Department of Electrical Engineering

Indian Institute of Technology (Indian School of Mines) Dhanbad

VIBHAV

Vol.III, No.3 | September, 2026 | Monthly Newsletter

Message from HoD's Desk

By PROF. KARTICK CHANDRA JANA



Dear All,

Greetings from IIT (ISM) Dhanbad!

I am pleased to share with you the "September 2026" edition of the Department of Electrical Engineering's monthly newsletter, "VIBHAV".

The month of "September 2026" has been marked by some remarkable individual achievements that highlight the dedication, perseverance, and collaborative ethos of our faculty members. These milestones not only celebrate personal success but also contribute to strengthening the collective identity and reputation of our department.

As we move forward, we warmly invite our students to play an active role in enriching the quality, diversity, and reach of "VIBHAV". Your thoughtful feedback and creative suggestions are always welcome and may be shared at ee@iitism.ac.in. Together, let us continue to make every edition of "VIBHAV" more engaging, inspiring, 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 Intelligent Control and Instrumentation, 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

Amit Kumar Singh, **Anirban Ghoshal** and **Sukanta Das**, "Multi-Phase Synchronous Buck Converter for the Charging Stage of An Off board Electric Vehicle Charger,"
Indian Patent No. 601316,
Granted on Sept. 03, 2026.

Y K Singh, Subrata K Ghosh and **Tanmoy Maity**, "A System of Exhaust Air Augmented Hybrid Wind Turbine with Guide Vanes for Energy Recovery at Ventilation Fan Outlets,"
Indian Patent No. 602776,
Granted on Sept. 16, 2026.

Individual Achievement

Tanmoy Maity has been awarded and appointed as Centenary S R Rungta Institute Chair Professor with effect from 12th September 2026.

Hearty Congratulations for his achievement !



Publications

Journals

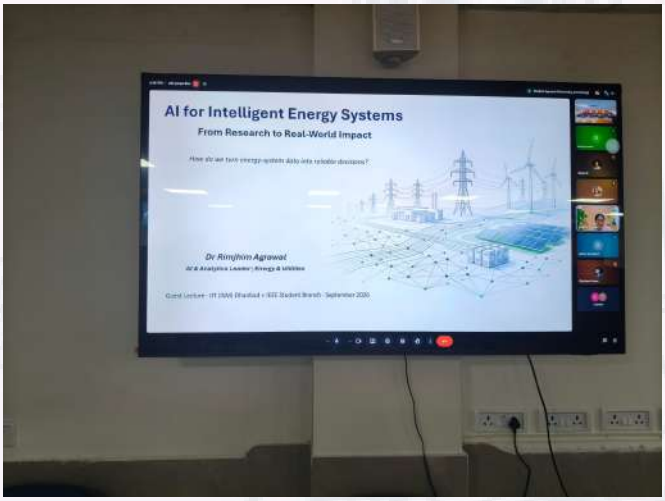
- D.Mishra, S. Parveen, **A. Baral**, S. Chakravorti, "A Model-Based Electrical Approach for Multi-Parameter Assessment of Marine Lubricating Oil," *IEEE Sensors Journal*, In Press, (DOI: 10.1109/JSEN.2026.3736476), 2026.

Conferences

- Bitupan Sarania and **Anirban Ghoshal**, "Design of 28V to 200V, 400Hz Three-Phase Power Supply for Airborne Applications," *IEEE 6th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Nagpur, India, 2026.
- Suman Nag and **Anirban Ghoshal**, "Generalised PWM implementation for DAB using multiple phase shifting carrier," *IEEE Power Electronics, Drives and Energy Systems (PEDES)*, Guwahati, India, 2026.
- R. Rana, A. Chakraborty and **T. Maity**, "Enhanced LVRT Capability of Grid-Connected DFIG Wind Turbines Using Crowbar-Coordinated Fuzzy-PI Control," *2026 IEEE 6th International Conference on Sustainable Energy and Future Electric Transportation (SEFET)*, Nagpur, India, 2026, (DOI: 10.1109/SEFET69291.2026.11687088). .
- Sushmita Kujur, Sourav Karmakar, and **Soumyabrata Barik**, "A Zero Bus Load Flow with Logic-OR Operation Extended to Weakly Meshed Distribution Networks," *National Power System Conference (NPSC)*, IIT Patna, India, 2026. [Accepted for Presentation]
- Anagha Rajendran K P, **Soumyabrata Barik**, Sudarshan Swain, and Sourav Karmakar, "Coordinated Incentive and Price-Based Demand Response for Electric Mobility Integration in Radial Distribution Networks," *National Power System Conference (NPSC)*, IIT Patna, India, 2026. [Accepted for Presentation]

Guest Lecture by Dr. Rimjhim Agarwal

Department of Electrical Engineering arranged an expert guest lecture on "AI for Intelligent Energy Systems: From Research to Real-World Impact" by Dr. Rimjhim Agarwal, AI & Analytics Leader, Energy & Utilities, Digital Transformation.





The session explored how AI is being applied to energy systems, with a focus on forecasting, prediction, and intelligent decision support, and the transition from research models to real-world engineering applications. It also touched upon emerging research opportunities at the intersection of AI and energy systems.

Teachers' Day Celebration











The Department of Electrical Engineering, celebrated Teachers' Day with great enthusiasm and respect in the gracious presence of the Hon'ble Director, IIT (ISM) Dhanbad. The occasion was dedicated to honoring the invaluable contributions of teachers in shaping young minds and fostering academic excellence, innovation, and research.

