

Dr. Muhammad Zaeem-ul-Haq Bhatti

HEC Approved PhD Supervisor

Curriculum Vitae

Personal Information

Address	Department of Mathematics, University of the Punjab, Quaid-i-Azam Campus, Lahore-54590, Pakistan
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Nationality	Pakistani

Education

2012–2015	PhD (Doctor of Philosophy) in General Relativity and Cosmology , <i>University of the Punjab</i> , Pakistan. - Department of Mathematics. - Thesis: Stability Analysis of Self-Gravitating Collapsing Systems.
2010-2012	MPhil (Master of Philosophy) in Applied Mathematics , <i>University of the Punjab</i> , Pakistan. - Department of Mathematics. - Thesis: Structure Scalars in Charged Cylindrical and Plane Symmetries.
2008-2010	MSc (Master of Science) in Mathematics , <i>University of the Punjab</i> , Pakistan. - Department of Mathematics. - Major: Applied Mathematics.

Practical Exposure

Lecturer in Department of Mathematics, University of the Punjab, Pakistan from May, 2014 to October, 2015.

Assistant Professor in Department of Mathematics, University of the Punjab, Pakistan since October, 2015 to Present.

Administrative Experience

Member of Departmental Admission Committee, Department of Mathematics, University of the Punjab, Lahore (2014, 2015, 2016).

Co-Coordinator of Departmental Seminar Series, Department of Mathematics, University of the Punjab, Lahore (2014, 2015, 2016).

In charge, Accounts and Stock Taking of Departmental Computer Center,

Department of Mathematics, University of the Punjab, Lahore (2014).

Secretary of the International Conference on Relativistic Astrophysics at Punjab University during February 10-14, 2015.

In charge, General Accounts and Stock Taking of Department of Mathematics, University of the Punjab, Lahore (2015).

Managerial Secretary of Punjab University Journal of Mathematics (**PUJM**), Department of Mathematics, University of the Punjab, Lahore, since November 04, 2015 to Present.

Acting Coordinator of Departmental M.Phil. /Ph.D. Program, Department of Mathematics, University of the Punjab, Lahore-Pakistan from June 20, 2016 to August 12, 2016.

Coordinator Departmental Time Table, Department of Mathematics, University of the Punjab, Lahore, Pakistan (2016-2017).

Coordinator of M.Sc. Program, Department of Mathematics, University of the Punjab, Lahore, Pakistan from September 01, 2016 -to-date.

Organizer of the One Day Conference on Gravitation and Cosmology at Punjab University on November 26, 2016

Awards, Scholarships and Honors

- 2011-2012 **DPC Merit Scholarship in MPhil** by Department of Mathematics, University of the Punjab, Pakistan.
- 2012-2014 **Indigenous PhD Fellowship**, Higher Education Commission, Pakistan.
Research Productivity Award by Pakistan Council for Science and Technology, Pakistan in Category D for 2013-14; in **Category A** for 2014-15; in Category C for 2015-16.
- 2014 **Research Incentive Award** by University of the Punjab, Pakistan.
- 2015, 2016 **Performance Evaluation Award** by University of the Punjab, Pakistan.
Life Member of Pakistan Physical Society since November 29, 2016.

Research Project

- Completed a research project as a Principal Investigator from University of the Punjab entitled **“Effects of Reflection Symmetry on the Stability of Adiabatic Axial Collapse”** during the fiscal year 2014-2015.
- Completed a research project as a Principal Investigator from University of the Punjab entitled **“Existence of Compact Celestial Bodies”** during the fiscal year 2015-2016.

Academic and Research Interests

Special Theory of Relativity,
General Theory of Relativity,
Electromagnetic Theory,
Modified Gravitational Theories,
Mathematical Physics,
Astrophysics and Cosmology.

Computer and Software Skills

Math Packages	Mathematica, Maple.
OS	Windows.
Typography	MS Word, Latex.

