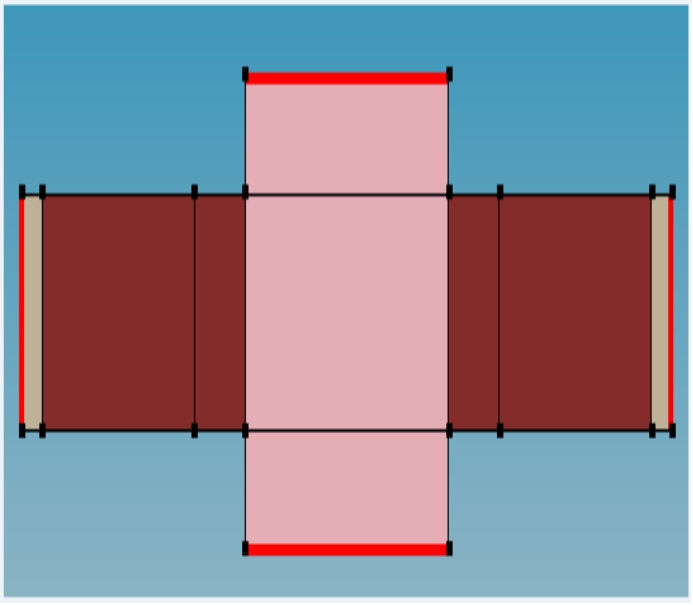
S. No.	Name	Institution	Supervisor name	Institution	Nature of work	Dates
1.	Mrs. M. Shenbagavalli	JP College of Engineering, Tenkasi.	Dr. T.S. Arun Samuel	National Engineering College, Kovilpatti	Finished DC simulation of Dual gate ferroelectric TFET using Sentaurus TCAD	15-07-2023 and 18-07-2023
2.	Mrs. A. Sharon Geege	National Engineering College, Kovilpatti	Dr. T.S. Arun Samuel	National Engineering College, Kovilpatti	Finished DC simulation of Dual gate biomolecule-based TFET using Sentaurus TCAD	27-07-2023 and 28-07-2023

Mrs. M. Shenbagavalli:

