IIT PALAKKAD

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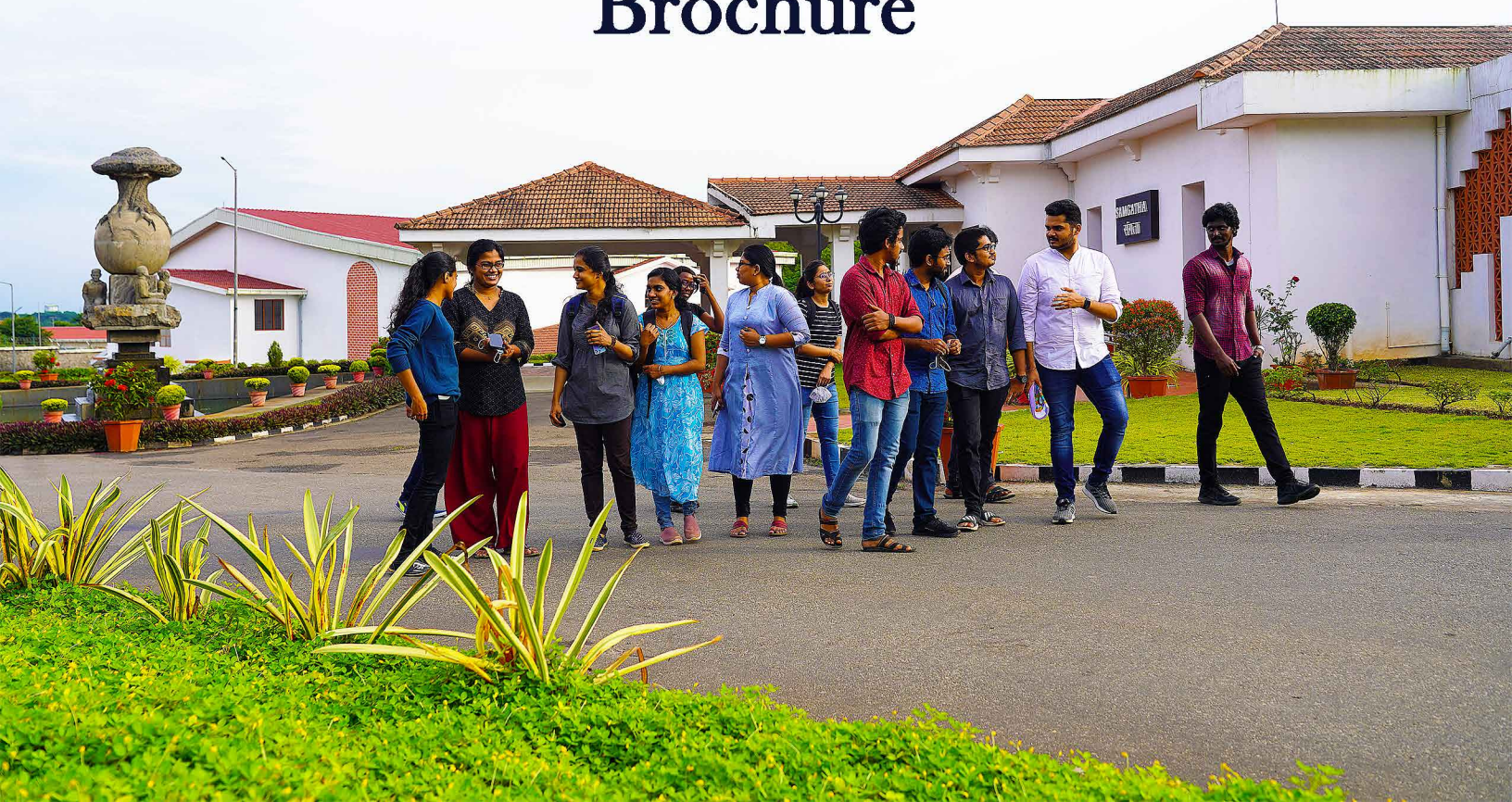
M. Tech
System-on-Chip Design (SoCD)
Brochure



DIRECTOR'S MESSAGE

Welcome to IIT Palakkad!

