Faculty Development Programme (FDP) Report on
"Emerging Frontiers in AI-Driven Edge & Quantum Computing: Bridging Future Technologies"

Date: 9th – 14th June 2025
Hub Institute: Noida Institute of Engineering & Technology (NIET), Greater Noida
Spoke Institute: Gujarat Technological University (GTU)
In Collaboration with: Electronics & ICT Academy, IIT Roorkee
Venue: Noida Institute of Engineering and Technology
Principal Investigator: Prof. Sanjeev Manhas, IIT Roorkee
Program Manager: Mr. Saurabh Pratap Yadav
Hub Institute Coordinator: Garima Jain, NIET Greater Noida
Spoke Institute Coordinator: Dr. Dipak Dabhi, Gujarat Technological University (GTU)

Day 1: 9th June 2025

Inaugural Function Highlights

The FDP commenced with a grand inauguration, setting the tone for an intellectually stimulating week. Esteemed dignitaries graced the occasion, delivering inspiring addresses:

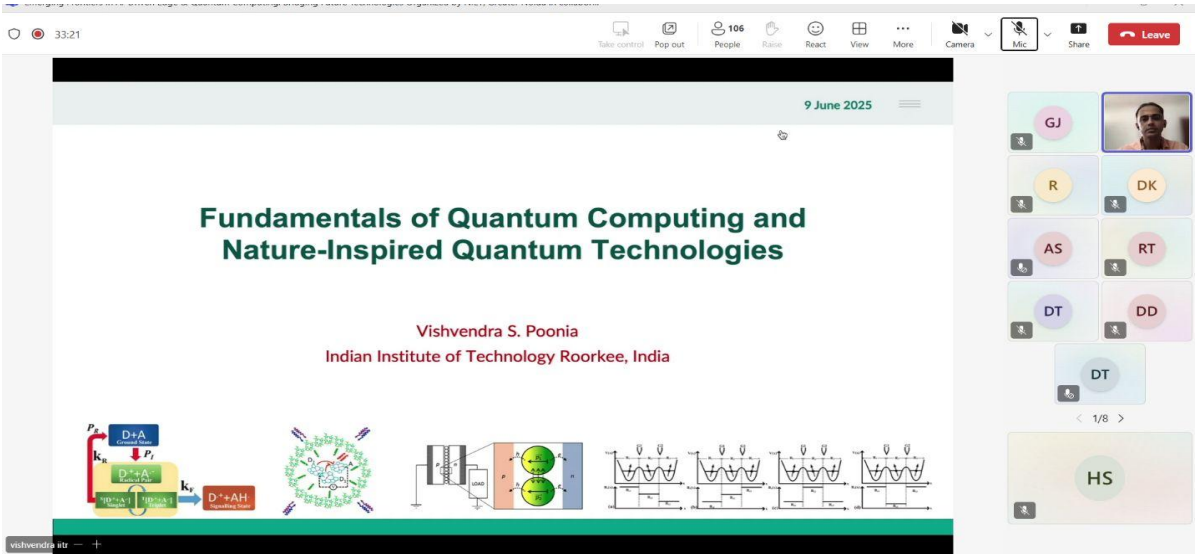
- **Dr. Vinod Kapse, Director, NIET**: Emphasized NIET's commitment to fostering innovation and quality education.
- **Prof. G. Raghavan, Chief Guest, Director, School of Quantum Technology, DIAT (D.U.), Pune**: Shared insights from his work with the Department of Atomic Energy, motivating attendees to embrace quantum advancements.
- **Prof. Sanjeev Manhas, Principal Investigator, EICT Academy IIT Roorkee**: Highlighted India's semiconductor and quantum technology roadmap.
- **Prof. Anil Ahlawat, Director Academics, NIET**: Provided strategic direction for academic excellence.
- **Prof. Rajesh Thakker, Director R&D, GTU**: Addressed India's potential in global R&D and quantum research.
- **Prof. (Dr.) Arun Kumar Tripathi, Dean, School of Computer Science in Emerging Technologies, NIET**: Outlined NIET's mission to integrate cutting-edge technologies into education.

