About Us

The Department of Electrical Engineering is one of the largest departments in IIT Delhi and has a distinguished faculty, all holding Ph.D. degrees from renowned institutes in India and abroad. Some of the objectives of the department include providing continuous education programs, training students at the undergraduate and postgraduate levels, research and development in all branches of Electrical Engineering and producing scientists and technologists of the highest caliber.

The Department of Electrical Engineering entitles students and researchers with adequate opportunities, which leads to innovations and strong developments in the field. To aid the development, extensive research facilities including well-equipped laboratories with latest state-of-the-art equipment are provided.

The admission to M.Tech programmes consists of shortlisting of students based on GATE (Graduate Aptitude Test in Engineering) Score which is followed by an interview. Such a rigorous process ensures that best of the students are inducted in the department.

The Electrical Engineering Department runs six M.Tech programmes specialising in certain areas of Electrical Engineering and are as follows:

- M.Tech in Communication Engineering
- M.Tech in Control and Automation
- M.Tech in Computer Technology
- M.Tech in Integrated Electronics and Circuits
- M.Tech in Power Electronics, Electrical Machines and Drives
- M.Tech in Power Systems
Notable Alumni

Arogyaswami Paulraj
Professor Emeritus in the Department of Electrical Engineering at Stanford University.

Known For: Sonar Technology, India MIMO Wireless

Vinod Khosla
Venture Capitalist

Known For: Co-founder of Sun Microsystems and Founder of Khosla Ventures

Raghuram Rajan
23rd Governor of the Reserve Bank of India, Chief Economist and Director of Research at the International Monetary Fund and Service Professor of Finance at the University of Chicago Booth School of Business.

Navin Chaddha
Venture Capitalist, Entrepreneur, Company Builder, Managing Director at MayField and Board Directors at Map R Technologies
Integrated Electronics and Circuits (IEC)

The IEC group is part of the Department of Electrical Engineering at IIT Delhi. It is one of the most sought-after courses for M.Tech amongst the students and inducts some of the brightest minds in the country. The faculty and graduate students conduct research in all areas of VLSI design, ranging from device design, photonics, analog, mixed-signal, RF circuits, memory technologies, spintronics and MEMS.

Important Courses

- Analog Integrated Circuits
- CMOS RF IC Design
- Digital system design
- Micro and nano electronics
- I.C. Technology
- Mixed Signal circuit Design
- MOS VLSI Design
- Physical Design Lab

Laboratory Facilities

- Impact and DRDO Labs: Graduate seating, workstation computing, server racks and access to softwares such as Cadence, Synopsys, Mentor, Xilinx Suites.
- Characterization Lab: Semiconductor device characterization facility; probe station, semiconductor parameter analyzer, wafer level measurements.
- VLSI Measurements Lab: Advanced measurements facility; DC, analog, mixed-signal and RF measurements up to a few GHz; temperature chamber, dark chamber.

On-Going M.Tech Projects

- Digital Bandgap
- Development of PMIC for hybrid energy harvesting device
- Digital Bandgap Reference design
- Design and exploration of One Time Programmable (OTP) ROM circuits.
- Background Light Substraction in ToF camera based on SPAD image sensors
- High Accuracy Altimeter System
- Hardware realisation of machine learning
- Design fabrication and testing of packaging platforms for solid state lighting and sensors.
- Bandwidth enhancement of CMOS image sensor
- High speed DAC design
- Microbolometer-based IR detector design
- Ultra-fast Modelling of Leakage: Nano-scale devices to Smartphones
- Signal Processing and Electronics for a microscale DMR (Diagnostic Magnetic Resonance)
- An analytical study of chemo-mechanical model for the lithiation behavior of silicon hollowsphere.
- Design of Error Correction Circuit in the memory system and Circuit design.
- Reliability Characterization and SPICE Modeling in 45nm RFSOI Technology
Computer Technology (C.Tech.)

