Indian Institute of Technology, Kanpur

Department of Electrical Engineering
https://www.iitk.ac.in/ee/

2021-2022

Contents

Department of Electrical Engineering

About the Department

- Widely recognized as a pioneer in the field of Electrical Engineering 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 55 highly qualified faculty, among the best in the world in their areas of interest.
- Around 250 students, selected through 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, carried out with active participation of the students, faculty, staff and research engineers.

Recent Notable Contributions

- Dr. Pradeep Kumar has received the P K Kelkar Research Fellowship at IIT Kanpur.
- Dr. Abheejeet Mohapatra has received the Devendra Shukla Young Faculty Fellowship at IIT Kanpur.
- Prof. Animesh Biswas has been chosen for 2020 IETE - Ram Lal Wadhwa Award for outstanding original contribution in the field of electronics and telecommunication during the last 10 years.
- Prof. S. C. Srivastava has received the Distinguished Teacher Award 2020 at IIT Kanpur
- Prof. A. R. Harish has received the Excellence-in-Teaching Award 2020 at IIT Kanpur.
- Prof. K. V. Srivastava has received the Excellence-in-Teaching Award 2020 at IIT Kanpur.
- Prof. Saikat Chakrabarti has been selected as Sajani Kumar Ray Memorial Chair Professor
- Prof. Adrish Banerjee has been selected as Sinclair Broadcasting Chair Professor
- Prof. Aditya Jagannathan has been selected as Arun Kumar Chair Professor
- Chirag Kumar (Supervisor: Prof. K. Rajawat) received the best oral presentation award and Ruchi Tripathi (Supervisor: Prof. K. Rajawat) received the best poster presentation award at Research Conclave'19 at IIT Guwahati.

- The team comprising of Parvraj Pachore, Yugal Gupta and Nachiketa Deshmukh under the guidance of Dr. Sandeep Anand has won the DST-Lockheed Martin-Tata Trusts IIGP 2.0-University Challenge 2019.
- The team of Mohamad Aasif Bhat and Anteshwar Chimadge with Dr. Imon Mondal is one of the eleven winning teams selected for Qualcomm Innovation Fellowship 2020.
- The paper titled 'Optimal Transmission Switching with Injection Uncertainties' by Snehil Chandra, P Naga Yasasvi, Prof. Abheejeet Mohapatra and Prof. S. C. Srivastava is one of the best conference papers on planning, operations, and energy markets submitted to the 2020 IEEE Power Energy Society General Meeting.
- The team of Tharun Kumar Reddy, Madhurdeep Jain, Archit Bansal, Palashdeep Singh, Kushangi Mittal with Prof. L. Behera and Prof. V. Arora got worldwide Second position in the Clinical BCI challenge at IEEE World Congress on Computational Intelligence(WCCI) 2020.
- Dr. Ekant Sharma (Supervisors: Prof. R. Budhiraja and Prof. K. Vasudevan) received the best doctoral dissertation award with honorable mention at the 13th International Conference on Signal Processing and Communications held at IISc Bangalore.
- The paper titled 'Spatial HRTF interpolation using spectral phase constraints' by Aditya Srivastava, Gyanajyoti Routray, and Prof. R. M. Hegde is one of the finalists for best student paper award at the 13th International Conference on Signal Processing and Communications held at IISc Bangalore.

Infrastructures : Labs and Facilities

- **Control and Automation**
  - Networked Control Systems Lab
  - Intelligent Systems Lab
  - Intelligent Informatics and Automation Lab
- **Microelectronics and VLSI**
  - Semiconductor Device Fabrication Lab
  - VLSI - EDA Lab
  - Organic Electronics Processing and Characterization Lab
  - Nano Lab
- **Signal Processing Comm. and Networks**
  - 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
  - 5G Test Lab

- **Power Engineering**
  - 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 Microwaves**
  - Microwave Circuits Lab
  - Microwave Imaging and Material Testing (MIMT) Lab
  - Antennas Lab
  - Anechoic Chamber RFID Lab
  - Microwave Metamaterial Lab
  - RFID Laboratory
- **Photonics**
  - Fiber and Quantum Optics Lab
  - Optoelectronics and Nanofabrication Lab
  - Quantum Photonics Lab
  - Tomographic Imaging Lab

