



HOPE Foundation's  
**Finolex Academy of Management & Technology,  
Ratnagiri**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

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**One Week Faculty Development Programme (FDP) on  
'Challenges in Evolving Power System'**

A One-week Online Faculty Development Programme (FDP) on 'Challenges in Evolving Power Systems' was organized by the Department of Electrical Engineering from 22nd November 2021 to 27th November 2021.

The power system is continuously evolving to meet the rise in demand, integrate renewable energy, and meet the decarbonization goal posed by the government. The evolution inevitably introduces formidable challenges to the system. This could affect system operations and could be a potential threat to a reliable power supply. Therefore, an in-depth understanding of the changing system is the need of the power industry. To address the evolving challenges and widen the understanding of academia, researchers, and industry, a one-week faculty development programme (FDP) was organized by the Department of Electrical Engineering.

The experts from academia and industries, active in real-time research of power systems, discussed key challenges of power systems as per their expertise. The challenges associated with Renewable Energy Integration to Power Systems, Distributed Energy Resources, Power System Planning and Modelling, and Cybersecurity were notably covered in the FDP.

**195** participants from academia and industry registered for the programme. There were **6 international registrations for the FDP**. The FDP also received entries from the *Institute of National Importance such as Indian Institute of Technology, Jodhpur, National Institute of Technology, Silchar, National Institute of Technology, Jaipur, National Institute of Technology, Durgapur, National Institute of Technology, Hamirpur, and IIT Bhubaneswar*. There were entries from *renowned government and private universities, government, and private engineering institutes across India (12 states)*. The participants from *CERC and Renew Power, New Delhi* also registered for the FDP.

The inaugural ceremony of FDP started with a welcome to the Chief Guest, participants, and the faculty from FAMT and other institutes. It was followed by Saraswati Vandana by Prof. Priya Potdar. The Convener and Head of the Electrical Engineering Department, Dr. Sandeep Chawda gave the preamble of the FDP. The **Chief Guest** of the inaugural ceremony **Dr. Kaushal Prasad**, Principal, FAMT highlighted the necessity of keeping up the pace with changing energy

needs and the role of academia in evolving energy scenarios. The ceremony concluded with a vote of thanks by **Prof. Milind N Tagare** (co-convener of the FDP).

The Day-1 session was delivered by **Dr. Vivek Prakash** (Postdoctoral Research Fellow, Faculty of Electrical Engineering and Computing (FER), University of Zagreb, Croatia). The topic of the session was '*Role of Active Neighborhoods in Fast Frequency Control*'. The challenges associated with power systems and the need for fast frequency control were addressed and discussed. The outcome of the session was useful for the participants to understand the challenges and opportunities for frequency response adequacy with low or no inertia.

The second day of the FDP was engaged by **Ms. Ankita Gaur** (Researcher, MaREI, The SFI Research Centre for Energy, Climate and Marine University College Cork, Ireland) who explained the concepts and challenges of '*Power System Planning*'. The session started with the basics of Power system planning. Challenges associated with planning were discussed and concluded with case studies. Case studies were helpful to the participants to understand the topic.

On the third day, **Dr Rajvir Kaur**, Assistant Professor, National Institute of Technology Puducherry, Karaikal delivered a session on '*Cyber Security in Power Systems*'. The challenges and opportunities in the Digitization of power systems, vulnerabilities in smart grids, and recent cyber-attacks on the smart grids were addressed.

On day four, **Dr. Priyanka Kushwaha**, Energy Market Analyst at ICF International, New Delhi delivered a session on '*Frequency Response Scenario in Low Inertia Power Systems*'. Frequency response in traditional power systems, Transition towards high RE integration, Frequency response scenario under low-carbon power systems, and Emerging responses/resources for frequency response adequacy were discussed. Real-time research conducted for enhancing frequency response was also discussed.