The Computer Technology Group pursues research in broad areas of Pattern Recognition, Machine Learning, Data Analytics, Neural Networks, Artificial Intelligence and Soft Computing, Multimedia Systems, Music and Audio Processing, Computer Networking, Sensor Networks, Graph Theory, Computer Vision and Image Analysis, Systems Biology, Bioinformatics, Embedded Systems, Parallel and Distributed Processing, Big Data Analysis, CAD for VLSI, Biometrics. The group comprises of faculty members, and Ph.D., M.S. (Research), M.Tech. and dual-degree students.

Important Courses

- Computer Architecture
- Operating Systems
- Machine Learning
- Deep Learning
- Algorithm Design and Analysis
- Multimedia Systems
- Computer Vision
- Computational Perception & Cognition
- Embedded Systems & Applications

Website: [http://ctech.iitd.ac.in/](http://ctech.iitd.ac.in/)

Laboratory Facilities

- **Multimedia Lab**: Computer Vision, Multimedia Systems, Computational Intelligence.
- **Embedded Systems Lab**: High-configuration Workstations, Programmable Motes, FPGA Development Platforms & Workstations.
- **Information Technology Lab**: VMware, Xilinx, Circuit-maker, PSpice, EE servers with openMOSIX cluster architecture.
- **Protocol & Developing Lab**: Good infrastructure with 7 workstations with softwares like NS-2, Mathcad and MATLAB.

On-Going M.Tech Projects

- Study of Various Classification Problems using Frequency Modulated Continuous Wave (FMCW) Radar (Sponsored by Texas instrumentation)
- Automatic detection of representative regions for Celiac Disease from human duodenal biopsies using Deep Learning (in collaboration with AIIMS Delhi)
- Deep ConvLSTM Model Compression for Action Recognition (Sponsored by Samsung Research Institute, Delhi)
- Multistage YOLO & Temporal YOLO - Application with High Frame Rate Camera
- Fingerprint enhancement using deep Reinforcement learning
- Simultaneous Latent Fingerprint Fusion based Matching Techniques
- Delhi AQI Monitoring (IOT), Controlling (Hukka Based Purifier) and Prediction (LSTM Model)
- Fake Fingerprint Detection using deep neural network
- Traffic signs detection and classification using neural networks
- Coloring an image and converting to oil painting (style rendering) using image processing
- Electric Vehicle Charging Protocols
- Video based underwater fish detection
- Machine learning based cuffless blood pressure estimation
Power Systems

The Power Systems group is a part of Department of Electrical Engineering at IIT Delhi. The research interests include Power Systems Analysis and Control, Power Generation, HVDC, FACTS, Distribution Automation, Power Quality, Energy Systems, Power Markets, Energy Audit and Energy Conservation, Renewable Energy (Wind, Small Hydro and Solar PV), Electrical Machines and Drives. In addition to that, this group also works in the areas of power electronics and machine learning/artificial intelligence for their applications in Power Systems.

Important Courses

- Power System Analysis
- Power System Dynamics
- Power Systems Lab
- Restructured Power System
- Power System Transient
- Advanced Power Systems Protection
- Advanced Power System Optimization
- Dynamic Modelling and Control of Sustainable

Laboratory Facilities

- **Power System Lab**: This lab hosts facilities for analysis, application and implementation of power system scenarios, Power Instrumentation, Data acquisition and Energy audit using computing tools/software such as MATLAB, DIgSILENT, PSS®E
- **Smart Grid Lab**: This lab facilitates integration of renewable sources like solar PV, energy management systems etc into conventional grid, hardware implementation of projects and real time simulation using OPAL-RT.

On-Going M.Tech Projects

- Dynamic study and control with penetration of renewable sources.
- Analysis of Fault Induced Delayed Voltage Recovery (FIDVR) using Data-Driven Techniques
- Empirical Fourier Transform-Based Power Transformer Differential Protection
- Electricity Markets: Ancillary Services Market Design for Renewable Integration
- Effect of renewable integration on voltage stability
The Power Electronics, Electrical Machines and Drives group is an integral part of the Electrical Engineering Department at IIT Delhi. The group provides extensive research facilities including well-equipped laboratories with latest state of art equipment. Faculty is actively involved in teaching at undergraduate and postgraduate level through courses covering latest trends in Power Electronics, Electric Machines and Drives, providing hands on laboratory experience. The faculty members have been awarded a number of international and national awards, and constitute editorial boards of leading journals and programme committees of several conferences worldwide. The group has research collaboration with several industries, power utilities and R&D organizations in India and abroad.