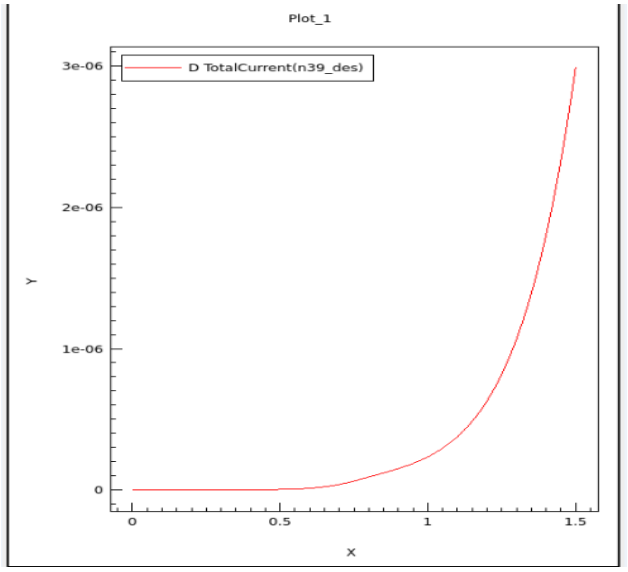


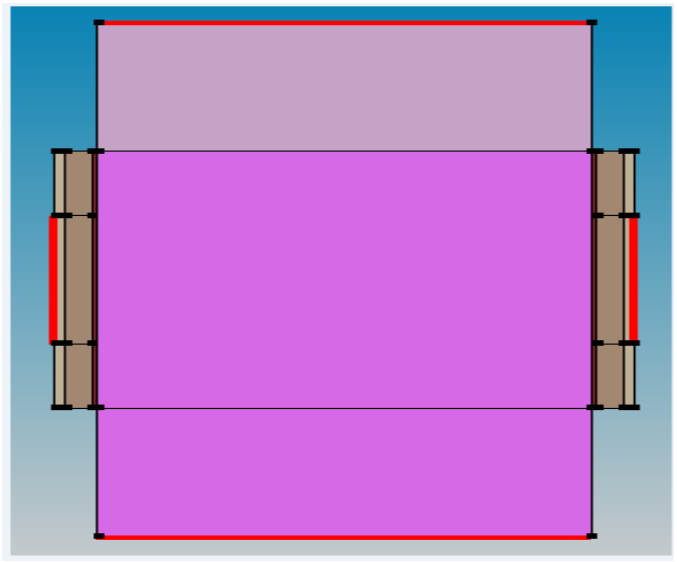
The DC Simulation of Dual gate ferroelectric TFET using Sentaurus TCAD has been performed in the research centre with the support of the research scholars working in the laboratory. The scholar is trained in the centre for performing the simulation. The ferro-electric material in the device simulation is a novel topic to obtain negative capacitance effect in the transistors. The ferro-electric material is created in the device simulation with the help of parameter files & the following promising outputs are obtained. The paper is communicated for possible publication in referred journals.



