Curriculum Vitae

Rana Hasnain Ali s/o Rana Ahmed Ali

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TEACHING PHILOSOPHY

Possessing excellent problem solving, analytical and logical skills make me suitable to work as a team member as well as an individual. I am always ready to meet deadlines, do challenging work, and eager to learn new things.

ACADEMICS

Doctor of Philosophy (Mathematics) **2021 - 2024**
PhD scholar in the Department of Mathematics,
The Islamia University of Bahawalpur, Pakistan.
Thesis Title: *Thermodynamical Analysis and Phase Transitions of Black Holes*.

Master of Philosophy (Mathematics) **2015 - 2017**
1st Division
Center for Advanced Studies in Pure and Applied Mathematics (CASPAM),
Bahauddin Zakariya University, Multan, Pakistan.
Thesis Title: Numerical Methods Based on Thiele's Continued Fraction for Root-Finding Problems for Solving the Nonlinear Equations.

Master of Science (Mathematics) **2011 - 2013**
1st Division
Center for Advanced Studies in Pure and Applied Mathematics (CASPAM),
Bahauddin Zakariya University, Multan, Pakistan.

Graduation (B. Sc.) **2009 - 2011**
1st Division
Iqra Post Graduate College, Sadik Abad affiliated with
The Islamia University of Bahawalpur, Pakistan.

Bachelor of Education (B. ED) **2015 - 2017**
1st Division
ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

Intermediate (Pre-Engineering) **2007 - 2009**

1st Division
BISE BahawalPur, Pakistan

Matriculation (Science) **2005 - 2007**
1st Division
BISE BahawalPur, Pakistan

EXPERIENCE

To my utmost abilities, imparting basic as well as advanced concepts of mathematics to different level of teaching over the last 10 years.

- Having 10 years teaching experience in a highly professional organizations with the core of values **DISCIPLINE, HONESTY, RESPECT** and **TOLERANCE**.
- **One year** (2014-2015) teaching experience as a lecturer Mathematics in **Madrassa-Tul-Banaat College (M.T.B)**, Sadik Abad.
- **Six month** worked as a lecturer in **TIMES Institute, The School of Engineering, Multan** and taught the following courses, Differential Equation, Complex Analysis, Discrete Structure and Calculus.
- **Two year** (2016-2018) teaching experience in **National Fertilizer Corporation (NFC), Institute of Engineering and Information Technology, Multan** and taught the subjects of Numerical Analysis, Calculus, Analytical Geometry, Probability and Statistics.
- **Three year** (2017-2020) worked as Visiting lecturer in **Institute of Southern Punjab (ISP), Multan**. The subjects were taught here Complex Analysis, Numerical Analysis, Differential Geometry, Measure Theory, Mechanics, Abstract Algebra, Linear Algebra, Set Topology, Functional Analysis, Partial Differential Equation Ring-Theory and Elements of set Theory & Mathematical logics.
- **Two year** (2018-2020) worked as a permanent lecturer in **Kaims International Institute, Multan** and taught the courses Metric spaces and set topology, Linear Algebra and Multivariable Calculus, Differential Equation and Affine and Euclidean Space.
- **Two year** (2018-2020) worked as a lecturer in **University of Education (UE), sub campus Multan**, and teaching the subjects of Complex Analysis and Numerical Analysis.
- **One year** (2018-2019) working as a lecturer in **University of Central Punjab (UCP) sub campus, Multan** and taught the subjects of Group Theory, Elements of set Theory & Mathematical logics and Mathematics-I.
- **One year** (2018-2019) working as a visiting lecturer in **National College of Business Administration and Economics (NCBA & E) sub campus, Multan** and taught the subjects of Real Analysis, Calculus and Elements of set Theory & Mathematical logics.
- From 01-01-2020 to 10-04-2021 serve as a permanent lecturer in Mathematics

in **Govt. Cadet College Pano Aqil**.

- From 10-04-2021 to present working as a visiting lecturer in **The Islamia University of Bahawalpur** and teaching the subjects of Elements of set Theory & Mathematical logics, Mathematics-I and Mathematics-II, Differential Equation and Linear Algebra, Calculus and Analytical geometry, Special Theory of Relativity.

