REPORT ON FACULTY DEVELOPMENT PROGRAMME

on

"Fabrication And Characterization of Nanomaterials For Device Applications"

27th May to 1st June 2024

Introduction

The School of Basic and Applied Sciences (SBAS) organized one week Faculty Development Program (FDP) on "Fabrication and characterization of Nanomaterials for device applications" from 27th May to 1st June 2024 under Mahatma Hansraj- Malaviya Mission Teacher Training Centre (MHMMTTC), New Delhi The event took place in the online mode from K.R. Mangalam University. It witnessed enthusiastic participation from more than 50 faculties and research scholars hailing from K.R. Mangalam and various other universities. The program includes invited talks and discussions, covering topics such as nanomaterial synthesis, characterization techniques, and device applications. It is designed for researchers, scientists, engineers, and professionals in nanotechnology and related fields. Upon completion, participants had a comprehensive understanding of nanomaterial fabrication and characterizations, enabling them to design, optimize, and integrate nanomaterials into various devices for practical applications.

Objectives:

- Understand the fundamental principles of nanomaterial fabrication techniques
- Investigate emerging trends and advancements in nanomaterial fabrication and characterization techniques
- Explore the characterization techniques used to analyze nanomaterial properties: Explore the applications of nanomaterials in various devices
- Assess the scalability and reproducibility of nanomaterial fabrication techniques
- Investigate the influence of fabrication parameters on nanomaterial morphology, size, crystallinity, and purity.
- Analyze the environmental and health implications of nanomaterial synthesis and device fabrication processes

The sessions of the FDP were planned to meet the desired objectives.

The participants used the following link daily to join the six-day online Zoom meeting of the FDP:

Day-wise Report of the Sessions Conducted

FDP-125 "Fabrication and Characterization of Nanomaterials for Device Applications"

Day 1 (27th May 2024)

Inaugural Session: (10:00 am - 10:30am)

During the inaugural session of the Faculty Development Program (FDP) on Fabrication and Characterization of Nanomaterials for Device Applications, Dr. Kriti, the Convenor from SBAS KRMU, warmly welcomed all participants. The session began with invoking blessings from Maa Saraswati through Saraswati Vandana. Dr. Kriti extended a heartfelt welcome to the Patron of the event, Prof. Dr. RaghuVir Singh, Vice Chancellor of K.R. Mangalam University, the Co-Patron, Dr. Meena Bhandari, Dean SBAS, the Guest of Honor, Dr. Rakesh Sinha, Dean Research KRMU, along with faculty and research scholars from various institutions. She

highlighted that the FDP, organized in collaboration with the Mahatma Hansraj Malaviya Mission Teacher Training Centre and supported by the Ministry of Education under the Malaviya mission scheme, aims to enhance faculty development through various programs addressing personal, instructional, and organizational aspects. The program seeks to empower faculty, strengthen institutions, and elevate educational standards. After that, Dr. Chandra Mohan emphasized KRMU's commitment to academic excellence and innovation, as evidenced by its rapid growth since its establishment in 2013. The one-week FDP is designed to equip participants with the necessary knowledge and skills in nanotechnology, covering a wide range of topics from nanomaterial synthesis to device applications. The session proceeded with addresses from Dr. Meena Bhandari, Prof. Dr. Raghuvir Singh, and Dr. Rakesh Sinha, who provided valuable insights and motivation for the participants.

Photo 1: Welcome speech delivered by Dr. Chandra Mohan and Dr. Meena Bhandari in inaugural session.

Photo 2: Prof. Raghuvir Singh addressing the participants at the inaugural session of the FDP.

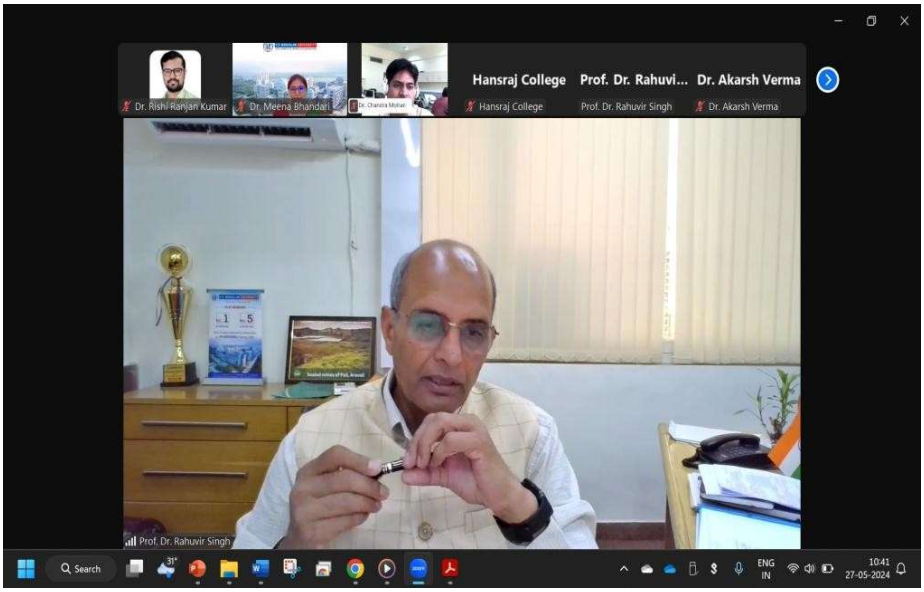


Photo 3: Prof. Raghuvir Singh interacting with the participants during inaugural session of the FDP.

The inaugural session was followed by the technical sessions:

Session 1 (10:30am - 12:00 noon)

Dr. Satish Kumar, Chief Scientist at the Centre of Excellence for Intelligent Sensors and Systems (ISenS), CSIR Chandigarh, delivered an enlightening lecture on "Next Generation Systems - Challenges and Opportunities." He emphasized the paramount importance of the Internet of Things (IoT) in driving future technological

advancements. Dr. Kumar discussed the critical need for IoT in enhancing connectivity and efficiency across various sectors, highlighting its applications in smart cities, healthcare, and industrial automation. He elaborated on the challenges of integrating IoT systems, including issues related to data security, scalability, and interoperability. The lecture underscored the transformative potential of IoT in creating intelligent, responsive environments and the necessity for continued innovation and collaboration to overcome the associated hurdles and fully leverage IoT's capabilities.

Following his lecture, Dr. Kumar engaged in a lively question-and-answer session with the participants, addressing their queries and providing deeper insights into the practical applications and potential challenges of implementing IoT systems, such as data security and integration complexities.

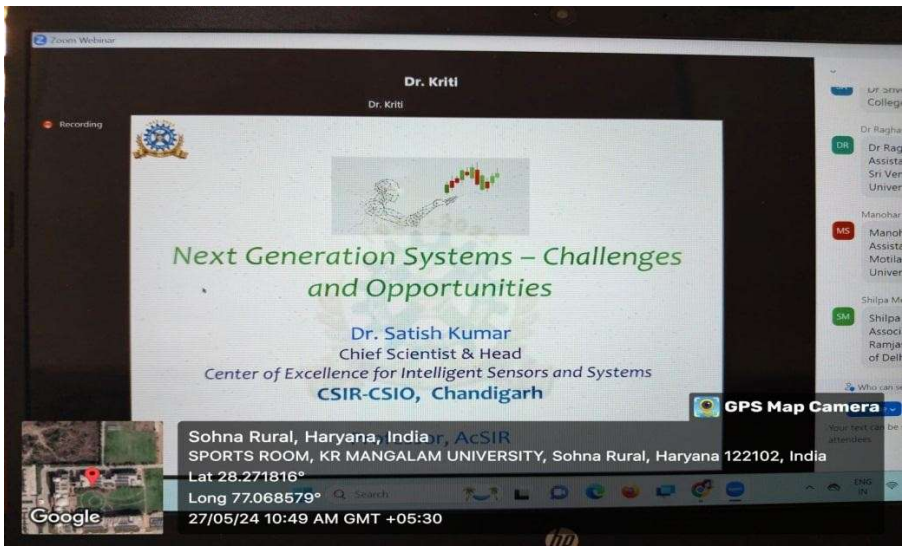


Photo 4: Title of the talk delivered by Dr. Satish.

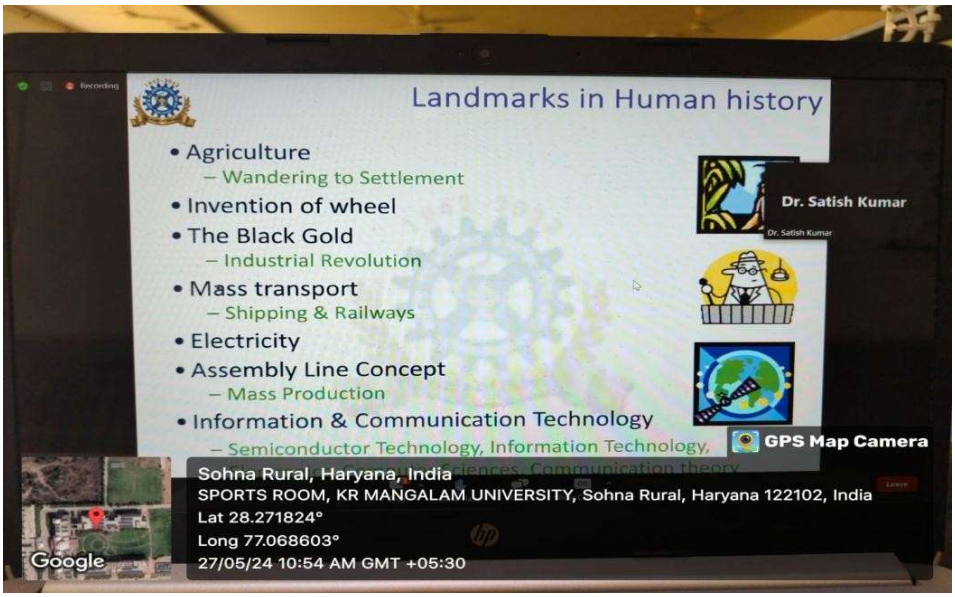


Photo 5: One of the slides of Dr. Satish's talk during FDP.

Session 2 (12:00 noon - 1:30pm)

Dr. Anoop Shukla, Associate Professor in the Department of Physics at Amity Institute of Applied Science (AIAS), Amity University Uttar Pradesh, Noida, delivered an engaging lecture on "Smart Materials and Their Applications". He discussed the transformative potential of smart materials, which can respond dynamically to environmental changes, making them invaluable in fields such as aerospace, biomedical engineering, and consumer electronics. Professor Shukla elaborated on various types of smart materials, including shape-memory alloys, piezoelectric materials, and electrochromic materials, highlighting their unique properties and practical applications. The lecture concluded with an interactive question-and-answer session, where participants posed insightful questions about the future prospects, challenges, and innovative uses of smart materials, leading to a deeper understanding of their significant impact on technological advancements.

Photo 6: Topic of the lecture given by Dr. Anoop Kumar Shukla during FDP.