To be a technologist of relevance today, one needs to have, along with deep understanding in a few core areas, knowledge in a broad set of related topics. This is the basic reason for our emphasis on interdisciplinary programs. I was, therefore, very excited when, a couple of years ago, my young faculty colleagues from EE and CSE decided to join together and start an interdisciplinary M. Tech program in VLSI & System Design areas. Even then, I never imagined that this program would become one of our most successful postgraduate programs with such fantastic internship and placement results from the beginning. It is aptly named as M. Tech in System-on-Chip Design which jointly considers applications, systems, circuits and devices aspects of the design flow in order to nurture far more efficient engineers than conventional programs. With richly equipped laboratories and competent faculty, I am sure that you will graduate with both academic knowledge and workforce skills and go on to make this Institute proud!

Prof. P. B. Sunilkumar

CURRICULUM

The demand for increased performance in modern computing systems has not diminished in spite of slowing down of Moore's law. With ever-increasing complexity of workloads, this demand cannot be met only through isolated advances in device technology, circuit design, or system-level design decisions.

Therefore, it is important that future graduates:

- Understand the performance requirements of complex systems under various operational constraints,
- Understand different components and design abstractions that contribute towards building complex systems, and
- Apply this understanding to improve state-of-the-art in System-on-Chip (SoC) design.

This curriculum is designed to meet these objectives and produce graduates with expertise at the intersection of devices, circuits and systems. At the end of this program, a student will be able to appreciate and apply advances made across domains to design better SoCs.

Daniel Elias Varghese
Graduate Technical Intern @ Intel

"Courses were structured such that the students could venture into the latest happenings and understand how technology is evolving at the moment. The lab facilities and hands-on kit provided by the Institute helped us to learn the courses effectively. Faculty ensured that the latest developments in the research world related to our courses were regularly discussed."

Dr. Vivek Chaturvedi
Assistant Professor, CSE

"SoCD program is curated systematically to bridge the gap between industry and academia. Based on our experiences and numerous interactions with industry, we spotted a severe deficit in engineers who are industry ready. Through this program, we aim to graduate students with industry relevant hard skills to excel in the highly competitive SoC technology industry and meanwhile help build a strong foundation if they choose to pursue higher studies."

WHY JOIN THIS COURSE?

INTERDISCIPLINARY LEARNING WITH EXTENSIVE HANDS-ON EXPERIENCE

DIVERSE PEER GROUP WITH EXTENSIVE ELECTIVES

INTERNSHIP AND JOB OPPORTUNITIES FROM TOP SEMICONDUCTOR COMPANIES

RESEARCH AND LAB FACILITIES WITH INDUSTRY STANDARD EDA TOOLS AND DEVELOPMENT KITS

Arjun Olachery
Interim Engineering Intern @ Qualcomm

"The calibre of the professors is unparalleled. The most striking feature was the high-quality labs that bridged the gap between academics and industry experience, giving us a feel of the real semiconductor world while we were still in college. I highly recommend this course to anyone interested in the fascinating field of SoC Design."

CORE COURSES

- VLSI Design (Theory & Lab)
- Nanoelectronics for Circuits and Systems
- Advanced Computer Architecture
- Advanced Computer Architecture Lab
- Programming Lab
- SoC Design Lab

ELECTIVE COURSES

- VLSI Architecture for Signal Progressing and Machine Learning
- Nanoelectronic Devices
- Sensors and Signal Conditioning Circuits
- Principles of SoC functional verification
- Design of Analog Circuits
- AI for Cyber Security
- Big Data Lab
- Computational Methods and Applications
- Digital Image Processing
- RF and Microwave Active Circuits
- Principles and Design of MEMS
- Computer Vision
- Compiler Optimization
- Parallel Programming

Sandhya K
Interim Engineering Intern @ Qualcomm

"This program has an excellent curriculum, which is taught by highly competent faculty. My internship at Qualcomm enabled me to apply the concepts learnt across my coursework. The curriculum, labs and the faculty have made it possible for me to work on real world SoCs, with ease and confidence."

