

Curriculum Vitae

Dr. Pratima Rai

Assistant Professor

Department of Mathematics

Faculty of Mathematical Sciences,

University of Delhi, Delhi- 110007, India

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Education

- **Ph. D.** (Mathematics) (December, 2013),
Thesis Title: Numerical Analysis of Singularly Perturbed Differential-Difference
Turning Point Problems
Advisor: Dr. Kapil K. Sharma,
Department of Mathematics
Panjab University, Chandigarh, 160014, India
- **M. Sc. Honours** (Mathematics) (2008),
Department of Mathematics
Panjab University, Chandigarh, 160014, India
- **B. Sc.** (Mathematics) (2006),
Govt. College for Girls, Sector-11
Panjab University, Chandigarh, 160014, India

Additional Qualification

- CSIR JRF - June 2008

Positions held

- **Assistant Professor** (February, 2014 – till date)
Department of Mathematics, University of Delhi, Delhi, 110007 India
- **Assistant Professor** (July, 2012–January 2014)
Department of Mathematics
Amity University, Noida, Uttar Pradesh, India
- **Research Scholar** (January, 2009 – June, 2012)
Panjab University Chandigarh, Chandigarh, India

Membership in Professional Bodies

Life Member of

- Indian Society of Industrial and Applied Mathematics
- Indian Academy for Mathematical Modeling & Simulation

Research area

- Singular perturbation problems
- Finite difference techniques
- Ordinary differential equations
- Partial differential equations
- Finite element methods

Research Publications

- Swati Yadav, **Pratima Rai**, An almost second order hybrid scheme for the numerical solution of singularly perturbed parabolic turning point problems, *Mathematics and Computers in simulation*, 185, 733-753, 2021.
- **Pratima Rai**, Swati Yadav, Robust numerical schemes for singularly perturbed delay parabolic convection diffusion problems with degenerate coefficient, *International Journal of Computer Mathematics*, 98(1), 195-221, 2021.
- Swati Yadav, **Pratima Rai**, A higher order scheme for singularly perturbed delay parabolic turning point problem, *Engineering Computation*, 38(2), 819-851, 2020.
- Swati Yadav, **Pratima Rai**, A higher order numerical scheme for singularly perturbed parabolic turning point problems exhibiting twin boundary layers, *Applied mathematics and Computation*, 376, 120951-120971, 2020.
- Kapil K. Sharma, **Pratima Rai** and Pankaj Mishra, A Robust Numerical Scheme for Singularly Perturbed Delay Differential Equations with Turning Point, *International Journal for Computational methods in Engineering Science and Mechanics*, 20 (5), 423-433, 2019.
- **Pratima Rai** and Kapil K. Sharma, Numerical approximation for a class of singularly perturbed delay differential equations with boundary and interior layer (s), *Numerical Algorithm*, 85(1), 305-328, 2020.
- Swati Yadav, **Pratima Rai**, Kapil K. Sharma, A higher order uniformly convergent method for singularly perturbed parabolic turning point problems, *Numerical Methods for Partial Differential Equations*, 36(2), 2020, 342-368.
- Komal Bansal, **Pratima Rai** and Kapil K. Sharma Numerical treatment for the class of time dependent singularly perturbed parabolic problems with general shift arguments, *Differential Equations and Dynamical Systems* 2017, 25 (2), 327-346.
- **Pratima Rai** and Kapil. K.Sharma, Singularly Perturbed Parabolic Differential Equations with Turning Point and Retarded Arguments *International Journal of Applied Mathematics* 2015, 45 (4).
- **Pratima Rai** and Kapil K. Sharma, Singularly perturbed convection-diffusion turning point problems with shifts, *Mathematical Analysis and its Applications*,

Springer 2015, 381-391.

- Kapil. K. Sharma, **Pratima Rai** and K. C. Patidar, A Review on Singularly Perturbed Differential Equations with Turning Points and interior Layers , *Applied Mathematics and Computation*, 219(22), 2013, 10575-10609.
- **Pratima Rai** and Kapil. K. Sharma, The numerical study of singularly perturbed differential-difference turning point problems: Twin boundary layers, Proceedings of ENUMATH 2011, the 9th European Conference on Numerical Mathematics and Advanced Applications, Leicester, September 2011, 285-292.
- **Pratima Rai** and Kapil. K. Sharma, Fitted mesh numerical method for singularly perturbed delay differential turning point problems exhibiting boundary layers, *International Journal of Computer Mathematics* 89(7) 2012, 944-961.
- **Pratima Rai** and Kapil. K. Sharma, Numerical study of singularly perturbed differential-difference equation arising in the modeling of neuronal variability, *Computer and Mathematics with Applications* 63 2012 118-132, ISSN: 0898-1221.
- **Pratima Rai** and Kapil. K. Sharma, Numerical method for singularly perturbed differential-difference equations with turning point, *International Journal of Pure and Applied Mathematics*, 73(4) 2011, 451-470, ISSN 1311-8080 (printed version), ISSN 1314-3395 (on-line version), impact.
- **Pratima Rai** and Kapil. K. Sharma, Numerical analysis of singularly perturbed delay differential turning point problem, *Applied Mathematics and Computation*, 218, 2011, 3483-3498.
- **Pratima Rai** and Kapil. K. Sharma, Parameter uniform numerical method for singularly perturbed differential-difference equations with interior layer, *International Journal of Computer Mathematics*, 88(16) (2011) 3416-3435.