**Important Courses**

- Modelling of Electrical Machines
- Power Electronic Converters
- Electric Drive System
- Advanced topics in Power Electronics
- Power Quality
- High Power Converters
- Digital Control of Power Electronics and Drive systems

**Laboratory Facilities**

- **PG Power Electronics Lab**: Various types of converters including rectifiers, AC controllers and inverters are available for extensive experimentation along with equipments like DSP Controllers, power quality analyzers and CROs.
- **PG Machines Lab**: It provides research facilities for electrical machines like induction machines, synchronous machines, DC machines and in addition to these, special electrical machines like stepper motors, BLDC motors, switched reluctance motors, and also sets of generalized machines are also present. The laboratory also houses technologies like solar simulators, Opal RT Real time simulators, etc.
- **PG Drives Lab**: It provides research facilities on drive systems with converter fed dc and ac drives and their operation and control.

**On-Going M.Tech Projects**

- Development of DSP and FPGA based control board for power electronic applications.
- Design and development of two isolated full bridge converters with high frequency transformer link (Dual Active Bridge Converter).
- Design and development of Soft-switching boost converter.
- Power Quality improvement in solar grid interfaced systems.
Control and Automation

The Control and Automation Group has been an integral part of the department of Electrical Engineering. Our mission is to promote cutting-edge research and innovation in the field of Control Engineering. The Group includes seven eminent faculty members with diverse research interest, exploring the following thrust areas: Nonlinear and Robust control, Robotics and Embedded control, Discrete Time Systems and Variable Structure Control, Reinforcement Learning and Adaptive Control, Computational Methods for Modelling Simulation and Control, Distributed Parameter Systems and Biological Systems.

Important Courses

- Linear Systems Theory
- Mathematical Methods in Control
- Nonlinear Systems
- Nonlinear Control
- Stochastic Filtering and system Identification
- Embedded systems
- Neural Networks and Machine Learning
- Optimal Control Theory
- Adaptive and Learning Control
- Networking and Multi Agent Systems

Laboratory Facilities

- **Analog Control Lab**: This lab houses facilities for conducting experiments relating to Analog control systems, such as a Linear system simulator, control of AC and DC servomotor, Analog control of DC motor, a transducer kit, a process control trainer kit, and a synchro transmitter and transformer.
- **Digital Control Lab**: This lab houses facilities for conducting experiments on Magnetic Levitation, Twin Rotor MIMO system (which serves as a model of a helicopter), Gyroscope, Inverted Pendulum, PIC microcontroller based digital control.
- **Biomolecular System control Lab**: The focus in this Laboratory is on developing and applying the mathematical methods of control & dynamical systems. Applications are to complex systems in engineering and nature, especially for design of biomolecular circuits. The approach here uses both theoretical models and laboratory experiments.

On-Going M.Tech Projects

- Control Design for soft exosuit for upper arm augmentation
- Data-Driven iterative controller tuning and learning
- Fuzzy logic based control of electromagnetic levitation devices
- Design and development of a Battery Management System
- Attack mitigation in multi-agent systems
- Soil Moisture Sensing for Agriculture Applications
- Disturbance decoupling by interconnections. Creating interconnections between multiple systems to mitigate disturbance effects.
- Problems in attitude control of spacecrafts
Communication Engineering

Communication Engineering in IIT Delhi is one of the most demanding and research oriented branches in the country. It is the largest research group of Electrical Engineering Department. Our main research areas are: Statistical Signal Processing, Wireless Communications, Cyber-Physical System, Communication Networks, Queueing Theory, Coding Theory, Wireless Security, Information Theory, Cognitive Radio, Array Signal Processing, Optical Communications & Networks, Fiber & Integrated Photonics, Photonic Switching, Nonlinear & Quantum Optics. The group consists of 21 faculty members, M.Tech, PhD and Post-Doc students.