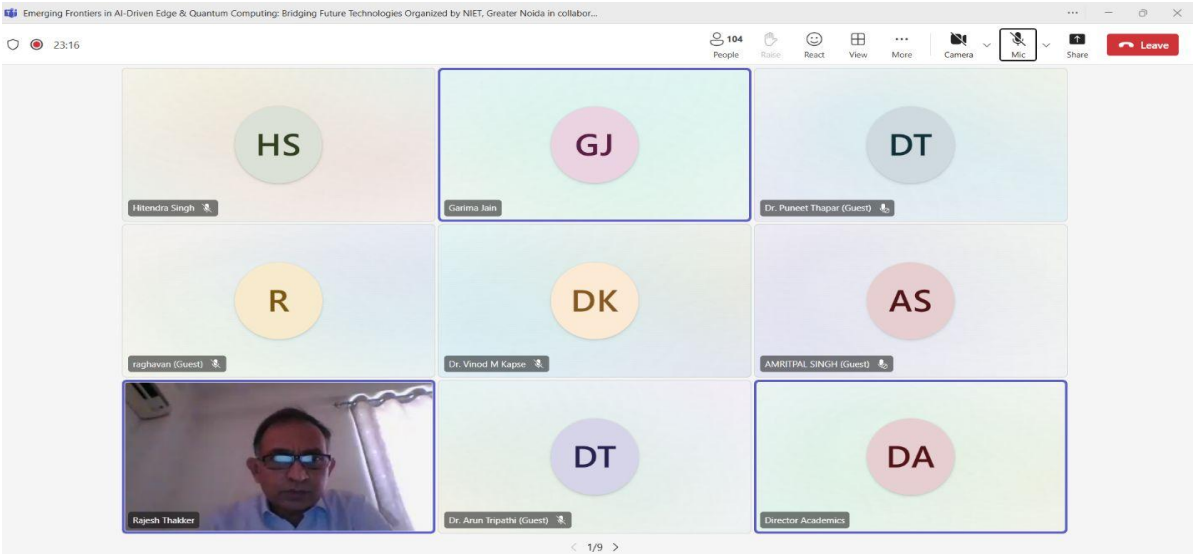
Sessions

1. **Session 1 (10:30 AM – 11:30 AM): Fundamentals of Quantum Computing and Nature-Inspired Technologies**
    - **Speaker**: Dr. Vishvendra Singh Poonia, IIT Roorkee

- **Highlights**: Dr. Poonia simplified quantum computing foundations, linking them to nature-inspired technologies and their relevance to next-generation applications.

2. **Session 2 (12:00 PM – 02:00 PM): Challenges and Opportunities in AI: How to Navigate**
    - **Speaker**: Prof. Deepak Garg, Vice Chancellor, SR University, Warangal
    - **Highlights**: Prof. Garg discussed AI ethics, real-world applications, and strategies to navigate the evolving AI landscape.
3. **Session 3 (02:00 PM – 05:00 PM): Hands-on with IBM Qiskit Framework**
    - **Speaker**: Dr. Jayakumar Vaithiyashankar, Founder and CEO, Anuthantra Pvt. Ltd., Bengaluru
    - **Highlights**: Participants engaged in live demonstrations of the IBM Quantum platform and Qiskit programming interface, gaining practical insights into quantum computing.

