Department of Electrical Engineering

Indian Institute of Technology (Indian School of Mines) Dhanbad

VIBHAV

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Message from HoD's Desk

By PROF. SUKANTA DAS

Dear All,

With a great pleasure, I am introducing the second edition of the Monthly Newsletter of the Department of Electrical Engineering: "VIBHAV".

This edition of the Newsletter presents the achievements of the department in terms of Publications, Patent Filing and Collaborative Research Initiatives. To motivate the participation of the students, a section for Technical Articles drafted by the students of the Department reflecting the present trends in Electrical Engineering has also been introduced in this Edition.

I invite you to go through this edition of our Monthly Newsletter. I request you to forward your constructive comments at ee@iitism.ac.in. With your constructive comments, our Editorial Team will surely be able to publish much improved versions in the forthcoming editions of "VIBHAV".

Thank you all.

Best regards.

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. Though, 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 the Ph.D. and Post-Doctoral Programs majority of the research activities are being carried out in the department.

Individual Achievement

Prof. Vedantham Lakshmi Srinivas has achieved the ISSS Young Scientist Award (First Prize) on 3rd October 2025.

Hearty Congratulations for his success !

Prof. Vedantham Lakshmi Srinivas

Publications/Book Chapter/Patent

Journals

Khalid Raza Khan, Suryakant Kumar, **Vedantham Lakshmi Srinivas**, Ram Khelawan Saket, **Kartick Chandra Jana**, and **Gauri Shankar**, "Voltage Stabilization Control with Hybrid Renewable Power Sources in DC Microgrid", Accepted for publication to *IEEE Transactions on Industry Applications*, (Accepted).

Soumyadip Banerjee, and **Tanmoy Maity**, "Recovery of Electrical Power from Exhaust Air – Role of Vertical Axis Wind Turbine", *Journal Environmental Progress & Sustainable Energy*, 2024.

Abhay Chhetri, Devender Kumar Saini, Monika Yadav and **Nitai Pal**, "Performance Analysis of Machine Learning Algorithms for Estimation of EV Penetration", *Microsystem Technologies, Springer-Nature*, pp. 1-15, 2024.

Promit Kumar Saha, **Nitai Pal**, Faizan A. Khan and Aftab Alam, "Modelling of small signals in MISO DC-DC converters for hybrid energy sources", *Microsystem Technologies, Springer-Nature*, pp.1-9, 2024.

Gaurav, J. Nakka, **Sukanta Halder**, U. Sudheer Kumar, M Patel, "Enhanced High Gain Switched-Capacitor-DC-DC Converter Optimizing Renewable Energy Integration", *International Journal of Circuit Theory and Applications*, pp.1-22, 2024.

Conferences

N. K. Ray, **Sukanta Das** and G. Goswami, "Active Power Based MRAS for Estimation of Rotor Resistance in Field-Oriented Control of Induction Motor Drive", *IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Hyderabad, India, 2024.

G. Goswami and **Sukanta Das**, "MTPA Based Energy Efficient Strategy for Scalar Control of Induction Motor Drives", *IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Hyderabad, India, 2024.

K. Kiran, **Sukanta Das**, A. Pal and S. Anand, "Sensorless Speed Control of Brushless Doubly-fed Reluctance Machine Drive: A Simplified Model Predictive Control Approach", *IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Hyderabad, India, 2024.

A. Pal, **Sukanta Das** and K. Kiran, "Optimized Power Control Strategy for Sensorless Induction Motor Drive Used in Electric Vehicle Applications", *IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Hyderabad, India, 2024.

Bhawana Singh, Xiaogang Xiong, Debdas Ghosh, and Shyam Kamal, "Numerical Integrator based on Implicit Euler Discretization of Twisting Control Algorithm", *17th International Workshop on Variable Structure Systems and Sliding Mode Control*, Khalifa University, Abu Dhabi, UAE, 2024.

S. Bittu, **Sukanta Halder**, M. Ghosh, S. Tolani, N. Das and U. S. Kumar, "Enhancing the Dynamic Control of Fast-Charging Strategies Driven by Reinforcement Learning for Li-Ion Battery", *IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Hyderabad, India, 2024.

U. S. Kumar, **Sukanta Halder**, N. Yalla, S. Tolani, N. Das and S. Bittu, "Mitigating Chattering Effect in PMSM Speed Regulation Through Enhanced Fixed Time Convergent Controller", *IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Hyderabad, India, 2024.

Patent filed no. 202431076064, Dated 8th Oct. 2024, "A small-scale straight-blade hybrid Darrieus-Savonius vertical axis wind turbine for urban power generation", **Prof. Tanmoy Maity**, Soumyadip Banerjee and Mihir Datta.

