Report on Project Demonstration: 2025-26

A SUMMARY OF THE ANNUAL PROJECT DEMONSTRATION DAY: 2025-26

The Department of Physics organized the **"Annual Project Demonstration"**, which commenced on 10th March 2026, under the supervision of Dr. Kirti Singha. The event provided a valuable platform for students to translate abstract mathematical concepts into tangible physical applications. It served as a significant milestone in the academic curriculum, encouraging students to apply core principles of Physics through hands-on experimentation.

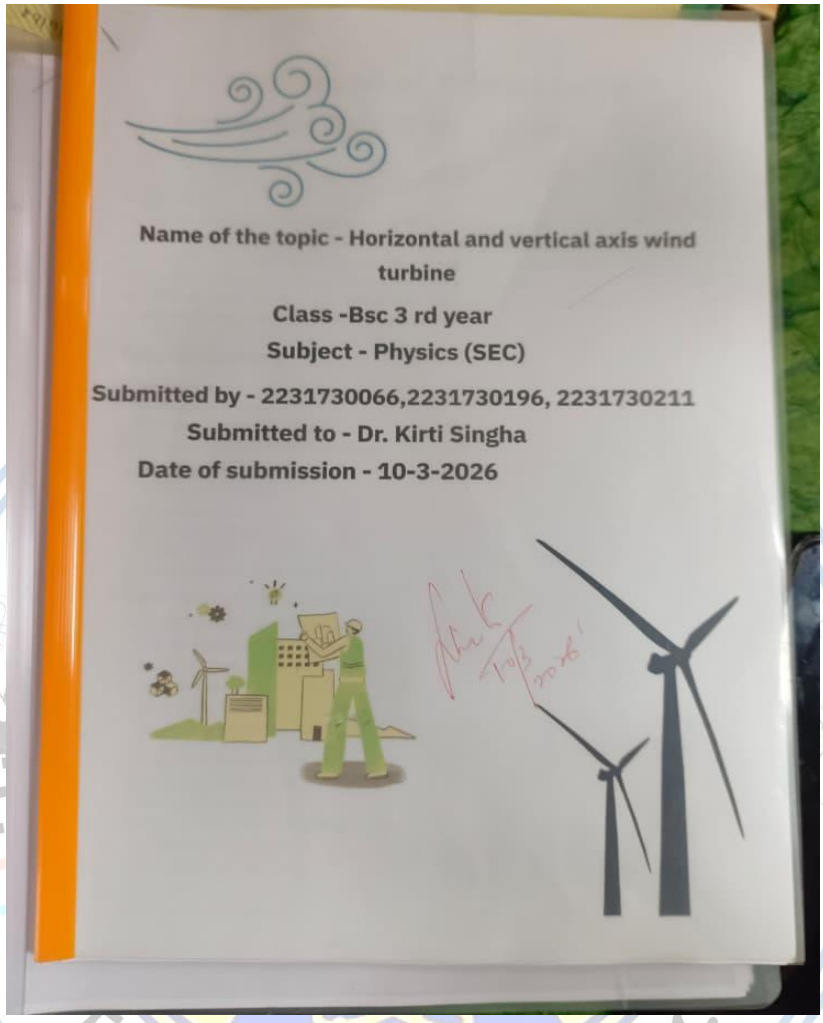
This report documents the technical execution and experimental outcomes of the student projects, highlighting their ability to perform rigorous data analysis and effectively integrate hardware components. Students of SEC Physics, B.Sc. II Year, were divided into four distinct groups, each presenting their work with a high level of technical competence, innovation, and collaborative problem-solving.

The projects were assigned in October 2025 and were systematically developed over the semester, culminating in their successful demonstration in March 2026 under the continuous guidance and mentorship of Dr. Kirti Singha

GROUP A : HORIZONTAL AND VERTICAL AXIS WIND TURBINE

This project was, submitted by Roll Nos. 2231730066, 2231730196, and 2231730211, analyzes the mechanics of Horizontal (HAWT) and Vertical Axis Wind Turbines (VAWT).

The physics of both systems relies on converting wind's kinetic energy into mechanical torque. HAWTs, the most common industrial design, feature blades rotating parallel to the wind stream. They are highly efficient, often approaching the Betz Limit (59.3%), and excel in high-altitude, laminar flow environments. However, they require complex "yaw" mechanisms to face the wind. Conversely, VAWTs rotate around a transverse axis. While generally less efficient, they are omnidirectional, meaning they capture wind from any direction without adjustment. This makes them superior for turbulent, urban environments where wind direction shifts rapidly. Furthermore, VAWTs allow heavy components like generators to be placed at ground level, significantly reducing maintenance costs. In conclusion, while HAWTs dominate large-scale power grids, VAWTs offer a versatile solution for localized, small-scale energy production.



