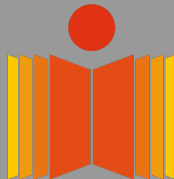


Ph.D. Admissions Brochure

Department of Electrical Engineering

Indian Institute of Technology Hyderabad

August 2024 Session



भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Electrical Engineering Department @ IIT Hyderabad

- Faculty: 34 + 1 (Emeritus) + 2 (Distinguished) + 5 (Adjunct)
- Programs: B.Tech., M.Tech. and Ph.D.
- Specializations:
 - Communications, Signal Processing, and Learning (CSPL)
 - Microelectronics and VLSI (Micro)
 - - Nanodevices and Technology
 - - Integrated Circuits and Systems
 - Power Electronics and Power Systems (PEPS)
 - Systems and Control (SysCon)
- Students: 516 (BTech - 212, MTech - 136, PhD -168)
- Research Labs: 14
- Teaching Labs: 15
- Journal + Conference publications > 1000
- Patents/Products/prototypes > 50
- Research funding in excess of Rs. 216 Crore since inception

Faculty profile (clickable names)



Amit Acharyya (Micro)

Professor

Research interests: Signal Processing Algorithms, VLSI Architectures, Low Power Design Techniques



Ravikumar Bhimasingu (PEPS)

Professor

Research interests: Power system analysis and modeling, AI techniques applications for power systems security improvement, Renewable Energy Integration.



Sushmee Badhulika (Micro)

Professor

Research interests: Nanomaterials, flexible devices, sensors, supercapacitors



Sumohana Channappayya (CSPL)

Professor

Research interests: Image and video quality assessment, perceptually optimal algorithms, multimedia communication



Gajendranath Chowdary (Micro)

Associate Professor

Research interests:
Analog and Mixed Signal Circuit Design



U. B. Desai (CSPL)

Professor Emeritus

Research interests: Wireless communications, cognitive radio



Ketan Detroja (Systems and Control)

Associate Professor

Research interests:
Multivariable control systems,
Distributed state estimation,
AI/ML for control applications,
Hardware-Software design for control



Abhinav Kumar (CSPL)

Associate Professor

Research interests: Green cellular networks, user network selection, device to device communications, and radio resource management in heterogeneous wireless access networks.

Faculty profile (clickable names)



Naresh Emani (Micro)
Associate Professor
Research interests: Nanophotonics,
Mid-Infrared Devices, Integrated Optical
Sensors, Semiconductor Devices.



Ashudeb Dutta (Micro)
Professor
Research interests: Analog Circuit Design,
RFIC, Semiconductor Devices.



Soumya Jana (CSPL)
Professor
Research interests: Multimedia signal
processing and compression,
Network communication,
Information theory



Kiran Kuchi (CSPL)
Professor
Research interests: Communication
theory, Signal processing
for communications, Network MIMO,
Interference mitigation



Sri Rama Murty Kodukula (CSPL)
Professor
Research interests: Signal Processing,
Speech Analysis, Pattern Recognition



Siva Kumar K. (PEPS)
Professor
& *Head of the Department*
Research interests: Multilevel inverters,
open-end winding induction motor drives,
Switched Mode Power Conversion,
micro grids, Power quality and control.



Mohammad Zafar Ali Khan (CSPL)
Professor
Research interests: Space-Time Coding
for MIMO Channels, Cognitive Radio
and MIMO Radar



Shishir Kumar (Micro)
Assistant Professor
Research interests: Bionanosensors,
Nanofluidics, Large scale microfluidics,
Nanocarbons, 2D materials, Composites.

Faculty profile (clickable names)



Kaushik Nayak (Micro)
Associate Professor
Research interests: Electron Device Physics
Nanoelectronic Devices
Novel Transistors.