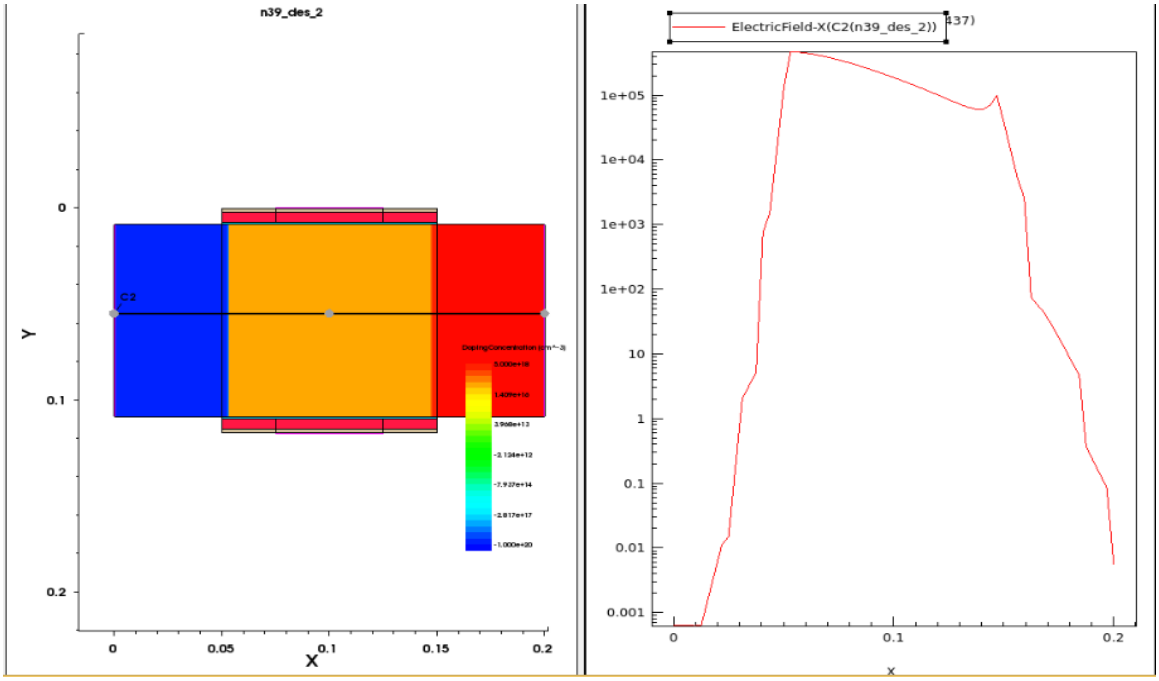


Mrs. A. Sharon Geege

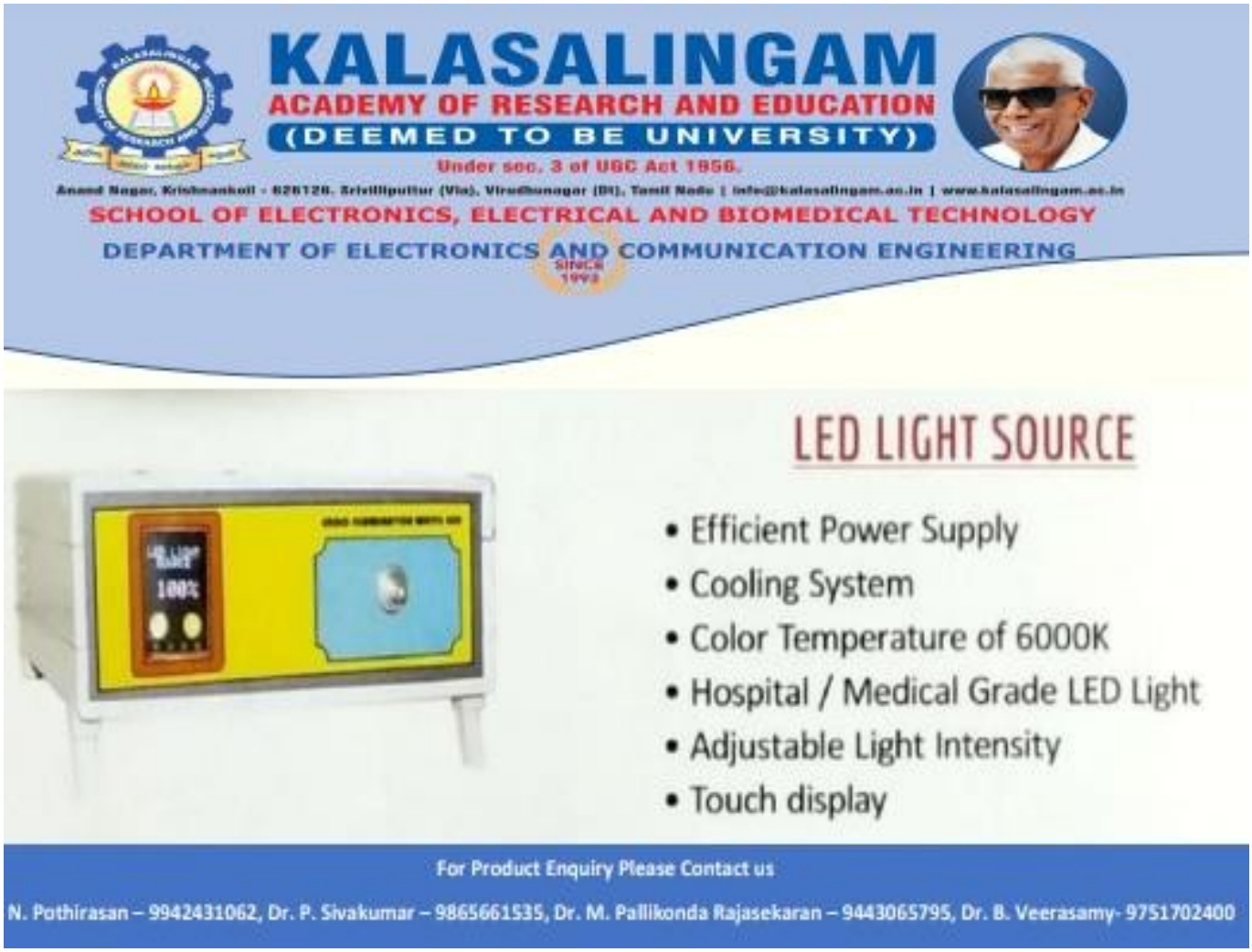




DC simulation of Dual gate biomolecule-based TFET using Sentaurus TCAD has been performed in the research centre with the support & assistance of the research scholars working in the laboratory. The scholar is trained in the centre for performing the simulation. The device is a bio-sensor having cavity for sensing the biomolecules & identifying the disease. The parameter files are optimized to quantify the presence of biomolecule in the device simulation. The paper is communicated for possible publication in referred journals.



