

Elina L. Shishkina

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Languages

Russian, English

Education

- 2004–2006 **PhD in mathematics**
Voronezh State University, Russia
Thesis advisor: Lev Nikolaevich Lyakhov
Thesis title: Inversion of Integral Operator of Riesz B-potential
Type with Homogeneous Characteristic in Weight Spaces
- 1998–2004 **Certified specialist in mathematics**
Voronezh State University, Russia
Thesis advisor: Oleg Mikhailovich Penkin
Thesis title: Variational Inequality on Stratified Sets
- 1988–1998 **Secondary school 72**
Voronezh, Russia
Special mathematical/physical line

Degrees

- 14/10/2019 **Awarded the degree of the doctor of physical and mathematical sciences**
Thesis consultant: Sergey Mikhailovich Sitnik
Thesis title: Integral transforms composition method for singular differential equations with the Bessel operator and its fractional powers
Location: Peoples' Friendship University of Russia
- 30/12/2013 **Assigned academic rank of assistant professor**
- 24/10/2006 **Awarded the degree of the candidate of physical and mathematical sciences**
Thesis advisor: Lev Nikolaevich Lyakhov
Thesis title: Inversion of integral operator of Riesz B-potential type with homogeneous characteristic in weight spaces
Location: Voronezh, Voronezh State University

Job experiences

- 2021–Present **Professor**, Department of Applied Mathematics and Computer Modeling,
Belgorod State National Research University ("BelGU")
- 2020–Present **Professor**, Mathematical and Applied Analysis Department,
Voronezh State University
- 2019–2020 **Associate Professor**, University of Information Technology and Management in Rzeszow
- 2010–2019 **Associate Professor**, Mathematical and Applied Analysis Department,
Voronezh State University
- 2008–2010 **Assistant**, Department of Differential Equations,
Voronezh State University
- 2006–2008 **Assistant**, Quality Control and Machine-Building Technology Department,
Voronezh State Technological Academy
- 2004–2006 **Assistant**, Mathematical Department,
Voronezh State Technological Academy

Awards

- 2019 The International Society for Analysis, its Applications and Computation (ISAAC)
presents the life membership for achievements in Integral Transforms, Operator Theory, PDE
- 2014 Voronezh State Government awarded for the fruitful work as a teacher
- 2010 Second place according to the results of the scientific session of the Voronezh State University

Books

1. Transmutations, singular and fractional differential equations with applications to mathematical physics. Publisher: Elsevier, 2020. (with S. M. Sitnik)
2. The transmutation operators method of for differential equations with Bessel operators. Publisher: Fizmatlit, 2019. (with S. M. Sitnik)
3. Fractional integrals and derivatives (generalizations and applications). Tutorial book. Publisher: "Fargona", Uzbekistan, 2022. (with A. K. Urinov, Sh. T. Karimov and S. M. Sitnik)

Chapters in the book

1. Hyperbolic B-potentials: properties and inversion. In: Kusraev A.G., Totieva Z.D. (eds) Operator Theory and Differential Equations. Trends in Mathematics. Birkhäuser, Cham. 2021, pp. 229–258
2. Inversion of the Weighted Spherical Mean. In: Karapetyants A.N., Kravchenko V.V., Lifyand E., Malonek H.R. (eds) Operator Theory and Harmonic Analysis. OTHA 2020. Springer Proceedings in Mathematics & Statistics, Vol. 357. Springer, Cham., 2021, pp. 507–520
3. A Neumann Series of Bessel Functions Representation for Solutions of the Radial Dirac System. In: Karapetyants A.N., Kravchenko V.V., Lifyand E., Malonek H.R. (eds) Operator Theory and Harmonic Analysis. OTHA 2020. Springer Proceedings in Mathematics & Statistics, Vol. 357. Springer, Cham., 2021, pp. 319–331 (with V. V. Kravchenko and S. M. Torba)
4. Inversion of Hyperbolic B-Potentials. In book Transmutation Operators and Applications. Trends in Mathematics. Chapter 12. Springer, Birkhauser. 2020, Ed. V. V. Kravchenko, S. M. Sitnik