Patent filed no. 202431073196, Dated 27th Sept. 2024, "Voltage Stabilization Control with Hybrid Renewable Power Sources in DC Microgrid", **Prof. Kartick Chandra Jana, Prof. Gauri Shankar, Prof. Vedantham Lakshmi Srinivas**, Khalid Raza Khan, Suryakant Kumar, and Ram Khelawan Saket .

Outreach Activities

Prof. Sukanta Halder delivered an Expert Lecture on "Evolving e-Drive System for e-Mobility" Five-Day Workshop on Sustainable Development: Intersection of Green Energy and eMobility (IGEEM-2024) organized by the Department of Electrical Engineering at NIT Rourkela, Odisha, India sponsored by SERB.

The Department has received a Training Program-Project for Five Years in Collaboration with Renew Power (1 Crore per Year) under the Leadership of **Prof. Sukumar Mishra**, Director, IIT (ISM) Dhanbad. An MoU has been signed by the Institute.

Prof. Vedantham Lakshmi Srinivas was invited from IEEE Vizag Bay section for an invited lecture on "Connecting the Home Grid to the Public Grid: A Viable Solution through Virtual Synchronous Machines".

International Visits

Prof. Biplab Bhattacharya attended an IEEE international conference, EPEI 2024 held at Gheorghe Asachi Technical University of Iasi, Romania, during 17-19 October 2024.

Prof. Bhawana Singh attended an international workshiop on VSS, held at Khalifa University, Abu Dhabi, UAE, durring 21-24 October 2024.

Upcoming Events

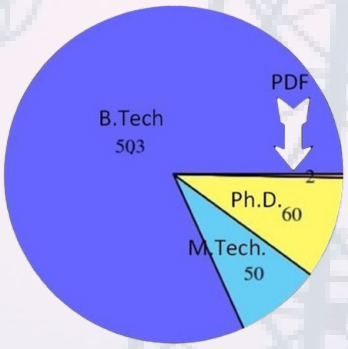
Five-day Executive Development Program entitled "Preventive Maintenance and Electrical Safety in Mines" to be organized by the Department of Electrical Engineering, IIT (ISM), Dhanbad from 20^{th} Jan. to 24^{nd} Jan. 2025.
Coordinators: **Prof. Nitai Pal** and **Prof. Pradip K. Sadhu**

Link to Access: https://www.iitism.ac.in/ announcement

First *IEEE International Conference on Smart and Sustainable Developments in Electrical Engineering (SSDEE)* from 28^{th} Feb. to 2^{nd} Mar. 2025.

Link to Access: https://people.iitism.ac.in/ ssdee-2025/

Students' Corner



Student Strength

Dr. Prasanta Kumar Barik, is awarded with the Ph.D. degree in Electrical Engineering in the month of Oct. 2024.

Hearty Congratulations to him!

Technical Articles

Formula E-Racing onto the Future: Maitreya Das - 23JE0536, 2nd Year B.Tech. (EE)

We all know Formula 1—the legendary racing series that has driven countless innovations in car engines and technology. But what if we took all that adrenaline and excitement and plugged it into a cleaner, greener future? Enter Formula E, a revolutionary racing series that's not just about speed—it's about racing towards a sustainable future, FASTER.

Launched by the FIA in 2014, Formula E became the world's first fully electric racing series. With top-tier teams like Mercedes, Porsche, and Nissan competing on circuits across the globe, the series has captured the attention of motorsport enthusiasts and environmental advocates alike. Drivers like Jean-Éric Vergne, who holds the record for the most championship wins, have cemented their place in electric racing history. Formula E races unfold on the streets of cities worldwide, where strict energy management rules create a unique challenge. India's TATA Group, through its Jaguar TCS Racing team, showcases Indian innovation on the global stage. Formula E's electric cars are powered by advanced lithium-ion batteries, delivering up to 54 kWh of usable energy. The Gen3 cars feature a 600 kW motor, reaching speeds up to 200 mph. The dual-motor powertrain offers 350 kW of regenerative capacity, recovering more than 40% of energy through braking. For an extra boost, "Attack Mode" gives drivers 50 kW of extra power at critical moments, pushing performance to its limits.

Formula E doesn't just push the limits on the track—it's also accelerating the development of electric vehicles (EVs) for everyday drivers. The technology found in Formula E, like the Gen3 Evo's 0-60 mph acceleration in just 1.82 seconds, has already begun influencing consumer EVs. Porsche, with their 99X Electric, has translated racing success into road cars like the TaycanTM. Jaguar is also pushing boundaries, especially with the Gen4 era, focused on more efficient regeneration and 600 kW peak output. Formula E is more than just speed—it's a strategic battle fought at 200 mph. Teams calculate energy consumption, optimize regenerative braking, and time "Attack Mode" perfectly. On the tight urban circuits of cities like Monaco, even a small miscalculation can cost a race. It's a mix of high-speed action, cutting-edge tech, and mental endurance. Sustainability is at the core of Formula E's mission. The series runs on 100% renewable energy and extends its impact beyond the racetrack through educational programs and community partnerships. The technologies developed in Formula E are shaping future consumer EVs, driving a greener future.