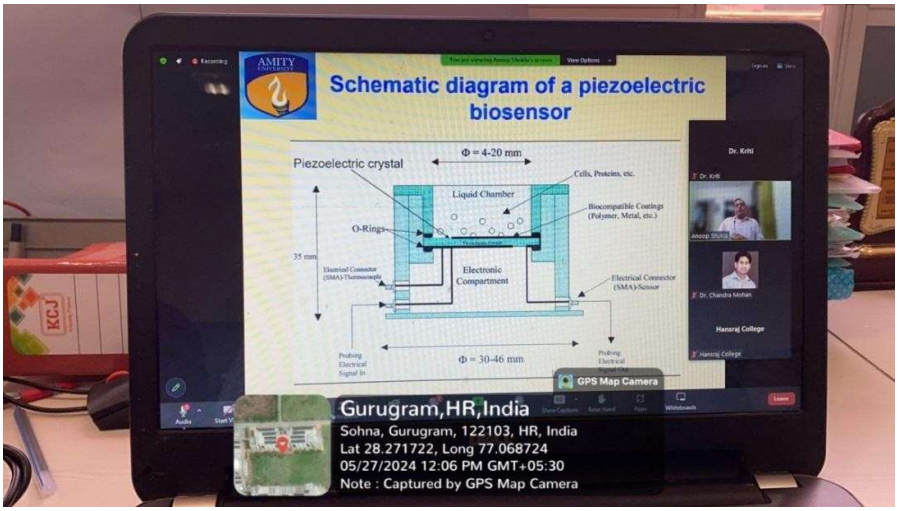


Photo 7: One of the slides of Dr. Satish's talk during FDP.

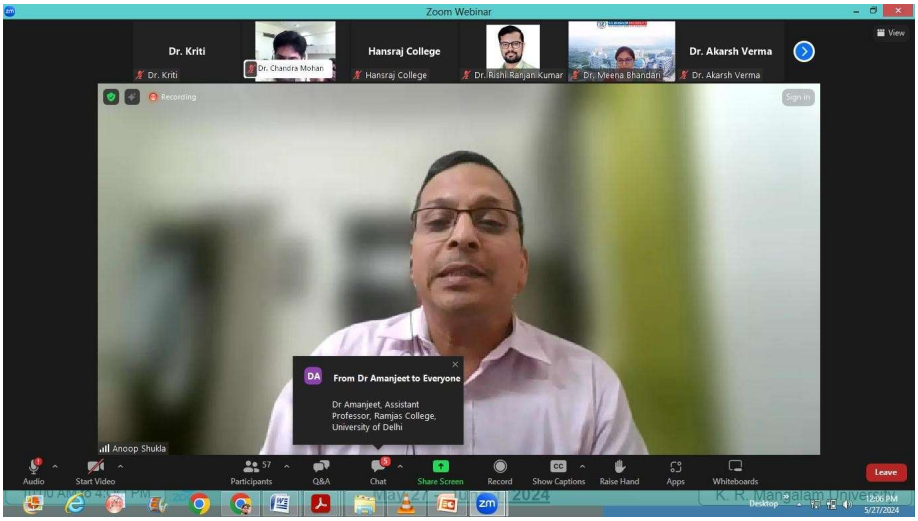


Photo 8: Dr. Anoop interacting with participants in the FDP.

Session 2 (1:30pm -3:00pm)

Dr. Indu Singh, Assistant Professor at the School of Medical and Allied Sciences, K.R. Mangalam University, Gurugram, delivered an enlightening lecture on "Nanomaterials: Frontliners for Biomedical Applications." She emphasized the revolutionary impact of nanomaterials in the biomedical field, detailing their applications in drug delivery, diagnostic imaging, and tissue engineering. Dr. Singh discussed how nanomaterials enhance the efficacy and precision of medical treatments, providing examples such as targeted cancer therapies and advanced imaging techniques that offer unprecedented resolution. The lecture highlighted the potential of nanomaterials to transform healthcare by enabling more effective and less invasive medical interventions. Following the presentation, Dr.

Singh engaged in a dynamic question-and-answer session, where participants explored topics such as the safety, ethical considerations, and future developments of nanomaterial applications in biomedicine, deepening their understanding of this cutting-edge field.

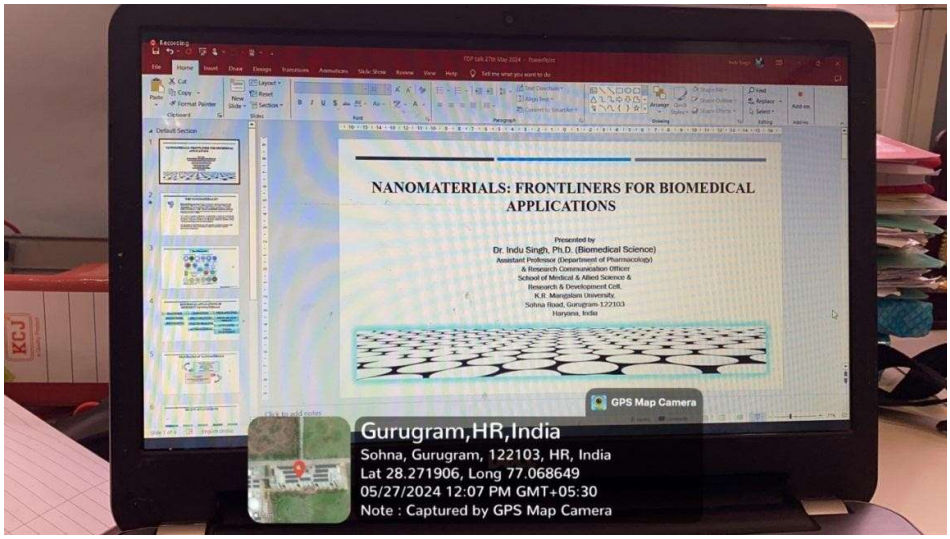


Photo 9: Presentation slides shared by Dr. Indu singh during her lecture in the FDP.

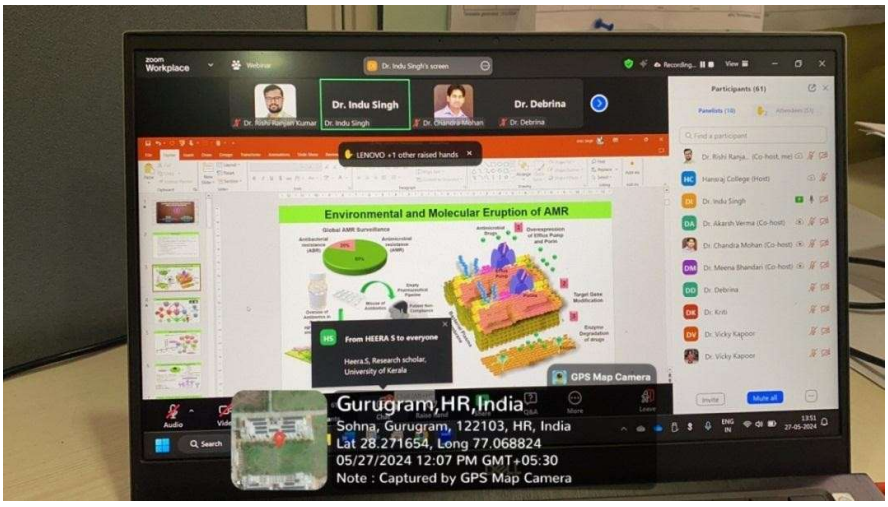


Photo 10: Dr. Indu Singh explaining about environmental and molecular eruption of AMR during FDP.

Session 4 (3:00pm - 4:00pm)

Dr. Debrina Jana, Assistant Professor at Gour Mohan Sachin Mandal Mahavidyalaya under the University of Calcutta, delivered an insightful lecture on "Perovskite Nanomaterials: New Paradigm in Photovoltaics and Optoelectronics." She highlighted the transformative potential of perovskite nanomaterials in advancing

photovoltaic technologies and optoelectronic devices. Dr. Jana discussed the unique properties of perovskites, such as their high efficiency, low cost, and versatility in application, which make them superior to traditional materials used in solar cells and light-emitting devices. She also explored the challenges and future prospects of integrating perovskite nanomaterials into commercial applications. Following the lecture, Dr. Jana engaged with participants in a question-and-answer session, addressing queries on topics such as the stability of perovskite materials, environmental impacts, and ongoing research to overcome current limitations, providing a comprehensive understanding of this cutting-edge field.

Photo 11: Dr. Debrina Jana giving overview about her talk during FDP.

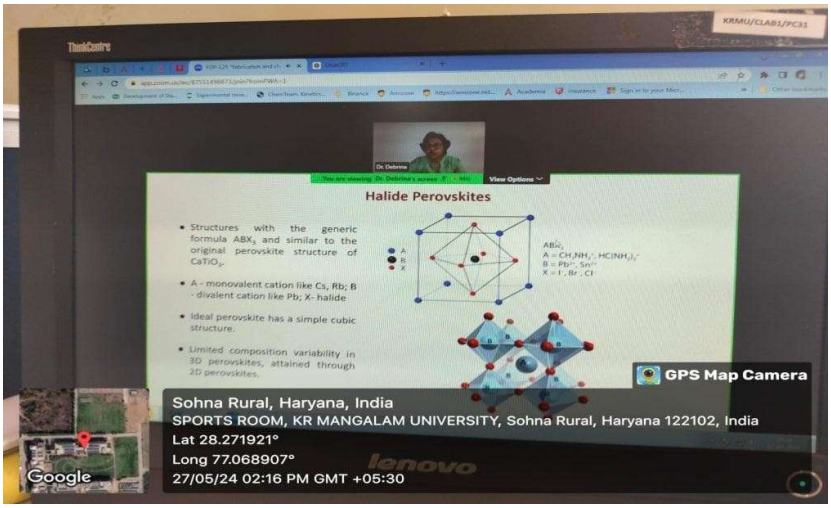


Photo 12: Dr. Debrina explaining Halide Pervoskites during FDP.

Day 2 (28th May 2024)

Session 1 (10:00am -11:30am)

The session commenced with a warm welcome by the Convenor, followed by an enlightening lecture by Dr. Amanpal Singh Clair, Assistant Professor in the Department of Physics at the University of Rajasthan, on the topic

"Nanotechnology in Energy and Environment: Sustainable Solutions for a Better Tomorrow." Dr. Clair emphasized the critical role of nanotechnology in developing sustainable energy solutions and environmental protection. He detailed how nanomaterials can improve energy efficiency, enhance renewable energy systems, and contribute to pollution control. Highlighting various applications such as solar cells, energy storage devices, and water purification systems, Dr. Clair illustrated the transformative potential of nanotechnology in addressing global energy and environmental challenges. The lecture concluded with an engaging question-and-answer session, where participants delved into discussions about the practical implications, challenges, and future directions of nanotechnology in creating a sustainable future.