Workshops, Conferences and Seminars Attended at National/International Level

2010–Present **Weekly Departmental Seminar Series** in Department of Mathematics, PU, Pakistan

Oct., 2010 **Lecture Series on Black Holes**, PU, Pakistan.

Nov., 2010 **Lecture Series on Cosmology**, PU, Pakistan.

Nov., 2011 **NUST Conference on Mathematical Sciences**, NUST, Pakistan.

Dec., 2011 **One Day Conference on Gravitation**, PU, Pakistan.

Feb., 2013 **IV Italian- Pakistani Workshop on Relativistic Astrophysics**, NUST, Pakistan.

March, 2013 **6th World Conference on 21st Century Mathematics**, ASSMS, Pakistan.

Nov., 2013 **Lecture Series on Cosmology**, PU, Pakistan.

Jan., 2014 **Symmetries, Differential Equations and Applications II**, NUST, Pakistan.

Sep., 2014 **1st National Conference on Mathematical Sciences**, UOM, Pakistan.

Feb., 2015 **International Conference on Relativistic Astrophysics**, PU, Pakistan.

March, 2015 **1st National Conference on Pure and Applied Mathematics**, UMT, Pakistan.

Nov., 2015 **14th Regional Conference on Mathematical Physics**, QAU, Pakistan.

Dec., 2015 **International Conference on Recent Advances in Applied Mathematics**, COMSATS Lahore, Pakistan.

March, 2016 **1st UMT International Conference on Pure and Applied Sciences**, UMT, Lahore, Pakistan.

July, 2016 **21st International Conference on General Relativity and Gravitation**, Columbia University, New York, USA.

April, 2017 **One Day Workshop for the Editors of Sciences Journals** by Quality

Assurance Division, HEC at Margala Hotel, Islamabad.

June, 2017 **The Southern Cross Conference: Surveying the Cosmos, The Science From Massively Multiplexed Surveys** by Australian Astronomical Observatory and CSIRO Astronomy and Space Science at Sydney, Australia.

Trainings

1. **Faculty Orientation Program** by Institute of Administrative Sciences, University of the Punjab, Lahore; August 19–22, 2014.
2. **Business Edge Course Titled Communicating Effectively** by International Finance Cooperation, World Bank Group, Lahore; August 20–21, 2014.

Courses Taught at University of the Punjab

Analytical Dynamics; MATH-410

Calculus (II); MATH-202

Electromagnetic Theory-I; MATH-411

Electromagnetic Theory-II; MATH-426

Mechanics; MATH-310

Special Theory of Relativity; MATH-425

Vector and Tensor Analysis; MATH-304

Vectors & Mechanics-I; MATH-102

Talks Delivered at National/International Level

- **Structure Scalars in Charged Cylindrical and Plane Symmetries** at Department of Mathematics, University of the Punjab, Lahore-Pakistan.
- **Charged Static Axial Symmetric Solutions and Scalar Structures** at Department of Mathematics, University of the Punjab, Lahore-Pakistan; December 04, 2014.
- **Stability of the Expansion-free Charged Cylinder** in an International Conference named “Symmetries, Differential Equations and Applications II” at School of Natural Sciences, NUST, Islamabad-Pakistan during January 27-30, 2014.
- At Department of Mathematics, University of the Punjab, Lahore-Pakistan; November 12, 2014.
- **Structure Scalars in Charged Cylindrically Symmetric Relativistic Fluids** in a National Conference named “1st National Conference on Mathematical Sciences” at University of Malakand, Khyber Pakhtukhwa-Pakistan during September 02-04, 2014.
- **Some Inhomogeneity Factors in Self-gravitating Systems** in an International Conference named “International Conference on Relativistic Astrophysics” at University of the Punjab, Lahore-Pakistan during February 10-14, 2015.