Formula E stands at the intersection of speed and sustainability. Its innovations are not only enhancing motorsport but also shaping the future of electric vehicles. As it pushes the boundaries of what's possible, Formula E sets a powerful example for the automotive industry and a cleaner, faster future.

Improvements in Smart Grid and Energy Storage: Ryali Sriram-23JE0834, 2nd Year B.Tech. (EE)

Smart Grids - Intro: Smart grids are an enhanced version of the traditional electrical grids. These represent the future of electric transmissions and production. Some of the major improvements of smart grids compared to the traditional grids include the integration of renewable energy for production, usage of better energy storage systems like Li-ion batteries and Supercapacitors to smooth out the fluctuations in energy generation from renewables, enhanced security and resilience, EV integration, real-time pricing and much more. These depend heavily on AI and Machine learning. Smart grids use a bunch of sensors to detect the need of electricity at a place. This successfully blends Communication systems with AI and power electronics. Smart grids also allow a two-way communication of power rather than one way which was with the traditional grids. The last and most important usage of smart grids is their integration with EV's, fully automated charging based on the best prices of power at times when most people don't use power.

Integration of Renewable Energy Re-

sources: This is the most crucial aspect that smart grids possess. Traditional grids use fossil fuels to get a continuous output. But smart grids vary them from solar panels to wind turbines and many more, based on conditions and they align with demand and supply. This increases efficiency and is eco-friendly. This could be a major leap towards sustainability.

Advanced Storage Technologies: Two-way communication in power supply is possible because of the technological improvements in storage systems like Li-ion batteries which are widely used in electric vehicles, and the supercapacitors, which are very useful for the storage of electricity during periods of excessive production and releasing it during times of peak demand.

AI & ML: These two terms need no introduction. These are the core of smart grids. They rely of sensors and smart meters to get information regarding power usage, grid health and fault detection. AI and ML algorithms predict demand surges and any potential faults before they lead to outages. They optimize power distribution in real time.

Real-Time Pricing and Response to Demand: These also introduce the concept of real-time pricing, where the price of electricity fluctuates regularly. This allows the consumers to adjust their activities during time of high demand and thus potentially reduces their electricity bill. This also tackles the need to maintain costly energy backup devices.

2-Way Power Flow: Unlike traditional grids where energy flows only from power plants to consumers, In smart grids energy flow is bidirectional. Hence houses having solar panels not only produce electricity but also send it back to the plants, and it can be very useful for areas having low production and high demands. These are often called DER's (Distributed Energy resources), and this leads to the decentralization of energy production.

Security Enhancement: As a grid becomes more and more digitalized, cybersecurity concerns increase and to tackle this, advanced encryption, authentication and security are being used. And, the decentralized nature of smart grids makes them more resilient to large-scale blackouts.

Conclusion: Smarts grids represent a huge shift in the way we produce, distribute and utilize electricity. With the combined advantages of advanced storage units, renewables, utilization of AI & ML and advanced encryptions, we can change the world entirely into a different one. This takes time to get implemented but is worth it. This implementation of smart grids paves the way for sustainable energy utilization.

Inspiring Speech

Exploring Opportunities in Higher Education Abroad:

Highlights of the talk given by Prof. Haswanth Vundavilli

Dr. Haswanth Vundavilli's recent presentation on seeking higher study abroad offered valuable insights for students wishing to advance their academic careers. He started by emphasising Step-1, that is, choosing Programs, in which he advised the audience on selecting the right academic path, such as M.S., M.Eng., Ph.D., or direct-Ph.D. programs. He underlined the importance of aligning career goals with the university's strengths and selecting between the Fall and Spring semesters, which may impact research and internship opportunities. His advice taught students to appropriately plan for their future education.

Step-2: The application, was reviewed to ensure it met the requirements for successful admission. He handled every stage methodically, from gathering and submitting essential documents, including transcripts, GRE and TOEFL scores, and a convincing statement of purpose (SOP), to obtaining strong letters of reference and constructing a comprehensive CV. He also underlined the need of delivering these components before the deadline to avoid delays. His practical advice strives to elevate students' understanding of key ideas to a more polished, application-ready standard.

Dr. Vundavilli talked about obtaining financial aid in Step-3, Funding, which is essential for a lot of potential students. Teaching assistantships, research assistantships, and other scholarships to assist with living expenses and tuition are available, he said. These financing choices offer professional development and practical learning in addition to financial stability. He concluded by going over Step-4, Immigration and Travel, which covered the crucial procedures for acquiring a student visa, an I-20, and SEVIS ID (for study in the US). His methodical approach made the process easier to understand and prepared students to embark on their international higher education journey with confidence.

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