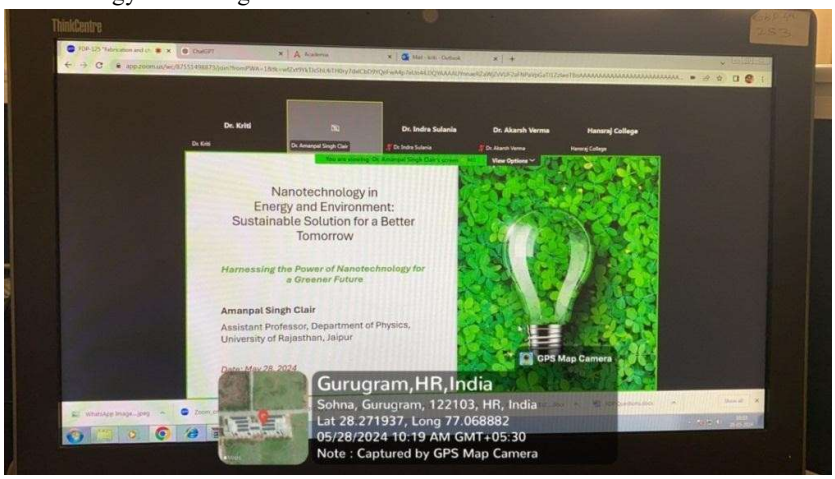


Photo 13: Title of the talk delivered by Dr. AmanPal Singh Clair.

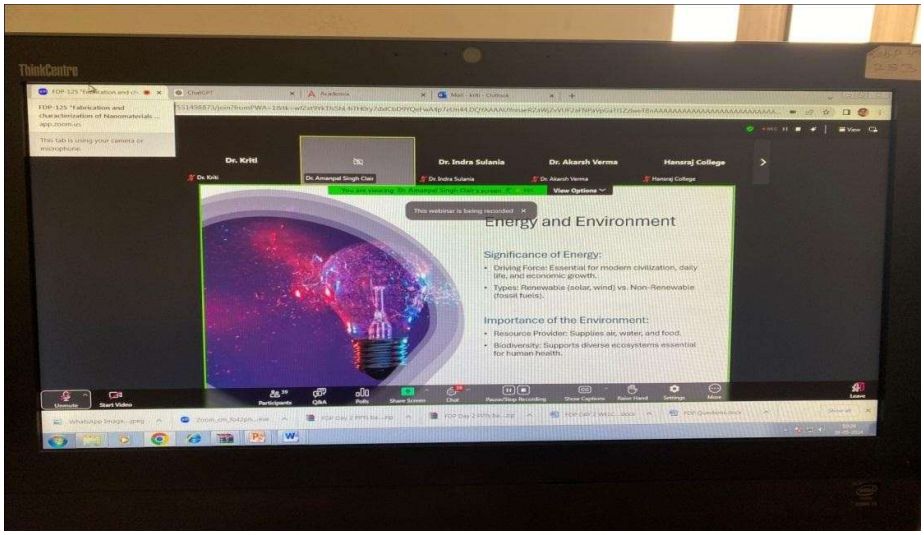


Photo 14: Dr. Aman Pal Singh Clair elucidating about role of nanotechnology in energy and environment.

Session 2 (11:30am -1:00pm)

Dr. Vimal Srivastava, Professor of Chemical Engineering at IIT Roorkee, delivered an informative lecture on the "Synthesis of Nanomaterials through Solution Combustion and Electrochemical Routes." Dr. Srivastava explained the principles and methodologies behind these synthesis techniques, emphasizing their efficiency and versatility in producing high-quality nanomaterials. He discussed the advantages of solution combustion, such as its simplicity and cost-effectiveness, and the precision and control offered by electrochemical routes. By providing detailed examples and case studies, Dr. Srivastava highlighted the practical applications of these methods in various fields, including catalysis, energy storage, and environmental remediation. The lecture concluded with an interactive question-and-answer session, where participants engaged in discussions on optimizing these synthesis processes, potential industrial applications, and future research directions in nanomaterial synthesis.

Photo 15: Dr. Vimal Srivastava sharing title of his talk during FDP.

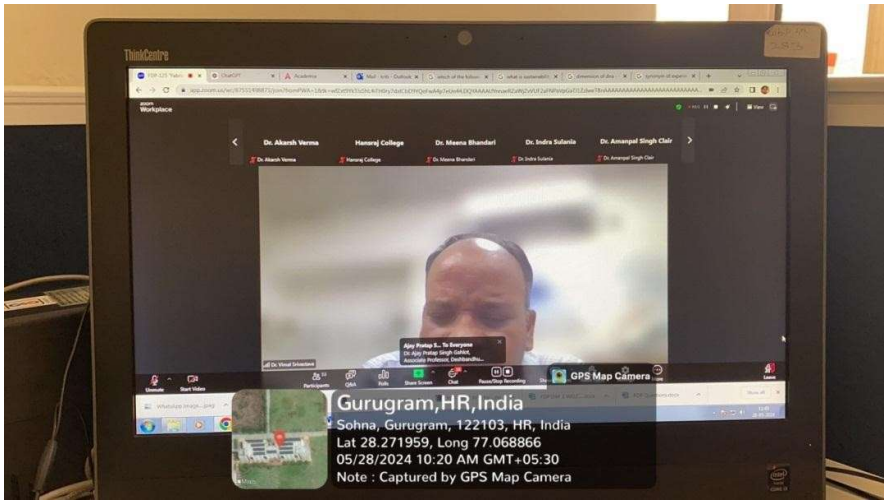


Photo 16: Dr. Vimal interacting with participants in FDP.

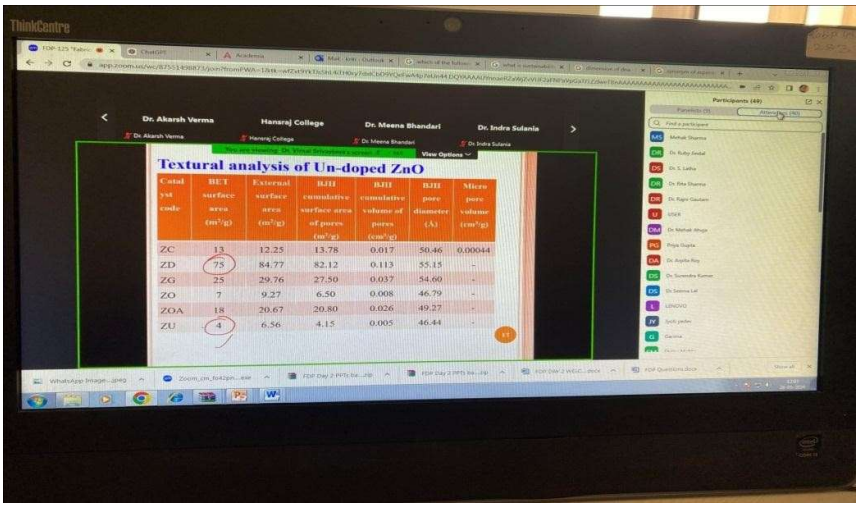


Photo 17: One of the slides of Dr. Vimal's talk during FDP.

Session 3 (1:00pm - 2:30pm)

Dr. Akarsh Verma, Assistant Professor at the University of Petroleum and Energy Studies, delivered an insightful lecture on "Nanomaterials Characterization through Molecular Dynamics." Dr. Verma explained the fundamental principles of molecular dynamics simulations and their application in understanding and characterizing nanomaterials. He discussed how these simulations provide detailed insights into the atomic and molecular behavior of nanomaterials, enabling researchers to predict properties and optimize performance for various applications. By presenting case studies and practical examples, Dr. Verma illustrated the versatility and precision of molecular dynamics in studying nanomaterials' structural, thermal, and mechanical properties. The lecture concluded with an engaging question-and-answer session, where participants explored topics such as the limitations of molecular dynamics, integration with experimental techniques, and future research possibilities in nanomaterials characterization.

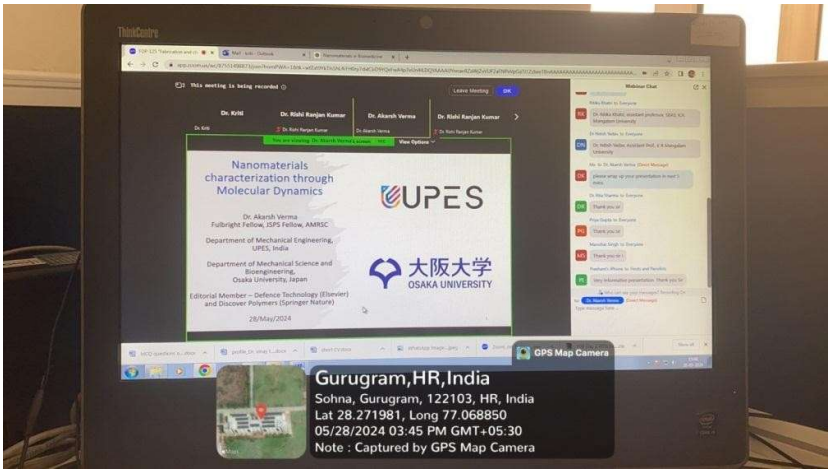


Photo 18: Topic of the lecture given by Dr. Akarsh Verma

Session 4 (2:30pm - 4:00pm)

Dr. Rishabh, an R&D Engineer at Jetchem International Co. Ltd., Taiwan, delivered a comprehensive lecture titled "From Lab Innovations to Industrial Solutions: Microfluids and PCB Manufacturing Techniques." Dr. Rishabh elucidated the journey of laboratory innovations to their practical implementation in industrial settings, focusing on microfluids and printed circuit board (PCB) manufacturing techniques. He discussed the significance of microfluidic systems in various industries, highlighting their role in enhancing efficiency, precision, and scalability in processes such as chemical synthesis, drug delivery, and diagnostics. Additionally, Dr. Rishabh provided insights into advanced PCB manufacturing techniques, emphasizing their crucial role in modern electronics production. The lecture concluded with a dynamic question-and-answer session, during which participants engaged in discussions regarding the integration of lab-scale innovations into large-scale industrial applications, challenges in scaling up processes, and emerging trends in microfluidics and PCB manufacturing.

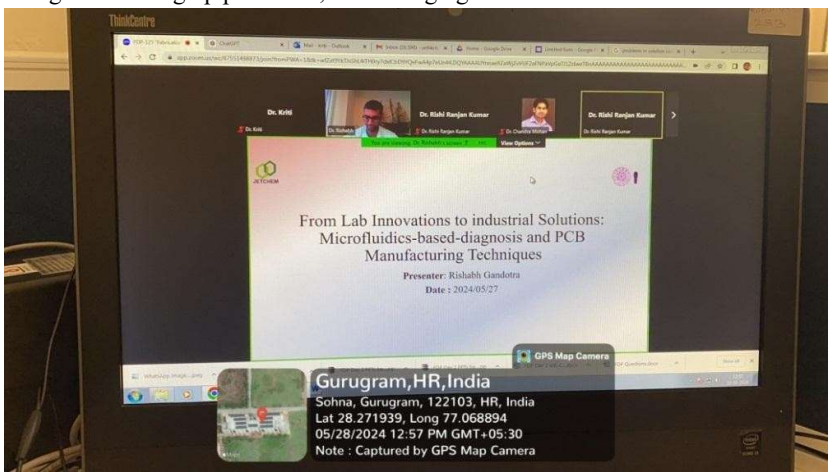


Photo 19: Topic of the lecture given by Dr. Rishabh Gandotra.

