

# Dr.Arvind Patel

## Curriculum Vitae

Professor  
Department of Mathematics  
University of Delhi, Delhi 110007, India  
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### Education

- 2004-2009 **Ph. D. (Fluid Dynamics)**, Department of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur (U.P.),India, Thesis: A study of shock waves in dusty gases. Thesis supervisor: Prof. J. P. Vishwakarma (jpv\_univgkp@yahoo.com)
- 1998-2000 **M. Sc. (Mathematics)**, Department of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur (U.P.),India, 82.5%, First Class, University II rank
- 1995-1998 **B. Sc. (Mathematics)**, Department of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur (U.P.),India, 71.5%, First Class
- 1993-1995 **Higher Secondary Course Certificate**, SSJS Janta Inter College, Bhitauli Bazar, Maharajganj, Board of High School and Intermediate Education, Uttar Pradesh, 71.6%
- 1991-1993 **Secondary School Leaving Certificate**, SSJS Janta Inter College, Bhitauli Bazar, Maharajganj, Board of High School and Intermediate Education, Uttar Pradesh, 74%

### Experience

- 2019– **Professor**, Department of Mathematics, University of Delhi, Delhi, India  
March 14, 2022 – till date
- 2019–2022 **Associate Professor**, Department of Mathematics, University of Delhi, Delhi, India  
March 14, 2019 – March 13, 2022
- 2009–2019 **Assistant Professor**, Department of Mathematics, University of Delhi, Delhi, India  
Oct. 30, 2009 –March 13, 2019
- 2007-2009 **Lecturer**, CSJM University Kanpur, Kanpur, India, March 14, 2007 – Oct 29, 2009
- 2003-2007 **Guest Lecturer**, Department of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur (U.P.),India, July 2003–March 13, 2007
- 2005-2007 **Senior Research Fellow CSIR**, Department of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur (U.P.),India, Dec 2005 – March 2007
- 2003-2005 **Junior Research Fellow CSIR**, Department of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur (U.P.),India, Gorakhpur (U.P.),India  
Dec 2003 – Dec 2005

### Other Academic Activities

- At University of Delhi:
  - Member of Training program of DU-KU Project, Jan.5, 2013 - Feb.22, 2013.
  - Member of internal expert group for formulation of the syllabi of the B.Tech. courses under the Faculty of Technology, University of Delhi, 2022.
- At Department of Mathematics, University of Delhi:
  - Convener, Workload, Time table and Tutorial allotment, Department of Mathematics, University of Delhi, June 2015–till date.
  - Member of Adhoc Panel perpetration committee, May 2019–till date.
  - Member, Purchase committee, June, 2014–till date.

- Convener, M.Sc. Entrance Examination committee, 2018-2020.
- Coordinator, Revision of Under-graduate syllabus for Applied Mathematics and Statistics Group under UGCF-2022 in view of NEP implementation, 2022.
- Member, Departmental Research committee(DRC), April 13, 2021- Oct. 26, 2022.
- Member, Board of Research Studies in Mathematical Sciences, Nov.1, 2017- Oct.30, 2019.
- Member, M.Phil. committee, July 31, 2018- July 30, 2020 and April 13, 2021- July 30, 2022.
- Member, Library committee, June, 2014 - June, 2019.
- Member, Project appointment committee and project purchase committee, Dec.4, 2014- June 2020.
- Member, Committee of Courses for Under-graduate, Honours, Post-graduate in Mathematics.
- Member of Moderation Committee for Post-graduate and Under-graduate in Mathematics.
- Developed one Computer Lab for Research scholars in Mathematics.

## ———— Courses taught

I have taught the following courses:

1. At Department of Mathematics, University of Delhi(2009–till date):
  - Fluid Dynamics, Complex Analysis, Differential Equations, Advanced Fluid Dynamics,
  - Hyperbolic system of Conservation Laws and Boundary Layer Theory, Functional Analysis,
  - Method of Applied Mathematics, Computational Methods for ODEs, Advanced Compressible Flows.
2. At NCWEB, University of Delhi,
  - Differential Equations, 2016-17, 2017-18, 2018-19.
  - Fluid Dynamics 2016-17, 2017-18, 2018-19, 2020-21, 2021-22.
  - Complex analysis 2021-22.
3. At Department of Mathematics, UIET, CSJM University, Kanpur(2007-2009):
  - Fluid Mechanics, Partial Differential Equations, Calculus, Linear Algebra, Real Analysis.
4. At Department of Mathematics and Statistics, DDU, Gorakhpur University, Gorakhpur(2003-2007):
  - Fluid Mechanics, Partial differential equation, Calculus, Mechanics, Analytical Geometry.

