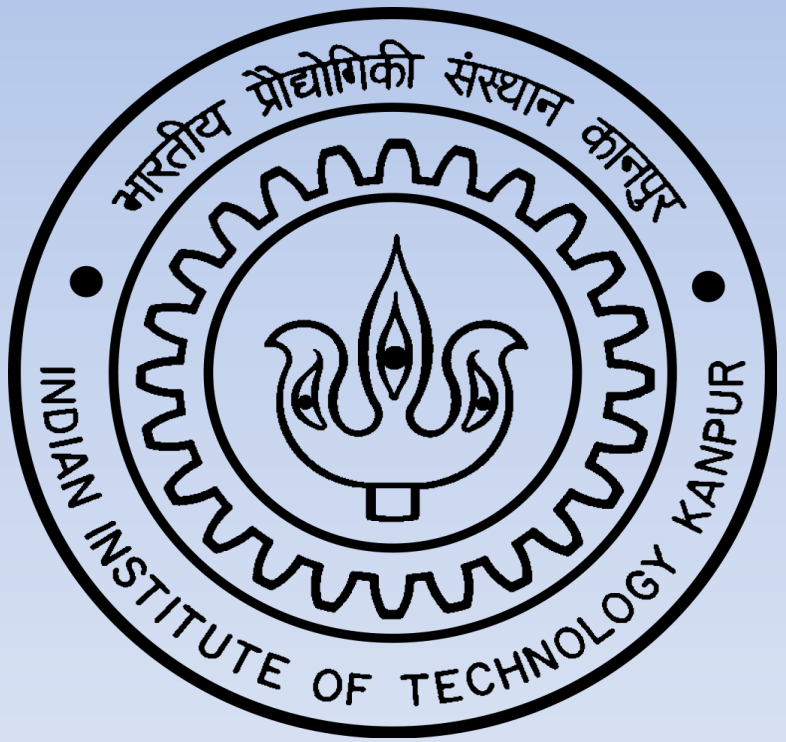
# Department of Electrical engineering




Indian Institute of Technology Kanpur

# About EE

- Indian Institute of Technology Kanpur
- 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 42 highly qualified faculty who are among the best in the world in their areas of interest
- Around 240 students, selected through examinations like GATE,JEE will be passing out this year

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.

"The largest multidisciplinary department"

# Infrastructure - Labs & Facilities

- Power Engineering Facilities:
  - High Voltage Laboratory
  - NaMPET Laboratory
  - Networked Control Systems Laboratory
  - Power Management Laboratory
  - Power System Simulation and Research Laboratory
  - Static Controller Laboratory
  - Power Electronics for Renewable Integration(PERI) Lab
- RF And Microwave Facilities:
  - Microwave Circuits Laboratory
  - Microwave Imaging and Material Testing (MIMT) Laboratory
  - Antennas Laboratory
  - Anechoic Chamber RFID Laboratory
  - Microwave Metamaterial Laboratory
- Photonics Facilities:
  - Fibre and Quantum Optics Laboratory
  - Optoelectronics and Nanofabrication Laboratory
  - Quantum Photonics Laboratory
  - Tomographic Imaging Laboratory
- Microelectronics and VLSI:
  - Semiconductor Device Fabrication Laboratory
  - VLSI - EDA Laboratory
  - Organic Electronics Processing and Characterization Lab
  - NanoLab
- Signal Processing, Communications & Networks Facilities:
  - Computer Vision Laboratory
  - Mobile Communications
  - Multimedia Wireless Networks Laboratory
  - Multimodal Information Processing Systems Laboratory
  - Networks Laboratory
  - Wireless Communications Coding and Cognitive Radio Laboratory
  - Telematics Lab
  - Signal Processing in Networks (SPiN) Lab
  - Wireless Sensor Networks Lab
- Control And Automation Facilities:
  - Networked Control Systems Laboratory
  - Intelligent Systems Laboratory
  - Intelligent Informatics and Automation Laboratory

"Labs @ IITK aim to equip the students with the latest technologies"

# Software and Equipment Used

- Signal Processing, Communications & Networks:
  - Software – CVX , C/C++ , Python, Simulink , Mathematica .
  - Equipment - Digital Oscilloscope, Frequency Analyser, FPGA, RTDS.

