Department of Electrical Engineering

Indian Institute of Technology (Indian School of Mines) Dhanbad

VIBHAV

Vol.II, No.4 | October, 2025 | Monthly Newsletter

Message from HoD's Desk

By PROF. SUKANTA DAS

Dear All,
Greetings from IIT(ISM) Dhanbad!

With great pleasure, I am delighted to present the "October 2025" edition of the Department of Electrical Engineering's Monthly Newsletter: "VIBHAV"

The month of October 2025 was also marked by a significant milestone for our department with a few notable individual achievements.

I encourage you all to explore this issue and invite our students to contribute actively toward enhancing the quality and reach of our Monthly Newsletter. We also welcome your constructive feedback and suggestions, which may be forwarded to ee@iitism.ac.in for the improvement of forthcoming editions of "VIBHAV".

Thank you all.

Best wishes.

About the Department

The Electrical Engineering department was established in the year 2005. The four-year B.Tech. program in Electrical Engineering was started in the academic session 2006-07. Although the Department of Electrical Engineering is one of the latest of the existing departments of the Institute, the Electrical Engineering Section existed as a part of earlier Mining Machinery Engineering department from 1975. Apart from different B.Tech. programs, the department at present also offers M.Tech programs in Power System Engineering and Power Electronics & Electrical Drives. Through funded projects, consultancies, Doctoral, and postdoctoral programs, most of the research activities are being carried out in the department.

Patents

Prakirty Kumari, Arvind Kumar, and **Dushyant Sharma**, "A System and Method for Stable Power Sharing in Microgrids with PV Voltage and Current Sensor-Less Self-Limiting Three-Phase Autonomous PV Generator,"
Indian Patent No. 571923,
Granted on Oct. 13, 2025.

C. Verma, S. K Sena, and **A. Kumar**, "Photovoltaic-based single DC input Hybrid output converter,"
Indian Patent No. 572457,
Granted on Oct. 23, 2025.

Individual Achievement

Biplab Bhattacharyya received "Author award" given by *Springer Nature* in collaboration with Ministry of Education, Govt of India on 29th October, 2025 at IIT (ISM) Dhanbad.

Hearty Congratulations for his achievement !

Publications

Journals

- Swati Lipsa, Ranjan Kumar Dash, Subhra Debdas, Korhan Cengiz, Pankaj Kumar, and **Nitai Pal**, "Enhancing cardiac disease prediction with explainable bidirectional LSTM," *Scientific Reports, Springer-Nature*, ISSN: 2045-2322, https://doi.org/ 10.1038/s41598-025-25071-8, pp. 1-18, 2025. [Accepted for publication]
- D. Mishra, **A. Baral** and S. Chakravorti, "Short-Duration Current Analysis for Predictive Aging Estimation in Power Transformer Insulation," *IEEE Transactions on Power Delivery*, 2025. [Accepted for publication]
- S. Ganguly, **A. Baral**, S. Chakravorti, "Temporal Development and Detection of Incipient Faults from DGA Data using Principal Component Analysis Based Methodology Incorporating Oil-Filtration History," *Proc. of the Indian National Science Academy, Springer*, 2025. [Accepted for publication]
- Suraj S, Narayan S. Manjarekar, **S. Barik**, S. Swain, and Kumar Kashyap "User-Centric Routing and Adaptive Charging EVCS for Battery Longevity and Improved Drive Anxiety," *IEEE Access*, vol. 13, pp. 176942-176957, 2025.

