

Report on the Online Workshop: "Exploring the Frontiers of Computational Physics: A Hands-on Workshop for Students"

The online workshop on "**Exploring the Frontiers of Computational Physics: A Hands-on Workshop for Students**," organized by the **Association of All Computer Science Teachers (AACST)**, was successfully conducted from **15th to 24th January 2025**. This initiative aimed to introduce students to the interplay of physics, computation, and real-world problem-solving, with a comprehensive focus on hands-on learning.

Highlights of the Workshop

- **Participation:** A total of **111 participants** (a "golden figure") enthusiastically participated in this workshop, showcasing a vibrant interest in computational physics.
- **Sessions:** The workshop spanned eight meticulously crafted sessions, each designed to explore different domains of physics using computational tools.
- **Programs Covered:** Around **70 programs** were explored during the sessions, empowering students with practical knowledge and skills.

Workshop Structure

The first two sessions provided a solid foundation in Python programming, covering basic to advanced topics. The remaining sessions set the stage for domain-specific explorations:

1. **Classical Mechanics**
2. **Electromagnetics**
3. **Optics**
4. **Thermodynamics**
5. **Sound**
6. **Quantum Mechanics** (two sessions focusing on Wavefunctions and Quantum Dots/Tunneling)

Each session featured interactive coding demonstrations, practical exercises, and simulations, tailored to deepen understanding and foster curiosity.

Google Classroom Integration

To enhance the learning experience, a dedicated Google Classroom was created for all participants. This platform served as a centralized hub for all resources related to the workshop, including:

- **Study Materials:** Comprehensive session-wise study materials.
- **Code Files:** Python codes and programs demonstrated during the sessions.
- **Daily Assessments:** Designed to reinforce learning and provide hands-on practice.
- **Final Test:** A concluding assessment to evaluate participants' grasp of the topics covered.

Contribution of Resource Persons

The workshop's success would not have been possible without the guidance and expertise of our esteemed resource persons, all AACST Life Members:

1. **Dr. Abha Khandelwal:** Delivered engaging Python sessions, providing additional resources and dedicated post-session support.
2. **Ms. Ritika Raghav:** Conducted sessions on simulating physics problems in kinematics and electromagnetism, demonstrating visualization techniques using Python.
3. **Dr. Aditya Singh:** Presented Python coding engagingly and memorably.
4. **Dr. Bhakti Patankar:** Delivered structured and visually engaging sessions on quantum mechanics.
5. **Dr. Jyoti Ghushhe:** Fostered an interactive learning environment with her enthusiastic teaching approach.

Their dedication and expertise significantly enhanced the learning experience.

Role of the Chairpersons

Each session was chaired by eminent scholars from across the nation, adding value through their insights. The details of chairpersons are as follows:

- **Session 1 (Python Programming):** Dr. Amin Nooral, Assistant Professor, Sadabai Raisoni Women's College, Nagpur, and Chief Guest Dr. Chitra Ravi, Research Director, Cybersena (R&D) India Pvt. Ltd., Bangalore.
- **Session 2 (Python Programming):** Dr. Gunjan Singh, Faculty of Computer Applications, R.B.S. Management Technical Campus, Agra.
- **Session 3 (Classical Mechanics):** Prof. Kamlesh Alti, Institute of Science, Nagpur.
- **Session 4 (Electromagnetics):** Dr. Saurabh Dube, IISER Pune.
- **Session 5 (Optics):** Prof. Somasekara Sidiginamale, Karnataka.
- **Session 6 (Thermodynamics):** Prof. Kamal Singh, Retired VC, Sant Gadgebaba Amravati University.
- **Session 7 (Quantum Mechanics):** Prof. P. C. Deshmukh, Retired Faculty, IIT Chennai.
- **Session 8 (Quantum Dots and Tunneling):** Prof. P. K. Ahluwalia, President of IAPT.

Their insightful comments and interactions with participants were invaluable.

