Shri Pragya Mahavidyalaya

Post Graduate College of Science, Technology, Management, Arts & Commerce
Pragya Road, Bijainagar - 305624 Distt.-Ajmer, Rajasthan, India
Email : info@pragyacollege.com, Website : www.pragyacollege.com
Ph. : 091-1462-230101, 9587888125, 126

NOTICE

Shri Pragya Mahavidyalaya announces a new course on Atomic Physics, Unravel the mysteries of the atom!

Course Details

This course explores atomic structure, energy levels, light interactions, and external field effects. Learn about the Schrodinger equation, quantum mechanics, electron spin, and more about atomic structures.

Date - 1st Novemebr 2022 to 15th December 2022

Timings – 10:00 Am to 11:00 Am

Course Coordinator – Suresh Joshi and Garima Saxsena

Venue – Room No. 110, Shri Pragya Mahavidyalaya

Take advantage of this opportunity to enrich a profound knowledge about atomic structures.

Director
Shri Pragya Mahavidyalaya
Bijainagar-305624

Director

Director
Shri Pragya Mahavidyalaya
Bijainagar-305624

Copy to: -

1. President and Secretary, Shri Pragya Jain Smarak Samiti
2. President and Secretary, Shri Pragya Mahavidyalaya
3. All Department HoD's
4. IQAC

Shri Pragya Mahavidyalaya

Add On Course

"Advanced Atomic Physics: Theory and Applications"

This course provides a concise yet comprehensive exploration of atomic physics, starting with the fundamentals of the hydrogen atom and expanding to cover more complex systems. Students delve into the Schrödinger equation, radiative transitions, fine structure, and the behavior of multi-electron systems. Key topics include the central-field approximation, angular problems in many-electron atoms, and interactions with external fields such as the Zeeman and Stark effects. Hyperfine structure and isotope shifts are also examined, offering insight into atomic interactions at a deeper level. Through theoretical principles and mathematical analysis, students gain a solid foundation in atomic physics with practical applications in various scientific fields.

UG and PG Students
(Science Stream)

Learning Outcomes

- **Understand atomic structure fundamentals, including the Schrödinger equation and quantum numbers.**
- **Analyze radiative transitions and their probabilities in light-matter interactions.**
- **Interpret fine structure in atomic spectra, considering electron spin and interaction effects.**
- **Apply theoretical models to analyze many-electron systems and predict atomic spectra patterns.**
- **Investigate external field effects on atoms and analyze hyperfine structure and isotope shifts.**

Classes will Commence from 1st November 2022 to 15th December 2022
at:
Room No.110
Shri Pragya Mahavidyalaya
Pragya Road, Bijainagar (Ajmer)
Course Coordinator - Suresh Joshi and Garima Saxena

Director
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Bijainagar-305624

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Report on Certification Course titled "Advanced Atomic Physics: Theory and Applications"

Introduction:

The Department of Physics at Shri Pragya Mahavidyalaya successfully concluded the certification course titled "Advanced Atomic Physics: Theory and Applications", which was conducted from 1st November to 15th December 2022 (10:00 Am to 11:00 Am). This course was designed to provide students with an in-depth understanding of atomic physics, covering both fundamental concepts and advanced topics.

Course Content Overview:

The course spanned 30 hours, offering a comprehensive exploration of atomic physics. Key areas covered included:

- **Empirical Aspects and Orders of Magnitude:** Introducing the foundational principles and scales relevant in atomic physics.
- **The Hydrogen Atom's Gross Structure:** Detailed study of the Schrödinger equation, stationary states, expectation values, quantum numbers, and the hydrogen energy spectrum.
- **Radiative Transitions:** Examination of Einstein's A and B coefficients, transition probabilities, the electric dipole approximation, and selection rules.
- **Fine Structure of the Hydrogen Atom:** Analysis of electron spin, interaction terms, the vector model, and the Lamb shift, providing a detailed understanding of the hydrogen spectrum.
- **Two-Electron Systems:** Focus on the electrostatic interaction, exchange degeneracy, and the helium atom's ground and excited states.
- **Central-Field Approximation:** Discussion on the central field, Thomas-Fermi potential, and the gross structure of alkalis.
- **Angular Problems and External Field Interactions:** Study of LS coupling, Zeeman and Stark effects, and hyperfine structure, including isotope shifts.