## ———— Area of specialization/interest

- Shock Waves
- Solitons
- Boundary Layer Theory
- Non-linear Waves
- Fluid Dynamics
- Partial Differential Equations
- Numerical analysis

## ———— Conference/Symposium Organized

1. Organizing Secretary, 23rd Annual Conference of Ramanujan Mathematical Society, Organized by Department of mathematics, University of Delhi, Delhi, June 1-3, 2018. Symposium talks on 10 parallel symposiums, 72 research papers were presented. Public lecture was organized at IIC, New Delhi.

2. Member, Organizing Committee, Research Scholar Seminar and Annual Conference of Society of Mathematical Sciences, Organized by Department of mathematics, University of Delhi, Delhi, May 1-2, 2017

## Research Guidance

### Ph. D.

1. Vineesh Kumar, PhD, University of Delhi, 4/2017-2/2022  
*Soliton Solutions and Modulation Instability Analysis of Certain Non-linear Evolution Equations*
2. Ruchi Bajargaan, PhD, University of Delhi, 10/2014-11/2020  
*Shock waves in rotating or non-rotating gases under radiation field*
3. Manoj Singh, PhD, University of Delhi, 10/2012-1/2020  
*Structure of shock waves in gases under viscosity and heat conduction*
4. Vinod Chauhan, PhD, University of Delhi, 10/2013-9/2016  
*Efficient numerical algorithms for higher even order non-linear two point boundary value problems on variable mesh, (Under joint supervision with Prof. R.K. Mohanty)*
5. Manoj Kumar, Ph.D. University of Delhi, 11/2018 (under progress)  
*Computational Fluid Dynamics (Under joint supervision with Prof. Shobha Bagai)*
6. Divya, Ph.D. University of Delhi, 11/2019 (under progress)  
*Shock Waves*
7. Yogeeta Garg, Ph.D. University of Delhi, 3/2021 (under progress)  
*Fluid Dynamics*
8. Komal Pandey, Ph.D. University of Delhi, 1/2022 (under progress)  
*Fluid Dynamics*
9. Kuldeep Singh, Ph.D. University of Delhi, 1/2022 (under progress)  
*Partial Differential Equations*
10. Yash Makwana, Ph.D. University of Delhi, 1/2022 (under progress)  
*Algebra and Cryptography (Under joint supervision with Dr. Anupama Panigrahi)*

### M. Phil.

11. Saurabh Mishra, University of Delhi, 2/2022 (under Progress)  
*Boundary Layer Theory*
12. Divya, M.Phil (2017-2019), University of Delhi, course work  
*Continuum vs kinetic theory model for study of shock wave structure*
13. Vivek Kumar, M.Phil (2016-18), University of Delhi  
*An analytical study of boundary layer flow of nano-fluid*
14. Vineesh Kumar, M.Phil (2014-2016), University of Delhi, *A study of some non-linear evolution equation under dispersion and dissipation effect by variational iteration method*
15. Amit Sharma (2014-16), M.Phil., University of Delhi  
*An application of homotopy perturbation method in boundary layer flow over a flat plate*
16. Ruchi Bajargaan, MPhil (2012-14), University of Delhi  
*A study of shock waves under gravitation and radiation field*
17. Tahir Nadeem, MPhil (2010-12), University of Delhi  
*A study of shock waves in gases*
18. Bharti Tiwari, M.Phil (2008-09), UIET, CSJM University Kanpur  
*A study of shock waves in dusty gas with gravitation and radiation heat flux*

