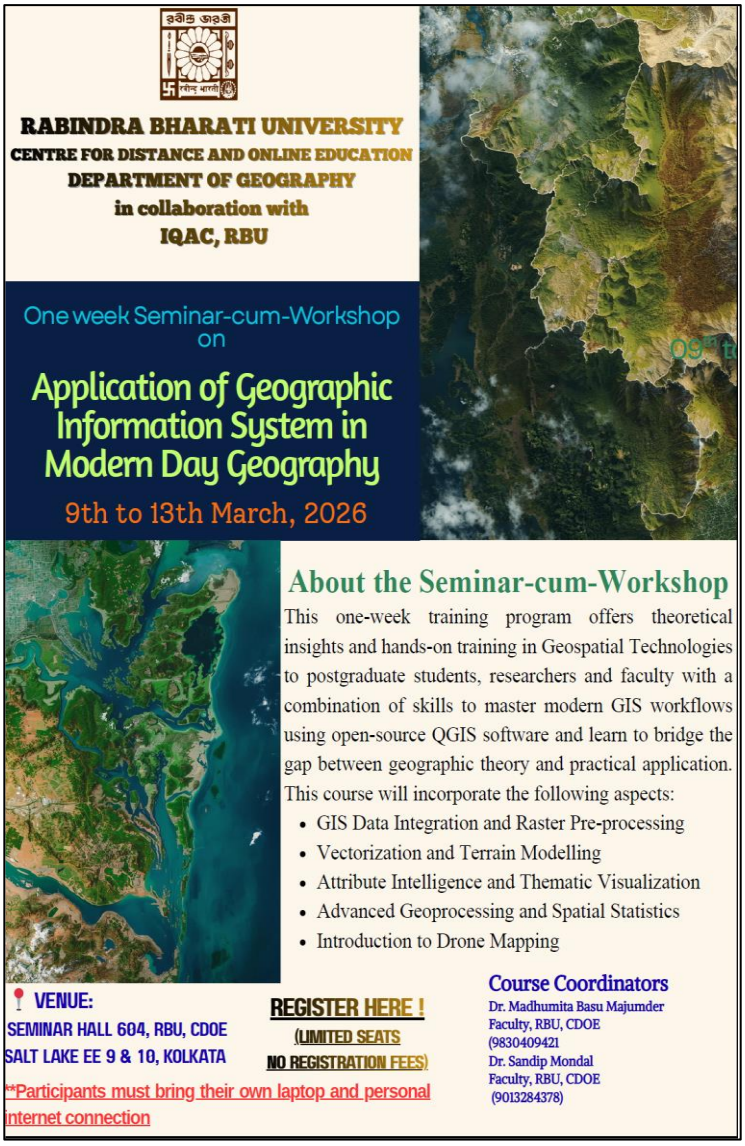
One week Seminar -Cum Workshop Report on "Application of Geographic Information System in Modern Day Geography"

The discipline of geography has undergone a profound paradigm shift over the last few decades, transitioning from traditional descriptive mapping to highly analytical, data-driven spatial science. In the contemporary era, Geographic Information Systems (GIS) and remote sensing technologies have become indispensable tools for geographers. These technologies provide the critical infrastructure required to analyze complex spatial data, model environmental changes, and formulate sustainable solutions to pressing global challenges such as climate change, rapid urban expansion, and resource depletion. Consequently, mastering these digital workflows is no longer merely an optional skill for emerging geographers; it is a fundamental prerequisite for rigorous academic research and effective professional practice.