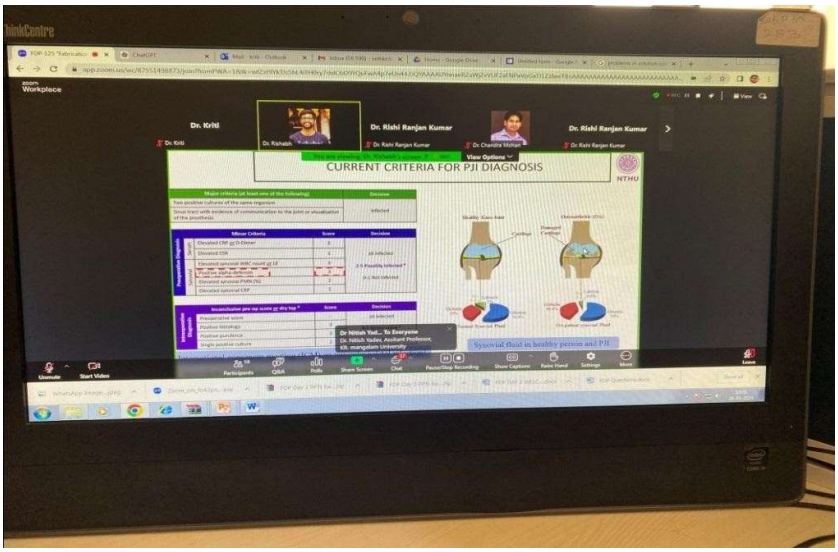


Photo 20: One of the slides of Dr. Rishabh's talk during FDP.

Day 3 (29th May 2024)

Session 1 (10:00am - 11:30am)

The session commenced with a warm welcome by the Convenor, followed by an insightful lecture by Dr. Sanjay Pratihar, a Senior Scientist at CSIR-CSMCRI, on "Smart Nanomaterials for Catalytic and Photocatalytic Applications." Dr. Pratihar elaborated on the cutting-edge advancements in nanotechnology that have paved the way for the development of smart nanomaterials with catalytic and photocatalytic properties. He discussed how these nanomaterials can play a pivotal role in addressing environmental challenges and facilitating sustainable development through their applications in pollution control, wastewater treatment, and renewable energy generation. Dr. Pratihar's lecture provided valuable insights into the design, synthesis, and optimization of nanomaterials for catalytic and photocatalytic applications. The session concluded with an engaging questionand-answer round, during which participants delved deeper into topics such as the mechanisms of catalysis, the efficiency of photocatalytic processes, and the scalability of nanomaterial production for industrial applications.

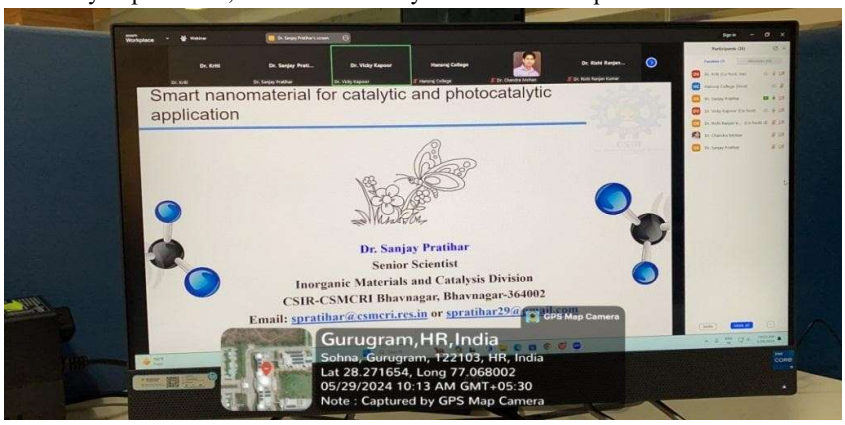


Photo 21: Dr. Sanjay Pratihar presenting the topic of his talk at the FDP.

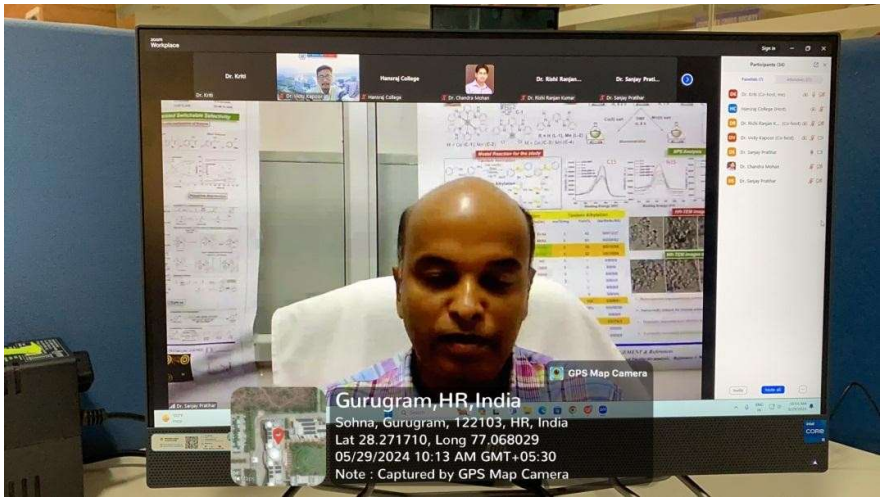


Photo 22: Dr. Sanjay Pratihar interacting with participants during his lecture in FDP.

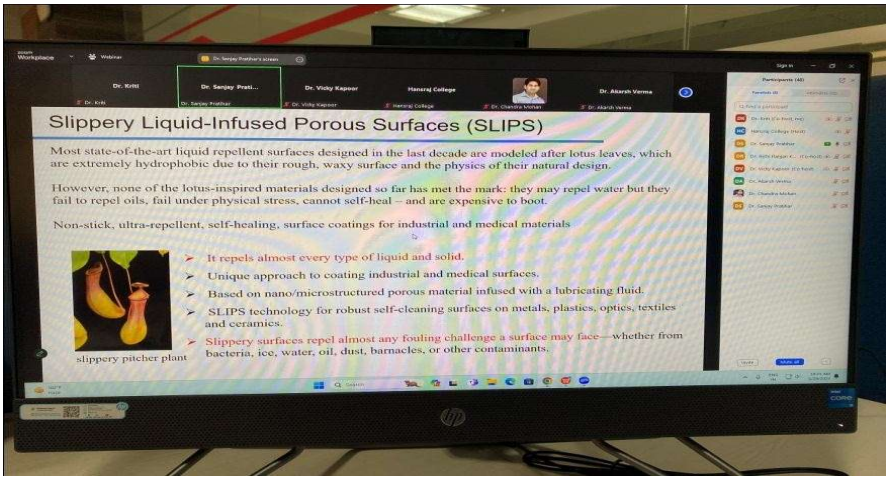


Photo 23: Dr. Sanjay clarifying about SLIPS during FDP.

Session 2 (11:30am - 1:00pm)

Dr. Kiran Kishore, Sales Section Manager at Scientech Corporation, Taiwan, delivered an insightful lecture on "Exploring Semiconductor Manufacturing Processes: Strategies for Skill Enhancement." Dr. Kiran delved into the intricate world of semiconductor manufacturing, elucidating various processes and techniques crucial for skill enhancement in the field. He provided a comprehensive overview of semiconductor fabrication methodologies, emphasizing the importance of continuous learning and skill development in keeping pace with the rapidly evolving semiconductor industry. Dr. Kiran's lecture offered valuable insights into strategies for enhancing proficiency in semiconductor manufacturing, catering to the diverse needs of professionals in the field. The session concluded with an interactive question-and-answer round, during which participants engaged in discussions on topics such as emerging trends in semiconductor technology, challenges in process optimization, and avenues for skill development in semiconductor manufacturing.

Photo 24: Dr. Kiran Kesavan joining for his talk in the FDP.

Photo 25: Dr. Kiran Kesavan presenting the topic of his talk at the FDP.

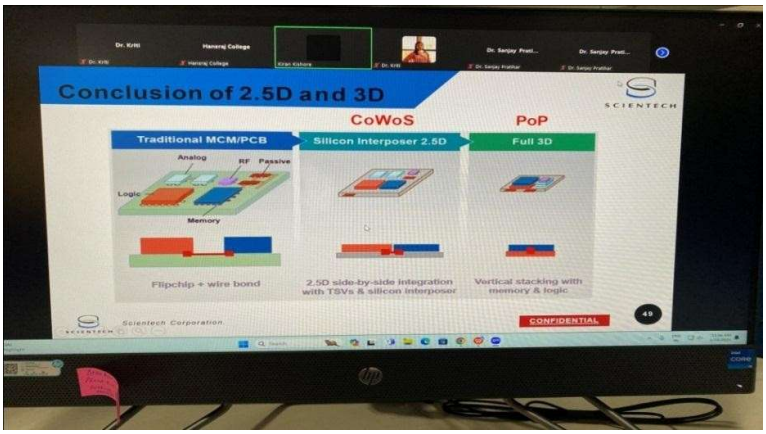


Photo 26: Dr. Kiran elucidating types of PCBs during his lecture.

Session 3 (1:00pm - 2:30pm)

Dr. Vinay Kumar Tyagi, a Senior Scientist at the Shri ram Institute for Industrial Research in Delhi, delivered an enlightening lecture on "Nano Materials: Advanced Applications." Dr. Tyagi explored the diverse and innovative applications of nanomaterials across various industries, shedding light on their significance in advancing technology and solving real-world challenges. He discussed cutting-edge developments in nanomaterial research, showcasing their remarkable properties and potential applications in fields such as electronics, medicine, energy, and environmental remediation. Dr. Tyagi's comprehensive presentation not only highlighted the immense potential of nanomaterials but also emphasized the importance of responsible innovation and ethical considerations in their application. The session concluded with a dynamic question-andanswer round, during which participants engaged in discussions on topics ranging from the scalability of nanomaterial production to safety concerns and regulatory frameworks governing their use in different sectors.

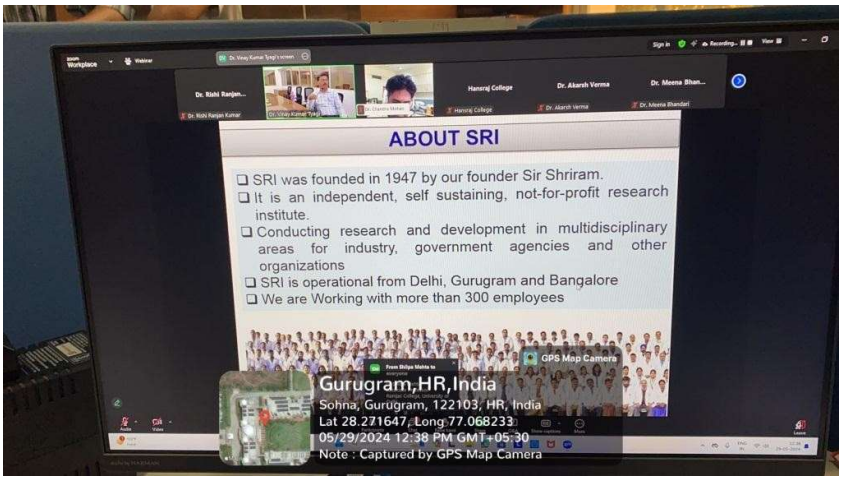


Photo 27: Dr. Vinay Kumar Tyagi introducing giving overview of his institute during FDP.

Photo 28: One of the slides showing Dr. Vinay during FDP.

