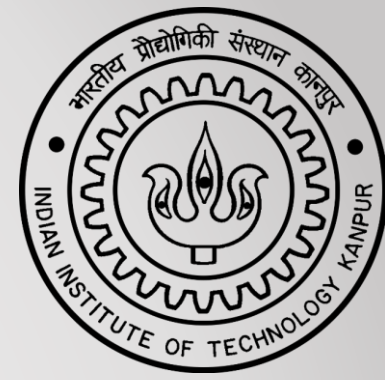


Department of Electrical Engineering



Indian Institute of Technology Kanpur

About EE

- Widely recognized to be a pioneer in Electrical Engineering education in India.
- It offers B. Tech, M. Tech, MS by research, dual-degree i.e. (B. Tech. + M. Tech.) and PhD programs.
- A total of 43 highly qualified faculty who are among the best in the world in their areas of interest.
- Around 250 students, selected through examinations like GATE, JEE pass out each year.
- The department currently houses 35 research labs and 9 teaching labs.
- The research interests of the faculty members encompass a wide gamut of sub-disciplines of Electrical Engineering. Collaboration with faculty members from other disciplines, both within and outside the institute, is encouraged. The research activity of the department includes fundamental research, sponsored and consultancy projects, and is carried out with active participation of the students, faculty, staff and research engineers.

Recent Notable Contributions

- Team NIRATYAYA won the software edition Smart India Hackathon (SIH) 2019 for their solution to the problem statement "To locate the fault in distribution network for ad-hoc maintenance " given by ABB GIS Pvt. Ltd.
- Abhishek Sharma is selected for the Asia-Pacific Radio Science Conference (AP-RASC) 2019 Young Scientist Award instituted by the International Union of Radio Science.
- Dr. Yogesh Singh Chauhan has been selected for the prestigious Swarnajayanti Fellowship in Engineering Sciences.
- Prof. S.C. Srivastava, Department of Electrical Engineering has received the 'Malaviya Award for Excellence in Power Systems' – 2018.
- Akash Bharadwaj and Shivangi Ranjan are featured among the Honda Young Engineer and Scientist's (Y-E-S) Award winners for 2018-19.
- Dr. Anurag Kumar, our alumnus is the current director of IISc Bangalore.
- A.K. Chaturvedi, our Faculty (on leave) is the current director of IITR.

Infrastructure - Labs and Facilities

- **Power Engineering Facilities:**

- High Voltage Lab
- NaMPET Lab
- Networked Control Systems Lab
- Power Management Lab
- Power System Simulation and Research Lab
- Static Controller Lab
- Power Electronics for Renewable Integration(PERI) Lab

- **RF And Microwave Facilities:**

- Microwave Circuits Lab
- Microwave Imaging and Material Testing (MIMT) Lab
- Antennas Lab
- Anechoic Chamber RFID Lab
- Microwave Metamaterial Lab

- **Photonics Facilities:**

- Fiber and Quantum Optics Lab
- Optoelectronics and Nanofabrication Lab
- Quantum Photonics Lab
- Tomographic Imaging Lab

- **Microelectronics and VLSI:**

- Semiconductor Device Fabrication Lab
- VLSI - EDA Lab
- Organic Electronics Processing and Characterization Lab
- Nano Lab

- **Signal Processing, Communications & Networks Facilities:**

- Computer Vision Lab
- Mobile Communications Lab
- Multimedia Wireless Networks Lab
- Multimodal Information Processing Systems Lab
- Networks Lab
- Wireless Communications Coding and Cognitive Radio Lab
- Telematics Lab
- Signal Processing in Networks (SPiN) Lab
- Wireless Sensor Networks Lab
- WiSDOM lab

- **Control And Automation Facilities:**

- Networked Control Systems Lab
- Intelligent Systems Lab
- Intelligent Informatics and Automation Lab

Software and Equipment Used

- **Signal Processing, Communications & Networks:**

Software -CVX , C/C++ , Python, Simulink , Mathematica ,Matlab.

Equipment- Digital Oscilloscope, Frequency Analyzer, FPGA, RTDS,USRPs.

- **RF And Microwave Facilities :**

Software – Cadence, CST, HFSS13.0, NEC, Mapple, Matlab.

Equipment - VNA, DSO, Frequency Generator, Anechoic Chamber, Spectrum Analyzer.

- **VLSI & Microelectronics:**

Software – Xilinx, Mentor Graphics, Cadence, ICCAP, HSPICE, Sentaurus TCAD, Silvaco TCAD.

Equipment - FPGA kits (Spartan 3E, Virtex2Pro, etc.), Spin Coater, Vacuum Annealing System, Agilent Semiconductor Characterization System, Spectrum Analyzer.