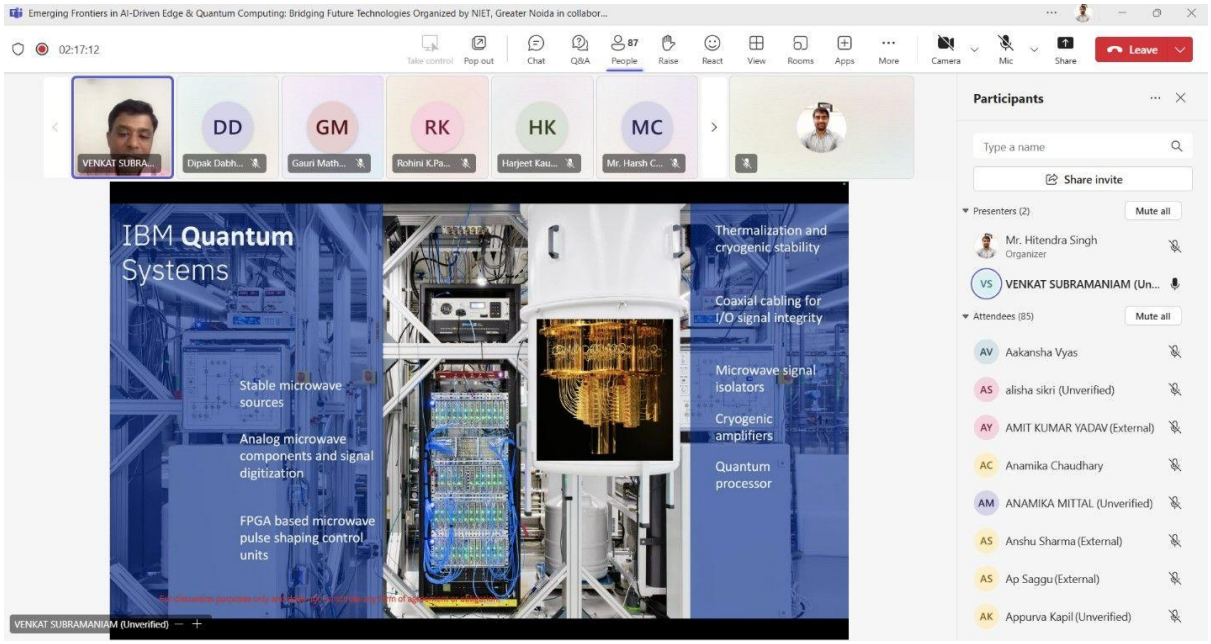




Day 2: 10th June 2025

Sessions

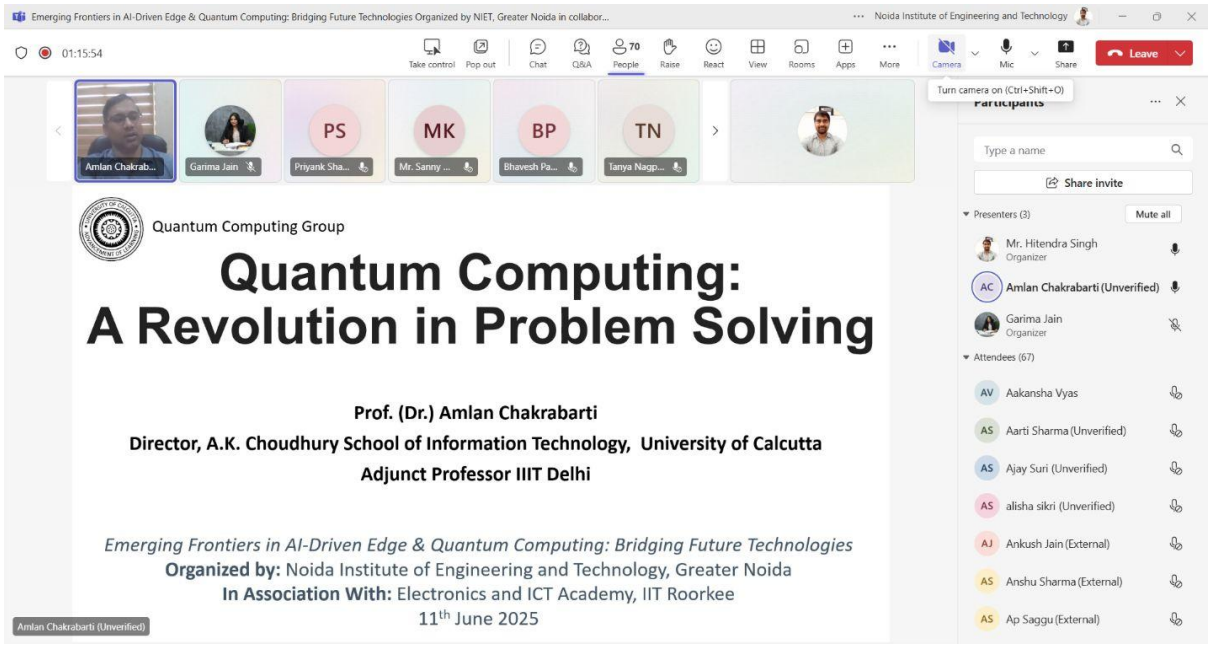
1. **Session 1 (09:30 AM – 11:30 AM): The Quantum Decade**
    - **Speaker**: Dr. L Venkata Subramaniam, IBM Quantum India Leader
    - **Highlights**: Dr. Subramaniam provided a visionary overview of the "Quantum Decade," discussing IBM's quantum roadmap, societal impacts, and India's leadership potential.
2. **Session 2 (12:00 PM – 02:00 PM): Quantum Technology for the Transportation Industry**
    - **Speaker**: Dr. Kumar Gautam, Founder, QRACE & EGREEN QUANTA
    - **Highlights**: Dr. Gautam introduced quantum-inspired algorithms for optimizing transportation networks, focusing on vehicle routing problems and logistics efficiency.
3. **Session 3 (02:00 PM – 03:30 PM): Quantum Approximate Optimization Algorithm (QAOA) using Qiskit**
    - **Speaker**: Dr. Ritajit Majumdar, Research Scientist, IBM Quantum
    - **Highlights**: A hands-on session where participants implemented QAOA using Qiskit, exploring cost and mixer Hamiltonians for quantum optimization.
4. **Session 4 (03:30 PM – 05:00 PM): Integrating Quantum and HPC for Sustainable Quantum AI**
    - **Speaker**: Garima Jain, Deputy Head, CSBS Dept., NIET
    - **Highlights**: Ms. Jain discussed the synergy between quantum computing and high-performance computing (HPC) for scalable, sustainable Quantum AI frameworks.