19. Neeti Verma, M.Phil (2008-09), UIET, CSJM University Kanpur  
*A study of shock waves propagation in a rotating non-ideal gas under radiation and gravitation*
20. Virendra Vikram Singh, M.Phil (2008-09), UIET, CSJM University Kanpur  
*A study of propagation of spherical shock wave in a dusty gas with heat conduction and gravitation*
21. Shailendra Singh, M.Phil (2008-09), UIET, CSJM University Kanpur  
*A study of Shock wave propagation in a dusty gas with heat conduction, radiation heat flux and gravitation field*
22. Maitri Verma, M.Phil (2008-09), UIET, CSJM University Kanpur  
*A study of shock waves in a rotating dusty gas with heat conduction and radiation heat flux*
23. Sudhakar, M.Phil (2007-08), UIET, CSJM University Kanpur  
*A study of shock waves in self-gravitating gas*
24. Suneel Kumar, M.Phil (2007-08), UIET, CSJM University Kanpur  
*A study of magnetogasdynamics shock wave in self-gravitating non-ideal gas*
25. Sunil Kumar, M.Phil (2007-08), UIET, CSJM University Kanpur  
*A study of shock waves in radiating and non-radiating gases*
26. Sonam Vaish, M.Phil (2007-08), UIET, CSJM University Kanpur  
*A study of shock waves in rotating dusty gas with radiation heat flux*

## Research Grants

- *Structure of shock waves in polyatomic gases*, FRP grant, IoE, University of Delhi, 2021-22, Rs. 1,75,000/-
- *Recent Analytic methods and their application in fluid flow problems*, R & D grant, University of Delhi, 2015-16, Rs. 1,30,000/-
- *Solution of system of hyperbolic conservation laws by Adomian Decomposition Methods and its application in fluid dynamics*, R & D grant, University of Delhi, 2014-15, Rs. 1,10,000/-
- *Shock Phenomena in Conducting and Non-Conducting Media*, R & D grant, University of Delhi, 2013-14, Rs. 1,50,000/-
- *Shock Phenomena in Conducting and Non-Conducting Media*, R & D grant, University of Delhi, 2012-13, Rs. 85,000/-
- *Shock Phenomena in a dusty gas in absence and presence of magnetic field, heat conduction and thermal radiation*, R & D grant, University of Delhi, 2011-12, Rs. 1,00,000/-

## Publications

(SCI – Science Citation Index Journal, SCIE – Science Citation Index Expanded Journal, MR – Mathematical Review, SCOPUS, ZBL – Zentralblatt MATH)

### Manuscripts In Refereed Journals

#### 2022

25. Divya, **Arvind Patel**, Shock wave structure in non-polar diatomic and poly-atomic dense gases under rotation and vibration, *Physics of Fluids*, 34, 066115 (2022); <https://doi.org/10.1063/5.0097397>, AIP, IF 3.521

#### 2021

24. **Arvind Patel**, Manoj Kumar, Shobha Bagai, Heat and mass transfer in a two-sided lid-driven square cavity with non-uniform sinusoidal heating on horizontal walls, *The European Physical Journal Plus*, 136(2021), 1034(1-32), Springer, IF 3.911.
23. **Arvind Patel**, Vineesh Kumar, Modulation instability analysis of a nonautonomous (3+1)-dimensional coupled nonlinear Schrodinger equation, *Nonlinear dynamics*,104, 4355-4365(2021),Springer, IF 5.022.
22. Vineesh Kumar,**Arvind Patel**, Dispersion and phase managed optical soliton solutions of a nonautonomous (3+1)-dimensional coupled nonlinear Schrodinger equation, *Optik*,242, 166648(2021), Elsevier, IF.2.443,.
21. Ruchi Bajargaan,**Arvind Patel**, Manoj Singh, Similarity Solution for the Flow Behind a Magnetogasdynamical Exponential Shock Wave in a Perfect Gas with Varying Density, Heat Conduction, and Radiation Heat Flux, *Journal of Engineering Physics and Thermophysics*, 94(2021), No. 1, pp.94-106, Springer
20. Sobha Bagai, Manoj Kumar,**Arvind Patel**, Mixed convection in a two-sided and four-sided lid driven square porous cavity, *International Journal of Heat and Technology*, 39(2021), No. 3, pp. 711-726, IETA.

