NOVEMBER 2023



### TRAINING SCERT, DELHI REPORT

### 06 DAYS TRAINING F<mark>OR PGT (PSYSICS)</mark> AT IIT M<mark>AND</mark>I



Coordinators: Dr. Apsara Ansari SCERT

# **ABOUT TRAINING**

Program Name: 05 days capacity building program for PGTs Physics

	of DoE, GNCTD at IIT Mandi
Duration:	05 day
Dates:	20-25 November 2023
Organised by:	SCERT Delhi collaboration with IIT Mandi
Venue:	IIT Mandi, Himachal Pradesh
Travelling:	SCERT, Delhi to IIT Mandi (19 November 2023) and
	IIT Mandi to SCERT Delhi (25 November 2023)
Target:	PGT Physics of DoE, GNCTD
Expected participants: 38 + 1 DDE + 1 Coordinator	
Actual participants: 38 + 1 DDE + 1 Coordinator	
DDE Zone -17: Mr. Hari Ram Sharma, Principal Dwarka, Sec-5 RPVV	
Coordinator: Dr. Apsara Ansari, Assistant professor, SCERT Delhi	

#### **OBJECTIVES**

- To promote hands on experiential learning in the specific context of physics education.
- To nurture creativity and conceptual understanding.
- To integrate experimentation and observation with Physics learning.
- To expose with an alternative pedagogy of Physical sciences.

Introduction: The 5-day capacity building program for Post Graduate Teachers (PGTs) in Physics at IIT Mandi aimed to enhance the knowledge and teaching skills of teachers in the field of physics. The program covered a diverse range of topics over the five days. (Refer Annexure 1: Course schedule)



The inaugural session of the capacity-building program commenced with an insightful address by the Head of the School of Physical Sciences at IIT Mandi. The Head welcomed the participants and highlighted the significance of continuous professional development

for teachers in the field of physics. Following the Head's address, the Deputy Director of Education (DDE) for Zone 17 shared the expectations and aspirations for the participating teachers in the capacity-building program.





Session 1: Work, Energy, and Power

The first session commenced with an in-depth session on 'Work, Energy, and Power'. The session delved into the fundamental principles of these concepts, exploring both theoretical and practical aspects. Participants engaged in hands-on activities and discussions, gaining insights into effective teaching methodologies and ways to make these concepts more accessible to students.

#### Session 2: Thermodynamics

The session was dedicated to the crucial subject of 'Thermodynamics'. The session covered the laws of thermodynamics, heat transfer mechanisms, and their applications. Participants had the opportunity to engage in case studies and problem-solving exercises, fostering a deeper understanding of thermodynamic principles.



Practical demonstrations and simulations were also incorporated to enhance the participants' grasp of the subject.

Session 3: Electronics I

The session focused on 'Electronics I' Participants explored the fundamentals of electronics, including semiconductor devices, electronic circuits, and basic electronic system such as centripetal force, magnetic field in a Helmholtz coil, magnetic field along the axis of a single coil, coupled pendula, Faraday and lenz's law of induction. The session emphasized the importance of practical demonstrations and experiments in teaching electronics. Participants were introduced to cutting-edge technologies and tools used in electronics education, equipping them with the knowledge to enhance their teaching methods.

Session 4: Physical World and Measurement

On the fourth session, the program shifted its focus to 'Physical World and Measurement'. The session covered the foundational concepts that form the basis of physics, including the principles of measurement and units. Practical sessions allowed participants to explore various measurement techniques and instruments. Discussions also revolved around how to integrate real-world examples into teaching to make the subject more engaging for students.



#### Session 1: Physics Lab 1 - Mechanics, Electricity, and Magnetism

The lab session commenced with a comprehensive session on physics laboratory experiments. The focus was on hands-on activities related to mechanics, electricity, and magnetism. The participating teachers were provided with practical insights into conducting experiments in these fundamental areas of physics, equipping them with the skills to create engaging and informative lab sessions for their students.









#### Session 2: Physics with Cell Phone - Phyphox App

The second session featured an innovative session on utilizing mobile technology in physics education. The teachers were introduced to the 'Phyphox app', a versatile tool that turns smartphones into experimental instruments.

The session demonstrated how this app can be effectively integrated into physics classes to enhance students' understanding through interactive experiments. Participants engaged in practical exercises, creating a dynamic learning environment.

Session 3: Lecture on physics Nobel "Femtosecond and Attosecond Time-Resolved Spectroscopy"

The highlight of the day was a captivating lecture by Dr. Kamal P Singh from the Indian Institute of Science Education and Research (IISER), Mohali. The session delved into the cutting-edge field of femtosecond and attosecond timeresolved spectroscopy. Dr. Singh provided insights valuable into the latest advancements in this field, connecting theoretical with real-world concepts applications. The lecture not only participants' knowledge expanded the base but also inspired them to incorporate contemporary topics into their teaching methodologies.