Product developed



Centre Outcome

Patent:

S.No	Name of the Faculty Members	Name of the Student Members	Department	Title of the Patent	Application No./C.B.R.No/	Status of the Patent Filed/Granted
1	Dr. A. Lakshmi	-	ECE	Design and Fabrication of Child Rescue Machine from Tube Wells with weight constraint using sensors and wireless camers	202041030735 A	Patent Published
2	Dr. J. Charles Pravin	Ravuru Siva Rakesh, Nagireddy Sumanth, Peddysetty Chakraesh	ECE	Anger prediction and control using machine learning	202141007582	Patent Published
3	Dr. Kalpana Murugan, Dr. V. Muneeswaran	Mrs. S. Murugeswari, Mr. A. Rahul Kumar Reddy, Mr. T. Monish kumar, Mr. P. Ammaar	ECE	Real Time Patient Health Monitoring and Indication to Doctors Using IOT	202141022856	Patent Published

4	Dr. V. Muneeswaran	-	ECE	Artificial Intelligence Tailored Interactive Smart Mirror	202141039094 A	Patent Published
5	Dr.Kalpanamurugan	Cherukuri Nikhil Kumar, Donthu Sai Subash	ECE	SPEECH BASED SECURITY SYSTEM	202141058511	Patent Published
6	Dr.V.Himadeepthi	M.Rohith Reddy, Ch.Satwik, K.Praharsha	ECE	BIOMETRICS BASED LOCKER SECURITY SYSTEM AND METHOD	20214105851	Patent Published
7	Dr. J .Deny	K. Alekhya, Amarnath Reddy, V. Maneesha	ECE	SYSTEM AND METHOD FOR DETECTING OSTEOARTHRITIS USING IMAGE ENHANCEMENT TECHNIQUES	202141058578	Patent Published
8	Dr. K. S. DHANALAKSHMI	E. PAVITHRA, AKASH ARJUN, K. JOSHNA	ECE	SYSTEM AND METHOD FOR EYE DISEASE DETECTION	202241001743	Patent Published
9	Mr.G.Ramesh	Dharmendra Rachakonda, Shaik Imran, Sadda Ashok Reddy	ECE	System And Method For Alzheimer Disease Recognition	202141056795	Patent Published
10	Dr. Shashi Kant Dargar	M.Vijayadharshini, G.Manisha, K.Deepthi	ECE	Medical Chatbot And Method Of Providing Voice Assistance	202141057944	Patent Published
11	Dr.V.Himadeepthi	Gorla Sujansouri, Gummalasainath Reddy, Panditipremsagar	ECE	System And Method For Automatic Attendance With Thermal Scanning	202141056976	Patent Published
12	Dr.T.Dhilipan Rajkumar, Dr.P.Sivakumar	-	ECE, CSE	IOT Based Smoke And Heat Detector	379888	Design Patent Granted
13	Dr. J. Charles Pravin	M. Chenna Reddy Balagonda Pavan Kalyan	ECE	P N Diode Switch	362938-001	Design Patent Granted

14	Dr. V. Muneeswaran	-	ECE	Comprehensive Dementia Support APP with AR Navigation System	202341043285	Patent Published

Research Article Publications:

Type	No. of publications	
	VLSI Lab	DSP Lab
SCI	15	28
Scopus	21	16
Conference	22	52
Book chapters	1	1
E-SCI (or) Web of Science	13	21
Total	**72**	**118**