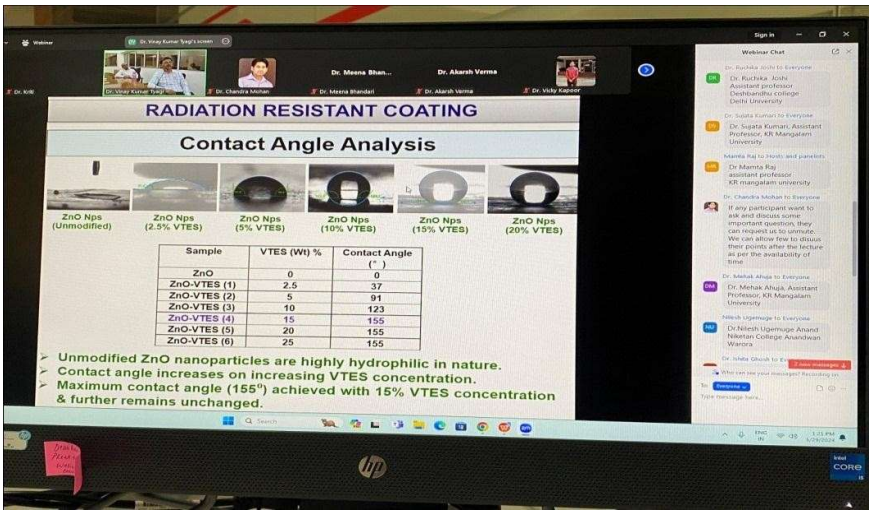


Photo 29: Dr. Vinay Kumar Tyagi discussing about radiation resistant material at the FDP.

Session 4 (2:30pm - 4:00pm)

Dr. Akash Pratap Singh, an Assistant Professor at Maitreyi College, University of Delhi, presented a thoughtprovoking lecture on "Computational Approaches to Drug Design for a Better Tomorrow." Dr. Singh delved into the realm of computational drug design, illustrating how advanced computational techniques revolutionize the drug discovery process by facilitating the identification of potential drug candidates with enhanced efficacy and reduced side effects. He elaborated on various computational methods, including molecular docking, molecular dynamics simulations, and quantitative structure-activity relationship (QSAR) analysis, emphasizing their role in accelerating drug discovery and development. Dr. Singh's lecture underscored the significance of computational approaches in addressing global health challenges and fostering innovation in pharmaceutical research. The session concluded with an engaging question-and-answer round, during which participants explored topics such as the integration of computational techniques with experimental methods, challenges in drug design, and future directions in computational drug discovery.

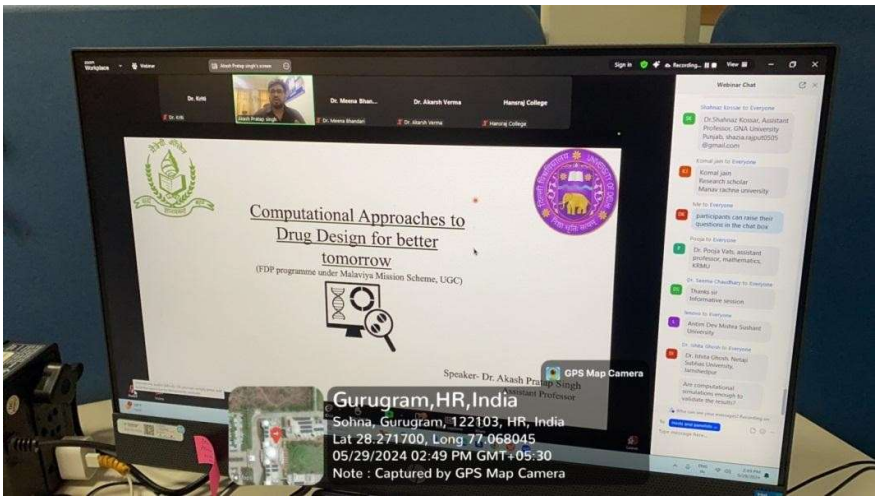


Photo 30: Title of the talk delivered by Dr. Akash Pratap Singh.

Day 4 (30th May 2024)

Session 1 (10:00pm - 11:30pm)

The session commenced with a warm welcome by the Convenor, followed by an illuminating lecture by Dr. Hirdesh Kumar, an Instrument Scientist at the Neutron Spectroscopy Department of the Budapest Neutron Centre in Europe, on "An Introduction to Structural Investigation Techniques: Neutron and X-Ray Diffraction." Dr. Hirdesh provided an insightful overview of neutron and X-ray diffraction techniques, elucidating their principles, applications, and significance in structural analysis. He discussed how these techniques enable researchers to probe the atomic and molecular structure of materials, offering invaluable insights into their properties and behaviors. Dr. Hirdesh's comprehensive presentation not only showcased the capabilities of neutron and X-ray diffraction but also highlighted their complementary roles in various scientific disciplines. The session concluded with an interactive question-and-answer round, during which participants engaged in discussions on topics such as the advantages of neutron diffraction over X-ray diffraction, emerging trends in structural investigation techniques, and practical considerations in experimental design for diffraction studies.

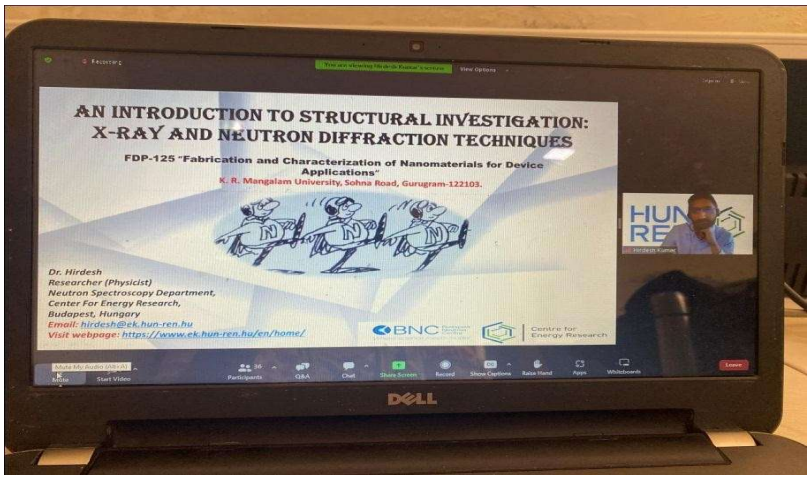


Photo 31: Dr. Hirdesh Kumar giving overview of his talk.

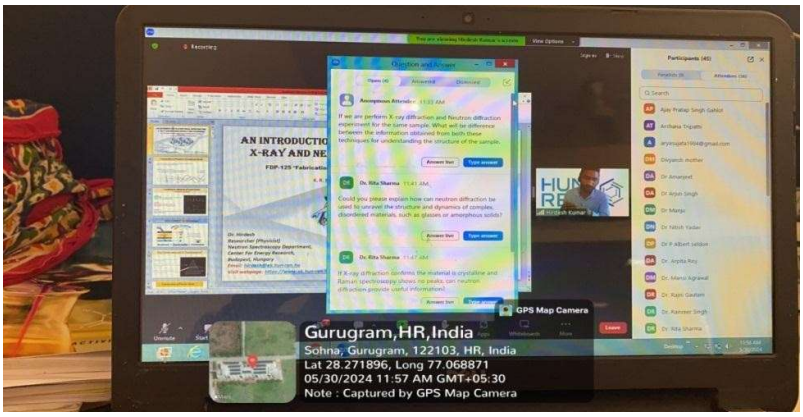


Photo 32: Dr. Hirdesh taking queries of the participants at the FDP.

Session 2 (11:30pm - 1:00pm)

Dr. Vinod Kumar, an Associate Professor in the Department of Chemistry at J C Bose University of Science & Technology, YMCA, Faridabad, delivered an enlightening lecture on "Fluorescence Spectroscopy and Its Applications." Dr. Kumar provided a comprehensive overview of fluorescence spectroscopy, elucidating its principles, instrumentation, and applications across various scientific domains. He discussed how fluorescence spectroscopy serves as a powerful analytical tool for probing molecular structure, dynamics, and interactions in diverse fields such as chemistry, biology, and materials science. Dr. Kumar showcased real-world examples of fluorescence spectroscopy applications, including biomolecular analysis, environmental monitoring, and pharmaceutical research. The lecture concluded with an engaging question-and-answer session, during which participants explored topics such as experimental techniques, data interpretation methods, and emerging trends in fluorescence spectroscopy, further enriching their understanding of this versatile analytical technique.

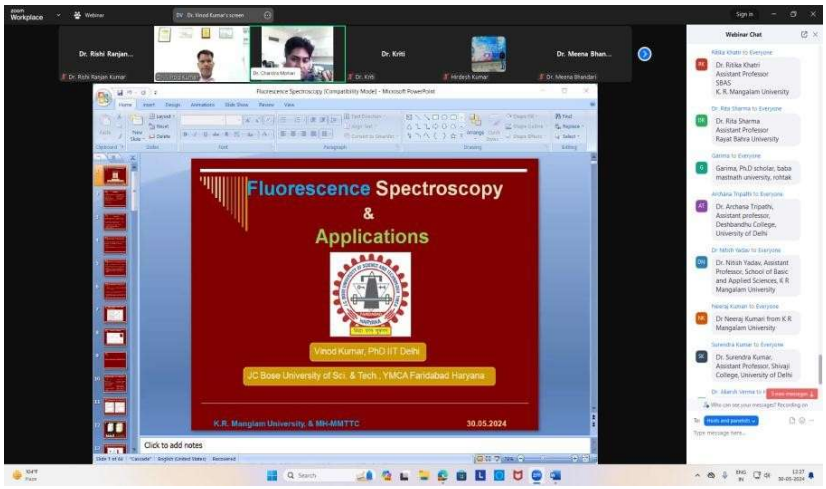


Photo 33: Topic of the lecture given by Dr. Vinod Kumar.

Session 3 (1:00pm - 2:30pm)

Dr. Suman Gajjala, Senior Principal Scientist in the Biomedical Metrology section of the Environmental Science and Biomedical Metrology division at the National Physical Laboratory, delivered an insightful lecture on "Fabrication of Biosensors for Clinical Diagnostics using Nanomaterials." Dr. Gajjala discussed the innovative use of nanomaterials in the development of biosensors for clinical diagnostics, emphasizing their pivotal role in enhancing sensitivity, specificity, and reliability. She provided a detailed overview of various nanomaterial-based biosensor fabrication techniques, highlighting their applications in detecting biomarkers for disease diagnosis and monitoring. Dr. Gajjala's lecture underscored the significance of biosensors in advancing healthcare technology and improving patient outcomes. The session concluded with an interactive question-andanswer round, during which participants engaged in discussions on topics such as biosensor design, nanomaterial selection criteria, and challenges in translating biosensor technology into clinical practice, fostering a deeper understanding of this cutting-edge field.

Photo 34: Dr . Suman Gajjala joining for her talk in the FDP.