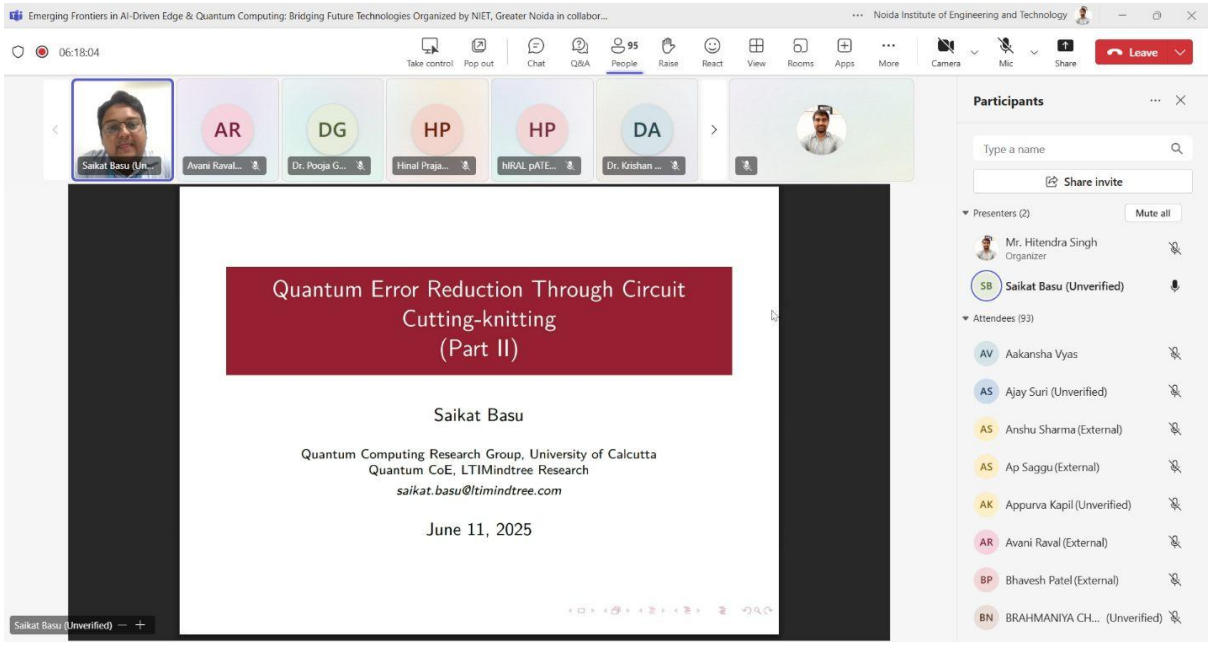


Day 3: 11th June 2025

Sessions

1. **Session 1 (09:30 AM – 11:30 AM): Quantum Computing – A Revolution in Problem Solving**
    - **Speaker**: Prof. Amlan Chakrabarti, Director, A.K. Choudhury School of Information Technology, University of Calcutta
    - **Highlights**: Prof. Chakrabarti highlighted quantum algorithms' strategic applications, India's quantum ecosystem, and real-world quantum advantage.
2. **Session 2 (12:00 PM – 02:00 PM): Explainable AI – Enhancing Transparency and Trust in AI Systems**
    - **Speaker**: Dr. Rakesh Kumar, Lead Data Scientist, YUM! Brands
    - **Highlights**: Dr. Kumar conducted a hands-on session on explainable AI models (SHAP, LIME), emphasizing transparency in healthcare, retail, and compliance sectors.
3. **Session 3 (02:00 PM – 05:00 PM): Quantum Error Reduction via Circuit Cutting & Knitting**
    - **Speaker**: Saikat Basu, Quantum Computing Research Lead, LTIMindtree
    - **Highlights**: Mr. Basu demonstrated advanced quantum error mitigation techniques, focusing on circuit cutting and knitting for reliable NISQ computations.