Conferences

- Sri Krishna Roshan and **Sethupathy S**, "Parametric Study on the Effect of Pole Area and Radial Placement of Poles in Disk Eddy Current Braking Systems for Electric Transportation," *IEEE International Conference on Power Electronics Smart Grid and Renewable Energy (PESGRE)*, IIT Dharwad, India, 2025. [Accepted for presentation]
- Sri Krishna Roshan and **Sethupathy S**, "Optimal Distribution of Pole Area and Its Angular Separation on Braking Performance in Eddy Current Brakes," *IEEE International Conference on Power Electronics Smart Grid and Renewable Energy (PESGRE)*, IIT Dharwad, India, 2025. [Accepted for presentation]
- Tushita Das, Mitikiri Sagar Babu, Sriranga Suprabhath Koduru, **Vedantham Lakshmi Srinivas**, and Sukumar Mishra, "Detection, Classification and Phase Localization of Cyber Attacks in 3-ϕ Standalone Inverter Systems," *IEEE 4th International Conference on Smart Technologies for Power, Energy, and Control (STPEC 2025).*
- Sriranga Suprabhath Koduru, Mitikiri Sagar Babu, **Vedantham Lakshmi Srinivas**, and Sukumar Mishra, "A Node Specific Dynamic Image-Based Watermarking for Secure DC Microgrid Control," *IEEE 4th International Conference on Smart Technologies for Power, Energy, and Control (STPEC 2025).*
- Md Akram Neyazi and **Ashok Kumar**, "Piezoelectric Energy Harvesting: Recent Trends – A Technical Perspective," *IEEE 6th International Conference on Electric Power and Renewable Energy (EPREC-2026)*. [Accepted for presentation]
- Anagha Rajendran K. P., **S. Barik**, and Sudarshan Swain, "Enhancing RDN Performance with Optimized EVCS, DG, and SC Placement Using Zero-Bus logic OR based Forward–Backward Load Flow," *IEEE 4th International Conference On Smart Technologies for Power, Energy and Control*, NIT Goa, 2025. [Accepted for presentation]
- Anagha Rajendran K. P., **S. Barik**, S. Swain, "Novel Zero Bus Logic OR-Based Load Flow for Techno-Economic Optimization of RDNs via Coordinated DG and EVCS Placement," *IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy*, IIT Dharwad, 2025. [Accepted for presentation]

Outreach Activities

- **Prof. Nitai Pal** is appointed as an External Member of Board of Studies (BoS) for the Department of Electrical Engineering, Tezpur University, Tezpur, Assam, India.
- **Prof. Nitai Pal** is nominated as a Member of the Advisory Committee for the *International Conference on Power, Environment, and Intelligent Systems (PEIS-2026)*, scheduled to be held during 03–04 April 2026 at the Department of Electrical Engineering, Ghani Khan Choudhury Institute of Engineering & Technology (GKCIET), Malda, West Bengal, India.
- **Prof. Nitai Pal** evaluated Ph.D. Thesis of Research Scholar of Jadavpur University, Kolkata as an External Examiner.
- **Prof. Dushyant Sharma** served as a Organizing Co-chair for the *2025 IEEE 1st International Conference on Electrical, Electronics and Computer Science with Advanced Power Technologies – A Future Trend (ICE2CPT 2025)*, organized by the Department of Electrical Engineering, National Institute of Technology (NIT) Jamshedpur, from 29th to 31st October 2025.
- **Prof. Arijit Baral** delivered an invited lecture in AICTE-ATAL Sponsored Faculty Development Programme (FDP) on "Advancements in AI & ML for Power System Analysis (AAMPS-2025)," organized by the Department of Electrical Engineering, School of Engineering & Technology, DRIEMS University, Cuttack, Odisha

Students' Corner

Emerging Opportunities in India's EV Charging and Power Ecosystem

Samiksha Biswas– (24JE0164)

Introduction

India's vision for future transportation is deeply tied to its clean energy transformation, with electric mobility emerging as a key driver of national progress. The rapid expansion of electric vehicle (EV) adoption has not only reshaped how mobility is viewed but has also revealed new opportunities for improvement within India's power ecosystem, particularly in grid modernization and renewable energy integration. This shift highlights that the road to sustainable transport cannot be separated from the evolution of the country's energy infrastructure.

Recognizing this interdependence, policymakers, innovators, and engineers are now working to strengthen the foundation creating a grid that is smarter, more resilient, and capable of supporting widespread EV charging without disruptions. Rather than viewing current bottlenecks as setbacks, India's EV movement represents an inflection point, a chance to reimagine how clean transportation, renewable power, and digital infrastructure can grow together. Through advancements like smart grids, microgrid-powered charging hubs, AI-driven energy management systems, and dynamic public–private collaborations, the country is paving the way for a transport and energy revolution that is cleaner, reliable, and inclusive.

As India moves towards its Vision 2047 goals of energy independence and carbon neutrality, electric mobility stands not just as a means of transport, but as a symbol of systemic progress, a bridge between innovation, sustainability, and equitable development for all.

Opportunities in India's EV Charging

India's power grid still depends largely on fossil fuels, especially coal, which remains the dominant source of electricity generation. This dependence not only leads to high carbon emissions but also makes the power supply vulnerable to fluctuations in fuel availability and rising energy costs. At the same time, the grid was not originally built to accommodate the intermittent nature of renewable energy sources like solar and wind. The sudden variability from these clean sources often causes frequency and voltage instabilities because of low grid inertia and uneven distribution of power. As a result, EV charging stations, particularly those on long-distance highways, often face interruptions or unstable current flow, making long-distance electric travel less convenient and reliable.