Students Corner

50 Hz or 60 Hz: Why the World Couldn't Agree on a Single Frequency?

Samiksha Biswas – (24JE0164)

Take a look at the electrical systems around the world and you will notice something interesting. India and Pakistan use 50 Hz, while the United States uses 60 Hz. Many countries in the Middle East, including Saudi Arabia, the UAE and Kuwait, also use 60 Hz. But why? Electricity is electricity, after all, so why did different parts of the world settle on different frequencies?

To understand this, we first need to go back to the basics of AC electricity. Alternating current, or AC, is the flow of electric charge that periodically reverses direction. Unlike direct current (DC), where the charge flows continuously in one direction, AC moves back and forth in a wave-like pattern. The current flows in one direction, then in the opposite direction, completing one cycle. The number of such cycles occurring in one second is called frequency, and it is measured in Hertz (Hz). So, a 50 Hz supply completes 50 cycles every second.

The interesting part is that 50 Hz and 60 Hz were not the result of some global engineering committee deciding that one was better than the other. In the early days of electrical power, different inventors, companies and countries were making their own choices based on the technology available to them and the practical problems they were trying to solve.

Thomas Edison is often associated with the early development of electrical power systems, although his initial systems were based on DC. As AC began gaining ground because of its ability to transmit electricity more efficiently over long distances, engineers began experimenting with different frequencies. In the United States, Westinghouse Electric eventually adopted 60 Hz, which offered a balance between mechanical efficiency and ease of generator design.

Meanwhile, European engineers moved towards 50 Hz. German and British electrical engineers played an important role in establishing the standard, with early Siemens generators working around 50 Hz. As British electrical technology spread through its colonies, the 50 Hz system traveled with it. And this is where history begins to matter just as much as engineering.

Electrical infrastructure is not something that can easily be replaced once an entire country has built its power system around it. The technologies, generators, transformers, motors and appliances developed alongside these early standards, creating a kind of technological inheritance. British influence helped establish 50 Hz in places such as India and Pakistan, while countries that developed their electrical infrastructure through American companies and technology often adopted 60 Hz.

This historical influence can still be seen today. India, Pakistan and much of Europe and Asia use 50 Hz, while the United States and several countries in the Middle East use 60 Hz. Much of this division can be traced back to the companies, technologies and countries that helped build their early electrical infrastructure.

But does the difference actually matter from an engineering point of view?

It does.

One of the most obvious differences appears in rotating machines. The synchronous speed of a motor or generator depends directly on frequency. For example, a two-pole machine has a synchronous speed of 3000 RPM at 50 Hz, but 3600 RPM at 60 Hz. Therefore, a 60 Hz system can allow certain machines to operate at higher speeds, potentially giving higher power output, although the increased speed can also result in greater mechanical stress and wear.

Frequency also affects the physical design of transformers and motors. Since higher frequency allows a magnetic core to operate with the same voltage using less magnetic material, 60 Hz transformers can generally be made smaller and lighter than equivalent 50 Hz transformers. This can reduce material requirements and cost. On the other hand, lower frequency can mean lower core losses in some equipment, particularly losses associated with hysteresis and eddy currents.

Transformers are a good example of this trade-off. A 50 Hz transformer generally requires a larger core or more turns of winding to maintain the same voltage compared with a 60 Hz transformer. That can make it larger and potentially more expensive. The 60 Hz transformer can therefore be more compact, although the higher frequency can also result in marginally higher core losses.

Transmission systems introduce another trade-off. The inductive reactance of a transmission line is given by:

$$X_L = 2\pi f L$$

Since reactance increases with frequency, a 60 Hz system has higher inductive reactance than a 50 Hz system for the same inductance. This can increase voltage drop over long transmission lines and may require additional reactive power compensation. So, does 50 Hz have an advantage? In some situations, yes. Its lower frequency means lower transmission reactance and can result in lower core losses in certain equipment. A 60 Hz system, on the other hand, can provide advantages such as smaller transformers and motors and higher operating speeds for rotating machines.

Neither frequency is simply "better." Each comes with its own engineering trade-offs. That brings us back to the original question: if one frequency has advantages and the other has different advantages, why didn't the world simply choose one standard?

The answer is history. When electrical grids were being developed in the late 19th and early 20th centuries, there was no global standard. Different regions developed their systems independently, often using technology supplied by particular companies or countries. Trade relationships, colonial influence and early industrial partnerships all played a role in determining which frequency became established.

Once a country has an entire electrical infrastructure operating at a particular frequency, changing it is an enormous undertaking. Generators, transformers, motors, industrial equipment and countless appliances would all have to be redesigned, replaced or adapted. The cost would be enormous, with very little practical benefit for most users.
And so the world simply kept what it already had. Today, the difference between 50 Hz and 60 Hz is therefore much more than a number printed on an electrical specification sheet. It is a reminder of how engineering decisions made more than a century ago can continue to shape the infrastructure around us. India runs at 50 Hz. The United States runs at 60 Hz. Both systems work, both have their own technical advantages and trade-offs, and neither is universally superior.
The reason we have two major frequencies today is not because engineers could not agree on which one was better. It is because, by the time anyone could have tried to make that decision globally, the world had already built two different electrical systems.

Upcoming Events

IEEE International Conference on Condition Assessment Techniques in Electrical Systems (CATCON-2026) under IEEE Dielectrics and Electrical Insulation Society (DEIS) to be held during 18th – 20th December 2026.
Link: `https://catcon2026.iitism.ac.in/index.php`

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