- **Gravitational Collapse and Structure Formation in General Relativity** at Department of Mathematics, University of the Punjab, Lahore-Pakistan; February 25, 2015.
- **Some Physical Factors on Expansion-free Collapse** at “1st National Conference on Pure and Applied Mathematics” at University of Management and Technology, Lahore, Pakistan during March 07-08, 2015.
- **Role of Some Physical Factors on the Stability of Collapsing System** in an International Conference named “14th Regional Conference on Mathematical Physics” at Quaid-i-Azam University Islamabad, Pakistan during November 09-14-2015.
- **Irregularity Factors for Collapsing Systems** in an International Conference named “International Conference on Recent Advances in Applied Mathematics” at COMSATS Institute of Information Technology, Lahore, Pakistan during December 17-18, 2015.
- **Energy Density Inhomogeneity in Self-Gravitating Stars** in an International Conference named “1st UMT International Conference on Pure and Applied Sciences” at University of Management and Technology, Lahore, Pakistan during March 05-07, 2016.
- **Energy Density Irregularities in Self-gravitating Systems (POSTER)** in an International Conference named “21st International Conference on General Relativity and Gravitation” at Columbia University in New York City, USA during July 10-15, 2016.
- **COSMOLOGY: Inflation to Dark Energy (Invited Talk)** in Department of Mathematics, University of Management and Technology, Sialkot Campus on April 09, 2017.
- **The Study of Inhomogeneous Universe Via Dynamical Variables** in an International Conference named “Surveying the Cosmos, The Southern Cross Conference” at Crystal Ballroom, Luna Park in Sydney, Australia during June 05-09, 2017.

Conference Proceedings

1. M. Sharif and **M.Z. Bhatti**: *Some Inhomogeneity Factors in Self-gravitating Systems*, Proc. Int. Conf. Relativ. Astrophys. (2015)48 (**Punjab University Press**).
2. **M.Z. Bhatti**: *Role of Some Physical Factors on the Stability of Collapsing Systems*, Proc. 14th Regional Conference on Mathematical Physics (**World Scientific**).

List of Journal Publications (Indexed by ISI-JCR)

1. M. Sharif and **M.Z. Bhatti**: *Structure Scalars for Charged Cylindrically Symmetric Relativistic Fluids*, Gen. Relativ. Gravit. **44**(2012)2811 (**Springer**).
2. M. Sharif and **M.Z. Bhatti**: *Structure Scalars in Charged Plane Symmetry*, Mod. Phys. Lett. A **27**(2012)1250141 (**World Scientific**).