RESEARCH AND LAB INFRASTRUCTURE

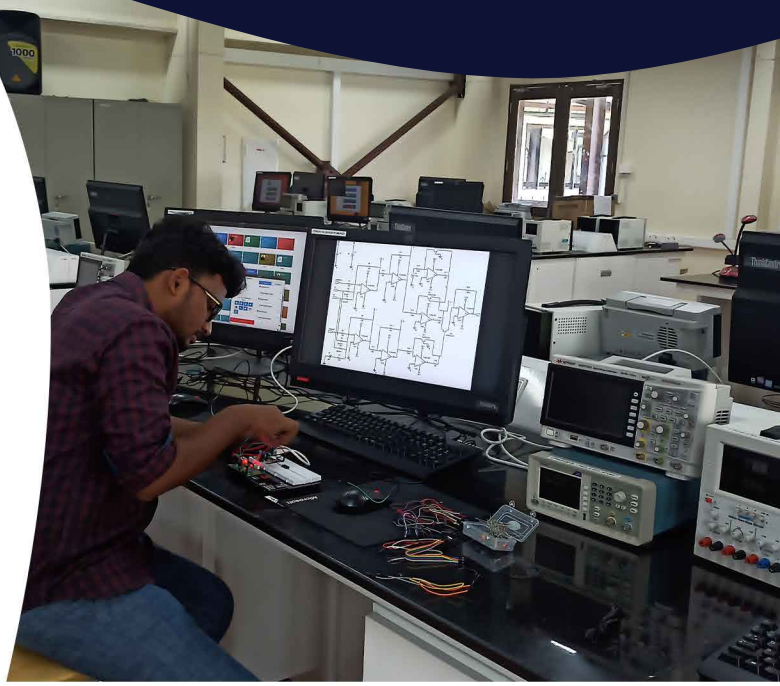
One of the main perks of studying at our Institute is that your curiosity and scientific spirit will be actively encouraged and nurtured. Labs are an integral part of this interdisciplinary SoCD program. Here are a few glimpses of the labs and facilities.

VLSI Design Lab

In the VLSI Design lab, students learn the entire ASIC design flow starting from architectural design, RTL design, design verification, synthesis, static timing analysis, design for testability and finally physical design using industry standard EDA tools.

Programming Lab

This lab grooms students with version control, shell scripts, Makefile writing, debugging, C and Python programming. All these competencies will help to automate the complete SoC design flow. Each of the topics are explored in depth with interesting use case assignments.



Advanced Computer Architecture Lab

A good understanding of Computer Architecture is crucial to understanding the functioning of an SoC. By working with system-level open-source processor tools such as gem5 along with using Verilog to simulate data path and control path of architectures, students can develop a solid understanding of concepts such as caching and pipelining to name a few.

SoC Design Lab

This lab covers all the aspects of SoC design using industry standard tools such as Xilinx Vivado HLx, Vitis USP, and Cadence tools. The complete hardware-software co-design is covered from modern heterogeneous SoC perspective. In this lab, students get access to FPGA development kits such as Zybo Z7, Pynq, Zynq Ultrascale + mpsoc Ev devices and many more to prototype and test their designs.

Course Projects

Some of the elective subjects offer projects as a part of the course. Subjects such as Synthesis of Digital Systems, Real Time operating systems, Digital Image Processing, Compiler optimization etc have practical assignments where students get to apply their knowledge.

Dr. Satyajit Das

Assistant Professor, Data Science

"With the advancements in different application domains such as Artificial Intelligence (AI), Genomic analysis, 5G, Big data, new system design challenges are emerging and the market is booming as well. In this context, IIT Palakkad's vision towards producing a talent pool equipped with broad academic and practical knowledge in modern system design through this M.Tech program is a milestone achievement. We look forward to meeting you all in this program!"