Skills

- Online teaching tools
- Student's research guidance
- Classroom management
- Student's Counseling
- Curriculum Development
- Computer relating software like Microsoft Office, Mathematica, Maple, Python and MATLAB
- Mathematics Writing Software including MS Word, Scientific Workplace and Latex, OverLeaf
- The use of Microsoft team software, Zoom Apps, Google meet and Socrative software for presenting lectures during online classes.
- Successfully Completed the 1st Pedagogical Training 2022 Organized by IUB

Research Activities

Accepted, Published and Submitted Research Articles in Highly Impact Factor International Journals,

Published/ Submitted Articles

1- Extended phase space thermodynamics of black hole with non-linear electrodynamics field,
G. Abbas and **R. H. Ali, Chinese Physics C 47 (2023)**

2- Thermal fluctuations, quasi-normal modes and phase transition of the charged AdS black hole with perfect fluid dark matter**,**
G. Abbas and **R. H. Ali**, **Eur. Phys. J. C *83* (2023)**

3- Thermal fluctuations of Torus-like charged AdS Black Hole.
R. H. Ali and G. Abbas, **Chinese Journal of Physics 85, (2023) 0577-9073**

4- Thermodynamics under the Impact of Thermal Fluctuations and Quasi-Normal Modes of Euler-Heisenberg AdS BH in the Framework of NLED,
R. H. Ali and G. Abbas, ***Chinese Physics C* (2023)**

5- Quantum thermodynamics of the charged AdS black hole with nonlinear electrodynamics field,
R. H. Ali, G. Mustafa, and B. Pourhassan, **Chinese Journal of Physics, (2024)**

6- Thermodynamical analysis with extended phase transition of AdS hairy black hole in gravitational decoupling theory,
G. Abbas, **R. H. Ali**, and G. Mustafa, **Physica Scripta, (2024)**

7- Effect of scalar hair on magnetically charge Euler-Heisenberg AdS black hole via extended phase transition,
R. H. Ali, G. Abbas, **Phys. Dark Universe (2024)**

8- Thermal Aspects and Joule-Thomson Expansion of ModMax Black Hole,
M. R. Shahzad, **R. H. Ali,** G. Abbas and Wen-Xiu **Eur. Phys. J. Plus (2024)**

9- Joule-Thomson Expansion of AdS charged non-linear electrodynamics black hole,
R. H. Ali, M. Zubair and G. Abbas **Revision** in **Nuclear Physics B**

10- Mathematical formalism of Joule-Thomson process for ADS-RN black hole coupled with non-linear electrodynamics field,
R. H. Ali and G. Abbas **Published** in **Nuclear Physics B**

11- Phase transition and thermal properties of the charged Acoustic black hole,
M. R. Shahzad, **R. H. Ali Published in Physics of Dark Universe**

12- Thermal and optical effects on the charged AdS Euler-Heisenberg black hole surrounded by PFDM,
R. H. Ali, M. R. Shahzad **Published in Eur. Phys. J. C**.

13. Thermal aspects, quasi-normal modes and phase transitions of black holes in STV Gravity,
R. H. Ali, M. R. Shahzad , Asifa Ashraf, Phongpichit Channuie, Imed Boukhris, M.S.Al-Buriahi Published in Physics of Dark Universe

14- Thermal Properties and Van der Waals Phase Transition of Nonlinear Electrodynamic Charged Black Hole via R$\acute{e}$nyi Entropy
Partially accepted in Physica Scripta

15- Probing the thermodynamics, phase transitions and Lyapunov exponent of charged AdS black hole with PFDM,
R. H. Ali, and Xiao-Mei Kuang accepted in **Eur. Phys. J. C**.

16- Astrophysical Accretion Around Spherically Symmetric Dynoic ModMax black hole.
R. H. Ali, and Xiao-Mei Kuang revision submitted in **Eur. Phys. J. C**.