3. M. Sharif and **M.Z. Bhatti**: *Gravitational Binding Energy in Charged Cylindrical Symmetry*, Can. J. Phys. **90**(2012)1233 (**NRS Research Press**).
4. M. Sharif and **M.Z. Bhatti**: *Effects of Electromagnetic Field on Shearfree Spherical Collapse*, Astrophys. Space. Sci. **347**(2013)337 (**Springer**).
5. M. Sharif and **M.Z. Bhatti**: *Stability of the Expansion-free Charged Cylinder*, J. Cosmol. Astropart. Phys. **10**(2013)056 (**IOP, UK**).
6. M. Sharif and **M.Z. Bhatti**: *Stability Analysis of Restricted Non-Static Axial-Symmetry*, J. Cosmol. Astropart. Phys. **11**(2013)014 (**IOP, UK**).
7. M. Sharif and **M.Z. Bhatti**: *Charged Static Axial Symmetric Solutions and Scalar Structures*, Astrophys. Space. Sci. **349**(2014)995 (**Springer**).
8. M. Sharif and **M.Z. Bhatti**: *Stability of the Charged Radiating Cylinder*, Phys. Lett. A **378**(2014)469 (**Elsevier**).
9. M. Sharif and **M.Z. Bhatti**: *On the Stability of a Class of Radiating Viscous Self-Gravitating Stars with Axial Symmetry*, Astropart. Phys. **56**(2014)35 (**Elsevier**).
10. M. Sharif and **M.Z. Bhatti**: *Shearfree and Cavity Models with Plane Symmetry*, Astrophys. Space Sci. **352**(2014)883 (**Springer**).
11. M. Sharif and **M.Z. Bhatti**: *Radiating Collapsing Relativistic Models*, Phys. Scr. **89**(2014)084004 (**IOP, UK**).
12. M. Sharif and **M.Z. Bhatti**: *Effects of Some Physical Factors on the Inhomogeneity in Planar Symmetry*, Mod. Phys. Lett. A **29**(2014)1450094 (**World Scientific**).
13. M. Sharif and **M.Z. Bhatti**: *Electromagnetic Effects on the Inhomogeneity of Planar Symmetry*, Mod. Phys. Lett. A **29**(2014) 1450129 (**World Scientific**).
14. M. Sharif and **M.Z. Bhatti**: *Effects of Some Physical Factors on the Stability of Collapsing Stars*, Int. J. Mod. Phys. D **23**(2014)1450085 (**World Scientific**).
15. M. Sharif and **M.Z. Bhatti**: *Dynamics and Stability of Charged Spherical Star with Tilted and Non-Tilted Congruences*, Mod. Phys. Lett. A **29**(2014)1450165 (**World Scientific**).
16. M. Sharif and **M.Z. Bhatti**: *Stability Analysis of Expansion-free Charged Planar Geometry*, Astrophys. Space Sci. **355**(2015)289 (**Springer**).
17. M. Sharif and **M.Z. Bhatti**: *Structure Scalars and Super-Poynting Vector of Tilted Szekeres Geometry*, Int. J. Mod. Phys. D **24**(2015)1550014 (**World Scientific**).
18. M. Sharif and **M.Z. Bhatti**: *Dynamics of Charged Planar Geometry in Tilted and Non-Tilted Frames*, J. Exp. Theor. Phys. **120**(2015)813 (**Springer**).

19. M. Sharif and **M.Z. Bhatti**: *Role of Bulk Viscosity and Electromagnetic Field on the Stability of Collapsing Cylinder*, Int. J. Theor. Phys. **54**(2015)2921 (**Springer**).
20. M. Sharif and **M.Z. Bhatti**: *Stability Analysis of Axial Reflection Symmetric Spacetime*, Mon. Not. R. Astron. Soc. **455**(2016)1015 (**Oxford University Press**).
21. Z. Yousaf and **M.Z. Bhatti**: *Electromagnetic Field and Cylindrical Compact Objects in Modified Gravity*, Mon. Not. R. Astron. Soc. **458**(2016)1785 (**Oxford University Press**).
22. Z. Yousaf, K. Bamba and **M.Z. Bhatti**: *Influence of Modification of Gravity on the Dynamics of Radiating Spherical Fluids*, Phys. Rev. D **93**(2016)064059 (**American Physical Society**).
23. **M.Z. Bhatti** and Z. Yousaf: *Influence of Electric Charge and Modified Gravity on Density Irregularities*, Eur. Phys. J. C **76**(2016)219 (**Springer**).
24. Z. Yousaf and **M.Z. Bhatti**: *Cavity Evolution and Instability Constraints of Relativistic Interiors*, Eur. Phys. J. C **76**(2016)267 (**Springer**).
25. M. Sharif and **M.Z. Bhatti**: *Binding Energy in Self-gravitating Charged Plane Symmetric Systems*, Chin. J. Phys. **54**(2016)451 (**Elsevier**).
26. Z. Yousaf, K. Bamba and **M.Z. Bhatti**: *Causes of Irregular Energy Density in $f(R,T)$ Gravity*, Phys. Rev. D **93**(2016)124048 (**American Physical Society**).
27. **M.Z. Bhatti**, *Shear-Free Stellar Solutions in Λ -Dominated Era*, Eur. Phys. J. Plus **131**(2016)428 (**Springer**).
28. **M.Z. Bhatti** and Z. Yousaf: *Dynamical Variables and Evolution of the Universe*, Int. J. Mod. Phys. D **26**(2017)1750029 (**World Scientific**).
29. **M.Z. Bhatti** and Z. Yousaf: *Gravitational Collapse and Dark Universe with LTB Geometry*, Int. J. Mod. Phys. D **26**(2017)1750045 (**World Scientific**).
30. Z. Yousaf, **M.Z. Bhatti** and Ume Farwa: *Stability of Compact Stars in $\alpha R^2 + \beta(R_{\gamma\delta} T^{\gamma\delta})$ Gravity*, Mon. Not. R. Astron. Soc. **464**(2017)4509 (**Oxford University Press**).
31. Z. Yousaf, K. Bamba and **M.Z. Bhatti**: *Role of Tilted Congruence and $f(R)$ Gravity on Regular Compact Objects*, Phys. Rev. D **95**(2017)024024 (**American Physical Society**).
32. **M.Z. Bhatti**, Z. Yousaf and Sonia Hanif: *Stability of Anisotropic Compact Objects in $f(T)$ Gravity*, Mod. Phys. Lett. A **32**(2017)1750042 (**World Scientific**).
33. Z. Yousaf, **M.Z. Bhatti** and Aamna Razaqat: *LTB Geometry with Tilted and Non-Tilted Congruences in $f(R,T)$ Gravity*, Int. J. Mod. Phys. D **26**(2017)1750099

