

# Department of Electrical Engineering

Indian Institute of Technology (Indian School of Mines) Dhanbad



## VIBHAV



Vol.II, No.7

January, 2026

Monthly Newsletter

### MESSAGE FROM HoD's DESK

By PROF. SUKANTA DAS



Dear All,

#### Greetings from IIT (ISM) Dhanbad!

It is with great pride and enthusiasm that we present the January 2026 edition of the Department of Electrical Engineering's monthly newsletter, VIBHAV. Each edition of VIBHAV reflects the vibrant academic culture of our department and its unwavering commitment to excellence. The month of January 2026 brings forth several noteworthy individual accomplishments that exemplify the dedication, perseverance, and collaborative spirit of our faculty members, students, and staff. These achievements not only mark personal milestones but also strengthen the collective identity and reputation of our department.

As we continue this journey, we warmly encourage our students to contribute actively toward enriching the quality, diversity, and outreach of our monthly newsletter. Your constructive feedback and valuable suggestions are most welcome and may be shared at [ee@iitism.ac.in](mailto:ee@iitism.ac.in). Together, let us strive to make every forthcoming edition of VIBHAV even more engaging and impactful. 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.

### PUBLICATIONS

#### Journals

- Banerjee, S., Maity, T., "Synergistic clustering of hybrid vertical axis wind turbines for optimal power extraction from industrial ventilation exhaust," *International Journal of Green Energy*, 1-14, doi: 10.1080/15435075.2025.2604264

#### Conferences

- C. Verma, A. Kumar, "A Refined Mathematical Model for Hybrid Output Converters: State-Space Analysis and Stability Assessment," *IEEE International*

*Power Electronics Conference 2026 - ECCE 2026, May 31 - June 4, 2026, Nagasaki, Japan [Accepted for Presentation].*

### INDIVIDUAL ACHIEVEMENT

**Prof. Tanmoy Maity (PI) and Prof. Sanjoy Mandal (Co-PI)** received a project titled "Development of Robust Gas Hazard Monitoring System suitable for Underground gassy coal mines using DSET Filter and CNN", from Wadhvani Foundation through WIN-CoE with the valuation of Rs. 1,15,05,936.

*Hearty Congratulations for their achievement !*



## OUTREACH ACTIVITIES

- **Prof. Nitai Pal** evaluated Ph.D. Thesis of Jadavpur University, Kolkata as an External Examiner in January 2026.
- **Prof. Nitai Pal** evaluated Ph.D. Thesis of UPES, Dehradun as an External Examiner in January 2026.
- **Prof. Biplab Bhattacharyya** delivered a technical talk on 18 December 2025 entitled, “Interfacing with I/O devices in Embedded system” in the refresher course “Deployment of Advanced Semiconductor devices, Microelectronics and VLSI for proficient Embedded system Design” 11-22 December, 2025, organized in the department of Electronics Engineering, IIT (ISM), Dhanbad under MMTT Programme.

## EXECUTIVE DEVELOPMENT PROGRAM (EDP) ON ELECTRICAL SAFETY AND SMART MAINTENANCE FOR SUSTAINABLE MINES

Department of Electrical Engineering, IIT (ISM) Dhanbad has organized successfully an Executive Development Program (EDP) on “Electrical Safety and Smart Maintenance for Sustainable Mines” during 05th–09th January 2026: PC- Prof. Nitai Pal, Professor and Co-PC- Prof. P. K. Sadhu, Professor (HAG).

The program was designed to keep in view the diverse aspects of electrical safety issues of the miners and smart maintenance

of machineries under operations in underground and open-cast mines. Besides the huge production, safety is the first and foremost choice for the miners as well as the preventive maintenance of machinery is the vaccine for production. Also, the realization of the vast potential of its applications in various dimensions of its functioning has been considered. So, the topic is quite relevant nowadays for sustainable mines to increase productiv-

ity efficiently and effectively with safety. The event witnessed enthusiastic participation from different CIL subsidiaries and other mining organizations across the country, fostering knowledge sharing, interdisciplinary learning and research initiatives. The EDP concluded successfully with valedictory function, receiving highly positive responses and feedback from the participants.





Prof. Pradip Kumar Sadhu (Co-coordinator), Prof. Yogesh Vijay Hote (Chief Guest), Prof. Dheeraj Kumar (Deputy Director), Dr. Utpal Goswami (Guest of Honor), Prof. Nitai Pal (Coordinator), Prof. Sukanta Das (HOD, EE)

## STUDENTS' CORNER

### The Rise of AI in Electrical Engineering

Shreyas Khanra – (25JE0104)

Traditional electrical systems required extensive manual effort for design, maintenance, and optimization, often resulting in reactive operations and limited efficiency. The integration of Artificial Intelligence (AI) and Machine Learning (ML) is fundamentally changing this approach by enabling intelligent, data-driven, and predictive system management. AI enhances reliability, reduces downtime, and optimizes performance by continuously analysing operational data and adapting in real time, effectively transforming electrical systems into smart, self-optimizing infrastructures and driving a broader digital transformation of the field.