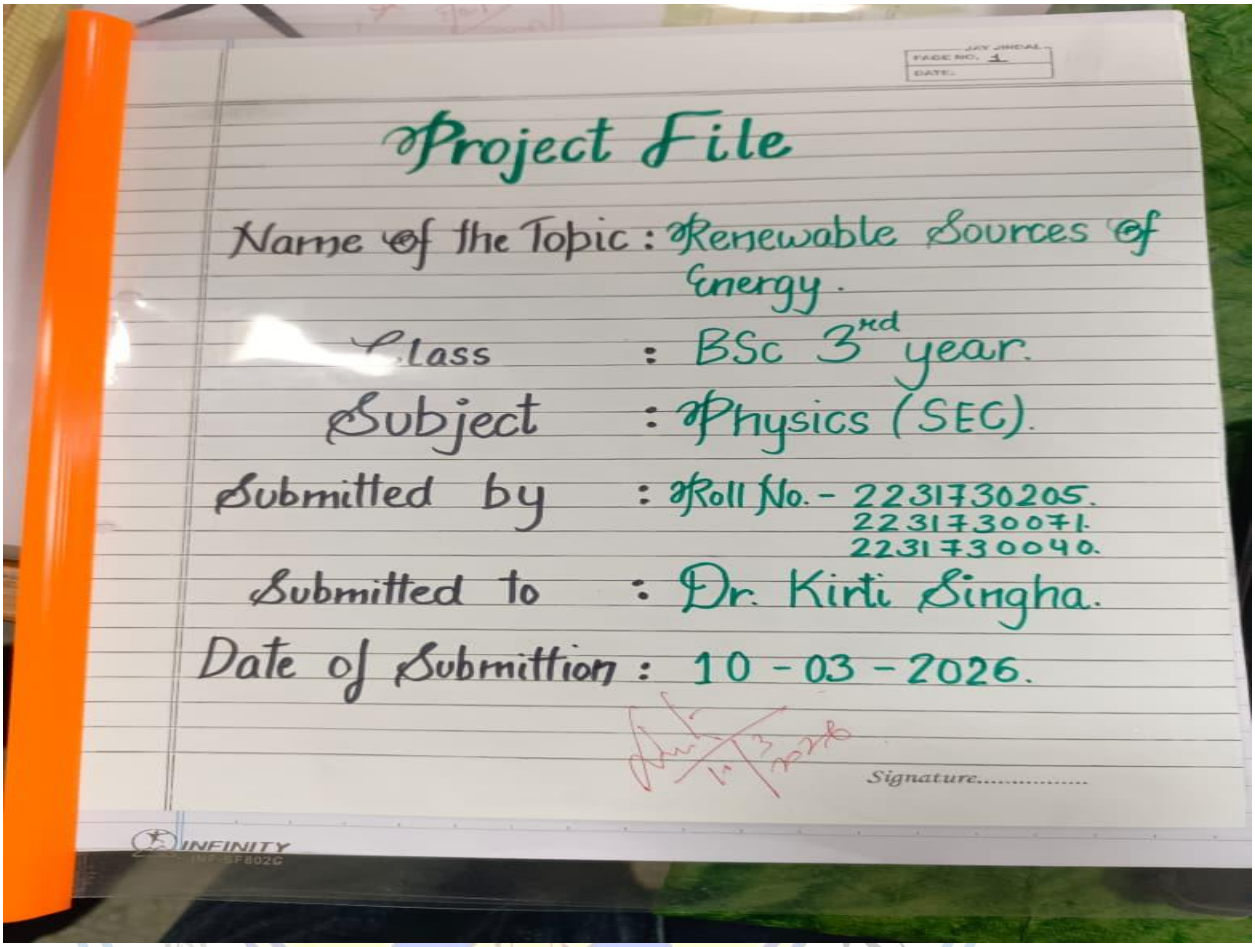
GROUP B : RENEWABLE SOURCE OF ENERGY

This project was, submitted by Roll Nos. 2231730205, 2231730071, and 2231730040, project explores sustainable energy alternatives essential for mitigating climate change and ensuring future energy security. By focusing on Solar, Hydro, and Wind energy, the study highlights the transition from finite fossil fuels to inexhaustible natural resources.