(World Scientific).

34. Z. Yousaf, **M.Z. Bhatti** and Aamna Razaqat: *Electromagnetic Effects on the Evolution of LTB Geometry in Modified Gravity*, *Astrophys. Space Sci.* **362**(2017)68 (**Springer**).
35. **M.Z. Bhatti**, Z. Yousaf and Sonia Hanif: *Role of $f(T)$ Gravity on the Evolution of Collapsing Stellar Model*, *Phys. Dark Universe* **16**(2017)34 (**Elsevier**).
36. **M.Z. Bhatti**, Z. Yousaf and Sonia Hanif: *Gravitational Collapse in Generalized Teleparallel Gravity*, *Eur. Phys. J. Plus* **132**(2017)230 (**Springer**).
37. Z. Yousaf, M. Ilyas and **M.Z. Bhatti**: *Static Spherical Wormhole Models in $f(R, T)$ Gravity*, *Eur. Phys. J. Plus* **132**(2017)268 (**Springer**).
38. **M.Z. Bhatti**, A. Aslam and S. Ashraf: *Construction of Thin-Shell Wormholes from Metric $f(R)$ Gravity*, *Mod. Phys. Lett. A* **32**(2017)1750111 (**World Scientific**).
39. Z. Yousaf, **M.Z. Bhatti** and Ume Farwa: *Role of $f(R, T, R_{\nu\delta} T^{\nu\delta})$ Model on the Stability of Cylindrical Stellar Model*, *Eur. Phys. J. C* **77**(2017)359 (**Springer**).
40. Z. Yousaf, **M.Z. Bhatti** and Ume Farwa: *Stability Analysis of Stellar Radiating Filaments*, *Class. Quantum Grav.* **34**(2017)145002 (**IOP, UK**).
41. Z. Yousaf, **M.Z. Bhatti** and Aamna Razaqat: *Evolution of Inhomogeneous LTB Geometry with Tilted Congruence and Modified Gravity*, *Can. J. Phys.*, accepted for Publication (**NRS Research Press**).
42. **M.Z. Bhatti**, Z. Yousaf and Sara Ashraf: *Charged Black String Thin-Shell Wormholes in Modified Gravity*, *Ann. Phys.* **383**(2017)439 (**Elsevier**).

M.Phil. Supervised

2015-2017 Miss Sonia Hanif