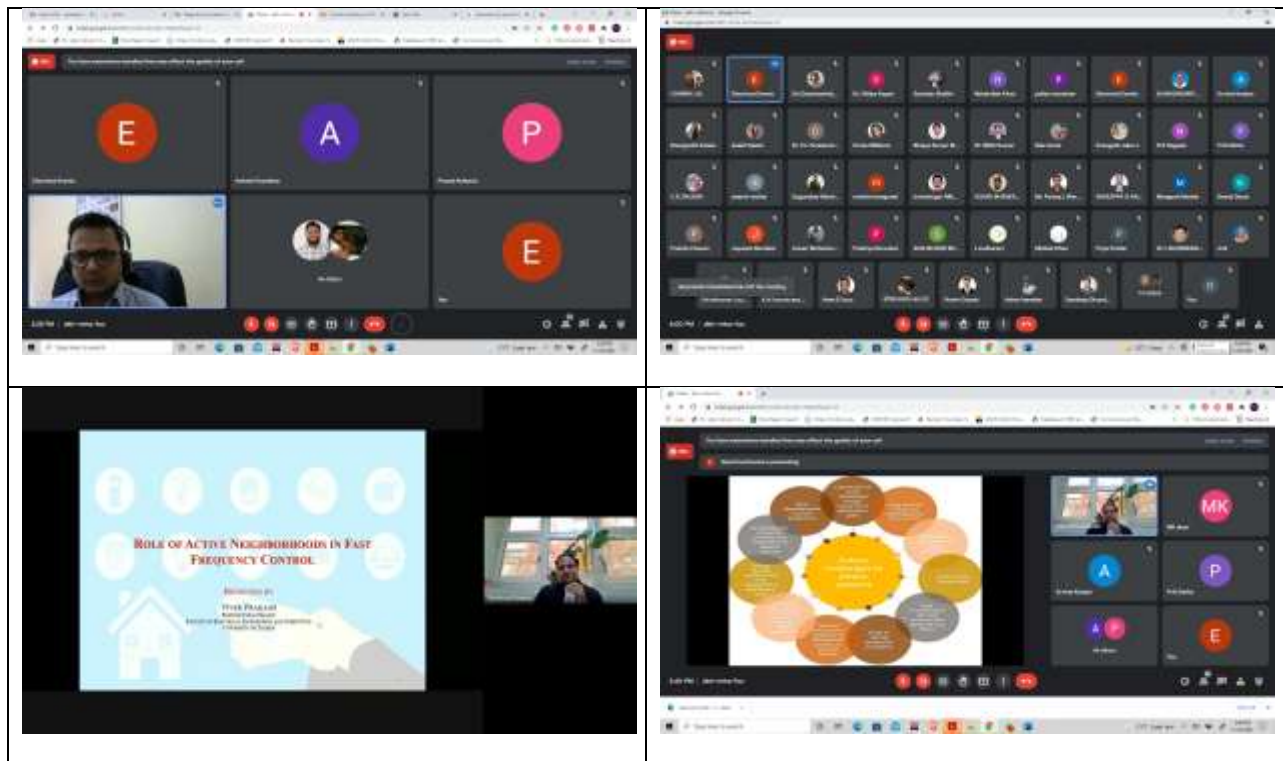
**Ms. Meenakshi Khandelwal**, Senior Research Fellow, Department of Electrical Engineering, Indian Institute of Technology Delhi delivered a session on '*Challenges and Opportunities with the Penetration of DERs*'. DERs integration at the distribution end introduces a lot of new challenges and opportunities into the power system. These evolving challenges and possible solutions were discussed.

On the last day of the FDP, **Ms. Anjali Jain**, Associate Fellow, The Energy and Resources Institute (TERI), New Delhi) on '*Evolving Power System of India and Modeling Challenges*' delivered the session. Indian Power Sector Evolution, Structure of Power Sector in India, RE Integration Targets and Recent Power Sector Reforms, Power System Planning Challenges with RES integration, Modelling Improvements to address the challenges, and Power System Planning Challenges and Required Modelling Improvements in India were discussed.

The FDP was concluded with a valedictory session. Several participants shared feedback and appreciated the efforts of the organizing team and FAMT management. The participants were convinced by the experts, quality, and smooth & well-managed conduction of FDP.

**Dr. Sandeep Chawda** (Convener) presented a summary report of the FDP followed by a vote of thanks. Participants' enthusiastic and active involvement was appreciated and they were thanked for making the FDP successful. The vote of thanks was extended to the FAMT management **Ms Aruna M Katara** and the Head of the institution for motivation and extending financial support and guidance for the successful execution of FDP. Efforts of the entire organizing team were appreciated with special mentions of **Prof. Milind Tagare**, (co-convener), **Prof. Vaibhav A Sansare**, and **Prof. Priya A Potdar** for their consistent efforts in FDP. Guidance and support from Prof. Jayant J Mane (Deputy HOD, Electrical Engineering Department, FAMT) and Prof. Suhas H Mhabadi were appreciated for making the FDP successful. Finally, thanks were extended to Prof. Mangesh Modak, Prof. Nitin V Kelkar, Prof. Sudhir S Wamane, Prof. Leslie Fernandes, and Prof. Nilashi P Sakhlikar for their endless support.