## 2020

19. Divya, **Arvind Patel**, Shock wave structure in non-ideal dilute gas under variable Prandtl number, *Shock Waves*, 30(2020), No. 6, pp. 585-602, Springer, IF 1.759
18. Sobha Bagai, Manoj Kumar,**Arvind Patel**, Mixed convection in four-sided lid driven sinusoidally heated porous cavity using stream function-vorticity formulation,*SN Applied Sciences*, 2:2066, (2020), Springer
17. Shobha Bagai, Manoj Kumar, and **Arvind Patel**. The four-sided lid driven square cavity using stream function-vorticity formulation. *Journal of Applied Mathematics and Computational Mechanics*, 19(2020), No.2, pp.17-30, Springer.
16. Vineesh Kumar, **Arvind Patel**, Construction of the soliton solutions and modulation instability analysis for the Mel'nikov system, *Chaos, Solitons and Fractals*, 140(2020), 110159(1-15), Elsevier, IF 5.944

## 2019

15. Manoj Singh, **Arvind Patel**, Shock wave structure in a non-ideal gas under temperature and density-dependent viscosity and heat conduction, *Theoretical and Computational Fluid Dynamics*, 33(2019), pp. 537-559, Springer, IF 1.675
14. **Arvind Patel** and Vineesh Kumar, Soliton solutions and modulation instability analysis of the coupled Zakharov-Kuznetsov equation, *European Physical Journal Plus*, 134(2019), No.4, 170(1-16), Springer, IF 3.911.
13. **Arvind Patel** and Manoj Singh, Exact solution of shock-wave structure in a nonideal gas under constant and variable coefficient of viscosity and heat-conductivity, *Shock Wave*, 29(2019), pp. 427-729, Springer, IF 1.759
12. Manoj Singh,**Arvind Patel**, Ruchi Bajargaan, Travelling wave solution of a Riemann problem and shock structure in an unsteady flow of a perfect gas under viscosity, *International Journal of Heat and Technology*, 37(2019), No. 3, pp. 909-917.

## 2018

11. **Arvind Patel** and Vineesh Kumar, Dark and kink soliton solution of generalized ZKBBM equation by iterative scheme, *Chinese Journal of Physics*, 56(2018), 819-829, Elsevier. IF 3.237
10. Ruchi Bagargaan and **Arvind Patel**, Self similar flow behind an exponential shock wave in a self-gravitating, rotating axisymmetric dusty gas with heat conduction and radiation heat flux, *Indian Journal of Physics*, 92(2018), No.4, pp.1119-1135, Springer, IF 1.947

9. **Arvind Patel** and Vineesh Kumar, Study of generalized ZK-BBM equation to construct solitary patterns solutions via variational iteration method, *Far East Journal of Mathematical Sciences* , 103(2018), No. 11, pp. 1721-1739.
8. Manoj Singh and **Arvind Patel**, Travelling wave solution of shock structure in unsteady flow of viscous non-ideal gas flow, *Ganita*, 68(2018), No.1, pp.165-179.

## 2017

7. Ruchi Bajargaan, **Arvind Patel**, Manoj Singh, Homotopy analysis method for one dimensional unsteady adiabatic gas flow, *International Journal of Pure and Applied Mathematic*, 115(2017),No.4,pp. 673-692.
6. Ruchi Bajargaan and **Arvind Patel** Similarity Solution for a cylindrical shock wave in a self-gravitating, rotating axisymmetric dusty gas with heat conduction and radiation heat flux, *Journal of Applied Fluid Mechanics*, 10(2017), No.1, pp.329-34. IF 1.405

## 2016

5. Manoj Singh, **Arvind Patel**, Ruchi Bajargaan, Study of a one -dimensional unsteady gas dynamic problem by Adomian decomposition method, *International Journal of Applied Mathematics*, 29(2016), No.6,pp. 775-794.

## 2014

4. **Arvind Patel**, A self-similar flow headed by a cylindrical shock wave in a rotating dusty gas, *J. Nat. Acad. Math.* 28(2014), pp. 1-14.

## 2013

3. **Arvind Patel**, A Self-similar Flow behind a Shock Wave in a Dusty Gas under a Gravitational Field, *J. Nat. Acad. Math.* 27(2013),pp. 83-98.