Solar Energy: Utilizes photovoltaic cells to convert sunlight directly into electricity, offering a scalable solution for both residential and industrial use.

Hydro Energy: Leverages the kinetic energy of flowing water through turbines, providing a high-capacity and reliable base-load power source.

Wind Energy: Harnesses atmospheric airflow via wind turbines to generate mechanical power, characterized by its low operational footprint.

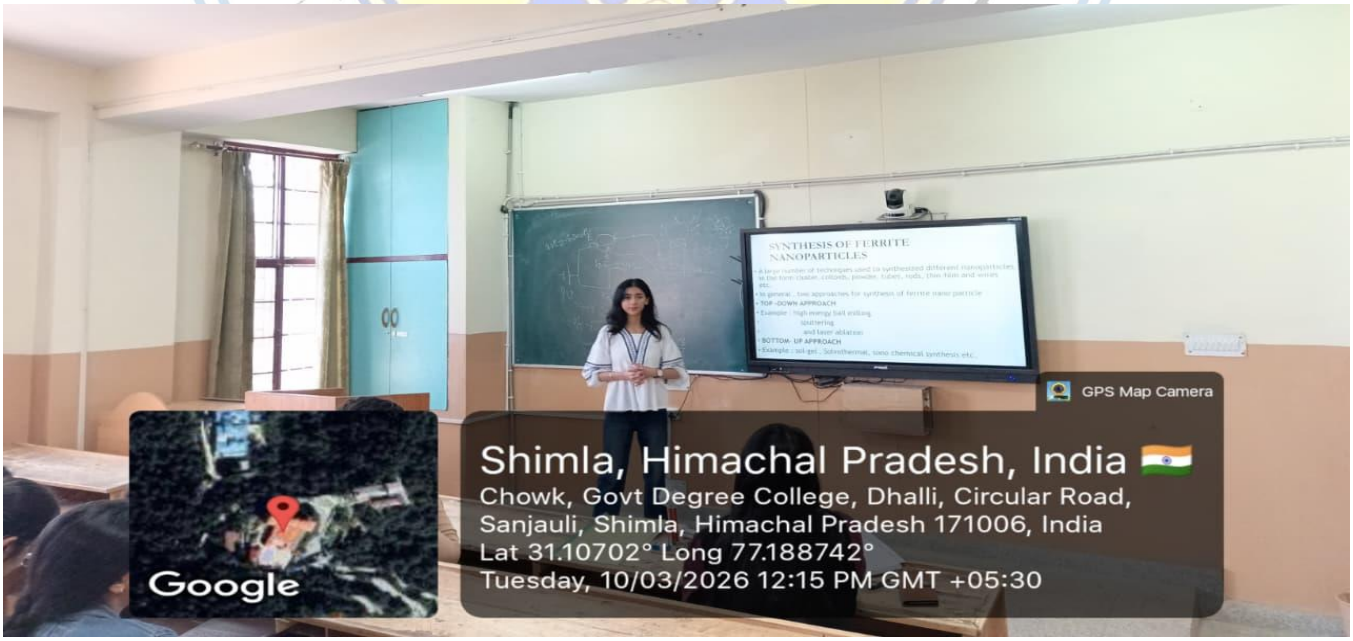


GROUP C : SYNTHESIS OF NI-SPINEL NANOFERRITES USING THE SOL-GEL AUTO-COMBUSTION METHOD

This project was, submitted by Roll Nos. 2231730185, 2231730030, 2231730203, 2231730010 and22321730220, the synthesis of Ni-Co-Zn spinel nano-ferrites via the sol-gel auto-combustion method is a highly efficient approach for producing advanced magnetic nanomaterials. This technique is favored for its cost-effectiveness, low processing temperature, and ability to produce chemically homogeneous powders with a high surface area.

By adjusting the ratio of Ni, Co, and Zn, researchers can fine-tune the material's magnetic and electrical properties. These nano-ferrites exhibit:

High magnetic permeability and low eddy current losses. Excellent chemical stability, making them ideal for high-frequency applications.