Softwares and Equipments

- **Control and Automation**
  - Software : Visual Studio, Eclipse, Arduino Programming
  - Equipment : - Arduino Platform Boards, Microsoft Kinect for Image Processing
- **Microelectronics and VLSI**
  - 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.
- **Signal Processing Comm. and Networks**
  - Software : CVX, C/C++, Python, Simulink , Mathematica ,Matlab.
  - Equipment : Digital Oscilloscope, Frequency Analyzer, FPGA, RTDS, USRPs
- **Power Engineering**
  - Software : PSPICE, Microchip, Altium, PSCAD,OPAL-RT,GAMS,RTDS,DIGSILENT
  - Equipment : Digital Oscilloscope, Frequency Analyzer, FPGA, RTDS
- **RF And Microwaves**
  - Software : -Cadence, CST Studio Suite, HFSS13.0, NEC, Mapple, Matlab, Advance Design System (ADS)
  - Equipment : VNA, DSO, Freq. Generator, Anechoic Chamber, Spectrum Analyzer.
- **Photonics**
  - Software : Comsol Multiphysics, Pspice, Optilux, Cuda GPU Programming, FPGA (Xilinx), IBM ILOG CPLEX Optimization Studio, Lumerical Mode Solution, 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

Ongoing Projects

- **Control and 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.
    - Automatic Book Copier
    - 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 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
    - Mechanical Design, Development And Control Of A Serial Six Axis Manipulator Arm For Intelligence And Complex Manipulation Tasks
    - Nano Uavs (Like Insect Copter) For Video Capture
    - Software Design For Autonomous Quadrator
    - Intelligent Control Of Multi Robot Systems Based On Serial And Parallel Manipulators In Cyber Physical Framework

- Sparc:Deployment Of Low-Cost MultiRotor Mini-Uavs For Early Detection Of Crop Diseases And Development Of An Optimal System For Management
- Design And Control Synthesis Of A TiltRotor Quadcopter
- Vajra Faculty Scheme

- **Power Engineering**
  - Electric Stress Control Using Filled Polymers
  - Reconfigurable Distribution Networks
  - Stabilize Energy
  - UK India Clean Energy Research Institute
  - Indo-Uk Center For Education And Research In Clean Energy (Sub Project-A)
  - Integrated Dc-Dc Converter Based Grid Connected Transformerless Photovoltaic Inverter
  - Re-Synchronizable Grid Interactive Inverters For Indian Rooftop Solar Pv Systems
  - Indo-Uk Center For Education And Research In Clean Energy
  - Indo-Uk Center For Education And Research In Clean Energy (Sub Project-B)
  - Ui-Assist:US India Collaborative For Smart Distribution System With Storage
  - Ui-Assist: IIT Kanpur Centre Budget
  - Ui-Assist: IIT Kanpur RD Budget
  - Ui-Assist: IIT Kanpur Pilot 1 Budget
  - Ui-Assist: IIT Kanpur Pilot 3 Budget
  - Ui-Assist: IIT Kanpur Pilot 2 Budget
  - 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
- Excellence Fund
- 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 RD 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
- Stability Analysis, Protection And Coordinated Control Of Networked Microgrids
- Mix-Energy-Source Electric Vehicle Charging System Design

- Integrated Dc-Dc Converter Based Grid Connected Transformerless Photovoltaic Inverter

- **RF and Microwave**
  - 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
  - High Power Device Analyzer, Enhancement Of Existing Vna, Time - Resolved Correlation Measurement, Power Electrics, Antenna Positioner System
  - Investigation On Rcs Reduction Characteristics Of Conformal Narrow Band Metamaterials Absorber For Complex Shapes
  - Design Of Conformal Microwave Metamaterial Absorber
  - 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 Exellence
  - Microwave Imaging Remote Sensing of Concealed Objects
  - Design Of Antenna Element And Array
  - Centre For Railway Research

- Design Of Polymer Nanocomposites Based Wideband Microwave Absorbers For Stealth And Electromagnetic Shielding Applications

- **<u>Photonics</u>**
  - Fluorescence Diffuse Optical Tomography for Grading of Dysplasia In Cervical Cancer Progression
  - Rte-Tomography Based Cloud Monitoring
  - Brihaspati Erp System Deployment In Igntu Amarkantak
  - Development Of Thunderbird Plugin Based P2p Messaging Client
  - Software Development Activities In Edrp Components
  - Design, Fabrication And Characterization Of Nanoparticle-Based Photonic Elements
  - 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
  - Development Of Non-Ivasive Techniques For Nanoscale Surface Metrology
  - Design, Fabrication And Characterization Of Nanoparticle Based Photonic Elements