## 2008

2. Vishnu Saran and **Arvind Patel**, Self-similar solution of Magnetogasdynamic spherical shock propagation in a rotating medium with radiation heat flux, *South East Asian Journal of Mathematics and Mathematical sciences*, 5(2008), 2, pp. 33-48.

## 2007

1. J.P. Vishwakarma, Vinay Chaube, **Arvind Patel**, 2007, Self-similar solution of shock propagation in non-ideal gas, *International Journal of Applied Mechanics and Engineering*, 129(2007), No.3, pp. 813-829.

## Editorial/Reviewer Assignments

**Reviewer** for the journals:

- Shock Waves
- Non-linear Dynamics
- Chaos, Solitons and Fractals
- European Physical Journal Plus
- Fluid Dynamic Research
- Journal of Applied Fluid Mechanics
- International Journal of Applied and Computational Mathematics
- Ganita

## Membership in Professional Bodies

- Life Member of Indian Society of Mathematics and Mathematical Science
- Life Member, Bharata Ganita Parisad
- Life Member, Indian Society of Theoretical and Applied Mechanics (ISTAM)

## Invited talk/ Paper presentation/Training Course participation in Conferences, Workshops etc

### Invited talk

1. *Structure of shock wave by continuum versus kinetic model* National conference on Recent trends in Mathematical Sciences, Organized by Department of Mathematics and Statistics, DDU Gorakhpur University Gorakhpur, India, Nov.24-25, 2018.
2. *Non-linear Wave Equations and Solitons* at National Conference on Recent Trends in Mathematical Sciences (NCRTMS) organized by Department of Mathematics and Statistics, DDU Gorakhpur University, at Gorakhpur, July 23-24, 2016.
3. *Homotopy Perturbation Method: Theory and Application* at National Conference on Recent Trends in Mathematical Sciences (NCRTMS) organized by Department of Applied Science of MMM University of Technology, Gorakhpur during April 12-13, 2016.
4. *Various Aspects of Conservation Laws*, at Department of Physical Sciences, SGT University Gurgaon, March 19, 2016.
5. *Solitary wave and travelling wave solution* at One week short term course on role of Mathematical sciences in engineering and technology, organized by Dept. of Mathematics, MNNIT, Allahabad, Oct.19-23, 2016.
6. *Variational iteration method: Theory and Application*, One week short term course on role of Mathematical sciences in engineering and technology, organized by Dept. of Mathematics, MNNIT, Allahabad, Oct.19-23, 2016.
7. *Homotopy Perturbation Method: Theory and Application*, at National Conference on Recent Trends in Mathematical Sciences (NCRTMS) organized by Department of Applied Science of MMM University of Technology, Gorakhpur, April 12- 13, 2016.
8. *Adomian Decomposition Method: a new approach to Partial Differential Equations* at 11th National Conference on Role of Mathematical Sciences in Science and Technology by ISMAMS and Department of Mathematics and Statistics, DDU Gorakhpur University, at Gorakhpur , Feb. 21-22, 2014.
9. *Algebra* DST Inspire Science Camp-2014, at K.S. Jain Institute of Engineering and Technology, Modinagar, Ghazaibad UP, Sept. 25, 2014
10. *The Dimensional Analysis and its Application*, National conference on ?Mathematical Sciences for the advancement of Science and Technology, held at Gorakhpur, India, Feb. 23- 24. 2013.
11. *Integral Equation: Theory and Applications I and II*, in Refresher Course on Mathematical Sciences by CPDHE, University of Delhi on Jan. 14-15, 2013.
12. *Dimensional Analysis : Theory and Applications* in Refresher Course on Mathematical Sciences by CPDHE, University of Delhi on Jan. 16, 2013.

### Paper presentations

13. *Shock wave structure in a viscous non ideal gas under heat conduction and radiation heat flux*, International Conference on Recent Advanced in Pure and Applied Mathematics and 28th Annual

Conference of Rajasthan Ganita Parishad, organized by Dept. of Mathematics and Statistics, MLSU, Udaipur (Rajasthan), India, Feb. 13-14, 2017.