Invited Talk delivered/ Paper presented

- Title: **An ε -uniformly convergent hybrid scheme for a singularly perturbed parabolic boundary turning point problems**
Presented paper at 9th International Congress on Industrial and Applied Mathematics, Universitat De Valencia, Valencia, Spain, July 15-19, 2019.
- Title: **Numerical solution of singularly perturbed delay differential parabolic turning point problems**
Presented paper at 25th international conference on difference equations and Applications, University College London, U. K, June 24- 28, 2019.
- Title: **Singularly Perturbed Delay Differential Equations with Boundary and Interior Layer**
Invited talk at 4th International Conference on Recent Developments in Theory

Computation and Application of Differential Equations, South Asian University, January 21-23, 2019.

- Title: **A higher order ε uniform method for singularly perturbed parabolic turning point problems**
Invited talk at International Conference on Mathematical Modeling and Computation, South Asian University, December 1-3, 2018.
- Title: **Numerical approximation of singularly perturbed delay differential equations**
Invited talk at International Conference on Non-linear differential equations-Theory, Modeling and Computations, SRM University, December 8-9, 2017.
- Title: **Robust Numerical schemes for singularly perturbed turning point problems**
Invited talk at International Conference on Current Trends in Theoretical & Computational Differential Equations with Applications, South Asian University, Delhi, December 1-5, 2017.
- Title: **Singularly perturbed turning point problems**
Invited talk at Advance workshop on finite difference methods for differential equations” held at South Asian University from March 13-17, 2015.”
- Title: **An ε -uniform fitted operator method for singularly perturbed delay differential turning point problem**
paper presentation at International conference on recent trends in mathematical analysis and its applications, IIT Roorkee , December 21-23, 2014.
- Title: **A uniformly convergent finite difference scheme for singularly perturbed differential-difference turning point problems: Interior layer**
Paper presentation at 11th Biennial conference of the Indian Society of Industrial and Applied Mathematics Emerging Mathematical Methods, Models and Algorithms for Science and Technology, Gautam Buddha University, Noida, December 15-16, 2012 .
- Title: **ε - uniformly convergent finite difference scheme for singularly perturbed delay differential equations with twin boundary layers**
Paper presentation at 77th Annual conference of Indian Mathematical Society, Swami Ramananda Teerth Marathwada University, Nanded, Maharashtra, December 27-30, 2011.
- Title: **The Numerical study of singularly perturbed delay differential turning point problems**
Paper presentation at European Numerical Mathematics and Advanced applications, University of Leicester, Leicester, U.K, September 5-9, 2011.
- Title: **A uniformly convergent numerical method for singularly perturbed delay differential equation with turning point**

Paper presentation at Chandigarh Science Congress, Panjab University Chandigarh, Chandigarh, 160014, India, February 26-28, 2011.

Workshop/ Seminars/ Conferences participation

- **International Workshop on Recent Advances on Operator Semigroups**
University of Delhi, December 18-21, 2017.
- **Orthogonal Spline Collocation Methods for PDEs**
South Asian University, Delhi, India, March 21-24, 2014.
- **Symposium on Discrete Mathematics and Discretization Methods**
South Asian University, Delhi, India, October 25-26, 2013.
- **Symposium on Computational Techniques and Mathematical Modelling**
South Asian University, Delhi, India, April 5-6, 2013.
- **Advance Instructional School on Numerical Analysis**
Panjab University Chandigarh, India, June 18-July 7, 2012.
- **Symposium in Mathematics**
Panjab University, Chandigarh, India, February 7-8, 2012.
- **Annual Foundation School- I**
Panjab University Chandigarh, India December 2- 29, 2010 .
- **International Congress of Mathematicians**
International Convention Centre, Hyderabad, August 19-27, 2010, India.
- **Workshop and international conference on “Multiple Scale analysis and Homogenization** Indian Institute of Sciences Bangalore, India, June 28- July 14, 2010.
- **Workshop on “Partial Differential Equations and related analysis”**
Indian Institute of Sciences, Bangalore, India, August 28-September 18, 2009.
- **Workshop on “Advance numerical techniques”**
Banaras Hindu University Varanasi, India, June 29-July 11 2009.
- **Chandigarh Symposium in mathematics**
Panjab University, Chandigarh, India, March 5-6, 2009.

Courses taught :

Post- Graduate level : Computational Methods for ODEs, Computational Methods for PDEs, Complex Analysis, Functional Analysis, Differential Equations, Fluid Dynamics.

Research Guidance:

- MPhil: Two completed and one pursuing.
- PhD: Supervising three students at present.

Awards and Recognition:

- Awarded UGC CSIR JRF from January 2009- January 2011
- International travel grant from CSIR for participating and presenting paper at the International conference “European Numerical Mathematics and Advanced applications University of Leicester, Leicester, U.K, September 5-9, 2011”.
- Awarded UGC CSIR SRF from January 2011- July 2012.
- Best paper award at Chandigarh Science Congress in the section “Mathematical Sciences” held at Panjab University Chandigarh from February 26-28, 2011.
- Best paper Award for the paper at Annual Conference of Indian Mathematical Society, held at Swami Ramanand Teerth Marathwada University, Nanded, Maharashtra, December 27-30, 2011.
- Research and Development grant of 1.2 lakh for the project “Numerical methods for singularly perturbed time dependent differential-difference equations ” from University of Delhi from September 2014-September 2015.
- International travel grant from University of Delhi for participating and presenting paper at the International conference “25th international conference on difference equations and Applications, University College London, United Kingdom, June 24- 28, 2019”.
- International travel grant from NBHM for participating and presenting paper at the International conference “9th International Congress on Industrial and Applied Mathematics Universitat De Valencia, Valencia, Spain, July 15-19, 2019”.