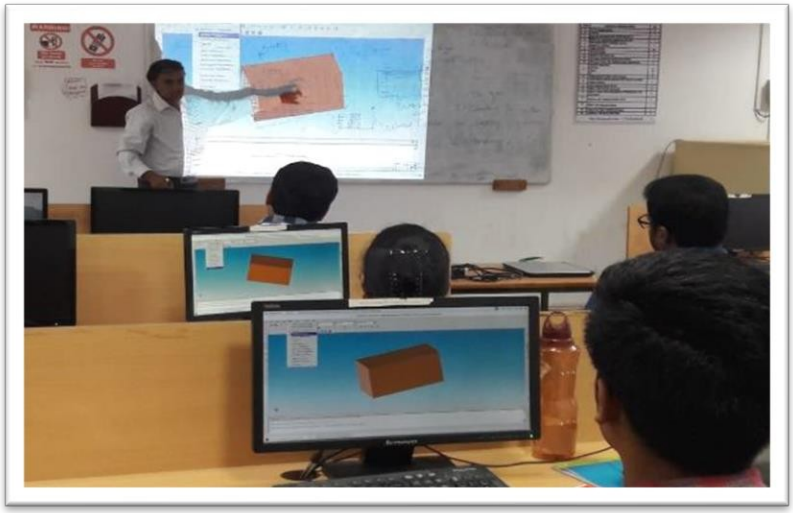
WORKSHOP/FDP ORGANIZED THROUGH CENTRE:

VLSI Design Research Lab

1. An IEEE technical seminar on “Micro and Nano Electronics and its Recent Trends”, organized by the Department of ECE, on 26th July 2017.

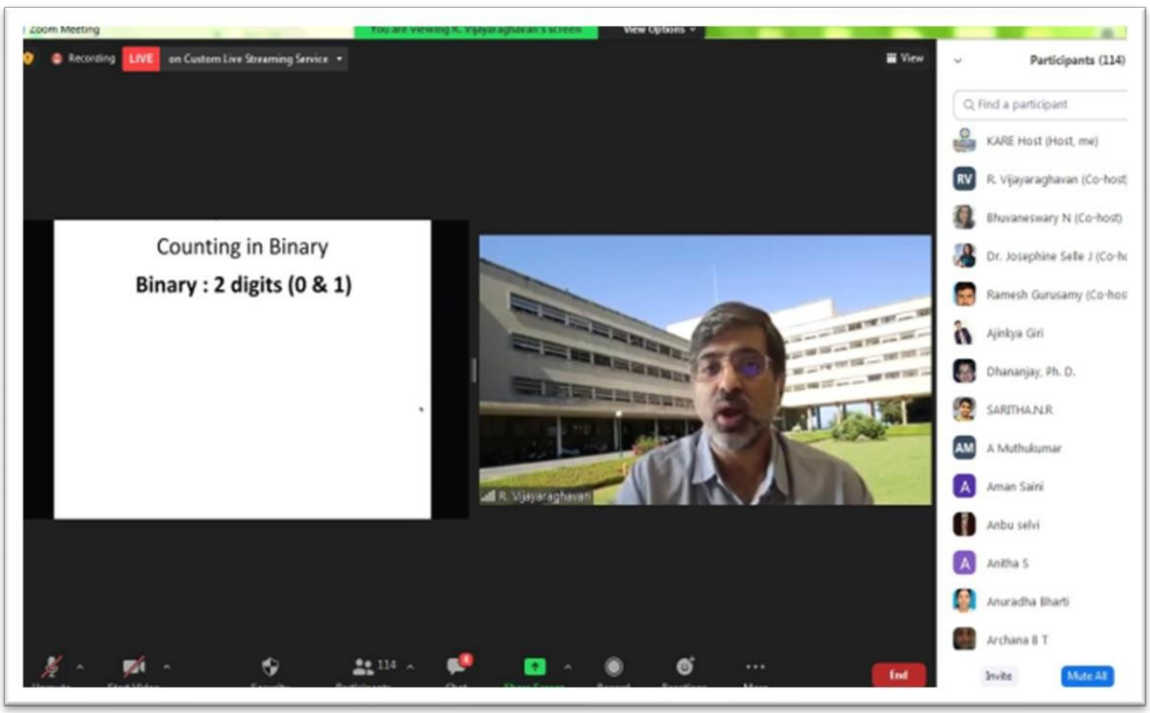
This seminar enhance the participants to cater their knowledge in the field of High-electron-mobility transistor (HEMT), Junction-less Transistor and a brief Introduction to Nano materials for electronics and MEMS applications & also to expand awareness, educate, and engage on all aspects of Technology Computer-Aided Design (TCAD).