Although charging stations have been set up across suitable routes, the true challenge lies deeper within the power infrastructure itself. The issue is not the shortage of chargers but the grid's limited ability to deliver consistent, stable power to them. To make EV adoption truly practical, the grid must evolve, developing smarter control systems, energy storage solutions, and renewable integration mechanisms that ensure reliability at every point of delivery. India's shift toward electric mobility, however, opens up immense opportunities to modernize both its energy and transportation systems together. The rapid rise in EV adoption has brought renewed focus to improving power quality, expanding renewable-friendly grid capacity, and scaling up connected charging networks. Far from being roadblocks, these challenges are driving innovation and collaboration among policymakers, engineers, and energy providers. Through these ongoing efforts, India is building a foundation for a cleaner, smarter, and more resilient grid, one capable of powering a sustainable electric future while leading the global movement toward low-carbon mobility.

What we can do:

Microgrid and Renewable-Based Charging Networks

A practical solution is to set up EV charging stations powered by renewable energy microgrids; small, local power systems that can keep running even when the main electricity grid is unstable or down. BluSmart and Tata Power are leading major implementations of solar power, wind power, and battery storage at charging sites. These configurations cut down on grid dependence by more than 60%, providing round the clock 24/7 availability of charging even in case of outages. Energy storage systems (ESS) save up excess renewable energy during the day to provide power at night or when there is a grid shutdown.

Strengthening and Digitalization of the Grid

In order to support increasing EV loads as well as renewables, India is adopting grid modernization under the National Smart Grid Mission (NSGM). This includes:

Mass smart meter deployment (more than 2.7 crore installed already), providing two-way real-time communication between consumers and utilities.

Integration of Advanced Distribution Management Systems (ADMS) for rapid fault detection, isolation, and restoration.

Use of AI and IoT technology for predictive maintenance and dynamic balancing of grid loads. A good approach is to encourage people to charge their EVs at times when electricity demand is low, helping to reduce pressure on the grid during busy hours.

Advancements by Other Countries

Countries that use a lot of renewable energy have already found smart ways to deal with the same problems we're facing, such as keeping their power grids stable and reliable. Some examples are:

1. Denmark uses AI-driven balancing, flexible grids, and real-time consumer load shift to balance almost 50% wind energy without issues.
2. The Netherlands addresses solar-induced grid overload through upgrading distribution grids and promoting flexible consumption.
3. The USA applies automated fault detection and AI-based grid management to enhance resilience and minimize downtime.
4. European countries such as Germany implement real-time data platforms connecting utilities, renewable generators, and EV fleets to ensure grid balance.

India can implement similar technologies and regulatory guidelines and utilize global collaboration to drive development at a faster pace

India's Plan and Future Advancements

The Indian government's EV Charging Infrastructure Policy 2025 aims to establish charging stations every 3 km in cities and every 25 km on highways, with mandates to integrate renewables and standardize interoperability for seamless use across vehicle types. Working together with private companies and offering government incentives helps build EV charging networks faster and more efficiently.
Upgrading the grid under the National Smart Grid Mission and building more small, local renewable power systems with battery storage will help reduce the load on the main grid and make sure EV charging stations always have steady power

Conclusion

India's EV future is solved by cracking an energy puzzle: widespread, dependable charging is not possible without a stable, flexible, and digitized electricity grid that is capable of supporting high penetrations of renewables. Through microgrid innovations, digital grid evolution, and internationally proven strategies, India can develop a green, resilient, and affordable EV charging system in support of its Vision 2047 aspirations of sustainability and energy independence.
This integrated system not only alleviates "range anxiety" and power deficit but also puts India on the global map as a clean mobility innovation and energy management leader.

Upcoming Events

Executive Development Program (EDP) on "Electrical Safety and Smart Maintenance for Sustainable Mines" to be held during 05th – 09th January 2026 at Seminar Room (No. 113), 1st Floor, New Academic Complex, Department of Electrical Engineering, IIT(ISM) Dhanbad: CI- **Prof. Nitai Pal**, Professor and Co-CI- **Prof. P. K. Sadhu**, Professor (HAG), Department of Electrical Engineering. Links: https://www.iitism.ac.in/seminar-1 https://www.iitism.ac.in/electrical-engineering

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