Important Courses

- Signal Theory
- Digital Communications
- Microwave Theory and Techniques
- Detection and Estimation Theory
- Wireless Communications
- MIMO Communication Systems
- Broadband Communication Systems
- Optical Communication Systems
- Advanced Digital Signal Processing
- Coding Theory
- Statistical Signal Processing
- Sensor Array Signal Processing
- Wireless Optical Communications
- Advanced Information Theory

Website: http://comm.iitd.ac.in/

Laboratory Facilities

- **5G Massive MIMO Lab**: This “Next Generation Wireless Communication Laboratory” is India’s first lab which is focused on cutting edge research in 5G wireless communication technologies (e.g. Large and Massive MIMO technologies, Cognitive Radio technologies, Physical Layer Security, Energy harvesting, Green Communication, Device to Device communication, mm-wave communication systems). This lab attracts large amount of funding from the government and industry giants. Through the M.Tech projects, students get trained in the field of emerging communication technologies, thus, helping them becoming skilled in industry R&D sector.

- **Wireless Communication Lab**: This lab is equipped with multitudes of antennas and antenna arrays along with other supporting resources like spectrum analyzer, modulators and demodulators etc. and has 4 complete SDR kits to easily test real-time simulation of different modulation-demodulation schemes.

- **Internet of Things (IOT) Lab**: It has various facilities to carry research in machine to machine communication, IOT along with virtualization technology where any device can access the cloud services. Main research areas are: cloud server based sensor data processing in remote devices like smart car, smart phone, industrial instruments etc.Besides areas such as Cyber security, network architecture and embedded intelligence are also included in research.

- **Multichannel Signal Processing (MSP) Lab**: Here, the research group uses theoretical and experimental array processing techniques for source localization, tracking, separation and reconstruction. The area of applications includes bio-medical signal processing, speech and radar communications.

- **Microwave Lab**: The research of this lab mainly focuses on RF and microwave circuits. Students also gain hands-on experience on microwave circuit fabrications and their operation in real-time circuits.

On-Going M.Tech Projects

- Performance of a Cooperative Link with Energy Harvesting Nodes and a Data-Buffer Equipped Relay.
- Media Based Modulation for Uplink Transmission by Energy Harvesting Nodes.
- Performance of Cluster-based Cooperative Multi-hop relaying with energy harvesting nodes.
- Power optimization in Full-Duplex Communication.
- Performance Analysis of IRS NOMA Wireless Aided downlink.
- Performance of Backscatter Communication.
- Performance Analysis of NOMA network using SWIPT based Energy Harvesting (EH) Full Duplex Relay(FDR).
- SDR-Based implementation of distributed beamforming for RF energy transfer.
- Performance analysis of buffer-aided cooperative communication
- Performance analysis of spatial modulation for mmwave communication.
- Application of MIMO Communication in Visible Light Communication.
- Battery Assisted Energy Harvesting Full Duplex relaying in Cellular Underlay.
- Intelligent Reflecting Surface assisted wireless communication with spatial modulation.
- Performance analysis of underwater visible light communication with oceanic turbulence and misalignment los extending minor project.
Areas Of Research

❖ **Communications:**


❖ **Computer Technology:**


❖ **Control and Automation:**


❖ **Integrated Electronics And Circuits:**


❖ **Power Electronics, Electric Machines & Drives:**

Energy Systems, Electrical Machines and Drives, Power Electronics, Special Electric Machines, Adjustable Speed Drives and Intelligent Motor Control, Power Electronics Converters, Modelling and Control of Power Electronic System.