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Teaching and Faculty Contributions:

The certification course was taught by two esteemed faculty members, **Mr. Suresh Kumar Joshi** and **Ms. Garima Saxsena**. Their expert guidance and dedication were instrumental in ensuring the success of the course.

- **Mr. Suresh Kumar Joshi** brought his extensive experience in atomic physics to the classroom, delivering complex topics with clarity and fostering a deep understanding among students. His interactive teaching style encouraged students to engage with the material actively.
- **Ms. Garima Saxsena** complemented the course with her strong theoretical knowledge and practical insights. Her well-structured lectures and ability to relate abstract concepts to real-world applications significantly enhanced the learning experience.

Student Feedback:

Students responded positively to the course, particularly appreciating the structured approach and the relevance of the content to current scientific advancements. The collaborative efforts of Mr. Joshi and Ms. Saxena were highly praised, with students highlighting their clear explanations, supportive teaching methods, and the ability to make challenging topics accessible.

Conclusion:

The "Advanced Atomic Physics: Theory and Applications" course was a significant success, thanks to the excellent instruction provided by Mr. Suresh Joshi and Ms. Garima Saxsena. The course equipped students with a solid foundation in atomic physics, preparing them for further studies and research in the field. The department looks forward to continuing this high standard of education in future offerings.

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1 Introduction to Quantum Mechanics (Week 1)

Empirical aspects and orders of magnitude in quantum mechanics
The Schrödinger equation and its solution for the hydrogen atom
Understanding stationary states, expectation values, and quantum numbers

2 Radiative Transitions and Fine Structure (Week 2)

Einstein's A and B coefficients and transition probabilities
The electric dipole approximation and selection rules
Fine structure of the hydrogen atom and the Lamb shift

3 Many-Electron Systems (Week 3)

Electrostatic interaction and exchange degeneracy in two-electron systems
Ground and excited states of helium and electron spin functions
Introduction to the periodic system and Pauli exclusion principle

4 Approximation Methods (Week 4)

Central-field approximation and Thomas-Fermi potential
Gross structure of alkalis and angular problems in many-electron atoms
LS coupling approximation, fine structure, and interaction with external fields

5 Hyperfine Structure and Isotope Shift (Week 5)

Magnetic dipole and electric quadrupole interactions
Zeeman effect, hyperfine structure, and isotope shift
Determination of nuclear spin and relative intensities in spectra

Note-: Every Week Consists of 6 Hours of Learning and Course will be of 5 Weeks.

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Reference No: 131-A

Date: - 20/10/2022

To,

The Director

Shri Pragya Mahavidyalaya

Subject: Approval for Commencement of Certification Course Titled "Atomic Physics: Theory and Application"

Respected Sir,

I am writing to seek your esteemed approval for the commencement of a new certification course titled **"Atomic Physics: Theory and Application"**. This course is designed to provide our students with a comprehensive understanding of atomic physics, focusing on both theoretical knowledge and practical applications.

We believe that this course will not only enhance the academic offerings of our institution but also prepare our students for further research opportunities and professional careers in physics and related disciplines.

We kindly request your approval to initiate this certification course as soon as possible. Your support will be instrumental in ensuring the successful implementation and smooth conduct of the course.

Thank you for your consideration.

Garima

Yours sincerely,

Director
Shri Pragya Mahavidyalaya
Bijainagar-305624

Permitted
21/10/22

Garima Saxsena

Assistant Professor

Department of Physics