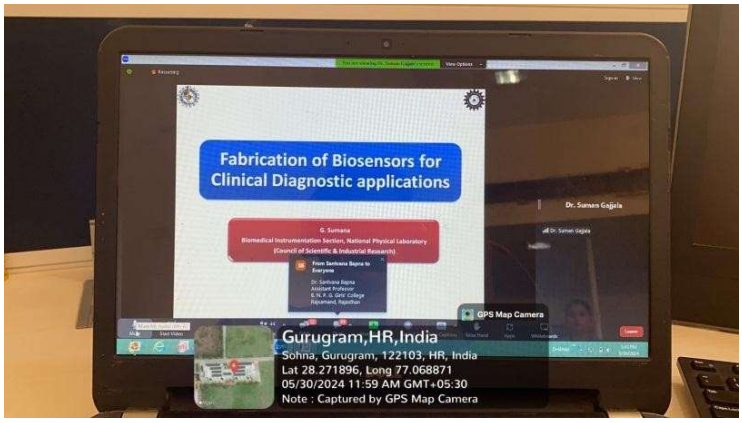


Photo 35: Title of the talk delivered by Dr. Suman.

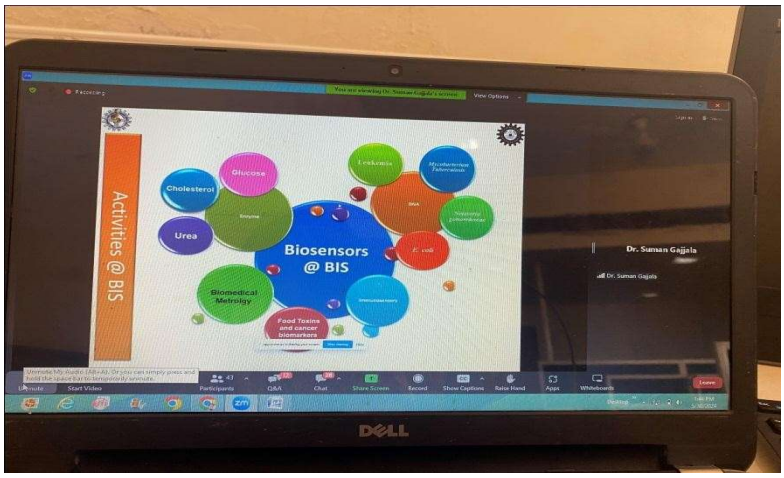


Photo 36: One of the slides of Dr. Satish's talk during FDP.

Session 4 (2:30pm - 4:00pm)

Dr. Himanshu Ojha, Scientist F and Joint Director at the Institute of Nuclear Medicine and Allied Sciences (INMAS), DRDO, recently delivered an enlightening lecture on the "Use of Graphene Materials for CBRN Decontamination." Dr. Ojha detailed the innovative applications of graphene in the decontamination of chemical, biological, radiological, and nuclear (CBRN) threats, highlighting its superior properties such as high surface area, mechanical strength, and chemical stability. He presented case studies and experimental results demonstrating the effectiveness of graphene-based materials in neutralizing hazardous substances, thus underscoring their potential in enhancing national security measures. The session concluded with a dynamic question and answer round, where participants engaged with Dr. Ojha, exploring deeper into the practical implementations and future advancements of graphene in CBRN decontamination strategies.

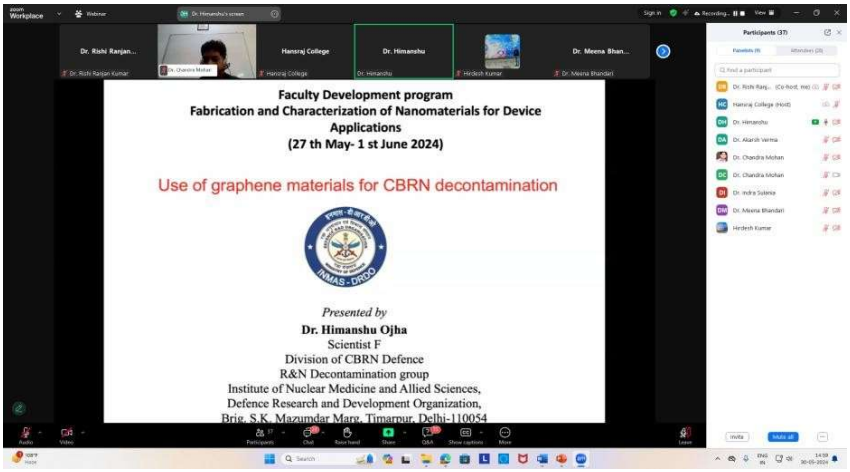


Photo 37: Dr. Himanshu Ojha sharing his screen during his talk in the FDP.

Day 5 (31st May 2024)

Session 1 (10:00pm - 11:30pm)

The session commenced with a warm welcome by the Convenor, followed by an enlightening lecture by Dr. Navjeet Kaur, Associate Professor in the Department of Chemistry & Division of Research and Development at Lovely Professional University, Punjab, on "Tools to Increase Citations." Dr. Kaur provided valuable insights into various strategies and tools available for researchers to enhance the visibility and impact of their scholarly work. She discussed the importance of citations in academic research and outlined practical approaches to improve citation metrics, such as utilizing online databases, optimizing keywords, and fostering collaborations. Dr. Kaur's presentation not only emphasized the significance of citation metrics in academic success but also offered actionable tips for researchers to maximize their research impact. The session concluded with an interactive question-and-answer round, during which participants engaged in discussions on topics such as citation management tools, citation analysis techniques, and ethical considerations in citation practices, enriching their knowledge on this essential aspect of scholarly communication.

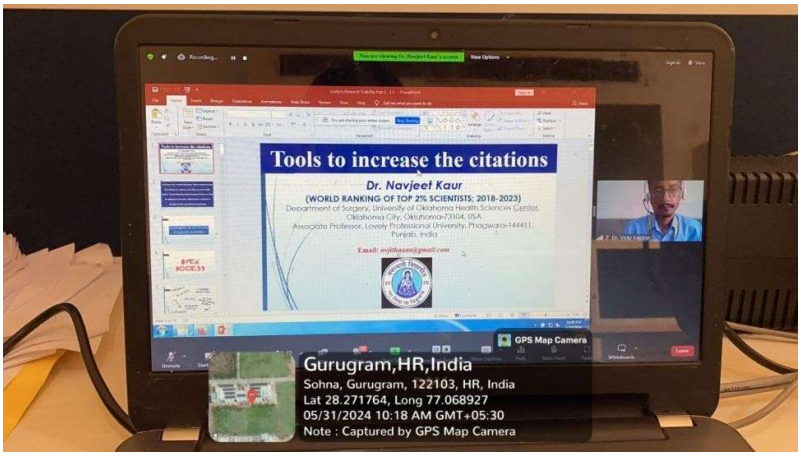


Photo 38: Topic of the lecture given by Dr. Navjeet Kaur.

Session 2 (11:30pm - 1:00pm)

Professor Pranav Kumar Prabhakar, Head of the Department of Research Impact and Outcome at LPU, delivered an insightful lecture on "Nanomaterials in Biomedical Applications: Drug Delivery and Imaging." Professor Prabhakar delved into the cutting-edge advancements in nanotechnology and its transformative impact on biomedical sciences, focusing on its applications in drug delivery and medical imaging. He elucidated how nanomaterials offer unique properties that enable targeted drug delivery, enhancing therapeutic efficacy while minimizing side effects. Additionally, Professor Prabhakar discussed the role of nanomaterials in revolutionizing medical imaging techniques, facilitating early disease detection and precise diagnosis. The lecture concluded with an engaging question-and-answer session, during which participants explored topics such as the safety profile of nanomaterials, challenges in their clinical translation, and future directions in nanomedicine research, fostering a deeper understanding of this interdisciplinary field.

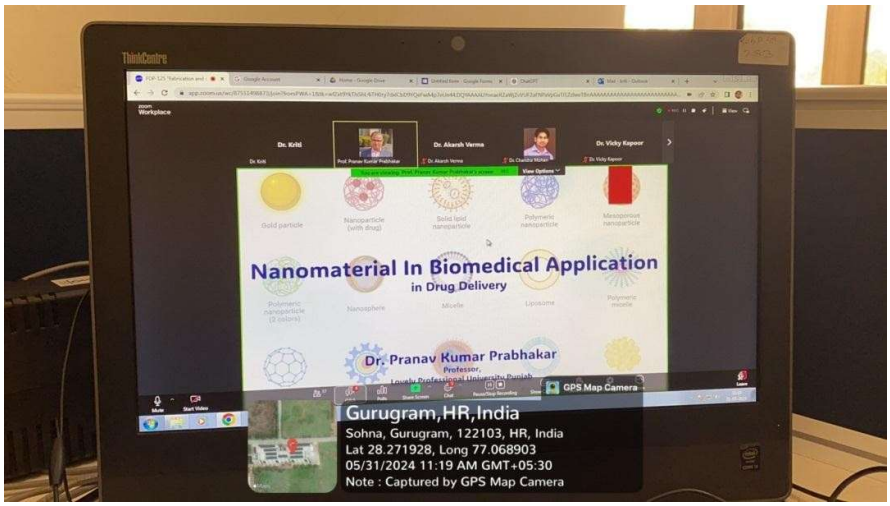


Photo 39: Title of the talk delivered by Dr. Pranav Kumar Prabhakar.

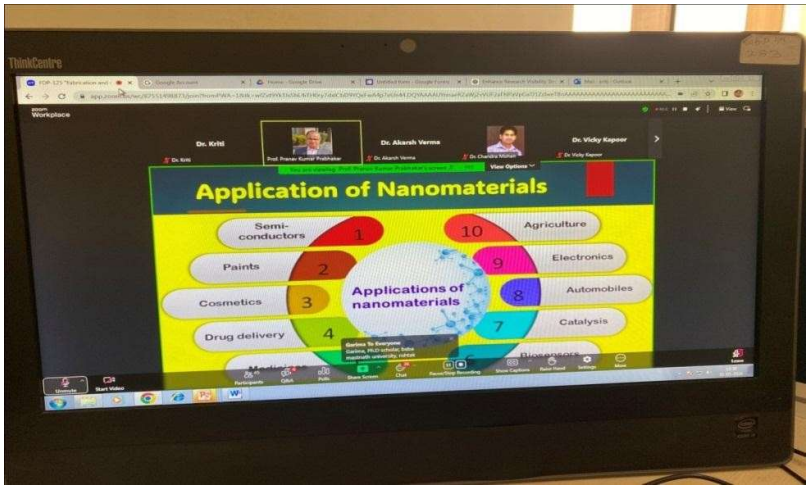


Photo 40: Prof. Pranav Kumar Prabhakar discussing various applications of nanomaterials during his talk in the FDP.

Session 3 (1:00pm - 2:30pm)

Dr. Indra Sulania, Scientist-F at IUAC, New Delhi, delivered an informative lecture on the "Atomic Force Microscopy Technique." Dr. Sulania provided a comprehensive overview of atomic force microscopy (AFM), highlighting its principles, capabilities, and applications in various scientific disciplines. She elucidated how AFM enables high-resolution imaging and precise manipulation of materials at the atomic and molecular levels, offering invaluable insights into surface morphology, mechanical properties, and surface interactions. Dr. Sulania showcased real-world examples of AFM applications, including nanotechnology, materials science, and biological research. The lecture concluded with an interactive question-and-answer round, during which participants engaged

in discussions on topics such as AFM operation, data interpretation, and emerging trends in AFM technology, further enriching their understanding of this powerful microscopy technique.