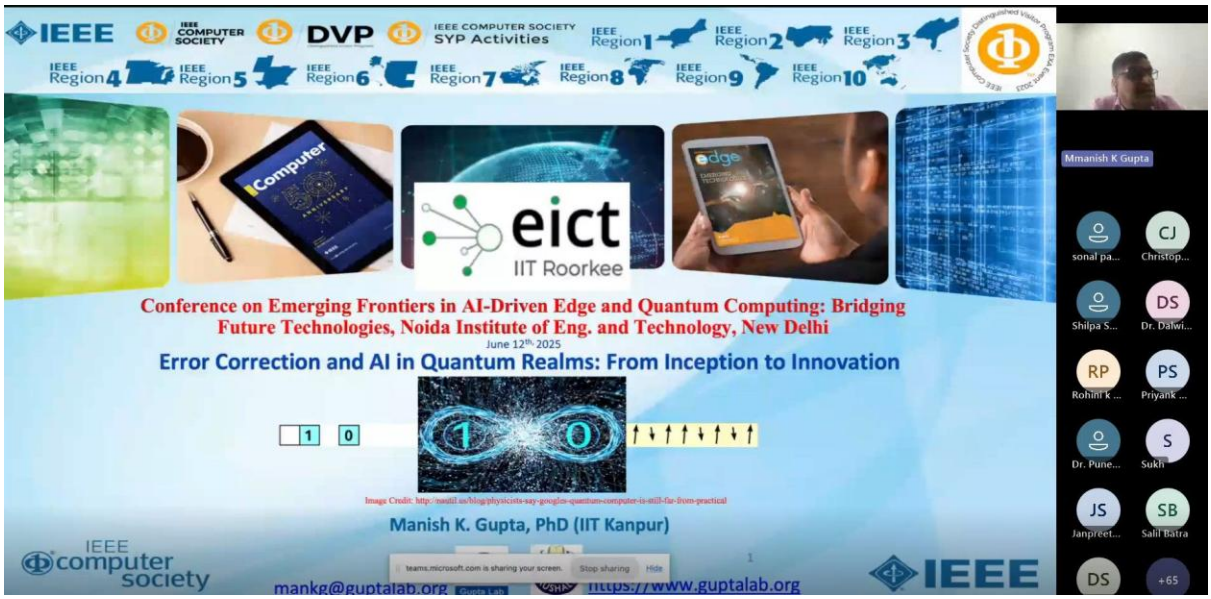


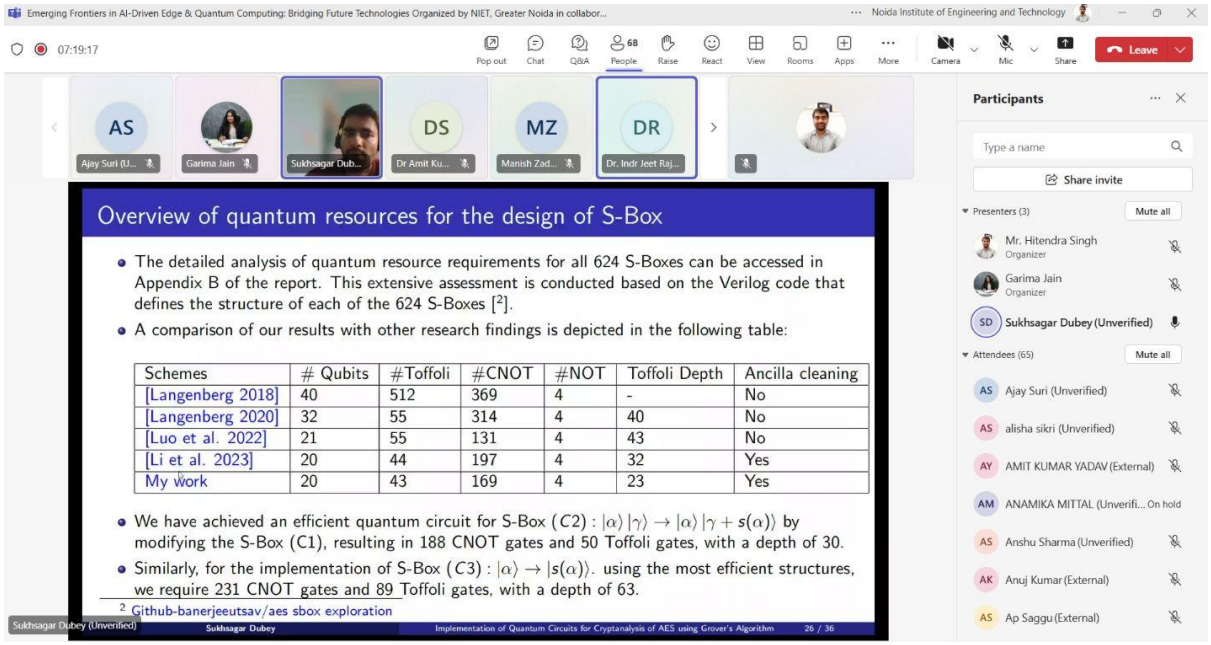
Day 4: 12th June 2025

Sessions

1. **Session 1 (09:30 AM – 11:30 AM): Quantum AI – Enhancing Machine Learning with Quantum Algorithms**
    - **Speaker**: Dr. Manish K. Gupta, Director Academics, Kaushalya The Skill University
    - **Highlights**: Dr. Gupta explored quantum neural networks and variational quantum circuits, discussing their role in accelerating machine learning.