❖ **Power Systems:**

### Sponsored Research Projects

List of sponsored research projects undertaken by Faculty of EE is as shown below:

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Sponsoring Agency</th>
<th>Sanctioned Funds (Rs. Lacs)</th>
<th>Point of Inflection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Projects During FY 2018-19 with funding above Rs. 200 Lacs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design and Development of Baseband Algorithms and Channel Modelling for Massive MIMO</td>
<td>Department of Telecommunications India</td>
<td>620.20</td>
<td>Saif K Mohammed</td>
</tr>
<tr>
<td>Development and Prototyping of ICT enabled Smart Charging Network Components</td>
<td>Department of Heavy Industry India</td>
<td>542.53</td>
<td>Sukumar Mishra</td>
</tr>
<tr>
<td>LiFi network</td>
<td>Department of Telecommunications India</td>
<td>480.00</td>
<td>Abhishek Dixit</td>
</tr>
<tr>
<td>Design and Development of Biomass -Solar Electricity and Cooling Solutions for Rural India</td>
<td>Department of Telecommunications India</td>
<td>398.88</td>
<td>Sukumar Mishra</td>
</tr>
<tr>
<td>Research and development of smart, secure, scalable, resilient and adaptive cyber-physical power system (S3RA-CPPS)</td>
<td>Department of Science &amp; Technology India</td>
<td>299.95</td>
<td>Bijaya Ketan Panigrahi</td>
</tr>
<tr>
<td>5G Test-Bed: Energy Harvesting - I</td>
<td>Department of Telecommunications India</td>
<td>241.00</td>
<td>Swades Kumar De</td>
</tr>
<tr>
<td>Demonstration of grid supportive EV charger and charging infrastructure at LT level (D-EVCI)</td>
<td>Department of Science &amp; Technology India</td>
<td>206.26</td>
<td>Sukumar Mishra</td>
</tr>
<tr>
<td><strong>Projects During FY 2019-20</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Of development Of Display Source, Projection &amp; Collimating Optics and Camera For Use in helmet Mounted display and Sight (HMDS)</td>
<td>DRDO, Ministry Of Defence India</td>
<td>320.68</td>
<td>Mukul Sarkar</td>
</tr>
<tr>
<td>Physical Unclonable Function(PUF) Based Application Specific IC (ASIC) by Technology CircuitsSystem Co-Development For Strategic Applications</td>
<td>Office Of the Principal Scientific Adviser, Gol India</td>
<td>132.30</td>
<td>Manan Suri</td>
</tr>
<tr>
<td>Physical Unclonable Function(PUF) For Electronic and communication Security</td>
<td>Department Of Science and Technology India</td>
<td>88.42</td>
<td>Manan Suri</td>
</tr>
<tr>
<td>Self-Healing and Energy-Efficient Internet Of Energy</td>
<td>Ministry Of Human Resource &amp; Development India</td>
<td>82.37</td>
<td>Sukumar Mishra</td>
</tr>
<tr>
<td>Biomolecular Circuit Design Using RNA Thermometers</td>
<td>Department Of Biotechnology , Ministry Of Sc&amp; Tech India</td>
<td>79.28</td>
<td>Shaunak Sen</td>
</tr>
</tbody>
</table>
✓ Student-in-charge or placement officer, Training and placement Cell shall provide
the company a Job Notification Form (JNF) https://tnp.iitd.ac.in/

✓ JNF requires details of the job offer – role offered, pay package, place of posting,
eligible departments.

✓ Once the filled-in-JNF with all the required details is received, companies are
assigned username/password to access their online account at https://tnp.iitd.ac.in/

✓ Companies are also assigned space on the server on which they may upload any
presentation, videos, data or other information they want the students to see.

✓ The JNF has to be frozen on the T&P website by the company till a deadline.

✓ Students shall be able to view all the details and the eligible candidates may apply.

✓ After the application deadline for the students, the resumes are visible to the
company.

✓ The company submits shortlist on its online account before a deadline. Short-listed
students get notified.

✓ The placement office allocates the dates for the campus interviews.

✓ After the completion of the selection procedure on campus, company is required to
announce the final list of the students on the same day itself.