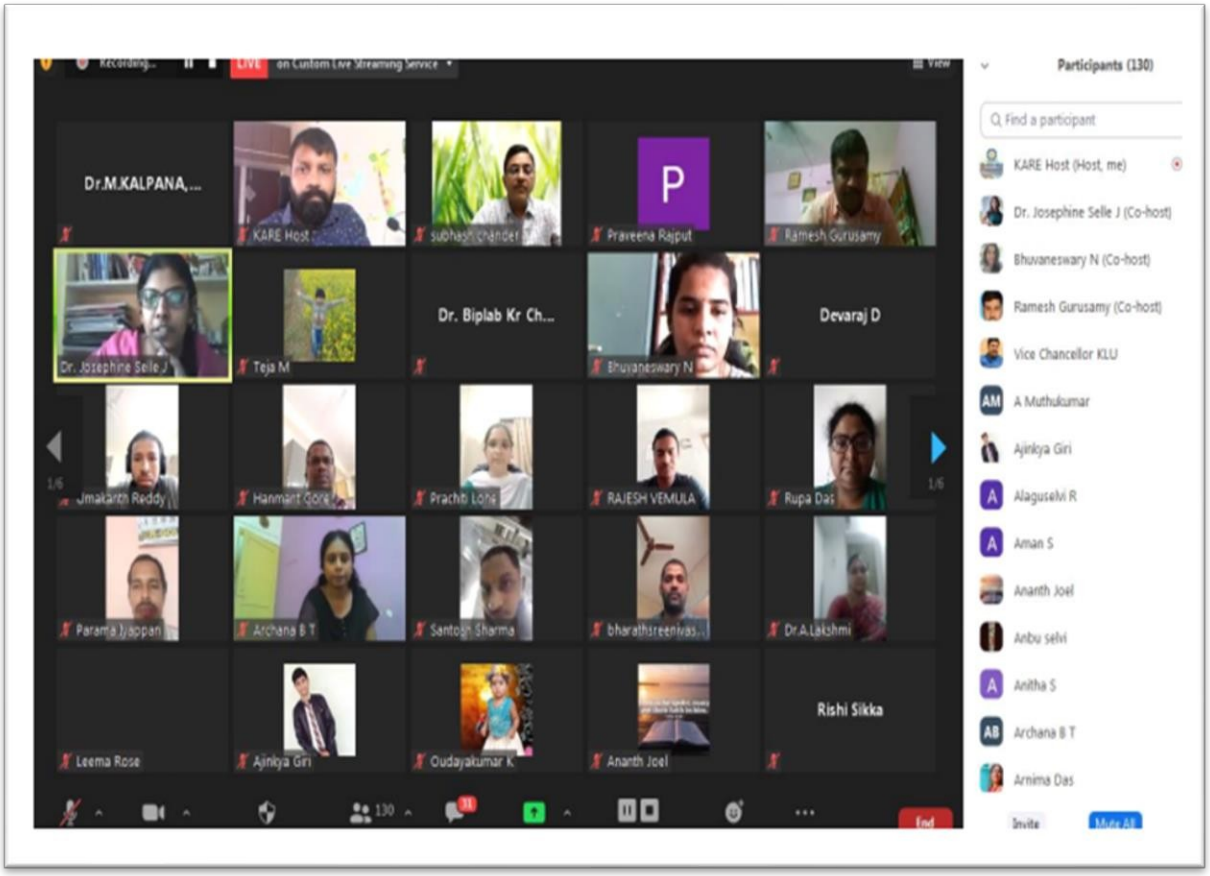
2. A Two-day IEEE Workshop on “Technology Development with TCAD”, organized by the Department of ECE, on 29th & 30th APRIL, 2019.