2. **Session 2 (12:00 PM – 02:00 PM): Bio-Inspired AI – Evolutionary Algorithms for Smart Environments**
    - **Speaker**: Dr. Ankush Jain, Assistant Professor, NSUT, New Delhi
    - **Highlights**: Dr. Jain showcased genetic algorithms and swarm intelligence, demonstrating their applications in smart cities and resource optimization.
3. **Session 3 (02:00 PM – 05:00 PM): Implementation of Quantum Circuits for Cryptanalysis of AES using Grover's Algorithm**
    - **Speaker**: Mr. Sukhsagar Dubey, Quantum Research Engineer, LTIMindtree
    - **Highlights**: Participants designed quantum circuits using Qiskit for AES cryptanalysis, exploring Grover's Algorithm's computational edge in symmetric encryption.

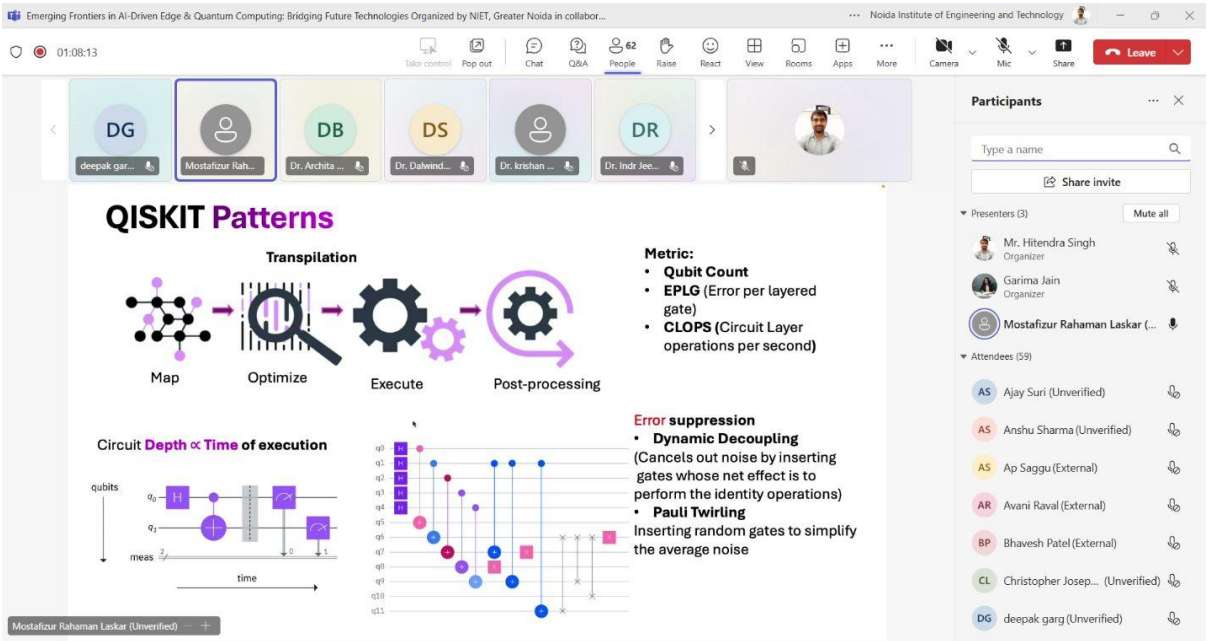


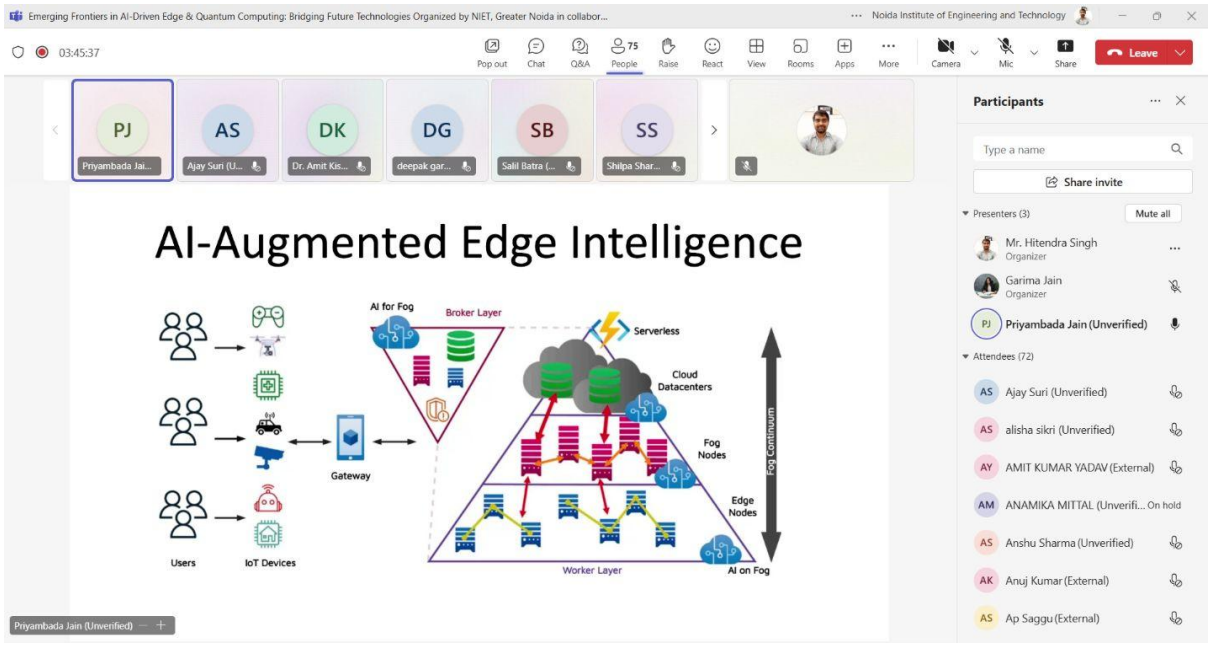


Day 5: 13th June 2025

Sessions

1. **Session 1 (09:30 AM – 11:30 AM): Quantum Algorithms for Utility Applications in Near Term**
    - **Speaker**: Dr. Mostafizur Rahaman, Research Scientist, IBM Quantum
    - **Highlights**: Dr. Rahaman discussed quantum linear algebraic subroutines for signal processing, focusing on NISQ-era applications and IBM Quantum's ecosystem.
2. **Session 2 (12:00 PM – 02:00 PM): AI-Augmented Edge Intelligence & Quantum Systems for Future Computing**
    - **Speaker**: Ms. Priyambada Jain, Vice President & Senior Data Scientist, BlackRock AI Labs, USA
    - **Highlights**: Ms. Jain shared insights on scalable AI systems, retrieval-augmented generation (RAG), and LLM fine-tuning for enterprise applications.
3. **Session 3 (02:00 PM – 05:00 PM): Quantum Communication, Cryptography, and Business Impact**
    - **Speaker**: Ms. Nivedita Dey, Emerging Technology Researcher, PwC US R&D
    - **Highlights**: Ms. Dey connected quantum cryptography with business implications, discussing secure communication and post-quantum readiness.