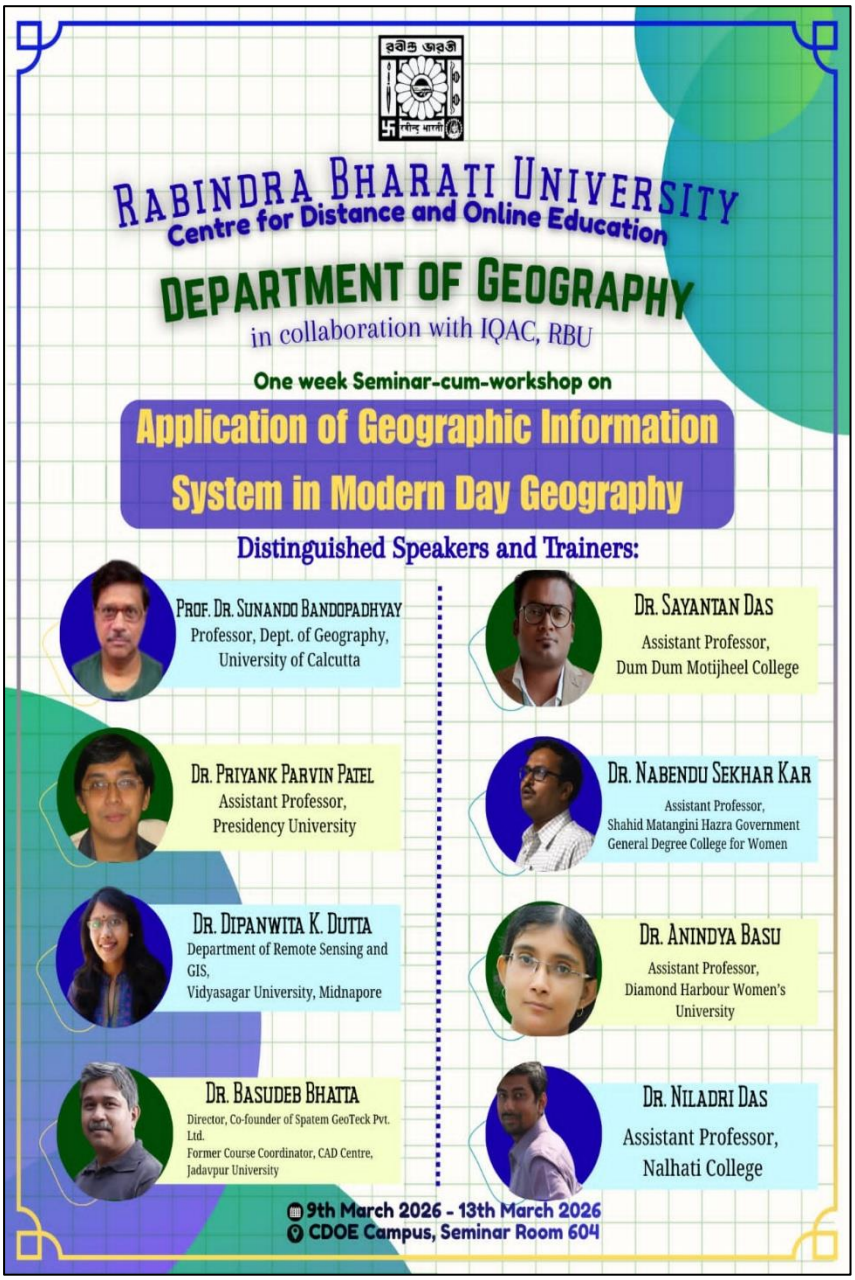


Recognizing this critical need, the Department of Geography at Rabindra Bharati University, Centre for Distance and Online Education (CDOE), organized a five-day National Seminar-cum-Workshop titled **"Application of Geographic Information System in Modern Day Geography."** Held via a blended mode from the 09th to the 13th of March 2026, the event was strategically designed to bridge the widening knowledge gap and equip the academic community—comprising postgraduate students, research scholars, and faculty members—with essential spatial analysis tools in an accessible, practice-oriented format.

The seminar-cum-workshop commenced with a solemn ceremonial tribute to Kabiguru Rabindranath Thakur, marked by the offering of flowers at his feet, followed by the watering of a plant to symbolize intellectual growth and the nurturing of knowledge. This inaugural ritual was gracefully conducted by Dr. Kiran Shankar Chakraborty, Director of RBU CDOE, and Shri Ram Krishna Mal, Officer on Special Duty (Finance), CDOE, RBU. As a gesture of

deep respect and appreciation, all visiting dignitaries were felicitated by the students of the Department of Geography.

The formal welcome address was delivered by **Dr. Kiran Shankar Chakraborty**, Director, RBU CDOE, who emphasized the timely relevance of such an initiative and introduced the overarching theme of the event. Following this, **Dr. Madhumita Basu**, Assistant Professor and Course Coordinator, Department of Geography, RBU CDOE, presented the inaugural speech. She outlined the specific objectives of the workshop, laying a strong analytical foundation for the budding geographers and setting the academic tone for the highly technical sessions ahead. The inaugural session was closed with vote of thanks delivered by **Dr. Sandip Mondal**, Assistant Professor and Course coordinator, Department of Geography RBU, CDOE.