Dr. Revathy Padmanabhan
Assistant Professor, EE

"The MTech(SoCD) program provides a unique experience to the students, in that their classmates are from diverse academic backgrounds: some with UG degrees in EE or ECE or CSE. This is further strengthened by our Institute's well-equipped research and lab facilities, with active push for interdisciplinary research at UG and PG levels. The Institute's career development and placement cell has enabled our students in receiving excellent internship and placement opportunities."

Central Micro-Nanofabrication Facility & Central Instrumentation Facility

The Central Micro-Nano Fabrication Facility (CMFF) has class 100000 and class 10000 cleanrooms, well-equipped for fabrication of devices. The cleanroom houses fume hoods, a deionized water plant, RF sputtering and thermal evaporator systems, glove box, and a mask aligner. The range of equipment in the Central Instrumentation Facility (CIF) facilitates chemical, structural and electrical characterization of the samples. We have the facilities to perform electrical characterization from low to high frequencies.

Innovation Laboratory

To promote the 'Make-in-India' initiative of the Indian Government, the Innovation Lab at IIT Palakkad is equipped with all the instruments a tech hobbyist would require. Comprising a set of table top computer controlled machining systems: a dual-head 3D printer, a CNC router, a CNC milling machine and a CNC lathe, this lab enables the precise fabrication of prototypes. The aim is to be able to eventually incubate companies and nurture entrepreneurs.

FACILITIES

Moodle

Information on courses, resources, content and assignments are given via the Moodle Learning Management System.

Libraries

A peaceful environment offering a plethora of resources including Books (fiction and non-fiction), Scientific Journals, Magazines, Newspapers. The Library also offers high speed internet access for accessing licensed online resources. The Library also offers access to various journals online with the support of national consortium E-Shodh Sindhu (INFLIBNET).

Student Clubs

There are more than 17 different talent based clubs like coding, sports, singing, dancing, dramatics, photography to name a few; whatever your talent or interest may lie in, name it and we assure you that you can fit right in.

Hostels

IIT Palakkad currently functions in 2 campuses: the Ahalia Integrated campus (Temporary Campus) at Kozhippara and the Nila Campus (Transit Campus) at Kanjikode. Basic facilities, areas for recreation and fitness and 24x7 high speed WiFi connection for all hostellers are available on campus.

Anup Patil
NSS Students' Secretary & Intern @ Synopsys

"Being a part of NSS Unit at IIT Palakkad has helped me in realizing the true meaning of nation building by identifying the community problems and solving them. NSS has built a philanthropic responsibility in me."

Healthcare

All the students of IIT Palakkad are covered under a yearly medical insurance plan during their tenure at the Institute. The Institute has signed MoUs with nearby hospitals for providing cashless medical attention to students. There are several hospitals in and around the campus.

MITRA-Student Wellness & Counselling Cell

Mental health and overall wellness of its students are a priority for the Institute. There are 2 well trained full time counselors who are a part of the Students Wellness Counselling Cell (SWCC) called MITRA. In addition to this, students have free access to YourDOST, an online counselling service, that they can use at any hour of the day.

Ashwini S
Center Coordinator of LiGHT Palakkad & PPO holder @ Intel

"LiGHT clan at IIT Palakkad has been a path finder for me. Being a Centre Coordinator, I was loaded with responsibilities, which nourished many of my social skills like leadership, teamwork and communication. We have conducted many events on the theme of Quality Education for the underprivileged students."

INDUSTRY ACADEMIA CONCLAVE

Our Institute ensures that the students are industry ready by enabling interaction with the top tech giants. This includes Intel, AMD, Microsoft, Nvidia, Qualcomm, Samsung, ARM among the several other leading companies. Participation in this event ensures that the students get well acquainted with the tools and technologies used in the industry, encouraging them to be better prepared for placement season.