- 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 Analyser, FPGA, RTDS.

- 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.

# Academic Projects

## 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 Enlcave
- 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 Synchorphasors 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
- Harmonic Compensation Using Distributed Solar PV Inverters

## Control and Automation

- Facial Expressions Analysis and Emotions Recognition
- 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 Vechicles(Uav)Aided Driver Assistance System

- Cyber-Physical Control of Grid Connected Photovoltaic Distributed Generation System
- Teaching Learning Centre for Internet-of-Things
- Development of an Autonomous Mobile Manipulator System for Ware-House Applications: Stowing and Picking
- Condition Based Monitoring of Air Compressors and Motors
- Cooperative Control for DC Microgrid

## Microelectronics and VLSI

- Study of Electrodes In Organic Solar Cell for Efficency 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 0.18micron Rf-Soi Technology for Analog Mixed-Signal Applications

- Ramanujan Fellowship
- 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

## Signal Processing, Communications & Networks

- BSNL Telecom Centre of Excellence
- Joint Target Detection and Localization Algorithms for Mimoradar Systems
- Qualcomm Wireless Short Course
- Cooperative Communication In Cellular Networks Protocol Design and Performance Analysis
- Device To Device (D2D) Communications for LTE-Advanced Cellular Networks
- Cross-Layer Optimization Techniques In Video Streaming Over Wireless Fading Networks
- Inspire Faculty Research Grant
- Deployment and Management of Brithaspati-3 Services Over NKN for Indian Academia

- Development of Personalized and Performance Based E-Learning Tool for Existing E-Resources
- Application -Aware Image Quality Evaluation of Result Sensing Images
- Commercially Viable Professional Courses
- National Conference on Communications (NCC)

## 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
- Microwave Metamaterial Absorbers
- BSNL Telecom Centre of Excellence

## 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 Films
- Electro-Optic and Mangneto-Optic Interaction Based High Speed Quantum Key Distribution
- Development of Frequency Coded Quantum Key Distribution Solutions Suitable for Development On 25 Km Fibre 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

# Academic Courses

- 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
- Low noise amplifier
- 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

- Simulation of Modern Power Systems
- Advanced Power System Stability
- Electric Power System Operation and Management
- Fundamentals of Electric Drives
- HVDC transmission and Flexible AC Transmission Systems
- Power Electronics Applications in Power Systems
- Control System Analysis
- Power Systems
- Power Electronics
- Electrical Machines
- Power Generation
- Fundamentals of HV ENGG & LABORATORY Techniques

- 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
- Finite Element Method
- Monolithic Microwave ICs
- Microwave Measurements and Design
- Electromagnetic Interference and Compatibility Techniques

- Electromagnetic Theory
- Microwaves
- Antennas and Propagation
- Radar Systems
- Radio Astronomy

- Optical Communications
- Optical Coherent Imaging
- Quantum Wave Phenomenon
- Network Analysis & Switching
- Photonics

# Contact us

**Dr. S. P. Das**
Professor and Head
EE Department

**Office:** WL 111B

**Email**: spdas@iitk.ac.in
**Phone**: +91-512-2597106
**Fax**: +91-512-2590063

**Dr. Aditya K. Jagannatham**
Associate Professor and Convener Students' Placement Committee
EE Department

**Office:** ACES 205D

**Email**: adityaj@iitk.ac.in
**Phone**: +91-512-2597494
**Fax**: +91-512-2590063

- Student Coordinator

Amit Kumar Sharma
PG Placement Coordinator
Mobile no. : 7318020889
Email : aksharma@iitk.ac.in