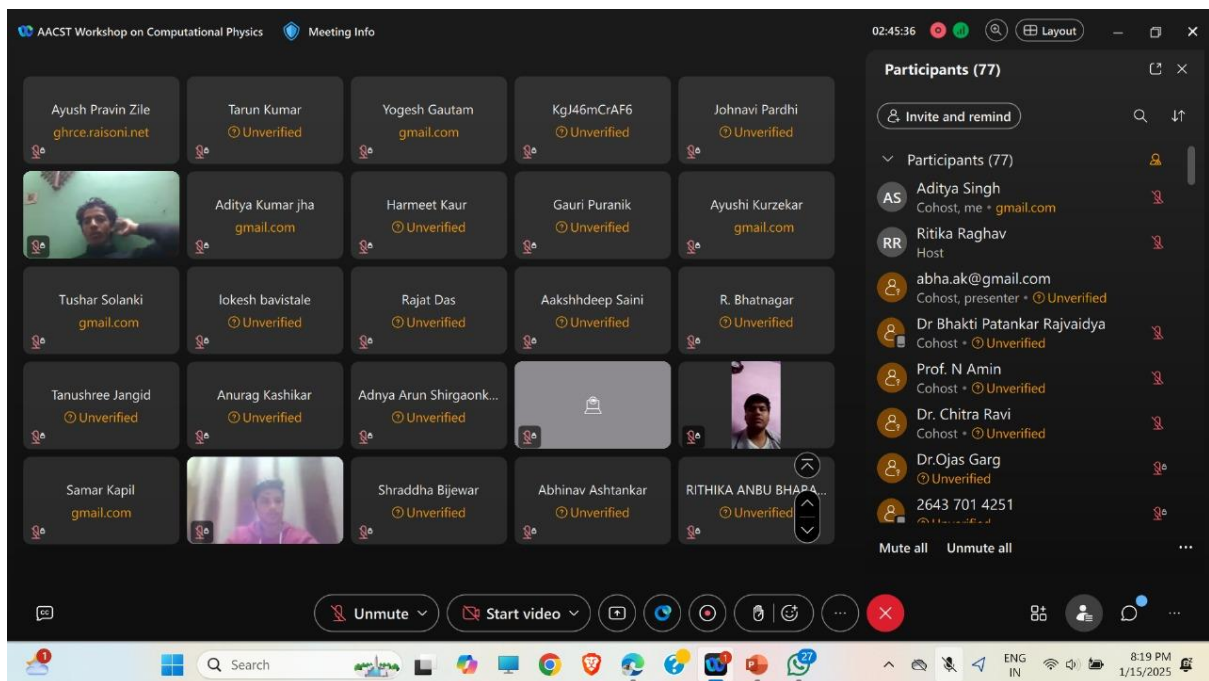
Conclusion

This workshop was a landmark event, providing participants with an immersive and enriching experience. The guidance of **Dr. Abha Khandelwal**, who has been a constant source of support and encouragement, played a pivotal role in its success. As a mentor, she provided continuous guidance, ensuring the smooth organization of the workshop. Her meticulous preparation, thorough explanations, and engaging delivery captivated participants. She was instrumental in designing the curriculum and study materials, which were made accessible via Google Classroom.

The efforts of all resource persons and chairpersons were instrumental in achieving the workshop's objectives. The workshop has undoubtedly left an indelible mark on the

participants, equipping them with computational tools to explore the fascinating world of physics.

Glimpse:



AACST Workshop on Computational Physics Meeting Info 02:45:55

Participants (76)

Invite and remind

Participants (76)

- AS Aditya Singh Cohost, me + gmail.com
- RR Ritika Raghav Host
- abha.ak@gmail.com Cohost, presenter + Unverified
- Dr Bhakti Patankar Rajvaidya Cohost + Unverified
- Prof. N Amin Cohost + Unverified
- Dr. Chitra Ravi Cohost + Unverified
- Dr.Ojas Garg Unverified
- 2643 701 4251

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8:20 PM 1/15/2025

Session 8 and Valedictory Function AACST Worksho... Meeting Info

PK Ahluwalia Unverified

Dr Abha Khandelwal

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Session 5: AACST Computational Workshop

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Participants (42)

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- Poonam Jain Unverified
- Prajakta Kumre Unverified
- R. Bhatnagar Unverified
- Reena Unverified
- Rishita Lunkad Unverified
- Ritika Negi Unverified
- ROHIT TYAGI
- Roshani Devendra Naik Unverified

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Roshani Devendr... Aaditya Shende Radnyee Parab Dr Abha Khandel... Ritika Raghav Kamlesh Alt

Program 1:

STEP 1:

```
x=0 #m
v=0.45 #m/s
t=0 #s
a=0.2 #m/s2
dt=0.25 #s
count = 0
```

} Initialising the variables

STEP 2:

```
while t<1.5:
```

} Loop will execute for time t is less than 1.5 seconds.

STEP 3:

```
t = t + dt
x = x + v*dt + 0.5*a*dt**2
v = v + a*dt
count = count + 1
```

} Updating Time, Position and Velocity

$$x_2 = x + v*dt + 0.5*a*dt^2$$

Session 6: AACST Workshop on Computational Phys... Meeting Info 14:53 Layout

Shraddha Bijewar Unverified

Neha Unverified

R. Bhatnagar Unverified

Hemanth Sista gmail.com



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Session 6: AACST Workshop on Computational Phys... Meeting Info 18:24 Layout

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Ritika Raghav



Dr.Ojas Garg
gmail.com

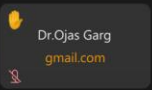
Dr Abha Khandelwal
Unverified



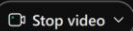
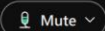
Dr Bhakti Patankar Unverified

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Session 8 and Valedictory Function AACST Worksho... Meeting Info

Ritika Raghav
PK Ahluwalia
Dr. Jyoti Ghushe...
Dr Abha Khandelwal

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Viewing Dr. Jyoti Ghushe's applications 100% Annotate

Contents of this presentation include:


- **Introduction and Principles**
 - Definition and Basic Principles of **Quantum Dots**
 - Writing Code to Solve and Plot the Wavefunction for a Particle in a Box
 - Definition and Basic Principles of **Quantum Tunneling**
 - Wavefunction Penetration and Potential Barriers in Quantum Tunneling
 - Quantum Confinement Effect in Quantum Dots
- **Simulations and Applications**
 - Simulation of Quantum Dots: Energy Levels and Band Gap Modeling
 - Applications of Quantum Dots: Biomedical Imaging, Solar Cells, and LEDs
 - Applications of Quantum Tunneling: Tunnel Diodes, Quantum Computing, and STM
- **Comparison and Distinctions**
 - Key take aways for Quantum Dots and Quantum Tunneling
 - Roles in Nanotechnology and Quantum Devices

1/24/2025 Computational Physics through Python 2

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Tanushree Jangid
Monisa Rajkhowa

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