5. Fractional Bessel integrals and derivatives on semi-axes. In book. Transmutation Operators and Applications. Trends in Mathematics. Chapter 28. Springer, Birkhauser. 2020, Ed. V. V. Kravchenko, S. M. Sitnik (with S.M. Sitnik)

Main articles

1. Comparison of simulation and analytical models for the distribution of a group of agents moving in random directions, *Mathematical Methods in the Applied Sciences*. 2022, pp. 1–13 (with A. V. Kuznetsov and M. Rataj) doi.org/10.1002/mma.9000
2. Uniqueness of the solution of the Cauchy problem for the general Euler–Poisson–Darboux equation, *Differential equations*, V. 58, Iss. 12, 2022, pp. 1688–1693.
3. Mean-Value Theorem for B-Harmonic Functions, *Lobachevskii Journal of Mathematics*. 2022. Vol. 43, Iss. 6, pp. 1401–1407.
4. Connection between generalized Bessel potentials and solutions to the singular heat equation, *Applied Mathematics & Physics*. 2022. V. 54, Iss. 2, pp. 89–97. (with A. Dzhabrailov)
5. Solution of the Euler–Poisson–Darboux equation of fractional order, *Vladikavkaz mathematical journal*. 2022. Vol. 24, Iss. 2, pp. 85–100 (with A. Dzarakhohov)
6. On the theory of spaces of generalized Bessel potentials, *Vladikavkaz mathematical journal*. 2022. Vol. 24, Iss. 3, pp. 62–77. (with A. Dzhabrailov)
7. The explicit formula for solution of anomalous diffusion equation in the multi-dimensional space, *Lobachevskii Journal of Mathematics*. 2021, Vol. 42, No 6, pp. 1264–1273. (with S.M. Sitnik and D. K. Durdiev)
8. Generalized Bessel potential and its application to non-homogeneous singular screened Poisson equation, *Integral Transforms and special functions*. 2021, Vol. 32, No 12, pp. 932–947 (with I. Ekincioglu and C. Keskin)
9. On sharp bounds in the T. Lyons’s neo-classical inequality, which is essential for the theory of stochastic differential equations, *Global and Stochastic Analysis*. 2021, Vol. 8, No 2, pp. 77–86 (with S. M. Sitnik and V. Polunin)
10. Two forms of an inverse operator to the generalized Bessel potential, *Axioms*. 2021, Vol. 10, No 232, pp. 1–20 (with A. Dzhabrailov and Y. Luchko)
11. Application of Integral Transforms Composition Method (ITCM) to obtaining transmutations via integral transforms with Bessel functions in kernels, *Siberian Electronic Mathematical Reports*. 2021, Vol. 18, No 2, pp. 884–900 (with S. M. Sitnik and I. Jebabli)
12. Special functions as solutions to the Euler–Poisson–Darboux equation with a fractional power of the Bessel operator, *Mathematics*, 2021, Vol. 9, No 13, pp. 1–18 (with A. Dzarakhohov and Y. Luchko)
13. On the boundedness of the generalized translation operator on variable exponent Lebesgue spaces, *Acta Applicandae Mathematicae*. 2021, Vol. 173, No 1, pp. 1–14 (with I. Ekincioglu and E. Kaya)
14. On two classes of operators of generalized fractional integro-differentiation, *Review of Science and Technique*. 2021, Vol. 198, pp. 109–122 (with S. M. Sitnik)
15. Fractional powers of Bessel operator and its numerical calculation, *Chelyabinsk physical and mathematical journal*. 2021, Vol. 6, No 2, pp. 172–189 (with D. K. Durdiev and S. M. Sitnik)