- **Power Engineering :**

Software – PSPICE, Microchip, Altium, PSCAD,OPAL-RT,GAMS,RTDS,DIGSILENT.

Equipment - Digital Oscilloscope, Frequency Analyzer, FPGA, RTDS.

- **Photonics:**

Software-Comsol multiphysics, matlab, python, pspice,optilux,cuda GPU programming, FPGA (xilinx), IBM ILOG CPLEX optimization studio etc.

Equipment - Optical spectrum analyzer, fiber optics cable, Lasers(Co2, HeNe),Lockin amplifier, spectrum analyzer,nanofabrication and imaging tools like FIB, SEM, and AFM , optical fiber components , pspice, altium.

- **Control & Automation:**

Software - Visual Studio, Eclipse, Arduino programming.

Equipment - Arduino Platform Boards, Microsoft Kinect for Image Processing.

- **Interdisciplinary Software:**

Matlab, GNU Octave, OPAL RT, RSCAD, PSSE, Android R, NS3, ROS, Scilab, LabVIEW.

- **Interdisciplinary Hardware :**

Odroid, Raspberry Pi, Arduino, LIDAR.

On Going Projects:

□ Control & Automation:

- Facial Expressions Analysis and Emotions Recognition
- A Condition Monitoring System With Multi Agent Mechanism For External Non Contact Smart Inspection Of Buried Oil And Gas Pipelines.
- Learning Robotic Motor Skill, Visual Control And Perception For Warehouse Automation
- Human-Driven Full-Size 4ws4wd Electric Vehicle
- Control of Cyber-Physical Systems- Applications to Smart Grid and Formation of UAVs
- Multi Mobile Wireless Sensor Networks in Tracking and Surveillance
- A Condition Monitoring System With Multi Agent Mechanism for External Non Contract Smart Inspection of Buried Oil and Gas Pipelines
- Development of Unmanned Aerial Vehicles(UAV) Aided Driver Assistance System
- Cyber-Physical Control of Grid Connected Photovoltaic Distributed Generation System
- Development of an Autonomous Mobile Manipulator System for Ware-House Applications: Stowing and Picking
- Condition Based Monitoring of Air Compressors and Motors

□ Signal Processing, Communications & Networks:

- BSNL Telecom Centre of Excellence
- Joint Target Detection and Localization Algorithms for MIMO radar Systems
- Cooperative Communication In Cellular Networks Protocol Design and Performance Analysis
- Device To Device (D2D) Communications for LTE-Advanced Cellular Network
- Cross-Layer Optimization Techniques In Video Streaming Over Wireless Fading Networks
- Development Of Commercial Package For Restoration Of Old Films And Videos
- Virtual Full-Duplex Relaying For Cellular Networks Using Half-Duplex Relays
- Electronic Digitization Of Biomolecules For Rapid And Real Time Detection Of Human Pathogens Using NPT
- Fog Visibility Enhancement
- Space Time Trellis Coding (STTC)/Turbo Coding Based Robust Satellite Image Processing And Communication
- Stochastic Optimization In 5g Networks

□ Power Engineering

- Electric Stress Control Using Filled Polymers
- Reconfigurable Distribution Networks
- Design & Development of Intelligent Electronic Transformer
- A Multi Dimensional Smart Energy Grids Analysis for Indian Scenario
- Adaptive Clustering for Decentralized Resilient Energy Management (ADREM)
- Technical Vetting of Electrical Estimates
- Development of Control Strategies for Grid Connected PV System Utilizing The MPPT and Reactive Power Capability
- Technical Vetting of Electrical Distribution Design of Alaknanda Enclave
- Design and Development of Control and Protection for Hybrid Renewable Integration
- High Reliability DC-DC Converter for Integrating Battery with Low Voltage DC System
- Inspire Faculty Research Grant
- Study to Minimize Over Voltage and Inrush Current of The Transformers During Connecting of Grid Tied Solar PV Plant
- Design and Development of Gan Based Compact DC-DC Converter
- Design and Development of Smart Solar Inverter for Grid Primary Frequency Control with Droop Characteristics and Integrated DC Supply
- Optimal Power Architecture for Next Generation Datacenters
- Development of R&D Platform for Smart City Projects in The Indian Context

- Advanced Communication and Control for The Prevention of Blackouts (Accept) Stabilize Energy
- Use of Synchrophasor In Power System
- Load Modelling and State Estimation
- Use of Synchrophasor Data for Tuning of Power System Stabilizer and on-line Estimation of Generator Parameters

□ Photonics

- Fluorescence Diffuse Optical Tomography for Grading of Dysplasia In Cervical Cancer Progression
- RTE-Tomography Based Cloud Monitoring
- Quantum Key Distribution Using Magneto-Optic Interactions In Epitaxial Garnet Film
- Electro-Optic and Magneto-Optic Interaction Based High Speed Quantum Key Distribution
- Development of Frequency Coded Quantum Key Distribution Solutions Suitable for Development On 25 Km Fiber Optic Links
- Photodiode Arrays for Near Infrared Detection and Tracking