Ashutosh Patidar

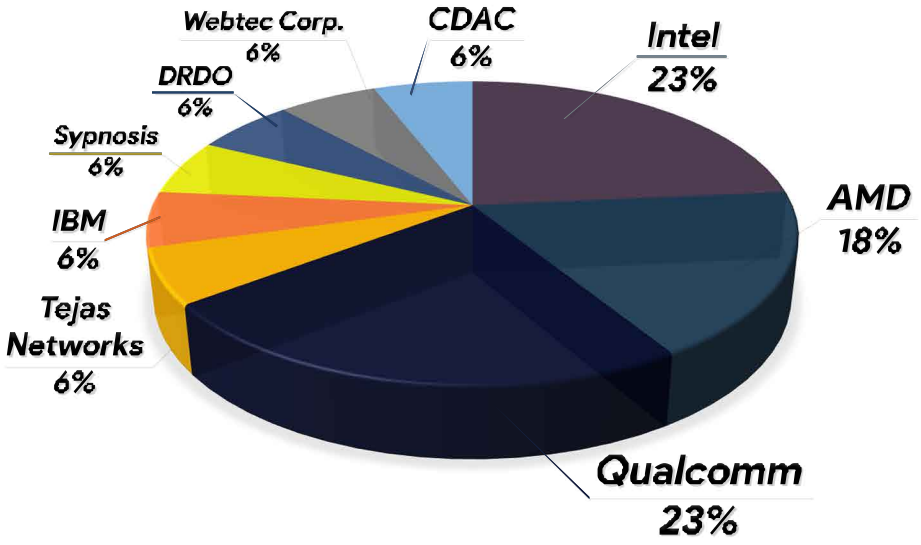
PPO holder in Formal Verification Team @ Intel

"As part of the pioneering graduating batch of the M. Tech (SoCD) program, I am grateful for the resources, facilities, and industry exposure I received at IIT Palakkad. The training and placement cell has brought ample internship and placement opportunities to students from the top chip manufacturing companies."

Dr. Subrahmanyam Mula
CDC Chair and Assistant Professor, EE

"It's inspiring to support students in their next big life step: starting creative and meaningful careers. It is always a joy to watch the excitement when new grads find their first career position! We at CDC, IIT Palakkad get to cultivate connections between employers, alumni, and student organizations leading to internships, jobs, and a larger IIT Palakkad community."

PLACEMENTS AND INTERNSHIPS



We are collaborating with industry leaders in offering joint courses on advanced topics which are typically not common in academic institutions but are extremely important for addressing real-world SoC design problems.

We strongly encourage industry academia collaboration and allow our students to pursue long term internships through which most of our students have received pre-placement offers.

Anupurba Mitra
CDC Coordinator and Research Intern @ CAIR DRDO

"CDC has rightfully caught the eye of the semiconductor giants in the industry. Qualcomm, AMD, Intel, NVIDIA, Texas Instruments and Applied Materials are among the top. The support from our faculty is noteworthy, as they allowed us to work as full time interns in our final year of study. As the placement coordinator, I am happy to say that at least 20 semiconductor and chip design companies have approached us for hiring interns and all of our students have grabbed lucrative opportunities."

Kundan Kumar
Co-Op Intern at AMD

"I am very happy to be a part of one of the best semiconductor companies in the world. This is because of an amazing curriculum designed and taught by highly competent faculty. Learning at IIT Palakkad has helped me do well in my internship, and apply the concepts I learned in real world projects."

Tejas Networks
IQVIA
IBM
cadence
Qualcomm
Wabtec
AMD
Synopsys
GE Healthcare
intel
Silizium Circuits
Mathworks
nVipani
exotel
CDAC
Texas Instruments
zoom
NVIDIA
Vmware
DETECT Technologies
L&T Infotech
ceremorphic

Naman Purohit
Interim Engineering Intern @ Qualcomm

"The course has a dynamic curriculum. The practical way of learning nurtured the way I think and look at real world problems. The programming lab and SoC Design lab made me more confident. I learnt all aspects of chip design."

Faculty Team

Arvind

Vivek

Revathy

Unnikrishnan

Satyajit

Sandeep

Subrahmanyam

Sabarimalai

Sukomal

Mahesh

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