

Dr. Roohi Zafar

Department of physics

NEDUET, Karachi

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➤ ACADEMIC QUALIFICATIONS

Degree	Subject	Institution/Awarding body	Grade/ G.P	Year
Ph.D.	Spectroscopy	University of Karachi	3.94	2021
MS	Spectroscopy	University of Karachi	3.9	2011
M.Sc.	Physics	University of Karachi	1 st class 1 st position	2004
B.Sc(H)	Physics (H), Mathematics and statistics	University of Karachi	1 st class 3 rd position	2003
H.S.C	Pre-engineering	Sir Syed Govt. Girls college	1 st division	2000
S.S.C	Science	Dehli Govt. School	1 st Divsion	1998

➤ Ph.D. SYNOPSIS TITLE:

“Theoretical Investigation of Fine Structure of Praseodymium-I”

➤ MS. THESIS:

“Investigation of the hyperfine structure of Praseodymium-I in far infrared region”

➤ JOB EXPERIENCE

1. 1st Jan 2005 -1st Nov 2006: I worked as a cooperative teacher in the Department of Physics at the University of Karachi.
2. 1st March 2005 – 31st Oct 2006: worked as a visiting faculty member in the Department of Physics, SSUET.
3. 1ST Nov 2006 – 13th March 2018: As a Lecturer in the Department of Physics, NEDUET.
4. 13th March 2018 – to date: As an Assistant Professor, NEDUET.
5. 2017 – to date: As a part-time teacher, Master of Science (MS) in Physics evening program, NEDUET.
6. 2017 – to date: Part Time Teacher, Master of Science (MS) in Physics, NEDUET

➤ ADMINISTRATIVE POSTS HELD

1. PT member of Ph.D. Physics Self-Assessment Report (SAR): 1st Cycle, June 2024– to date
2. Board of Studies Member (BoS): 2024 – to date
3. Member of Duty Society: 2022 – to date
4. Member of PhD admission committee: Spring 2025
5. Member of MS admission committee: Spring 2024, Fall 2023, Spring 2023

6. Member of thesis proposal evaluation of Postgraduate: Spring 2023.
7. Class Advisor: 2016 to 2023.
8. PT member of BS Physics SAR 4th Cycle: 2023.
9. Convener: “Curriculum Revision Committee” 2022-2023

➤ **AWARDS:**

1. Recognized as an NED Approved PhD Supervisor in the discipline of Physical Sciences for three years, effected from 19-11-24.
2. Was awarded the Best Teacher Award at the CPE Annual Day event in 2024.
3. Was awarded Sultana N. Nahar Prize for distinction in Teaching in Physics, 2023.
4. Was awarded a letter of Congratulations for outstanding performances in “Atomic Astrophysics and Spectroscopy with Computational workshops on the SUPERSTRUCTURE and the R-matrix codes (online), organized by Indo-US APJ Abdul Kalam STEM Education, Research Center of Aligarh Muslim University and the Ohio State University, 2021.
5. Was awarded certificate and shield of Conference Finance head in the “1st International Conference on Applied Physics and Engineering” organized by the Department of Physics, NED University of Engineering and Technology, 2021.
6. Was Awarded the shield of a judge in RESEARCHATHON 2024 on 20-09-2024 at Aga Khan Higher Secondary School, Karimabad, Karachi.
7. Was Awarded the Philips Gold Medal for academic distinction in M.Sc. in Physics from the University of Karachi in 2004.

➤ **NATIONAL ASSOCIATION**

Invited as an observer in Technical committee meetings in Weights & Measures Division at Pakistan Standards & Quality Control Authority.

➤ **REVIEWER (JOURNALS)**

1. Sigma
2. Pakistan Academy of Sciences

➤ **AREA OF RESEARCH**

1. Committed to fostering a deep understanding of quantum mechanics principles and their applications.
2. Dedicated to advancing the understanding of atomic and molecular systems through precise ionization energy calculations, analysis of transition probabilities, oscillator strengths, line strengths, and Rydberg energy levels

➤ **CONFERENCES/ WORKSHOPS/TRAINING**

1. Attended and presented at the “4th International Conference on Innovation in Computer Science,” organized by the Department of Computer Science and Information Technology, NED University, in November 2024.
2. Attended the “Quantum Technologies” workshop organized by the Department of Computer Science and Information Technology, NED University, in November 2024.
3. Organized “1st Particle Physics Workshop and Virtual Tour of CERN”, jointly organized by FUUAST and NED University, November 2024.
4. Attended the training programme on the “Effective PhD Supervision workshop, jointly organized by ASRB and QEC, NED University, October 2024.

5. Attended and Organized the “Hands-on Julia HEP” Workshop jointly organized by NED and Karachi University on 27th September 2024.
6. Organizer and Speaker at the “Introduction of AI in Physics” workshop organized by the Department of Physics, NED University, September 2024.
7. Organizer and Speaker at the “Quantum state classification with Machine Learning” Workshop organized by the Department of Physics, NED University, June 2024.
8. Attended “Faulty training for undergraduate STEM education, a project by UK-Pakistan Science and Innovation Global Network in collaboration with NED University, April 2024.
9. Attended “International Day of Medical Physics” organized by Physician Organization of Medical Physicists and JPMC Karachi, 2021.
10. Attended “Atomic Astrophysics and Spectroscopy with Computational workshops on the SUPERSTRUCTURE and the R-matrix codes” (online), organized by Indo-US APJ Abdul Kalam STEM Education, Research Center of Aligarh Muslim University and the Ohio State University, October 2021.
11. Organized and presented a paper at the “1st International Conference on Applied Physics and Engineering”, NED University of Engineering and Technology, 2021.
12. Attended LaTeX workshop organized by NEDUET.
13. Attended ITE workshop organized by HEC-NEDUET, 2011.
14. Attended and presented a poster paper at the national conference “Physics and The World of Today”, organized by the Department of Physics, University of Karachi, 2011.
15. Attended and presented a paper at the national conference “Physics and The World of Today”, organized by the Department of Physics, University of Karachi, 2009.
16. Attended training on “Research Methodology” held at NEDUET, 2009.
17. Attended training on “Presentation and Communication Skills” at NEDUET, 2006.
18. Attended the training on “Role of Teacher as an Examiner and Invigilator” held at NEDUET in 2006.
19. Attended international school on “Surface, Thin Film, Nano Structures and Application” held at COMSATS Information Technology, Lahore, 2006.
20. Attended International Nathiagali Summer College, held at Nathiagali, 2006.