Photographs:



Screen Shot of Inaugural ceremony and session 1

**Introduction to Power System Planning**

Ankita Singh Gaur  
PSC Specialist  
NERL, IIT Bombay Center for Energy, Climate and Market  
Laboratory, College Park, India

**Examples of Cyberattacks**

- Stuxnet** (June 20, 2010) - The first industrial worm discovered, used for spying on Iran's nuclear program.
- Operation Aurora** (December 15, 2009) - A series of cyberattacks on Chinese companies.
- Operation Olympic Games** (March 9, 2014) - A series of cyberattacks on the Sochi Winter Olympics.
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**Primary Frequency Response in Low Inertia Power Systems**

PRESENTED BY  
**DR. PRIYANKA KISHORE**  
ICF INTERNATIONALS, NEW DELHI  
November 2021

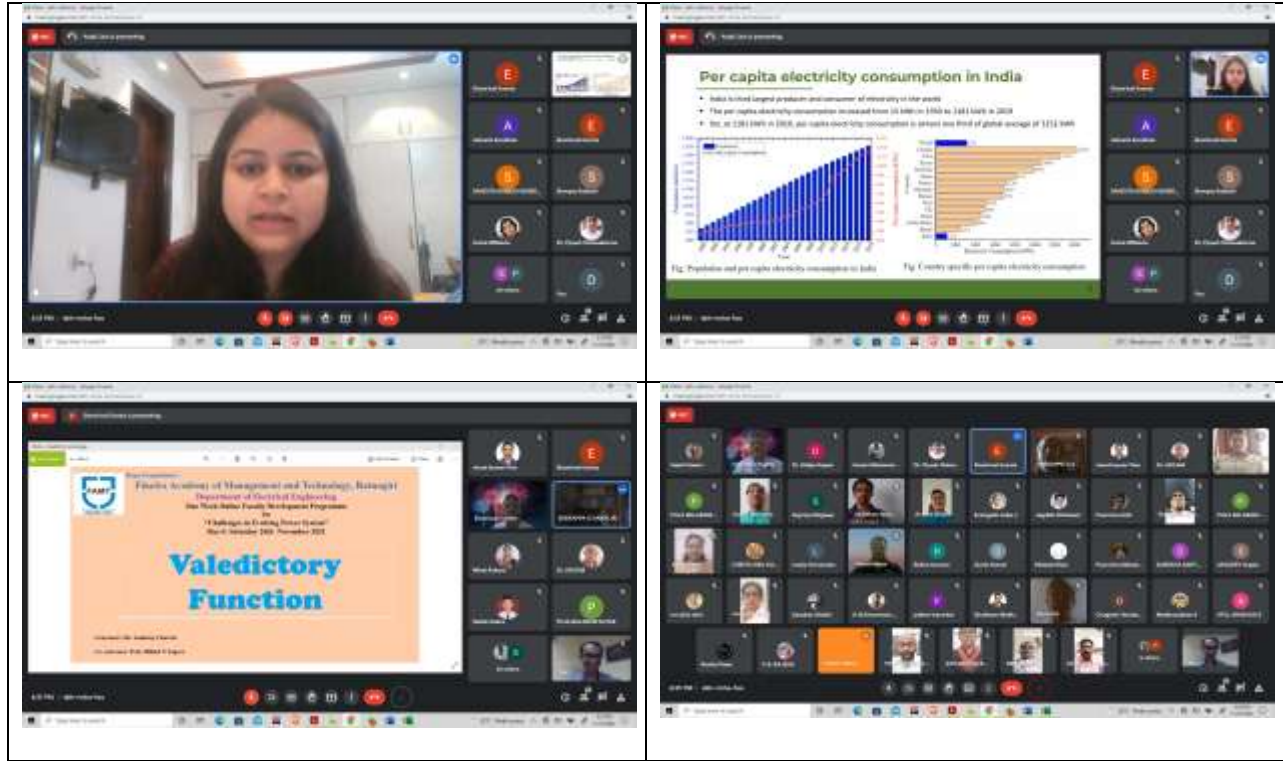
**Frequency Response**

- Large disturbances cause sudden generation-demand imbalance, to be corrected by Frequency Response
- Frequency response is the spontaneous actions provided by the system, or elements of the system, for balancing the demand and the power supply at the time of frequency deviation

Point A: pre-disturbance frequency  
Point B: maximum excursion point  
Point C: quasi-steady state

**TRANSMISSION & DISTRIBUTION SYSTEM**

Module	Topic
1	Introduction
2	Transmission Line Parameters
3	Transmission Line Performance
4	Transmission Line Protection
5	Transmission Line Modeling
6	Transmission Line Simulation
7	Transmission Line Design
8	Transmission Line Maintenance
9	Transmission Line Safety
10	Transmission Line Environment
11	Transmission Line Economics
12	Transmission Line Future



**Screen shots of all the sessions with Valedictory Function**