#### 1. Power Systems

Earlier, engineers used deterministic models to maintain power systems- estimating linear loads and predictable patterns;

but now, power systems have become complex and chaotic. Consumers have changed essentially to prosumers: Energy doesn't only flow from the Grid to Consumers but also from the Consumers to Grid, due to the rise of Household Solar Power Generation Systems.

**Deep Learning for Fault Diagnosis:** Engineers now use Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks to analyse transient voltage waveforms. CNN analyses the voltage waveform and uses "filters" to look for tiny distortions in the wave pattern that might be indicative of a fault in the system, for example, a failing transformer. LSTM's, on the other hand, remember what happened previously in the system to understand what is happening currently in the grid. Combining these two architectures can significantly increase the consistency and diagnosis of

these systems.

**Renewable Energy Integration:** AI helps balance the grid by predicting when the sun will shine or the wind will blow, managing when to store and release energy from battery systems to ensure a steady power supply.

#### 2. Adaptive Control Systems and Robotics

Traditional control systems rely on PID (Proportional-Integro-Derivative) loops. While they are reliable, it doesn't learn from its mistakes.

**Neural Feedback Loops:** AI-driven controllers can learn from their environment and adjust parameters in real-time. This is crucial for drone stability, autonomous vehicles, and industrial robots. E.g. If a drone loses a propeller or carries a shifting payload, a Neural Network-based

controller can re-learn the system's new physics in flight to maintain stability.

### 3. Intelligent Signal Processing

In telecommunications, one of the main objectives is extracting a tiny signal from a mountain of noise (interference).

*AI-Driven Noise Reduction:* Instead of defining which frequencies to cut, we train a neural network on pairs of "noisy" and "clean" signals. The Neural Network learns the underlying "manifold" (the structure) of a clean signal.

*AI-Driven Beamforming:* In 5G technology, antennas must steer a signal toward a moving user. AI uses Reinforcement Learning to predict the user's next movement and adjust the phase of the antenna

array in microseconds, maintaining a "perfect" beam.

### 4. Smart Energy Management

*Demand Response:* AI can monitor grid pricing in real time. If grid pricing spikes, the building automatically turns off or dims non-essential loads (like dimming hallway lights and turning off lights in a room with zero occupancy) to save costs. For large enough buildings and industries, these small adjustments can significantly reduce expenses.

*Intelligent HVAC Systems:* AI can be embedded with HVAC systems to smartly manage heating and ventilation based on various factors such as weather, number of persons in the room and monitoring CO2 and VOC levels. It can tune in the

amount of cooling required by analysing the number of persons essentially preventing overcooling.

The integration of Artificial Intelligence into Electrical Engineering brings about a revolution in the field as it enables us to make data-driven decisions for complex problems rather than manually tackling those problems ourselves. However, this transition does not render traditional knowledge about systems obsolete. On the contrary, the "black box" nature of AI demands engineers who possess a deep, intuitive understanding of core Electrical Engineering to validate and supervise these intelligent systems. The spark of human creativity, combined with the predictive power of AI, is lighting the way toward an era of unprecedented efficiency and technological possibility.

**Mr. Murari Lal** has fulfilled all the requirements for the award of Ph.D. degree under the guidance of **Prof. Pradip Kumar Sadhu** and Dr. Soumya Das, UIT, Iniversity of Burdwan, West Bengal. His thesis title is "Some Efficient Techniques for Solar PV Power Generation and Utilization in Indian Scenario".

*Hearty Congratulations for his achievement !*

**Mr. Sumeet Sahay** has fulfilled all the requirements for the award of Ph.D. degree under the guidance of **Prof. Gauri Shankar**. His thesis title is "Integrated Planning of Distributed Energy Resources and Compensating Devices in Radial Distribution systems Through Advanced Optimization Techniques".

*Hearty Congratulations for his achievement !*

**Mr. Rajendra Kumar Sharma** has fulfilled all the requirements for the award of Ph.D. degree under the guidance of **Prof. Bhukya Krishna Naick**. His thesis title is "Optimal Allocation of Distributed Generation in Radial Distribution Systems using Modified Artificial Rabbits Optimization Algorithm".

*Hearty Congratulations for his achievement !*

**Mr. Avikit Karmakar** has fulfilled all the requirements for the award of Ph.D. degree under the guidance of **Prof. Pradip Kumar Sadhu** and Dr. Soumya Das, UIT, Iniversity of Burdwan, West Bengal. His thesis title is "Cost Effectove Photovolatic Power Generation and Utilization".

*Hearty Congratulations for his achievement !*

**Mr. Suraj Saha** has fulfilled all the requirements for the award of Ph.D. degree under the guidance of **Prof. Sanjoy Mandal**. His thesis title is "Modelling and Performance Analysis of High-Contrast Bragg Grating-Embedded Multi-Bus Micro-Optical Ring-Resonator Devices in the Z Domain".

*Hearty Congratulations for his achievement !*

*EDITORIAL TEAM***Editor-in-Chief :** Prof. Sukanta Das**Associate Editors :** Prof. Soumyabrata Barik & Prof. Shyam A. B.**Student Editor :** Upasana Tharu

+91-326-223-5287, 5443, 5024



ee@iitism.ac.in



+91-326-229-6563