➤ **PUBLICATIONS:**

1. R., Raza, R., Zafar, et al. (2025). Successful Approximation of Energies in Hg I. Journal of Quantitative Spectroscopy and Radiative Transfer. (Under review)
2. Zafar, R., Kamran, M., Malik, T., Karera, K., Tariq, H., Mustafa, G., & Khan, M. M. (2024). Randomness from Radiation: Evaluation and Analysis of Radiation-Based Random Number Generators. arXiv preprint arXiv:2409.20492.
3. Shaheen, K., Zafar, R., Javaid, S., & Rajput, A. A. (2024). Analytical estimate of effective charge and ground-state energies of two to five electron sequences up to atomic number 20 utilizing the variational method. Beni-Suef University Journal of Basic and Applied Sciences, 13(1), 92.
4. Mateen, M. R., Zafar, R., Rajput, A. A., Rehman, S. U., & Zahid, M. M. (2023). Non-Relativistic Calculation of Excited-State Ionization Potentials for Li-Like Ions Using Weakest Bound Electron Potential Model Theory. East European Journal of Physics, (4), 311-317.
5. Shafi, Misha, et al. "New Numerical Approach to Calculate Microstates of Equivalent and Non-Equivalent Electrons." Proceedings of the Pakistan Academy of Sciences: A. Physical and Computational Sciences 60.4 (2023): 29-33.
6. Siddique, R., Zafar, R., Raza, S., Iqbal, S. Z., & Uddin, Z. (2023). Mean Lifetimes of ns, np, nd, & nf Levels of NV. East European Journal of Physics, (3), 424-429.

7. A survey on radiation protection awareness at various hospitals in Karachi, Heliyon, 8(11), e11236 2022.
8. Spectroscopic properties of lithium like ions: Prospective elements for quantum computation. Mehran University Research Journal of Engineering and Technology. Accepted: 13 September 2021.
9. Python program to Generate Spherical Harmonics. International journal of advanced trends in Computer Science and Engineering, Vol.10, 2021.
10. Wave functions for Ground state $4f^3 6s^2$ configuration of Praseodymium to calculate energy of fine levels and other spectroscopic quantities. Journal of Physics Communications, 4(3), 035003, 2020.
11. Theoretical analysis of $4f^2 5d^2$ configuration of singly ionized praseodymium. Journal of Physics Communications, 3(9), 095012, 2019.
12. Investigation of Pr-I lines by a simulation of their hyperfine patterns: Discovery of new levels J.Phys. B: At. Mol. Opt. Phys. 45205001, 2012, IOP Science.
13. Composition related time dependent dielectric response of lithium ion conducting glasses. Publish in Karachi University, journal of science, Volume 33 (I and II) July-December, 2005. PP.13-19.

➤ **STUDENT MENTORSHIP:**

Undergraduate and Post Graduate Research Supervision

Degree/ Role	Supervised	Co-Supervised	Currently Supervising	Currently Co-supervising
BS	10	1	3	-----
Master's Thesis	11	1	2	-----

List of projects and thesis

1. Probing Gravitational interaction between small masses using Cavity optomechanics (In Progress).
2. Exploring Decoherence in Infinite Potential well with theoretical Analysis of Decoherence dynamic of quadratic energy spectra. (In Progress).
3. Enumeration of the density of states in the cavity and its application by using the graphic user interface (GUI) (In Progress).
4. Cosmological Inflation from Polymer Quantization (In Progress).
5. Exploring Quantum States spaces using hybrid quantum and Classical Classifiers Algorithm (In Progress).
6. Analysis of FSO Communication Using Principles of Quantum Mechanics.
7. Investigation of a quantum random number generator.
8. Determination of Term Energy of Ca I using Semi-Classical formula.
9. The study of radiation protection aspect (occupational medical and public) in a radiology facility (In Collaboration with PNRA).
10. Quantum Neural Network.
11. Theoretical Investigation of the fine structure of Tantalum (Ta I).
12. Asymptotic behavior of Rydberg atoms.
13. Dose rate mapping during Angiography procedure and estimation of occupational. (In Collaboration with PNRA).
14. Hybrid quantum system involving Nanomechanics.
15. Theoretical Investigation of Rydberg Energy levels of Sodium Atom.
16. Implementation of machine learning in Medical linac Quality Assurance and treatment plans (In Collaboration with JPMC)
17. AB Initio Calculations of Ionization Energy Of Boron Ions.
18. AB Initio Calculations of Ionization Energy Of Beryllium Ions.
19. Monitoring of radiation doses from patients undergoing PET/CT scans (In Collaboration with PNRA).

20. Radiation exposure assessment and mitigation strategies during Fluor-Deoxyglucose (FDG) production in medical Cyclotron Facility. (In Collaboration with JPMC)
21. Study of Primordial Black Holes as Dark Matter.