14. *Exact solution of shock wave structure in a non ideal gas under constant and variable coefficient of viscosity and heat-conductivity*, International conference on Mathematics and Applications, Ramjas College, University of Delhi, Delhi, April 26-28, 2017.
15. *Solitary patterns solution of gZK-BBM nonlinear evolution equation via variational iteration method* National conference on recent trends in Mathematical sciences, organized by Dept. of Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur, India, July 23-24, 2016.
16. *An application of homotopy perturbation method for modified boundary boundary layer equations over a flat plate*, National Conference on Recent Trends in Mathematical Sciences (NCRTMS) organized by Department of Applied Science of MMM University of Technology, Gorakhpur, India, April 12- 13, 2016.
17. *Solution of system of gas dynamic equation for the unsteady adiabatic flow by Adomian decomposition method*, National Workshop on Analysis, Differential Equation and Application, Department of Mathematics and Statistics, MLS University Udaipur, Feb. 25-27, 2016.
18. *Homotopy analysis method for the solution of the system of unsteady gas flow* 60th congress of ISTAM 2015 an international conference organised by MNIT Jaipur, India, Dec. 16- 19, 2015.
19. *Similarity Solution for a cylindrical Shock Wave in a Self-gravitating, Rotating and axisymmetric dusty gas with heat conduction and radiation heat flux*, 11th National Conference on Role of Mathematical Sciences in Science and Technology by ISMAMS and Department of Mathematics and Statistics, DDU Gorakhpur University, at Gorakhpur, India, Feb. 21-22, 2014.
20. *A Self-similar flow of a mixture of non-ideal gas and small solid particles behind an exponential shock*, National conference on Recent Trends in Mathematics and Statistics, DDU Gorakhpur University, Gorakhpur, India, March 12-13, 2012.
21. *Self-similar adiabatic flow headed by a cylindrical shock wave in a rotating dusty gas*, National conference on modern application of mathematical sciences, organized by ISMAMS, Gorakhpur, India, Feb, 22-24, 2008.
22. *Self-similar flow behind a shock wave in a dusty gas with gravitational field*, National conference on mathematical sciences and technological innovation diffusion, organized by ISMAMS, Gorakhpur, India, March 16-18, 2007.

#### **Training course participation**

23. *Webinar on Understanding Plagiarism Detection Software Ouriginal* organized by University of Delhi in Association with e-Galactic Pune on Jan. 28, 2022.
24. *Workshop on MOOCs, e-content development and open educational resources*, HRDC, CPDHE, University of Delhi, Delhi, March 13, 2019 to March 19, 2019.
25. *Short term course on Research methodology*, HRDC, CPDHE, University of Delhi, Delhi, from Dec. 18, 2018 to Dec 24, 2018.
26. *Training course on E-Procurement*, Delhi University Computer Centre, University of Delhi, Delhi from July 4, 2016 to July 5, 2016.
27. *Refresher Course in Mathematical sciences* organized by HRDC, CPDHE, University of Delhi, Delhi, Nov. 26 to Dec. 16, 2015.
28. *Orientation Course* organized by the CPDHE, University of Delhi, Delhi, June 8 to July 4, 2015.
29. *ATM Workshop on conservation laws with applications to continuum mechanics* held at Department of Mathematics, Punjab University, Chandigarh, from Dec. 2, to Dec. 7, 2014.



30. *Instructional School for Lecturer on Numerical Analysis* held at Department of Mathematics, Punjab University, Chandigarh, from June 9, 2014 to June 28, 2014.
31. *Refresher Course on Mathematical Sciences* organized by the CPDHE, University of Delhi, at Delhi, Dec.14. 2013 to Jan. 4, 2014.

#### **Others**

32. Worked as a jury member in 4th National Level Exhibition and Project Competition (NLEPC)- 2014 under INSPIRE Awards component of Department of Science and Technology during October 06-08, 2014.
33. Delivered Popular talk on *Yog Darshan* at celebration of Yoga Day on June 21, 2018 in the Department of Mathematics, University of Delhi, Delhi.
34. Part of Summer Internship Program organized by University of Delhi.

**Dr. Arvind Patel**

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July 1, 2022.