- Integrated Nanophotonic Devices Operating at Room Temperature
- Multi Component Signal Analysis Method in Digital Holography for Precision Metrology
- High Throughput Surface Characterization Using Coherent Optical Imaging

□ RF and Microwaves

- Application of Meta-Material Mushroom Structure for Realization of Planar Single/Triple Passband Filter for Significant Size Reduction
- Microwave Active Remote Sensing of Buried Objects
- Microwave Imaging & Remote Sensing of Concealed Objects
- Develop A Compact Microwave Sensor for Characterization of Radomes and Dielectric Signature Detection of Materials In 3g and 4g Ism Bands
- Microwave Imaging & Material Testing Project
- Development of Microwave Sensor System for Humanitarian Technology Applications
- Design of Compact Multi-Band Multi- Polarized Antennas for Wireless Communication Systems
- High Power Device Analyzer, Enhancement of Existing Vna, Time-Resolved Correlation Measurement, Power Electrics, Antenna Positioner System
- Microwave Metamaterial Absorbers
- BSNL Telecom Centre of Excellence

□ Microelectronics and VLSI

- Study of Electrodes In Organic Solar Cell for Efficiency and Reliability Improvement
- SMDP - C2SD
- Special Manpower Development Programme for Chips To System Design
- Modeling Advanced FDSOI for IC Design
- Hemt Modeling for Broad Temperature and Frequency Ranges
- Modeling and Simulation of III-V and Ge Transistors for Logic and Power Applications
- Characterization and Modeling of Gan Hemt for RF Applications
- Modeling of Advanced Bulk and Soi Mosfets
- Characterization and Modeling of Radiation Hardened Cmos Transistors for Space
- Integration and Enablement of 0.18 micron Rf-Soi Technology for Analog Mixed-Signal Applications
- Application of Meta-Material Mushroom Structure for Realization of Planar Single/Triple Passband Filter for Significant Size Reduction
- Photodiode Arrays for Near Infrared Detection and Tracking
- Design and Development of Control and Protection for Hybrid Renewable Integration
- Codes for Distributed Storage

Academic Courses

- 4G/5G wireless standards design
- 5G wireless technologies
- Machine learning for signal processing
- VLSI system design
- Semiconductor optical communication devices
- Non-linear fiber optics
- Intelligent system and control
- Power electronics in solar photovoltaic
- System , Architecture & application of DSP,
- computer vision and document processing.
- Power convertors for consumer electronics
- Analog/Digital VLSI Circuits Compact Modelling
- Solid State Devices
- Semiconductor Device Modelling
- Organic Electronics
- IC Fabrication Technology
- Microelectronics – I
- Microelectronics- II
- Digital Electronics
- Semiconductor devices technology
- Linear Integrated Circuit Design
- Introduction to VLSI design
- Basics of Modern Control Systems
- Linear Stochastic Dynamic Systems
- Digital Control
- Mathematical Methods in Control Systems
- Neural Networks
- Control of Cyber Physical Systems
- Control System Analysis
- Advanced Control Systems
- Transducers and Instrumentation

- Mathematical Structures of Signals and Systems
- Mathematical Methods in Signal Processing
- Statistical Signal Processing
- Image Processing
- Introduction to Signal Analysis
- Video Signal Processing
- Representation and Analysis of Random Signals
- Detection and Estimation Theory
- Speech Signal Processing
- Digital Switching
- Digital Communication Networks
- Convex Optimization in Signal Processing
- Signals Systems and Networks
- Digital Signal Processing
- Principles of Communication
- Communication Systems
- Communication Skills
- Advanced Digital Signal Processing
- Communication System

- Engineering
- Fiber Optic Systems
- Computational Electro-Magnetics
- Advanced Engineering Electromagnetics
- Smart Antennas for Mobile Communications
- Basics of Power electronic convertors
- Monolithic Microwave ICs
- Microwave Measurements and Design
- Electromagnetic Interference and Compatibility Techniques
- Electromagnetic Theory
- Optimization for Big Data
- Antennas and Propagation
- Radar Systems
- Radio Astronomy
- Optical Communications
- Optical Coherent Imaging
- Quantum and Wave Phenomenon
- Network Analysis & Switching

- Photonics
- Fundamentals of Electric Drives
- Simulation of Model Power systems
- Control Techniques in Power electronics
- Power Management Circuits
- Fuzzy Set, Logic & Systems & Applications
- Advanced Electric Drives
- Smart Grid Technology
- Smart Grid Technology Applications



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