16. A transmutation operator method for solving the inverse quantum scattering problem, *Inverse Problems*. 2020, Vol. 36, No 12, pp. 1–23 (with V. V. Kravchenko and S. M. Torba)
17. The Dirichlet problem for an elliptic singular equation, *Complex variables and elliptic equations*. 2020, Vol. 57, No 7, pp. 1210–1218
18. Hyperbolic Riesz B-potential and solution of an iterated non-homogeneous B-hyperbolic equation, *Lobachevskii Journal of Mathematics*. 2020, Vol. 41, No 5, pp. 895–916
19. General Euler-Poisson-Darboux Equation and Hyperbolic B-Potentials, *Contemporary Mathematics. Fundamental Directions*. 2019, Vol. 65, No 2, pp. 157–338
20. A fractional equation with left-sided fractional Bessel derivatives of Gerasimov–Caputo type, *Mathematics*. 2019, Vol. 7, No 12, pp. 1–21 (with S.M. Sitnik)
21. Solutions to non-linear Euler–Poisson–Darboux equations by means of generalized separation of variables, *Lobachevskii journal of mathematics*. 2019, Vol. 40, No 5, pp. 640–647 (with R. Garra, E. Orsingher)
22. Weighted generalized functions and hyperbolic Riesz B-potential, *Mathematical methods in the applied sciences*. 2019, Vol. 42, No 15, pp. 5060–5071
23. Some methods of solution to the Cauchy problem for a inhomogeneous equation of hyperbolic type with a Bessel operator, *Journal of physics: Conference series*. 2019, Vol. 1203, No 1, pp. 1–12 (with Sh. T. Karimov)
24. Space of images of the mixed Riesz hyperbolic B-potential and analytic continuation, *Journal of inverse and ill-posed problems*. 2019, Vol. 27, No 2, pp. 171–184 (with I. P. Polovinkin and S. M. Sitnik)
25. Probabilistic properties of near-optimal trajectories of an agent moving over a lattice, *Journal of optimization theory and applications*. 2019, Vol. 182, pp. 768–784 (with A. V. Kuznetsov and S. M. Sitnik)
26. On fractional powers of the Bessel operator on semiaxis, *Siberian Electronic Mathematical Reports*. 2018, Vol. 15, No 1, pp. 1–20 (with S. M. Sitnik)
27. Properties of mixed hyperbolic B-potential, *Progress in Fractional Differentiation and Applications*. 2018, Vol. 4, No 2, pp. 83–98
28. Singular Cauchy problem for the general Euler–Poisson-Darboux equation, *Open mathematics*. 2018, Vol. 16, No 1, pp. 23–31
29. Solution of the singular Cauchy problem for a general inhomogeneous Euler–Poisson–Darboux equation, *Carpathian Journal of Mathematics*. 2018. Vol. 34, No 2, pp. 255–267
30. Generalized Euler–Poisson–Darboux equation and singular Klein–Gordon equation, *Journal of physics: Conference series*. 2018, Vol. 973, No 1, pp. 1–20
31. Applications of integral transforms composition method to wave-type singular differential equations and index shift transmutations, *Electronic journal of differential equations*. 2018, No 130, pp. 1–27 (with A. Fitouhi, I. Jebabli and S. M. Sitnik)
32. On a series representation for integral kernels of transmutation operators for perturbed Bessel equations, *Mathematical notes*. 2018, Vol. 104, No 4, pp. 530–544 (with V. V. Kravchenko and M. Torba)