Synthesis of Ni–Co–Zn Spinel Nano-Ferrites Using the Sol–Gel Auto-Combustion Method

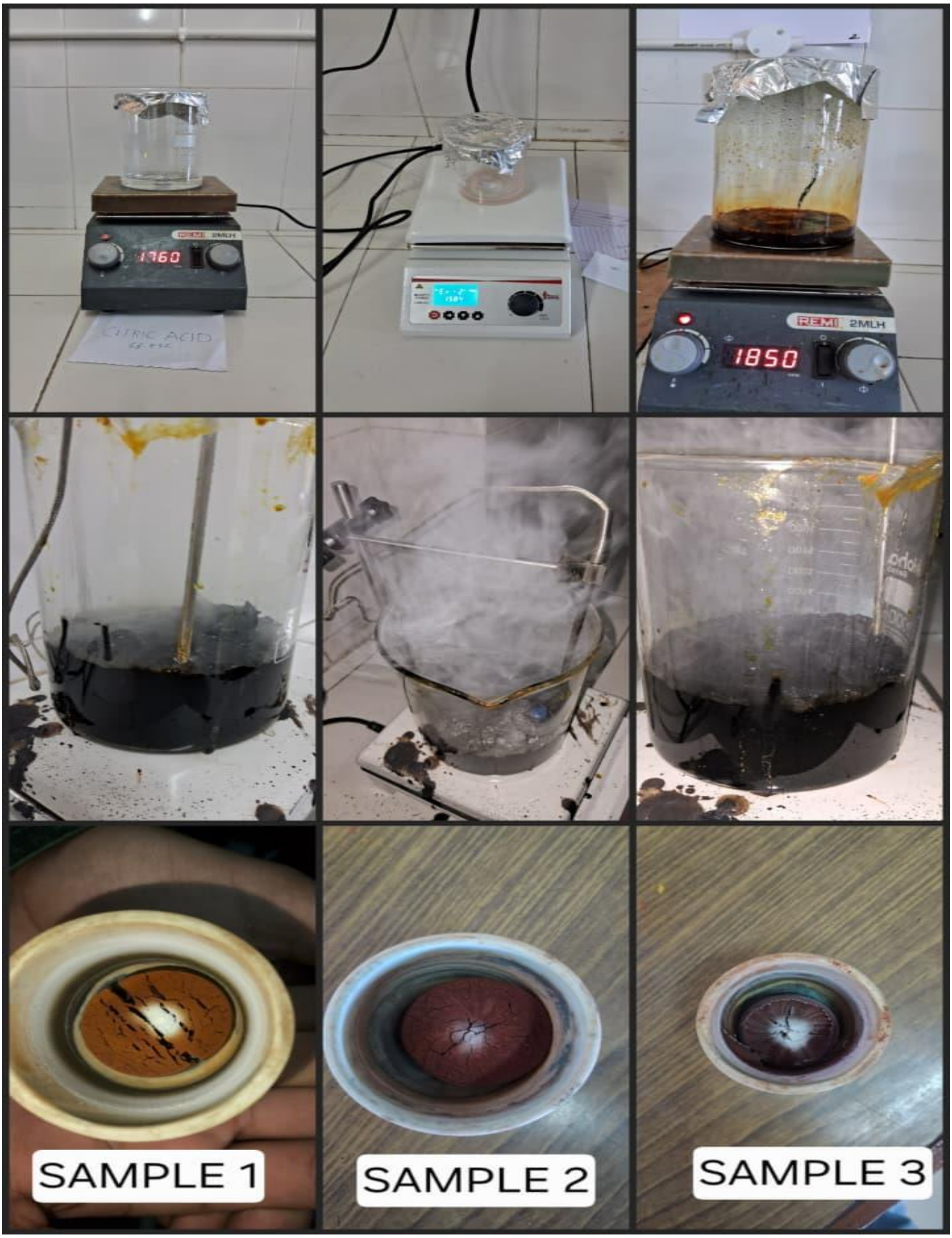
Centre of Excellence Government Degree College Sanjauli, Shimla (Himachal Pradesh)

Submitted By:

- Vanshika Sharma – Roll No. 2231730203
- Abhishek Sharma – Roll No. 223173010
- Yugal Kishore Kashyap – Roll No. 2231730220
- Anjali Verma – Roll No. 2231730030
- Tamanna – Roll No. 2231730185