#### Session 1: Electronics II (Transducers)

The third day of the capacity building program commenced with an insightful session on Electronics II, focusing on transducers. Renowned expert in the field shared his expertise, covering topics such as the principles



Session 2: Electronics lab (Half Wave Rectifier)

The participants engaged in a practical electronics lab session, where they delved into the intricacies of halfrectifiers. The hands-on wave experience provided a valuable opportunity for the Post Graduate Teachers (PGTs) to apply theoretical knowledge gained during the morning session. The lab session facilitated a deeper understanding of electronic and their practical components implications.





Session 3: Real Effects of Pseudo Forces (Newton's Law)

Commenced with an intellectually stimulating session on the real effects of pseudo forces, focusing on Newton's laws. The expert discussed the theoretical framework behind pseudo forces and their significance in various physical phenomena.



Session 4: Tinkering lab

holistic provide learning То а experience, the afternoon session involved a visit to the Tinkering Lab at **Participants** IIT Mandi. had the opportunity to explore cutting-edge technologies, experimental setups, and innovative projects. The visit aimed to inspire PGTs by showcasing applications of physics practical concepts, fostering creativity and innovation in teaching.









Session 1: Physics lab II (Light, Heat, Modern Physics)

The morning session delved into Physics Lab II, focusing on experiments related to Light, Heat, and Modern Physics. The following topics were covered:

- Newton's Ring: Participants explored the interference pattern formed by a thin film of air between a lens and a flat surface, demonstrating the principles of wave interference.
- He Neon Laser: The session included hands-on experience with a helium-neon laser, illustrating its applications and characteristics.
- Polarization: The concept of polarization in light was explored through practical demonstrations, showcasing its relevance in various optical phenomena.
- Four Probes: An experimental overview of four-probe measurements, a technique used to characterize the electrical properties of materials, was conducted.
- Frank Hertz Experiment: Participants engaged in the Frank Hertz experiment, exploring the quantization of energy levels in a mercury vapour discharge tube.
- Stefan Constant: The Stefan constant, which relates the power radiated by a blackbody to its temperature, was discussed and measured in a laboratory setting.

Session 2: Simple Harmonic Motion and Beyond

The afternoon session focused on Simple Harmonic Motion (SHM) and its applications in which the basics of SHM were covered, including mathematical representations and real-world examples. Participants explored more advanced concepts and applications of harmonic motion in physics.



Session 1: Dual Nature of Matter and Radiation

The morning session centered on the dual nature of matter and radiation, covering topics such as: Wave-Particle Duality, Participants delved into the fundamental concept of wave-particle duality, exploring the behaviour of particles and electromagnetic radiation by the demonstration setup.

**Session 2: Sensors Demonstration** 

The afternoon session featured practical demonstrations of various sensors prepared by students of IIT based on IR and ultrasonic sensor, showcasing their applications and significance with the help of models such as Flood control and flood management, Traffic management, Street Light management and Blind stick.







### CULTURAL ACTIVITIES

The program included enriching cultural activities, offering participants a glimpse into the local heritage and traditions:

- Temple Visits: Participants visited the Punch Vakr Temple and Booth Nath Temple, experiencing the architectural and cultural richness.
- Indrani Market: A visit to Indrani Market allowed participants to explore local crafts and traditions.
- •Visit to Prashar Lake: The serene Prashar Lake provided a picturesque backdrop for a day of relaxation and reflection.
- Gala Dinner: A gala dinner provided an informal setting for networking and camaraderie among participants and organizers



### VALEDICTORY

Valedictory Session: The program concluded with a valedictory session, acknowledging the participants' experiences and feedback Followed by certificate distributions.











## CONCLUSION

The 5-day capacity building program at IIT Mandi successfully empowered PGTs in Physics with enhanced knowledge and teaching skills. The program's structure allowed for a balanced mix of theory and practice, ensuring that participants gained both conceptual understanding and practical proficiency. The diverse range of topics covered, combined with practical demonstrations and interactive sessions, ensured that the participants left the program with valuable insights and tools to enrich their teaching practices. The program not only contributed to the professional development of the participants but also fostered a community of teachers dedicated to advancing the field of physics education.

The visit to the Tinkering Lab added a unique dimension to the program, encouraging teachers to incorporate innovative teaching methodologies and inspiring them to create an interactive and dynamic learning environment for their students.