33. Singular Cauchy problem for generalized homogeneous Euler–Poisson–Darboux equation, *Mathematical notes of NEFU*. 2018, Vol. 25, No 2, pp. 85–96 (with M. Karabacak)
34. Method of Riesz potentials applied to solution to nonhomogeneous singular wave equation, *Mathematical notes of NEFU*. 2018, Vol. 25, No 3, pp. 68–91 (with S. Abbas)
35. General form of the Euler–Poisson–Darboux equation and application of the transmutation method, *Electronic journal of differential equations*. 2017, No 177, pp. 1–20 (with S. M. Sitnik)
36. Inversion of the mixed Riesz hyperbolic B–potentials, *International Journal of Applied Mathematics*. 2017, Vol. 30, No 6, pp. 487–500
37. On fractional powers of Bessel operators, *Journal of Inequalities and Special Functions*. 2017, Vol. 8, No 1, pp. 49–67 (with S. M. Sitnik)
38. On refinements of neo-classical inequality and its applications to stochastic differential equations and Brownian motion, *Chelyabinsk physical and mathematical journal*. 2017, Vol. 2, No 3, pp. 257–265 (with D. S. Donchev and S. M. Sitnik)
39. On weighted generalized functions associated with quadratic forms, *Issues of analysis*. 2016, Vol. 5(23), No 2, pp. 52–68
40. On the boundedness of hyperbolic Riesz B-potential, *Lithuanian Mathematical Journal*. 2016, Vol. 56, No 4, pp. 540–551
41. Accompanying distributions of singular differential operators, *Journal of mathematical sciences*. 2016, Vol. 219, No 2, pp. 184–189 (with L. N. Lyakhov and M. V. Polovinkina)
42. Weighted mixed spherical means and singular ultrahyperbolic equation, *Analysis*. 2016, Vol. 36, No 2, pp. 65–70 (with L. N. Lyakhov)
43. Formulas for the Solution of the Cauchy Problem for a Singular Wave Equation with Bessel Time Operator, *Doklady Akademii Nauk*. 2014, Vol. 459, No 5, pp. 533–538 (with L. N. Lyakhov and I. P. Polovinkin)
44. On a Kipriyanov problem for a singular ultrahyperbolic equation, *Differential Equations*. 2014, Vol. 50, No 4, pp. 516–528 (with L. N. Lyakhov and I. P. Polovinkin)
45. Inversion of General Riesz B-Potentials, *Journal of Analytic Methods of Analysis and Differential Equations: AMADE 2012*. — Cambridge, 2014, pp. 115–125 (with L. N. Lyakhov)
46. Inversion of integral of B-potential type with density from Φ_γ , *Journal of Mathematical Sciences*. 2009, Vol. 160, No 1, pp. 95–102
47. Inversion of general Riesz B-potentials with homogeneous characteristic in weight classes of functions, *Doklady Mathematics*. 2009, Vol. 79, No 3, pp. 377–381 (with L. N. Lyakhov)
48. General B-hypersingular integrals with homogeneous characteristic, *Doklady Mathematics*. 2007, Vol. 75, No 1, pp. 39–43 (with L. N. Lyakhov)
49. Generalized weighted function r^λ . *Bulletin of Voronezh State University, a series of physics, mathematics*. Voronezh. 2006, No 1. pp. 215–221
50. Generalized Riesz B-potentials of the mixed type, *Doklady Mathematics*. 2006, Vol. 73, No 1, pp. 42–45 (with L. N. Lyakhov)

Areas of interest

- Differential Equations
- Integral Equations
- Fractional calculus
- Singular Operators
- Mathematical Physics
- Transmutation operators
- Harmonic analysis
- Special Functions
- Differential Geometry
- Bioinformatics
- Teaching of Mathematics

Courses taught

- Mathematical Analysis
- Differential equations
- Complex Analysis
- Methods of Mathematical Physics
- Bioinformatics
- Digital Image Processing
- Special Functions and applications
- Fractional Calculus
- Application of statistics
- Computational Methods in Science and Technology
- Research Methodology

Other

- A member of the special Interest ISAAC (The International Society for Analysis, its Applications and Computation) group in Operator Theory and Harmonic Analysis (OTHA)
- Participate in the programme "Fractional differential equations" at the Isaac Newton Institute for Mathematical Sciences in Cambridge during the period Mon 4th Jan 2022 to Fri 30th Apr 2022
- Member of the editorial board of the journal Applied Mathematics & Physics