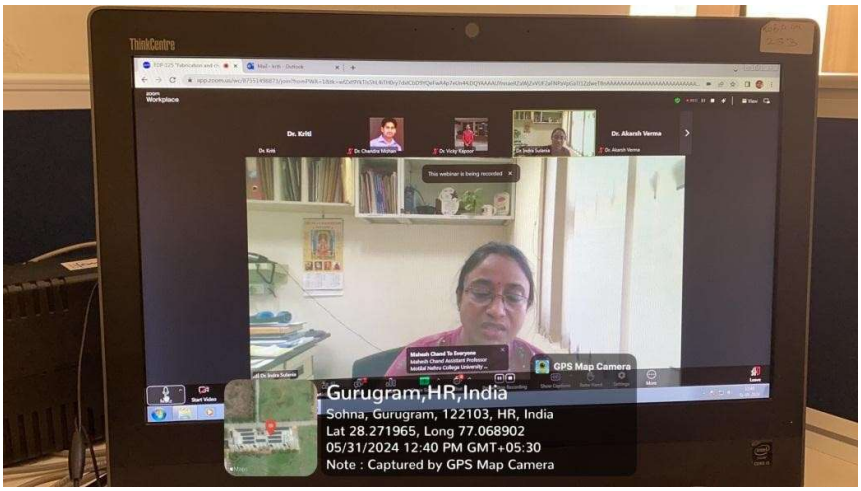


Photo 41: Dr. Indra Sulania joining for her talk duing FDP.

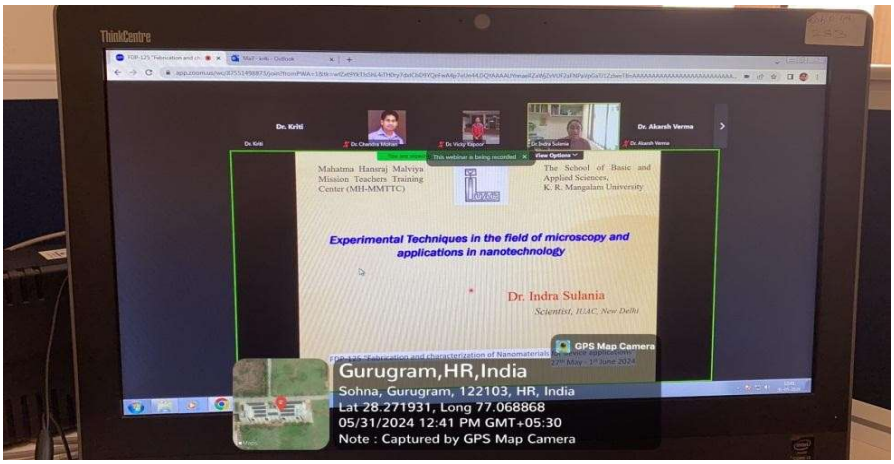


Photo 42: Title of the talk delivered by Dr.Indra Sulania.

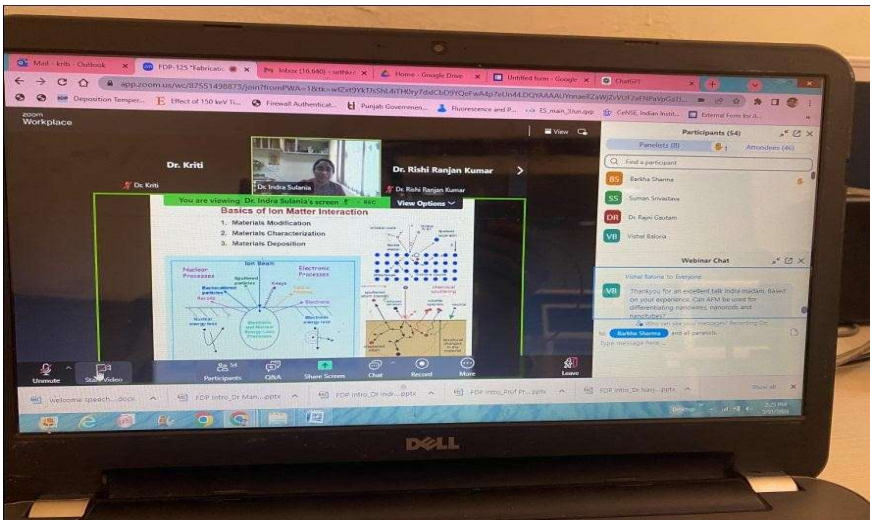


Photo 43: Dr. Indra Sulania explaining about ion beam interaction with matter during her FDP session.

Session 4 (2:30pm - 3:30pm)

Dr. Manoj K Patel, Principal Scientist at CSIR-CSIO, Chandigarh, delivered a thought-provoking lecture on "Interdisciplinary and Applied Research for Sustainable Development and Aatmanirbharta." Dr. Patel emphasized the importance of interdisciplinary collaboration and applied research in achieving sustainable development goals and fostering self-reliance (Aatmanirbharta). He discussed how interdisciplinary research approaches, integrating knowledge from various fields, can lead to innovative solutions to complex societal and environmental challenges. Dr. Patel highlighted examples of successful interdisciplinary research initiatives aimed at addressing issues such as renewable energy, environmental conservation, and healthcare accessibility. The lecture concluded with an engaging question-and-answer session, during which participants explored topics such as interdisciplinary research methodologies, funding opportunities for applied research projects, and strategies for promoting collaboration between academia, industry, and government agencies, enhancing their understanding of interdisciplinary research for sustainable development and self-reliance.

Photo 44: Title of the talk delivered by Dr. Manoj Kumar Patel.

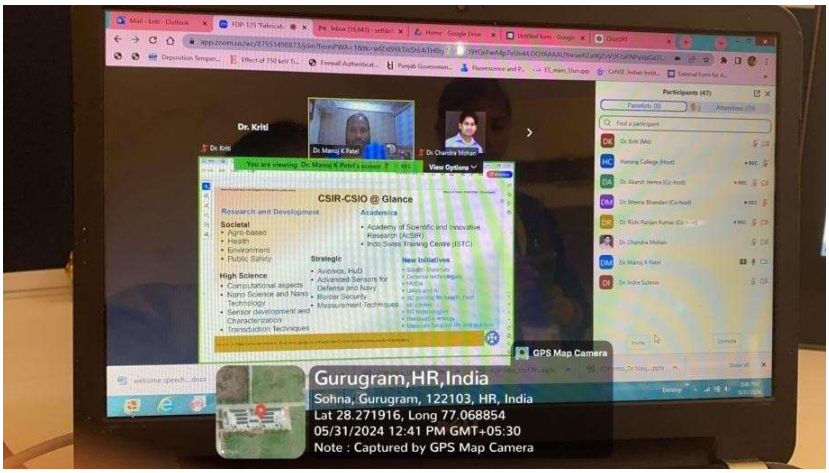


Photo 45: Dr. Manoj Kumar Patel giving overview of CSIR-CSIO during his talk in FDP.

Day 6 (1st June 2024)

Session 1 (10:00pm - 11:30pm)

The session commenced with a warm welcome by the convenor, followed by an engaging lecture by Dr. Bindiya Arora, Assistant Professor at Guru Nanak Dev University, on "Quantum Theory to Quantum Revolution." Dr. Arora navigated through the evolution of quantum theory, tracing its journey from its inception to the transformative quantum revolution of the present day. She delved into the fundamental principles of quantum mechanics and its profound implications in various fields, including physics, chemistry, and information technology. Dr. Arora elucidated how quantum concepts such as superposition and entanglement are driving revolutionary advancements in quantum computing, cryptography, and communication. The lecture concluded with a dynamic question-and-answer session, during which participants explored topics such as the practical

applications of quantum theory, challenges in quantum technology development, and the potential societal impacts of the quantum revolution, fostering a deeper understanding of this groundbreaking field.

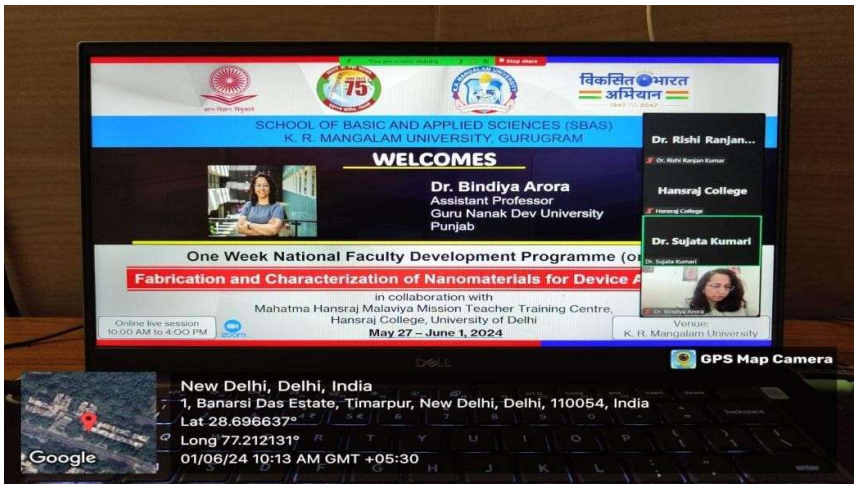


Photo 46: Welcoming Dr. Bindiya Arora during FDP.

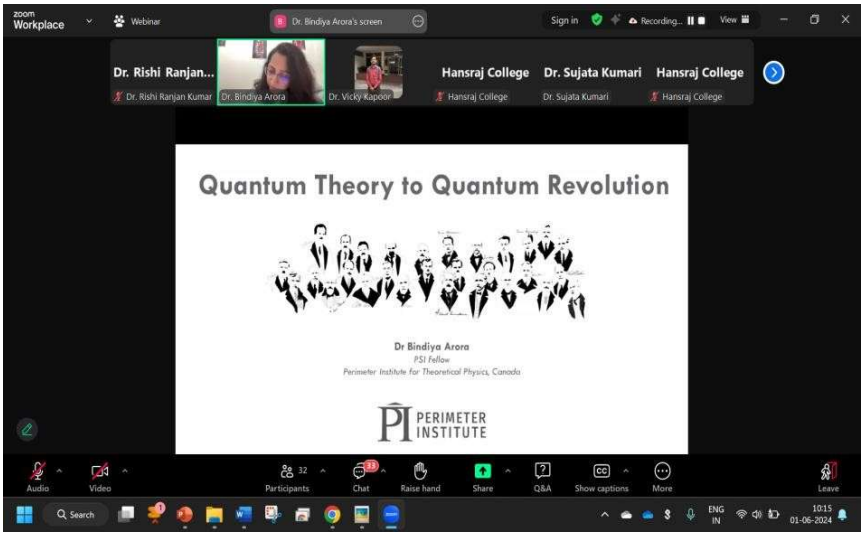


Photo 47: Topic of the lecture given by Dr. Bindiya Arora.