17- Probing thermodynamic phase transitions by dynamics of timelike geodesic around a magnetic black hole,
R. H. Ali, and Xiao-Mei Kuang submitted in **Physics Review D**

18- Precessions and parameter constraints from quasiperiodic oscillations in a rotating charged black holes,
R. H. Ali, and Xiao-Mei Kuang submitted in **Physics Review D**

Conferences/ Workshops/ Seminars

- Presented a paper in **"8th Jiangsu Physics Spring Academic Conference"** in Southeast university of Nanjing 2025.
- Presented a paper in "International Conference on RELATIVISTIC ASTROPHYSICS AND COSMOLOGY (ICRAC-24) 2024" held on February 01-02, 2024, at Department of Mathematics and statistics, **COMSATS University Islamabad, Lahore-Campus, Lahore, Pakistan.**
- Presented a paper in "International Conference on Gravitation and Cosmology (ICGC-24) 2024" held on January 29-31, 2024, at Department of Mathematics and statistics, **The University of Lahore, Pakistan.**
- Presented a paper in "GLOBAL SCIENCE TTECHNOLOGY & MANAGEMENT CONFERENCE" held on February 09-11, 2023 at the Bagdad-ul-jaded campus, **The Islamia University of Bahawalpur.**
- Attended "International Conference on Mathematical Sciences-2022" held on March 28-29, 2022, at the Baghdad-ul-Jaded campus, **The Islamia University of Bahawalpur.**
- Attended "4th PU International Conference on Gravitation and Cosmology" held on November 22-25, 2021 at Department of Mathematics, **University of Punjab, Lahore, Pakistan.**
- Attended "International Conference on Impact of Mathematics in Modern Era" held on April 08, 2021 at the Baghdad-ul-Jaded campus, **The Islamia University of Bahawalpur.**
- Attended the Webinar on ***Review on Dark Energy and Modified Gravity Theories (January 08, 2021)*** Organized by the Department of Mathematics, The Islamia University of Bahawalpur, Pakistan
- Attended the Webinar on ***Why We Modify Theory of Gravity ? Can Torsion Based Theory of Gravity Make Situation Better (June 22, 2021).*** Organized by the Department of Mathematics, The Islamia University of Bahawalpur, Pakistan.
- Attended "International Conference on Mathematics and Applications (CICMA)" held on November 06-07 2017 at the Center for Advanced Studies in Pure and Applied Mathematics (CASPAM), **Bahauddin Zakariya University**, Multan, Pakistan.
- Attended the seminars, lectures arranged during 2021 up to now in Department of Mathematics, **The Islamia University of Bahawalpur.**

- Certified with 1ST Pedagogical Training 2022 organized by **The Islamia University of Bahawalpur.**
- Attended and presented the psychological training for the better understanding and the Psychology of the students held by the Brig. (R) Manzoor Abbasi Principal of **Cadet College Pano Aqil.**
- Attended the seminars, lectures and workshops arranged during 2011 up to 2017 in Center for Advanced Studies in Pure & Mathematics (CASPAM), **Bahauddin Zakariya University, Multan**.
- Attended as a participant of 18th International Pure Mathematics Conference 2017 organized by **The Islamia University of Bahawalpur**, Preston University and Pakistan Mathematical Society, Islamabad from August 05-07, 2017.
- Attended the seminars, lectures arranged during 2007-2011 in **Iqra Post Graduate College**, Sadik Abad.

Research Interest

My research interests encompass various topics within the field of applied mathematics, mathematical physics, Theoretical Physics, special and general theory of relativity, Modified theories of gravity, and black hole physics.
By pursuing these research interests, I aspire to contribute to advancing our understanding of stellar structure modeling in general relativity (GR) and modified theories of gravitation and different aspects of black holes (BHs) and their profound implications for astrophysics, astronomy, cosmology, and their relation with observational evidence. Especially, the following areas constitute the core of my research pursuits:
Extended phase space, P– V criticality, critical exponents of BH thermodynamics, BH shadow, weak and strong gravitational lensing, and topological classes of static and rotating BH thermodynamics. Different types of BH thermodynamics related to change in entropy, quasi-normal modes and phase transition, Euclidean and Hamiltonian thermodynamics, Dynamic phase transition, Wald procedure, conserved quantities, thermodynamics of spherically symmetric thin-shell space-times, triple points, multi-critical Points, light ring images, the optical appearance, light trajectories, null geodesics, orbits around the BH, the process of Joule-Thomson expansion and holographic heat engines of some BHs. Moreover, to study the static and spherically symmetric accretion, accretion disk, accretion properties, circular orbits, and process of spherical accretion flow. Probing thermodynamic phase transitions by dynamics of geodesic around the black holes.