- **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
  - Atomistic Simulation And Compact Modeling Of Alternate Channel Materials For Nanoscale Devices
  - Ramanujan Fellowship
  - Application of Meta-Material Mushroom Structure for Realization of Planar Single/triple Passband Filter for Significant Size Reduction
  - Design and Development of Control and Protection for Hybrid Renewable Integration
  - Codes for Distributed Storage
  - Photodiode Arrays for Near Infrared Detection and Tracking
  - Photodiode Arrays for Near Infrared Detection and Tracking
  - Development Of Compact Model For Sspl'S Gan-Hemts
  - Pdk Development And Modeling Support For ISRO'S Gan Hemt Technology
  - Asm-Gan-Hemt

- **Signal Processing, Communications Networks**
  - BSNL Telecom Centre of Exellence
  - 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 Network
  - Cross-Layer Optimization Techniques In Video Streaming Over Wireless Fading Networks
  - Inspire Faculty Research Grant
  - Inspire Faculty Award
  - Joint Target Detection And Localization Algorithms For Mimoradar Systems
  - 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
  - Underlay Cognitive Radio Based Satellite - Terrestrial Non-Cooperative/Cooperative Communication For Efficient Resource Utilization Performace Analysis

- Space Time Trellis Coding (Sttc)/Turbo Coding Based Robust Satellite Image Processing And Communication
- Stochastic Optimization In 5g Networks
- Minimum Phase Hrtf Modeling Using Fbs Interpolation In Spherical Harmonic Domain For Spatial Audio Systems
- Deployment and Management of Brithaspati-3 Services Over NKN for Indian Academia
- Development of Personalised 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)
- Design Development Of Aquatic Autonomous Observatory (Niracara Svayamsasita VedhshalaNsvs) For In Situ Monitoring, Real Time Data Transmission Web Based Visualization (Sub Project-C) Dept. Of EE
- Intel India Faculty Excellence Program
- Physical Layer Design Techniques For Next Generation Cellular Technologies
- Non Contact Metrology Of Hexagonal Wrapper Tube Throgh Glass Medium
- Indigenous 5g Test Bed Design

Academic Courses

- Mathematical Structures of Signals and systems
- Convex Optimization in Signal Processing and Communication
- Statistical Signal Processing-1
- Machine Learning for Signal Processing
- Image Processing
- Introduction to Signal Analysis
- Optimization for Big Data
- Computational Aspects of Tomographic Imaging : Models to inversions
- AI, ML and its applications
- Advanced Topics in Machine Learning
- Estimation and Detection Theory

- Electromagnetic Theory
- Integrated Circuit Fabrication Technology
- VLSI System Design
- Analog/Digital VLSI Circuits
- Solid State Devices
- Semiconductor Device Modelling
- Compact Modelling
- High Frequency Analog Circuit Design
- Physics of Semiconductors and Nanostructures
- Introduction to Flexible Electronics
- Memory Technology and Neuromorphic Computing
- Special topics in Microelectronics
- RF Microelectronics

- Communication Systems
- Basics of Modern Control System
- Non-Linear systems
- Digital Control
- Kalman Filtering and Applications
- Robust Control Systems
- Fuzzy set, logic systems and applications
- Smart Grid Technologies
- Fiber optics communications
- Semi conductor Optical Communication Devices
- Charge and Heat Transport in Semiconductors
- Intelligent Systems and Control
- Industrial Automation and Control

- Optical coherent Imaging
- Detection and Estimation Theory
- Topics in stochastic Processes
- Speech Signal processing
- Representation and Analysis of Random Signals
- Digital Switching
- Peer to Peer Networks
- Analysis of Modern Wireless Networks
- Machine Learning for Wireless Communications
- Information Theory
- Coding Theory
- Wireless Communication
- Digital Communication Networks
- MIMO Wireless Communication

- Simulation of Modern Power System
- Economic Operation and Control of Power Systems
- Electrical Insulation in Power Apparatus and systems
- Synchrophasor Technology and its Applications
- Advanced Power system Stability
- Economic Operation and Control of Power system
- Control Techniques in Power Electronics
- Electric Power System Operation and Mgmt. under restructured environment
- Advanced Electric Drives
- Power converters for EV charging
- High Voltage Power Transmission Engineering

- Basics of Electronics Converters
- Fundamentals of Electric drives
- Power Management Circuits
- Smart Grid Technologies
- Advanced RF Antennas
- Smart Antennas for Mobile communication
- Electromagnetic Interference and compatibility Techniques
- Microwave Measurement and Design
- Microwave Circuits
- Finite Element Method for Electric and Magnetic Fields
- Monolithic Microwave ICS
- Advanced Engg. Electromagnetics
- Analog circuits for Signal Processing

Contact Us

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