Session 2 (11:30pm - 1:00pm)

In a recent lecture, Prof. Tokeer Ahmad, Professor of Nano/Energy/Physical Chemistry at the Department of Chemistry, Jamia Millia Islamia, New Delhi, delivered an insightful talk on "Nanocatalysis for Renewable Energy." Prof. Ahmad elucidated the pivotal role of nanocatalysis in advancing renewable energy solutions, highlighting how nanoscale catalysts can significantly enhance the efficiency and sustainability of energy conversion processes. He discussed the latest advancements and applications of nanocatalysts in renewable energy technologies, emphasizing their potential to address global energy challenges. The session was followed by an

engaging question and answer round, where participants actively interacted with Prof. Ahmad, seeking clarifications and further insights into the practical applications and future directions of nanocatalysis in the renewable energy sector.

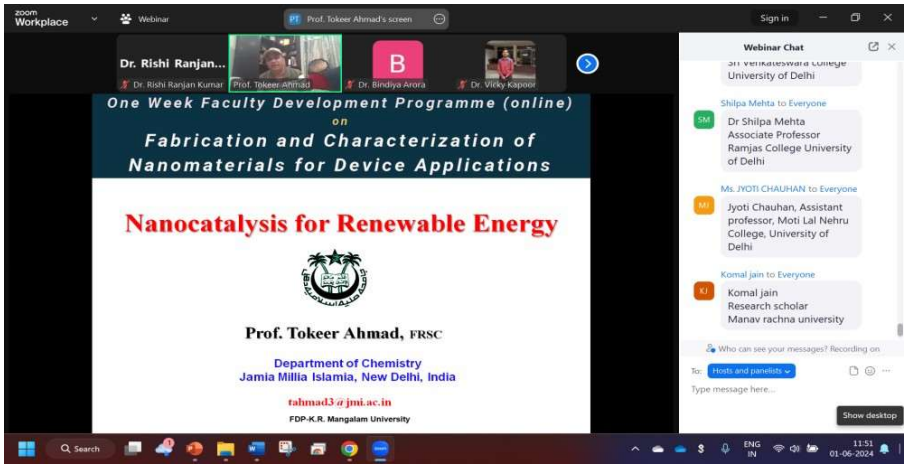


Photo 48: Prof. Tokeer Ahmad explaining about his Title of the talk.

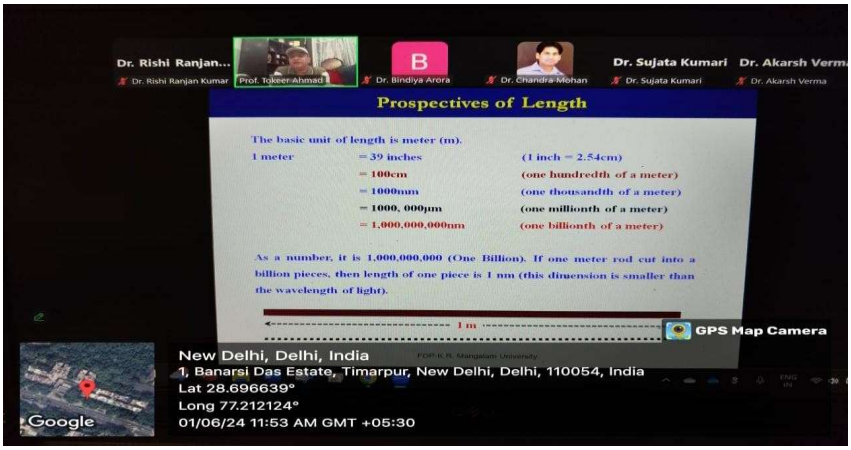


Photo 49: One of the slides of Dr. Satish's talk during FDP.

Session 3 (1:00pm - 2:30pm)

Ms. Ruchi, a Patent Officer at the Ministry of Commerce and Industry, Government of India, delivered an insightful lecture on "Intellectual Property Awareness." Ms. Ruchi shed light on the importance of intellectual property rights (IPR) and their role in fostering innovation, creativity, and economic growth. She discussed various aspects of intellectual property, including patents, trademarks, copyrights, and trade secrets, elucidating their significance in protecting inventions, brands, artistic works, and confidential information. Ms. Ruchi highlighted the procedures for obtaining and enforcing intellectual property rights, emphasizing the need for awareness and compliance among researchers, entrepreneurs, and businesses. The lecture concluded with an interactive question-and-answer session, during which participants engaged in discussions on topics such as the relevance of

intellectual property in different industries, strategies for safeguarding intellectual assets, and the role of government policies in promoting innovation and entrepreneurship through intellectual property rights, enhancing participants' understanding of this vital aspect of business and innovation.

Photo 50: Title of the talk delivered by Ms. Ruchi.

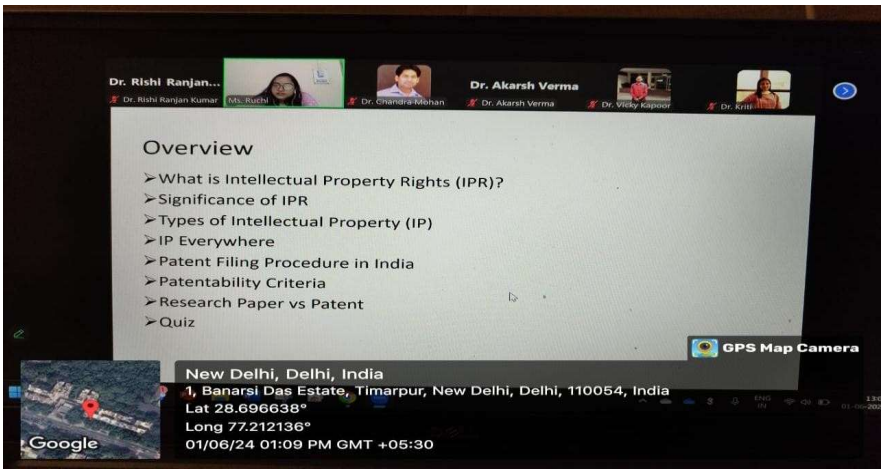


Photo 51: Ms. Ruchi giving overview of her talk.

Session 4 (2:30pm - 3:30pm)

Dr. Tulika, a postdoctoral fellow at the JCNS within Forschungszentrum Jülich, delivered an enlightening lecture on “Amphiphilic Copolymer-Based Hydrogels: From Nanostructure Design to Superior Mechanics.” Dr. Tulika provided a detailed overview of her current research, focusing on the design and synthesis of amphiphilic copolymer-based hydrogels and their unique nanostructures. She discussed the methodologies employed to achieve superior mechanical properties in these hydrogels, emphasizing their potential applications in various fields such as biomedical engineering, drug delivery, and tissue engineering. Dr. Tulika illustrated how the tailored nanostructures of these hydrogels contribute to their enhanced performance and functionality. The lecture was followed by an engaging question-and-answer session, where participants delved into topics like the synthesis

techniques, real-world applications, and future prospects of amphiphilic copolymer-based hydrogels, further enriching their understanding of this innovative material. She will explain how small angle scattering technique can be used to understand the Nano structures in my hydrogels and show the mechanical properties.

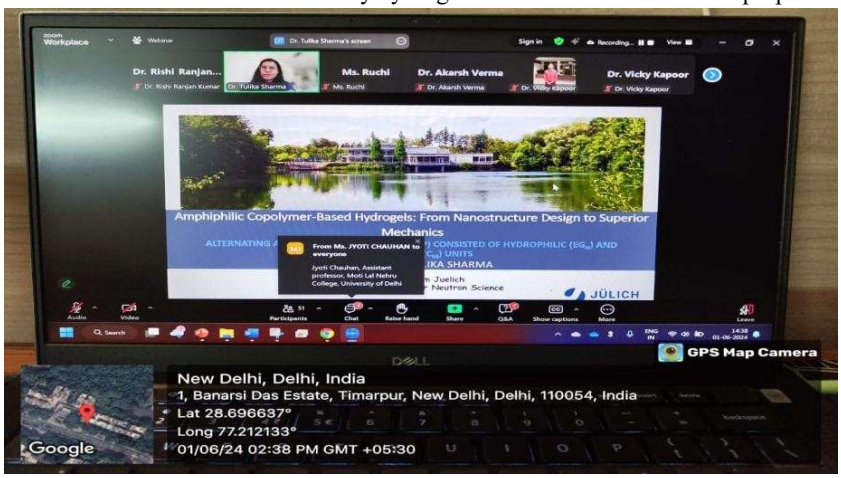
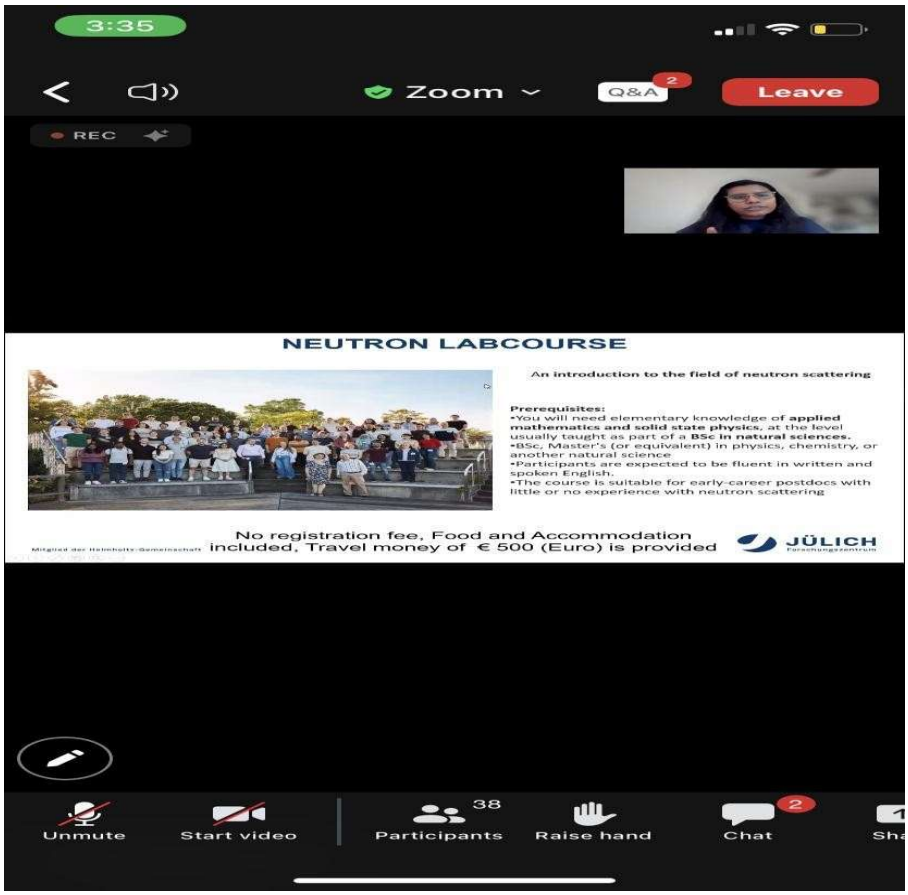


Photo 52: Dr. Tulika introducing title of her talk.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NEUTRON LABCOURSE
An introduction to the field of neutron scattering
Prerequisites:
•You will need elementary knowledge of applied mathematics and solid state physics, at the level usually taught as part of a BSc in natural sciences.
•BSc, Master's (or equivalent) in physics, chemistry, or another natural science
•Participants are expected to be fluent in written and spoken English.
•The course is suitable for early-career postdocs with little or no experience with neutron scattering
No registration fee, Food and Accommodation included, Travel money of € 500 (Euro) is provided
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