Vaskar Sarkar (PEPS)
Professor
Research interests: Power system restructuring, voltage stability, transmission expansion planning, microgrids, distribution system analysis



Lakshmi Prasad Natarajan (CSPL)
Associate Professor
Research interests:
Coding and Modulation for Communications



Shiv Govind Singh (Micro)
Professor
Research interests: 3D ICs (Metal-Metal interconnect Technology, Wafer scale Heterogeneous integration) Bio/Gas Sensors, MEMS, Lab on Chip and organic Solar cell



P. Rajalakshmi (CSPL)
Professor
Research interests:
Wireless Sensor Networks,
Cognitive Radio; Embedded Systems;
Optical Networking



Aditya Siripuram (CSPL)
Assistant Professor
Research interests: Signal processing,
Sparse representations, Sampling techniques



G. V. V. Sharma (CSPL)
Associate Professor
Research interests: Communication
Theory, Signal Processing



V. Seshadri Sravan Kumar (PEPS)
Associate Professor
Research interests: Grid Connected
Renewable Energy Systems, Micro Grids,
Wide Area Monitoring & Control.

Faculty profile (clickable names)



Siva Rama Krishna Vanjari (Micro)
Professor

Research interests: Biosensors,
Lab on Chip applications,
VLSI Technology



Abhishek Kumar (Micro)
Assistant Professor

Research interests:
Analog and radio-frequency IC design,
Full-duplex wireless communication



Rupesh Wandhare (PEPS)
Associate Professor

Research interests: Power Electronics,
Electric Drives,
Renewable Energy Sources,
Distributed Energy Generation,
Standalone and Hybrid Energy Generation,
Microgrid,



Shashank Vatedka (CSPL)
Assistant Professor

Research interests:
Information theory and coding,
Physical layer security



Pradeep Yemula (PEPS)
Associate Professor

Research interests: Smart Grids,
Power System Control Centers,
Information Technology Architectures
Smart Grid Standards,
Smart Cities



Oves Badami (Micro)
Assistant Professor

Research interests:
Semiconductor Device Physics,
Computational Nanoelectronics
and TCAD Development



Sundaram Vanka (CSPL)
Associate Professor

Research interests:
Mathematical modeling,
Simulation and prototyping of wireless systems
and networks, especially low power applications

Faculty profile (clickable names)



Shubhadeep Bhattacharjee (Micro)

Assistant Professor

Research interests:

Low-power nanoelectronic devices:
steep-slope (sub-60 mV/dec) transistors,
neuromorphic devices, twisted 2D
heterostructures, nanofabrication and
characterization



Vishal Sawant (Systems and Control)

Assistant Professor

Research interests:

Multi-agent Systems,
Optimal Control,
Autonomous Motion Planning,
Cyber-Physical Security



Jose Titus (PEPS)

Assistant Professor

Research interests:

Medium Voltage Drives,
Electric Machine Design,
Sensorless Control Techniques



Kapil Jainwal (Micro)

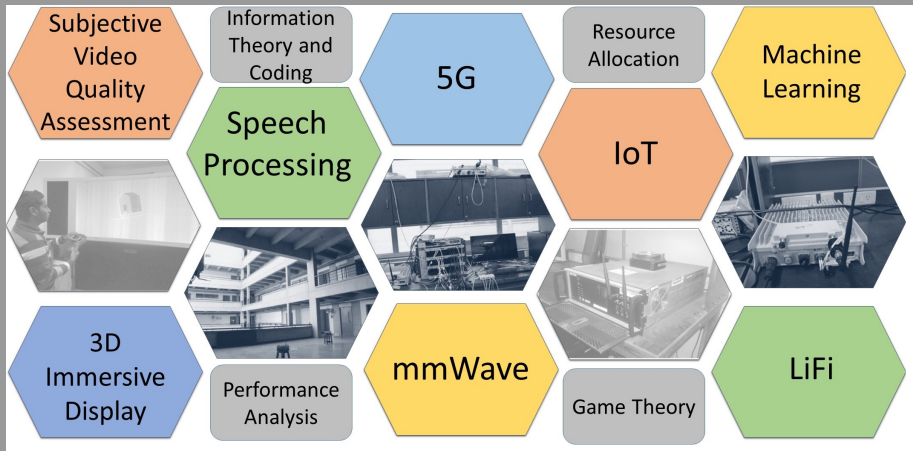
Assistant Professor

Research interests:

Analog/Digital IC Design,
CMOS Image sensors, 2D/3D vision sensors,
ToF based 3D Cameras,
Event-Based Cameras, LiDAR,
Pixel Design and Characterizations

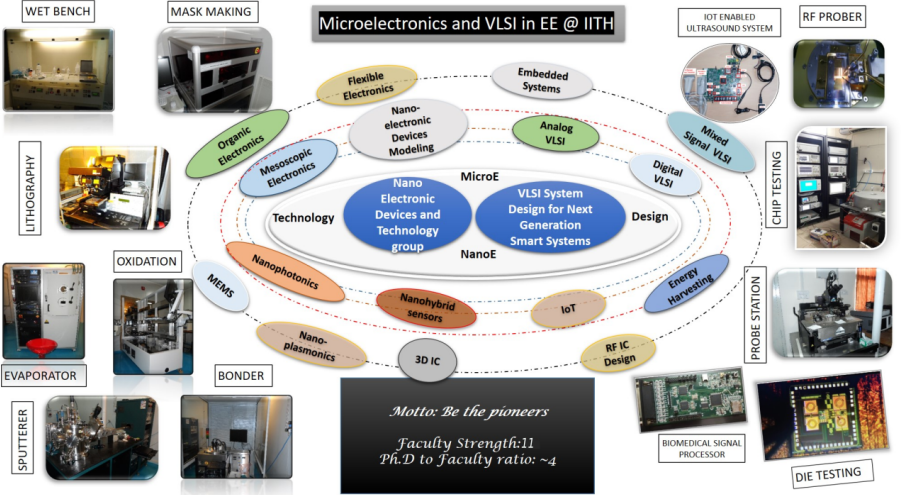
Communications, Signal Processing, and Learning (Research Areas)

Please visit: <https://ee.iith.ac.in/cspl.html>

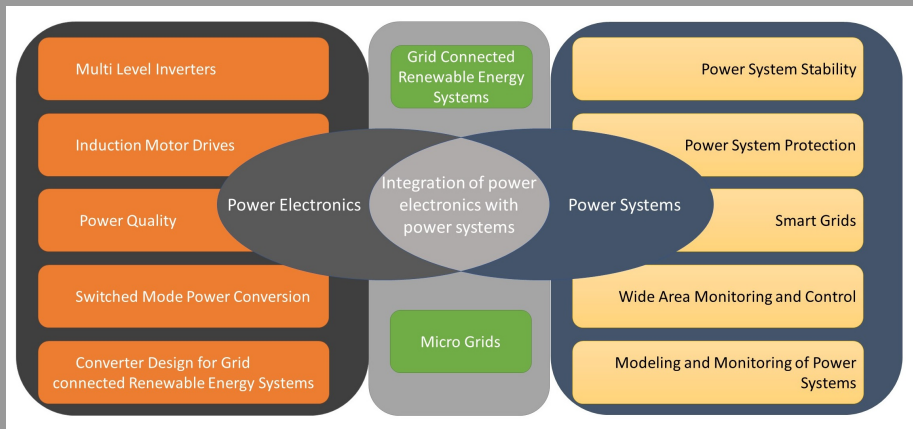


Microelectronics and VLSI (Research Areas)

Microelectronics and VLSI in EE @ IITH



Power Electronics and Power Systems (Research Areas)

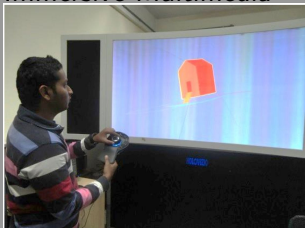


Systems and Control (Research Areas)

- Pattern Matching and Data Mining
- Big Data Analytics
- Condition Monitoring
- Advanced/Statistical Control
- Multi-Agent System
- Systems Biology

Research facilities @ EE, IITH

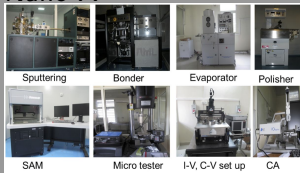
- Immersive Multimedia



- Smartgrids



- Nano-X



- Next-gen communication



Eligibility (Communications, Signal Processing, and Learning)

Who can apply?