A central tenet of this training program was its strong emphasis on open-source technology, specifically utilizing QGIS software. By focusing on open platforms, the workshop aimed to democratize access to high-level spatial data processing, ensuring that researchers can execute reproducible methodologies without the constraints of proprietary software licenses.

Over the course of five days, the curriculum provided a meticulously structured progression from core conceptual frameworks to advanced computational tasks. Participants were systematically guided through vital geoinformatics workflows, including raster pre-processing, georeferencing, vectorization, terrain modelling, attribute intelligence, and multi-criteria

decision-making. Furthermore, the program introduced participants to the frontiers of the discipline, integrating discussions on Artificial Intelligence in environmental monitoring, advanced spatial statistics, and the burgeoning application of drone mapping.

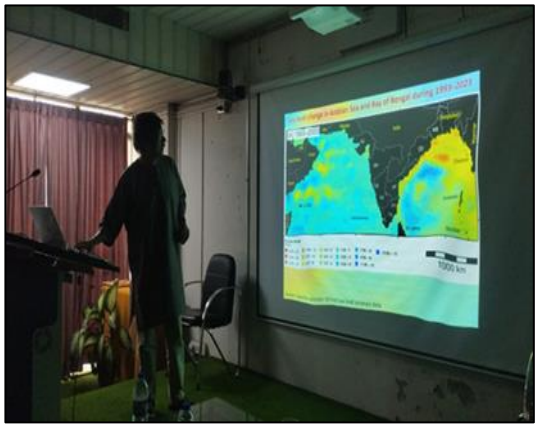
Ultimately, this seminar-cum-workshop served as a vital capacity-building initiative. It successfully empowered attendees from Geography department, RBU CDOE and Remote Sensing department of Behala college with the technical acumen necessary to transform raw spatial and non-spatial data into actionable, thematic intelligence, thereby significantly enhancing the analytical rigor of geographic research conducted within the institution. The following sections of this report detail the specific proceedings, expert sessions, and hands-on modules executed during this comprehensive training program.

Inaugural session addressed by Director, CDOE and felicitation of dignitaries. (09/03/2026)

Key Session Insights

On the **first day** of the workshop, held on the **9th of March 2026**, the overarching theme was Environmental Monitoring and Urban Transformations. The **first session**, titled Real-Time

Environmental and Coastal Monitoring, a key-note lecture was delivered by **Prof. Sunando Bandopadhyay.** He opened the workshop by demonstrating the real-world applications of modern remote sensing and AI. He illustrated how satellite heat-sensing data can pinpoint agricultural crop burning down to specific plots, distinguishing them from industrial emissions. This data can be automated using AI tools to extract tables and rapidly alert law enforcement, bypassing tedious manual labor. A major segment of his lecture addressed sea-level rise in the Bay of Bengal, utilizing satellite altimetry and tide gauge data from 1993 onwards. His key insights highlighted regional disparities, noting that the Bay of Bengal is experiencing a sea-level rise of 4.2 millimeters per year, significantly exceeding the global average of 3.3 millimeters per year. Addressing vulnerability, he pointed out that nearly 75 million people in India live in vulnerable zones. The Ganges-Brahmaputra delta, with 80 million people living in the zero to three-meter elevation zone, and the Krishna-Godavari deltas, rising at 4.7 to 5 millimeters per year, are at severe risk. He also detailed geomorphic shifts, explaining how local estuaries, such as the Matla and Vidyadhari rivers, act as sediment sinks. This leads to rapid siltation that has drastically altered historical waterways connecting places like Canning to Salt Lake. Concluding on a pragmatic note regarding demographic projections, he projected that population declines beginning around 2038 in Bangladesh and 2046 in India may naturally alleviate several severe environmental pressures.