Submitted To: Dr. Kirti Singha

Date of Submission: 9 March 2026


1760
CITRIC ACID
REMI 2MLH
1850
SAMPLE 1
SAMPLE 2
SAMPLE 3

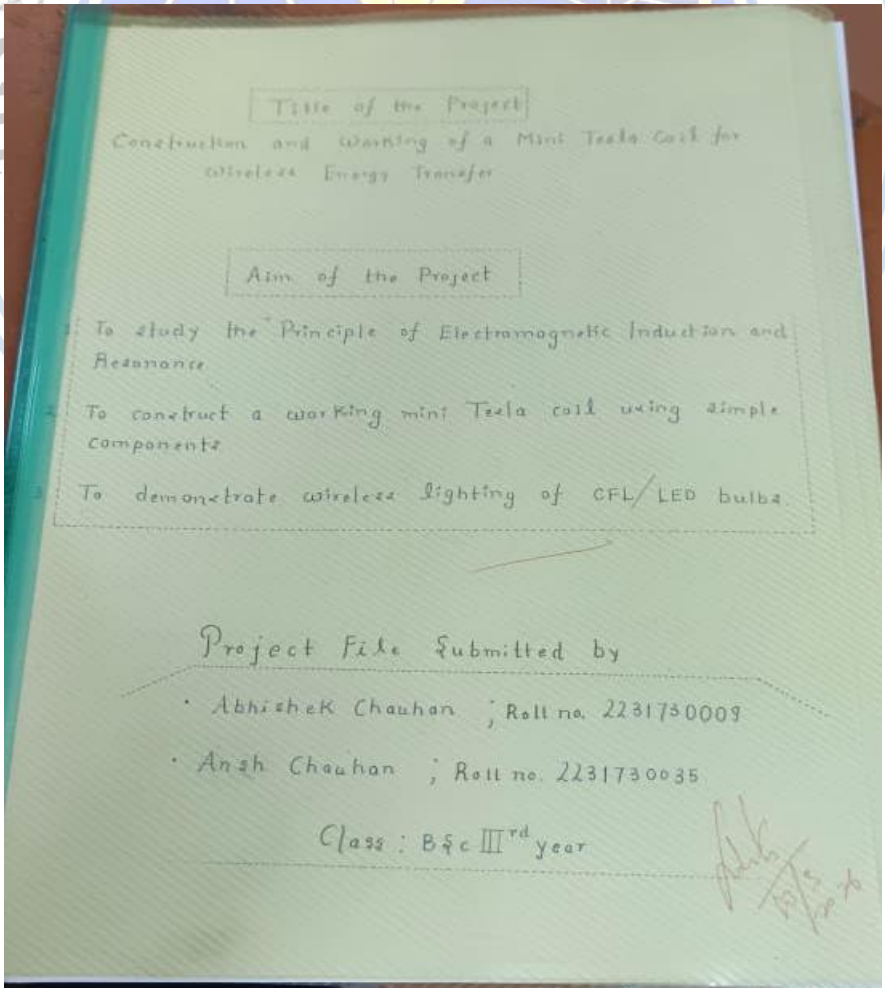
GROUP D : CONSTRUCTION AND WORKING OF A MINI TESLA COIL OF WIRELESS ENERGY TRANSFER

This project was, submitted by Roll Nos. 2231730009 and 22321730035,This project explores the fascinating world of high-frequency electromagnetics. The primary objective is to build a functional Mini Tesla Coil—a resonant transformer circuit designed by Nikola Tesla—to demonstrate how electrical energy can be transmitted through the air without physical connectors.

The system operates on two fundamental physics concepts:

Electromagnetic Induction: A changing magnetic field in the primary coil induces a high voltage in the secondary coil.

Resonance: By matching the oscillating frequencies of the primary and secondary circuits, energy transfer efficiency is maximized.



Title of the Project

Construction and Working of a Mini Tesla Coil for Wireless Energy Transfer

Aim of the Project

1. To study the Principle of Electromagnetic Induction and Resonance
2. To construct a working mini Tesla coil using simple components
3. To demonstrate wireless lighting of CFL/LED bulbs

Project File Submitted by

- Abhishek Chauhan ; Roll no. 2231730009
- Ansh Chauhan ; Roll no. 2231730035

Class : B.Sc III rd year

Takeaways: : The event effectively bridged the gap between theoretical concepts and real-world application, transforming classroom learning into tangible scientific experience. Students demonstrated strong proficiency in data collection, experimental design, hardware troubleshooting, and confident scientific communication. The projects not only validated the feasibility and relevance of their ideas but also deepened their conceptual understanding of Physics through hands-on inquiry.

Beyond technical skills, the experience nurtured critical thinking, collaboration, and problem-solving abilities, reflecting a holistic learning approach. The Department of Physics continues to cultivate a culture of innovation and inquiry, ensuring that academic learning is both meaningful and application-oriented. All students successfully met the core academic requirements for the session while actively engaging in experiential learning

Report Compiled by: Ms Tamanna, B.Sc. IIIrd year(Vice President UPSS)

Edited & submitted by: Dr. Kirti Singha (HOD, Physics)