Candidates satisfying any of the following criteria

- BE/BTech in EE, EC, AI, MC, CS, ES, EP OR equivalent
(OR)
- ME/MTech in EE, EC, AI, MC, CS, ES, EP OR equivalent
(OR)
- MSc in Mathematics/Statistics OR equivalent
(OR)
- Candidates with a valid GATE score in EC/CS

Eligibility (Microelectronics and VLSI)

Research track: Nanodevices and Technology

Who can apply?

- Candidates with B.E./B.Tech. in Telecommunication Engineering (EC)/Electrical Engineering (EE) / Engineering Physics (EP) / Instrumentation Engineering (IN) / Engineering Sciences (ES) / Nanotechnology / Nanobiotechnology / Material Science and engineering

(OR)

- M.Sc. OR equivalent in Electronics / Electronic Sciences (EL) / Physics (PH)/ Nanotechnology/Material Science

(OR)

- Candidates with M.E./M.Tech. in Microelectronics / VLSI Design / Nanoelectronics / Nanotechnology/ Nanobiotechnology / Material Science and engineering

Candidates without M.E./M.Tech. must also fulfill ONE of the following additional requirements:

- Valid GATE score in EC, EE, IN, PH, MT or XE.
- Valid JEST score in Physics.
- Junior research fellowship (JRF) of CSIR/UGC OR DST INSPIRE fellowship.

Eligibility (Microelectronics and VLSI)

Research track: Integrated Circuits and Systems

Who can apply?

- Candidates with B.E./B.Tech. in Telecommunication Engineering (EC) / Electrical Engineering (EE) / Engineering Physics (EP) / Instrumentation Engineering (IN) / Engineering Sciences (ES) / Nanotechnology
(OR)
- M.Sc. OR equivalent in Electronics / Electronic Sciences (EL) / Physics (PH)
(OR)
- Candidates with M.E./M.Tech. in Microelectronics / VLSI Design / Nanoelectronics / Nanotechnology

Candidates without M.E./M.Tech. must also fulfill ONE of the following additional requirements:

- Valid GATE score in EC, EE, IN, PH.
- Junior research fellowship (JRF) of CSIR/UGC (OR) DST INSPIRE fellowship.

Eligibility (Power Electronics and Power Systems)

Who can apply?

- Candidates with B.E./B.Tech. with following specialization:
 - Electrical/Electrical and Electronics/Power engineering (OR) equivalent
 - Any other related branch of Electrical Engineering/Technology(OR)
- Candidates with M.E./M.Tech. with following specialization:
 - Power Electronics/Power Systems/Electrical Engineering
 - Any other related branch of Electrical Engineering/Technology(OR)
- Candidates with a valid GATE score in the following: EE GATE paper

Eligibility (Systems and Control)

Who can apply?

- Candidates with B.E./B.Tech. with following specialization:
 - Instrumentation and Control/Control Engineering
 - Any other related branch of Engineering/Technology(OR)
- Candidates with M.E./M.Tech. with following specialization:
 - Systems/ Control & Computing/ Automation Engineering
 - Any other related branch of Engineering/Technology(OR)
- Candidates with a valid GATE score in the following: IN/EE/EC
GATE paper

Dual Degree (M. Tech. + Ph.D.) for direct B.Tech./B.E. to Ph.D. candidates

- After successful completion and examination of Ph.D. thesis, both the degrees (M. Tech. & Ph.D.) are awarded to the candidate.
- The following categories are available for Dual Degree (M. Tech. + Ph.D.) program;
 - Direct admission to dual degree program right after B.Tech. from an IIT: $CGPA \geq 8.0$ for admission without GATE;
 - Direct admission to dual degree program right after B.Tech./B.E. at a non-IIT institution: GATE Score based shortlist followed by written test and interview for students with $CGPA \geq 8.0$.