Prof. Sunando Bandopadhyay delivering the keynote address. (09/03/2026)

Continuing the **first session** with a focus on GIS Applications in Modern Human Geography, **Dr. Dipanwita K. Dutta** shifted the discussion to urban microclimates and spatial transformations. Using Landsat and SPOT-VGT NDVI data spanning 1977 to 2014, she analysed the National Capital Territory of Delhi, proving a strong correlation between the rise

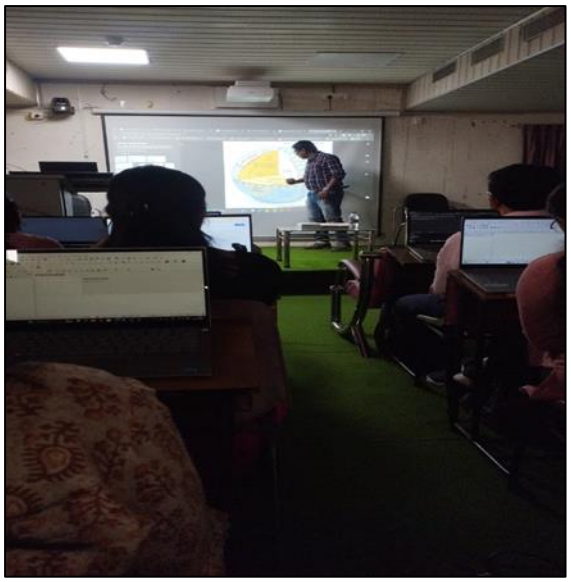

Dr. Dipanwita K. Dutta delivering her lecture. (09/03/2026)

in Impervious Surface Fractions in peri-urban areas like Gurgaon and Noida and escalating Land Surface Temperatures, which exacerbates the Urban Heat Island effect. In a comparative study of the Kolkata Metropolitan Area, she measured the cooling effect of blue-green spaces like Rabindra Sarobar and the East Kolkata Wetlands, noting a cooling influence extending 50 to 100 meters and recommending a strict 250-meter preservation buffer. She also introduced advanced remote sensing techniques. These included Thermal Infrared for mapping urban and validating cool roof initiatives, Hyperspectral Imaging for creating spectral fingerprints to differentiate urban materials such as asphalt versus concrete, and LiDAR and SAR for generating 3D Digital Twins of cities and measuring millimeter-level ground subsidence using InSAR techniques.

The **second session**, titled The True Nature of GIS and Geoinformatics, was delivered by **Dr. Priyank Patel.** He emphasized that GIS is fundamentally a logic and problem-solving discipline, not merely software operation. He distinguished the physical concept of space from the emotionally driven concept of place. He challenged students to recognize inherent biases in cartography, citing the Mercator projection's colonial roots which visually distort the Global South, and introduced Flex Projector to visualize these distortions. He showcased diverse GIS applications, including overlaying 1880s Calcutta Port maps with modern bathymetric data, analyzing Kolkata's morphology as a Colonial Port City centered around Fort William and Khidirpur, and mapping micro-economies beneath the Gariahat flyovers. He urged students to embrace programming languages like Python and cloud-based tools like Google Earth Engine to remain relevant in the modern geospatial industry.


Dr. Priyank Pravin Patel is being felicitated in the second session before delivering his lecture. (09/03/2026)