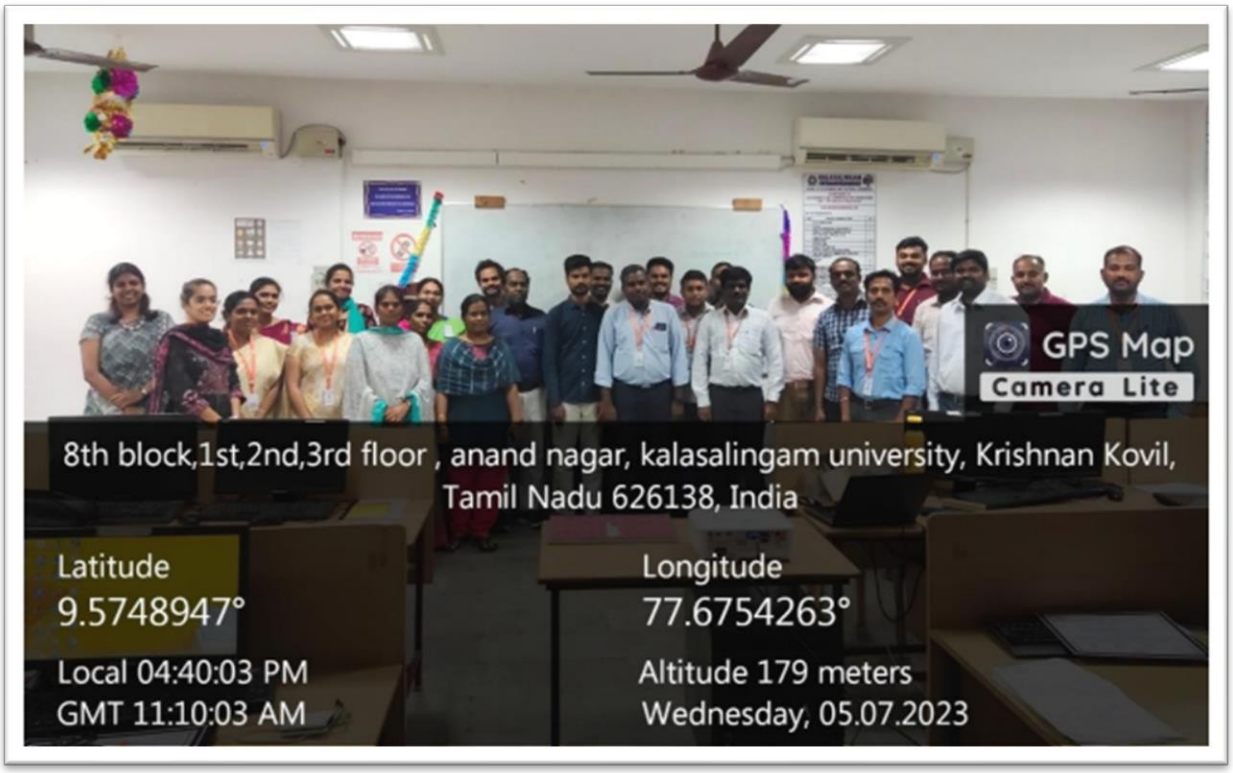
Designing of novel device structures using complex device geometries are the reason for a remarkable growth in simulations in terms of computational as well as physical complexity. Performing an integration task with such computational complexities require the use of a highly efficient simulation software tool. TCAD (Technology Computer Aided Design) simulation tool help us to build new circuits and structures and evaluate its electrical performances. Such a tool requires proper training for addressing the important issues and challenges in this field and for simulating innovative designs thoroughly.

3. Five-day Faculty Development Program on “Future Perspective of Semiconductor Devices”, organized by the Department of ECE, from 21st to 25th June, 2021.





4. Three Days Faculty Development Programme on “Microcontroller Interfacing and IoT Sensors & Devices”, organized by the Department of ECE, on July 3rd to July 5th 2023.



FDP covered Microcontroller Interfacing & IoT using MATLAB and Arduino. Participants gained hands-on skills in sensor interfacing and data analysis. Collaboration and networking opportunities enhanced knowledge sharing. Improved teaching abilities and research potential for attendees. FDP opened doors to promising IoT career prospects.