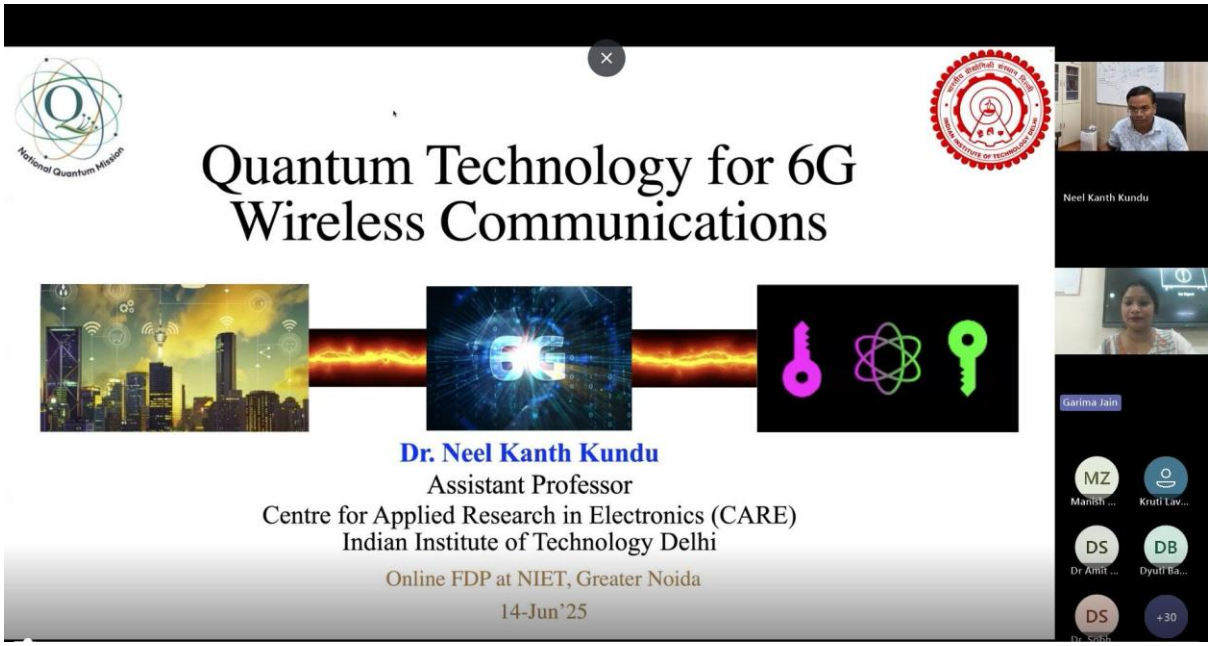


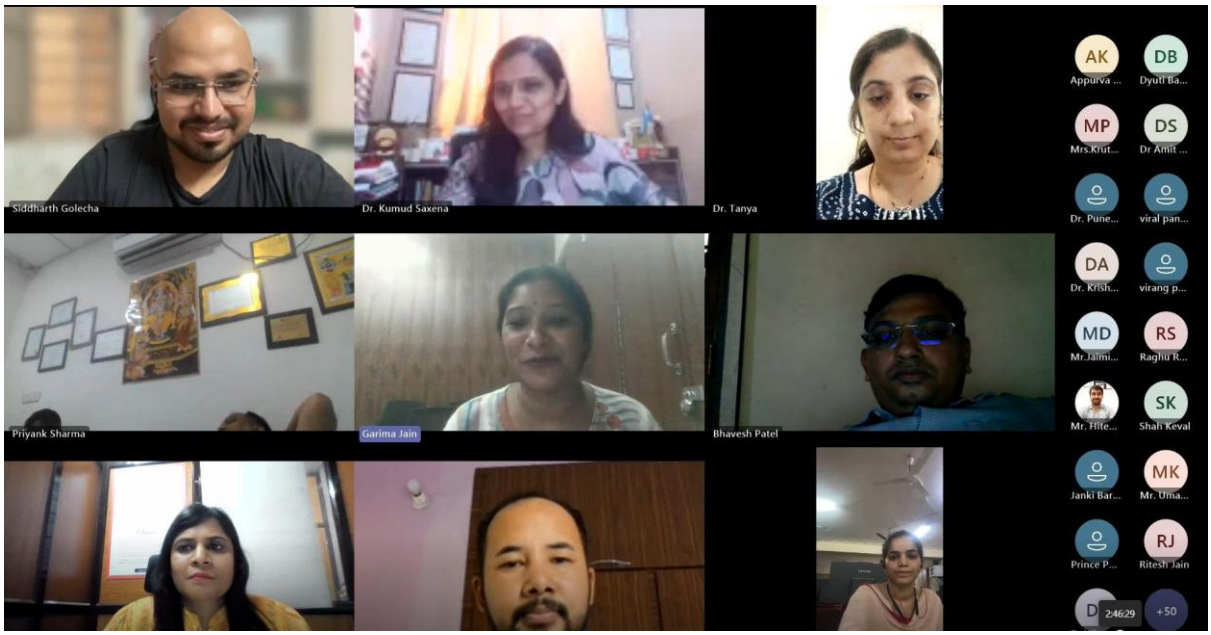


Day 6: 14th June 2025

Sessions

1. **Session 1 (09:30 AM – 11:30 AM): Quantum Technology for 6G Wireless Communications**
    - **Speaker**: Dr. Neel Kanth Kundu, Assistant Professor, IIT Delhi
    - **Highlights**: Dr. Kundu discussed quantum-enhanced signal processing and entanglement-based communication for 6G wireless networks.
2. **Session 2 (12:00 PM – 02:00 PM): Quantum Safe Cryptography: Securing the Future of Data Privacy**
    - **Speaker**: Dr. Harish Sahu, Scientist, DRDO
    - **Highlights**: Dr. Sahu outlined post-quantum cryptographic techniques, emphasizing quantum-resilient security for national cybersecurity.
3. **Session 3 (02:00 PM – 03:30 PM): Hands-On: Simulating the Hydrogen Molecule on IBM Quantum Systems using VQEs**
    - **Speaker**: Mr. Siddharth Golecha, Quantum Support Engineer, IBM Quantum
    - **Highlights**: A repeat hands-on session reinforcing quantum chemistry simulations using VQE algorithms.





Valedictory Ceremony Highlights

The FDP concluded with a valedictory ceremony, reflecting on the transformative journey:

- **Chief Address**: **Prof. Kumud Saxena, Dean, SCSIT, NIET**
    - Highlighted educators' role in preparing quantum-ready talent and the urgency of advancing AI and frontier technologies.
- **Vote of Thanks**: **Dr. Deepti Gupta, Head, Department of CSBS, NIET**
    - Commended participants' dedication and emphasized interdisciplinary convergence in addressing real-world challenges.

Participants' Overview:

The Faculty Development Program (FDP) witnessed enthusiastic participation from a total of **63 individuals**. The participants comprised **48 faculty members**, **1 industry professional**, **3 research scholars**, and **11 undergraduate students**, contributing to a diverse and engaging learning environment. This diverse group contributed to a rich exchange of knowledge and perspectives, enhancing the collaborative learning experience throughout the FDP.