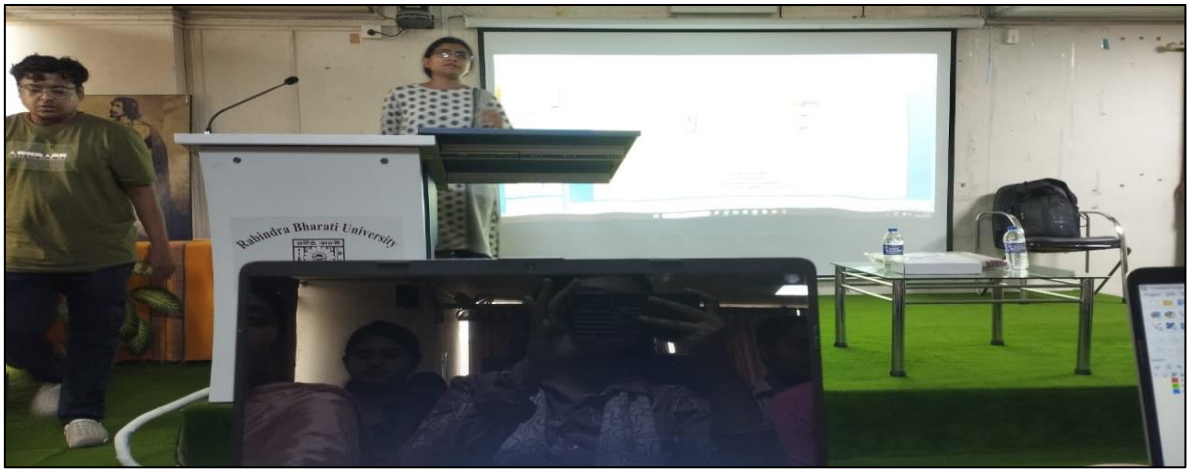
On the **second day** of the workshop, held on the **10th of March 2026**, the focus shifted to GIS Foundations and Georeferencing. Session three, covering fundamentals and practical georeferencing, was delivered by **Dr. Niladri Das**. He provided a clear distinction between remote sensing as data collection and GIS as data analysis, detailing the five pillars of GIS, which are hardware, software, data, methods, and people. He introduced Multi-Criteria Decision Making using the Analytic Hierarchy Process, demonstrating how to assign statistical weights to various geological and meteorological layers to map future groundwater potential. The session then transitioned into a rigorous, hands-on QGIS tutorial focused on the geometric correction or georeferencing of unreferenced raster maps. Participants were instructed on the critical parameters required, which included inputting a minimum of four Ground Control Points, understanding the difference between global datums like WGS 84 and regional datums like Everest India Nepal, and applying the Universal Transverse Mercator projection. Specifically, they utilized EPSG 32645 for UTM Zone 45N, covering West Bengal and Jharkhand. During this process, participants were trained to maintain a residual error value strictly below 10 for accurate spatial registration.



Dr. Niladri Das, delivering his lecture and conducting the hands-on training on 10/03/26

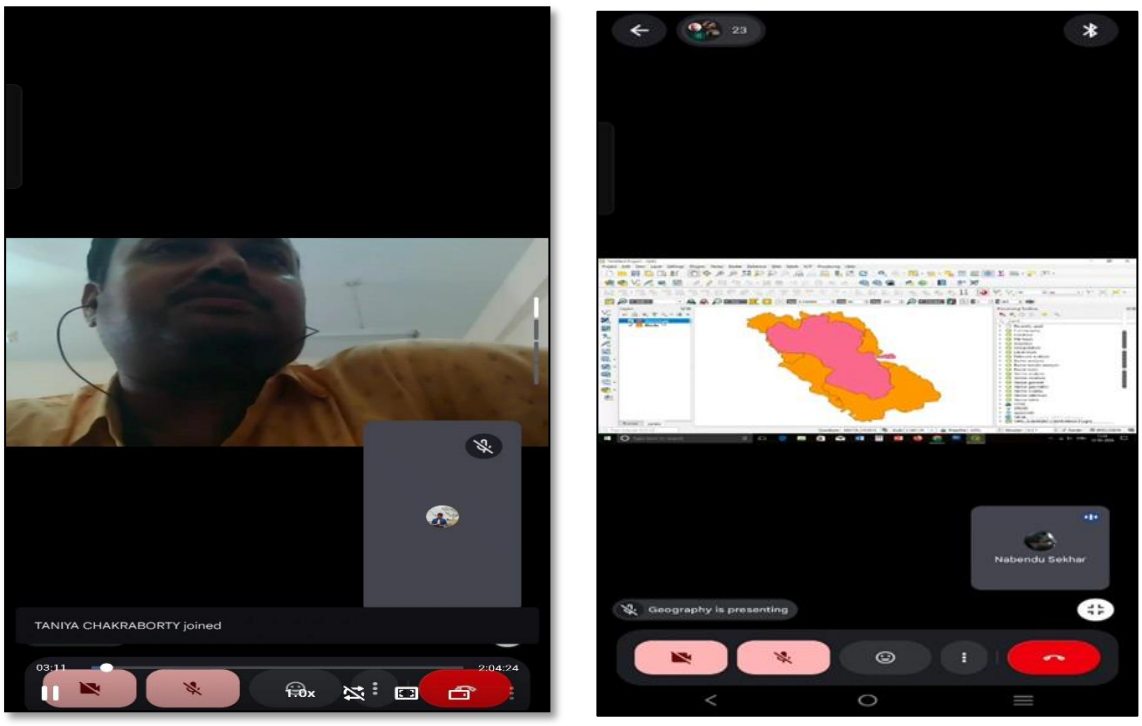
The third day, on the 11th of March 2026, covered Raster-Vector Conversions and Terrain Analysis. Session four, focusing on digitization and elevation modeling, was delivered by **Dr. Sayantan Das.** This highly practical session focused on data extraction and visual interpretation. Dr. Das debunked the myth that False Colour Composites are used to hide sensitive military information; rather, they are scientifically utilized to visualize near-infrared radiation, making high-biomass vegetation distinctly visible in red. Students executed raster-to-vector conversions, or digitization, across three geometries: polygons for administrative boundaries like Basirhat, lines for transport networks, and points for landmarks like Eden Gardens. Crucial editing techniques, such as the snapping tool for seamless boundaries, were mastered. In the final segment, students generated a Digital Elevation Model from a topographical map of Uttarakhand. By inputting spot heights and applying the Inverse Distance Weighting interpolation method, they created a continuous 3D surface, subsequently automating the extraction of slope, aspect, and contour layers.