PhD in External/Sponsored Category

- Candidates employed in well-resourced scientific institutions, R & D establishments, and industry laboratories, engaged in research based activities can opt for applying in the external (or sponsored) category.
- The candidate should be working in an organization closely related to the proposed Ph.D. research topic.
- The minimum educational qualification is same as mentioned in the previous specialization specific Eligibility in this brochure.
- In case the candidate is shortlisted for further selection process, the candidate should furnish a No Objection Certificate (NOC) issued by his/her organization for verification.
- The candidates given admission under this program are NOT eligible for any financial assistantship from the institute.

How to Apply

Interested candidates can apply online through IIT Hyderabad's website:
<http://www.iith.ac.in>

Selection Process

- Candidates called for selection should choose one of the four specializations for consideration.
- Selection is based on a two-stage screening process:
 - Written/online test (see syllabus in following slides).
 - Candidates selected after the written/online test will have to appear for a technical interview.
- Final selection is based on performance in the interview.
- It is advisable that shortlisted candidates bring call letter, original educational degree certificates, GATE score cards (if applicable), and hard copy of recommendation letters from two referees in sealed envelopes for the selection process.
- Decision of selection committee will be final.

Syllabus (Communications, Signal Processing, and Learning)

- The written test and interviews will test understanding of fundamental concepts and how they can be applied to problems.
- Focus of the Written Test
 - Linear algebra
 - Probability theory and random variables
 - Mathematical aptitude
- **Interview has a broader scope.** In addition to the above,
 - Linear algebra, probability, math aptitude, programming aptitude
 - Fundamentals of Communications (OR) Signal Processing (OR) Machine Learning
 - Your areas of interest and previous projects
- Please see **<https://ee.iith.ac.in/csplphd.html>** for more information.

Syllabus (Microelectronics and VLSI)

Research track: Nanodevices and Technology

- **Fundamentals of semiconductor devices:** Band-diagrams, Carrier transport, Diode operation, MOSCAP CV, MOSFET operating regimes
- **Basic Quantum Mechanics:** Wave-particle duality, uncertainty, Wave-functions, Schrodinger equation and particle in a box problem.
- **VLSI Technology:** Photolithography, Deposition (Physical and chemical), Wet and dry etching.
- **Basic Electromagnetics:** Coulomb's law, Laplace and Poisson's equations, Maxwell's equations in differential and integral form.
- **Computational skills:** familiarity with a programming environment(C/Matlab/python), writing pseudocode.
- **Miscellaneous topics:** Basic operating principles of electronic and electrical devices in everyday life, basics of signal processing(Fourier transform, windowing, low and high pass filtering).

Syllabus (Microelectronics and VLSI)

Research track: Integrated Circuits and Systems

- **Electrical networks:** Network theorems, Steady state sinusoidal analysis, Time domain analysis of simple linear circuits, 2-port networks.
- **Analog electronics:** Diodes, BJTs and MOSFETs, BJT and MOSFET amplifiers: biasing, small signal analysis and frequency response, feedback, op-amp circuits, Active filters, Sinusoidal oscillators.
- **Digital electronics:** Number systems, Combinational circuits: Boolean algebra, Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders, Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines
- **Signals and systems:** Fourier series and Fourier transform, LTI systems: causality, stability, impulse response, convolution, poles and zeroes, frequency response.

Syllabus (Power Electronics and Power Systems)

In addition to GATE EE syllabus, emphasis will be on:

- Electrical networks
- Electrical machines
- Power systems
- Power electronics
- Control systems
- Linear algebra
- Signals and systems

Syllabus (Systems and Control)

In addition to GATE IN syllabus, emphasis will be on:

- Electrical Networks
- Linear Algebra
- Control systems
- System design
- Advanced Control
- State Space Techniques
- Optimization

Selection Process Note

The department reserves the right to set any cut off criteria for shortlisting the candidates. The shortlisted candidates will be called for further selection process. The department has the right not to select any if appropriate candidates are not found.

Thank You...!

All the Best....!!