Dr. Sayantan Das is being felicitated before conducting the hands-on training on 11/03/26



Dr. Anindya Basu, delivering her lecture and conducting the hands-on training on 12/03/26

On the **12th of March 2026**, the **fourth day** centered on Attribute Intelligence and Thematic Visualization. Session five, covering data integration and intelligence, was delivered by **Dr. Anindya Basu,** assisted by scholar **Sonamoni Mondal**. This session addressed one of the most vital tasks in demographic geography, which is joining spatial data to non-spatial attributes. Dr. Basu emphasized the technical necessity of using plain-text CSV files over standard Excel sheets to prevent software lag during complex joins. Using a shapefile of Purba Medinipur, participants successfully joined demographic census data using matching identification keys. Key practical exercises included permanent exporting by converting temporary virtual joins into permanent ESRI shapefiles, and thematic visualizations involving the generation of bar diagrams to compare SC and ST populations and pie charts for gender demographics directly onto the map canvas. Participants also engaged in spatial calculations, utilizing the field calculator area function to compute polygon sizes in square kilometers, allowing for the subsequent calculation of population density. Furthermore, they practiced advanced extraction by isolating specific blocks like Haldia into new shapefiles and using density analysis plugins to generate heatmaps representing the spatial concentration of variables.



Dr. Nabendu Sekhar Kar, delivering his lecture and conducting the hands-on training session in online mode on 13/03/26

The fifth and final day, held on the 13th of March 2026, focused on Advanced Spatial Statistics and concluded with the Valedictory session. Session six on advanced geoprocessing was delivered by **Dr. Nabendu Sekhar Kar**, in online mode who introduced participants to the computational side of QGIS. Topics included geospatial metrics for precise feature measurement, vector overlays involving intersections and unions for complex boundary analysis, and network intelligence for routing and creating service area buffers. The session concluded with a geostatistical practicum focused on advanced interpolation methods for surface generation.

Participants for the online session 13/09/2026

Following this, the valedictory lecture was delivered by **Dr. Basudeb Bhatta.** The seminar concluded with his forward-looking presentation, where the Director of Spatem GeoTeck Pvt. Ltd. highlighted the rapid integration of drone mapping within geography. He detailed how ultra-high-resolution aerial imagery is replacing traditional survey methods and shaping the future trajectory of advanced geospatial analysis.

Felicitation of Dr. Basudev Bhatta in the valedictory session. (13/03/26)

Lecture being delivered by Dr. Basudev Bhatta in the valedictory session 13/09/2026

Demonstration of Drone Technology in map making

Participants feedback 13/09/2026

Certificate Distribution. 13/09/2026

Conclusion and Learning Outcomes

The "*Application of Geographic Information System in Modern Day Geography*" seminar-cum-workshop provided a rigorous, technically advanced environment for skill development. By utilizing open-source frameworks (QGIS), participants were empowered to independently execute complex workflows, from basic georeferencing to advanced demographic data integration, thermal mapping, and spatial statistics. The program successfully demonstrated that modern geographical challenges—ranging from localized urban heat islands to regional coastal vulnerabilities—require a sophisticated, data-driven approach, which the participants are now well-equipped to undertake.

The seminar cum workshop was attended by Assistant Professors, staff, and students from the Departments of Geography and Environmental Studies at RBU CDOE. We thank all the attendees for their active participation and contribution, which ensured the smooth and successful conduct of this enriching seminar cum workshop.

Thank You