

Dr. Bikram Bir

Assistant Professor
Department of Mathematics
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Research Interests

Solve ordinary/partial differential equations using the numerical tools like conforming finite element method (FEM), non-conforming FEM, and discontinuous Galerkin FEM. Elliptic and parabolic PDEs, Incompressible fluids, Navier-Stokes equations, Oldroyd model of order one.

Current Research

Discontinuous Galerkin method for the kinetic-fluid system, Chemotaxis system in fluid medium and microfluidic-electrochemical systems

Future Plan

Local and Hybrid Discontinuous Galerkin methods, Virtual Element methods, Hybrid High-Order methods, Adaptive FEM

Academic Positions

- Aug 2024 – **Assistant Professor**, *Department of Mathematics*, The Royal Global University, Guwahati
- Oct 2022 – **Post-Doctoral Fellow**, *Department of Mathematics*, IIT Bombay, India, July 2024
Topic: *Discontinuous Galerkin method for the kinetic-fluid system*.
Mentor: Dr. Harsha Hutridurga.

Education

- Feb 2023 **Ph.D.**, *Department of Mathematical Sciences*, Tezpur University, Assam, Thesis Title: *Finite Element Analysis of a Linear Viscoelastic Fluid Flow Model: Oldroyd Model of Order One*.
Supervisors: Dr. Deepjyoti Goswami
- 2017 **M.Sc.**, *Department of Mathematical Sciences*, Tezpur University, Assam, C.G.P.A. 7.37
M.Sc. in Mathematics, specialization on both “pure and applied”.

- 2015 **Graduation**, *A. B. N. Seal College, University of North Bengal, Coochbehar, West Bengal*, 64.25%
B.Sc. in Mathematics Honours.
- 2012 **Higher Secondary**, *Jateswar High School, Board-W.B.C.H.S.E., Jateswar, West Bengal-735216*, 83.40%
Higher Secondary in Pure Science.
- 2010 **Secondary**, *Dhulagaon High School, Board-W.B.B.S.E., Dhulagaon, West Bengal*, 84.5%

Publications

5. **Bir, B.**, Goswami, D., and Pani, A. K. Optimal error estimates of the penalty finite element method for the unsteady Navier-Stokes equations with nonsmooth initial data. *Journal of Scientific Computing*, 98:51, 2024. (SCIE) (link)
4. Goswami, D., Damazio, P. D., Yuan, J. Y., and **Bir, B.** Two-Grid Finite Element Galerkin Approximation of equations of motion arising in Oldroyd fluids of order one with non-smooth initial data, *Computational Mathematics and Mathematical Physics*, 63(4):659–686, 2023. (SCIE) (link)
3. **Bir, B.**, Goswami, D., and Pani, A. K. Backward Euler method for the equations of motion arising in Oldroyd model of order one with nonsmooth initial data. *IMA Journal of Numerical Analysis*, 42:3529–3570, 2022. (SCI, SCIE) (link)
2. **Bir, B.**, Goswami, D., and Pani, A. K. Finite element penalty method for the Oldroyd model of order one with non-smooth initial data. *Computational Methods in Applied Mathematics*, 22(2):297–325, 2022. (SCIE) (link)
1. **Bir, B.** and Goswami, D. On a three-step two-grid finite element method for the Oldroyd model of order one. *ZAMM-Journal of Applied Mathematics and Mechanics/Zeitschrift für Angewandte Mathematik und Mechanik*, 101(11):e202000373, 2021. (SCIE) (link)

Submitted/Preprint

- **Bir, B.** and Goswami, D. A finite element method for the equations of motion arising in the Oldroyd model of order one with grad-div stabilization. (Submitted)
- **Bir, B.**, Hutridurga, H., Kumar, K., and Pani, A. K. Discontinuous Galerkin combined with time splitting method for the Vlasov-Navier-Stokes system. (Preprint)
- **Bir B.**, Hutridurga, H. and Pani, A. K. On a Completely Discrete Discontinuous Galerkin Method for Incompressible Chemotaxis-Navier-Stokes Equations. (Submitted)

- **Bir B.** A Decoupled Fully Discrete Pressure Correction Discontinuous Galerkin Method for Poisson-Nernst-Planck/Navier-Stokes Equations. (In preparation)

Conferences

- Workshop on Multi-scale Analysis cum Conference on Differential Equations (MSADE-24), Department of Mathematics, IIT Ropar, Punjab, India, 26th February to 2nd March, 2024.
- Latest Advances in Computational and Applied Mathematics-2024 (LACAM-24), Department of Mathematics, IISER Thiruvananthapuram, Kerala, India, 21st to 24th February, 2024.
- International Conference on Computational Partial Differential Equations and Applications (ICCPDEA-2022), BML Munjal University, India, 6th to 8th September, 2022.
- International Conference on Emerging trends in Pure and Applied Mathematics, Department of Applied Sciences, School of Engineering in association with Department of Mathematical Sciences, School of Sciences, Tezpur University, Assam, India, 12th to 13th March 2022.
- 2nd International Conference on Applied Mathematics in Science and Engineering (AMSE-2022), Centre for Applied Mathematics & Computing and Department of Mathematics ITER, Siksha O Anusandhan, Bhubaneswar, Odisha, India, 24th to 26th March 2022.
- International Conference on Advances in Differential Equations and Numerical Analysis (ADENA2020), Department of Mathematics, IIT Guwahati, India, 12th to 15th October 2020.
- 1st International Conference on Applied Mathematics in Science and Engineering (AMSE-2019), Centre for Applied Mathematics & Computing and Department of Mathematics ITER, Siksha O Anusandhan, Bhubaneswar, Odisha, India, 24th to 26th October 2019.

Seminars/ Webinars

- Webinar on PDE and related areas, IIT Kanpur, in collaboration with TIFR-CAM, IISER-Pune and IISER-Kolkata, 3rd September 2020 to 15th December 2020.
- Webinar on Machine learning and Deep learning using MATLAB, Department of Mathematics, Rajiv Gandhi University, Arunachal Pradesh and Elmax Systems and Solutions, MathWorks (MATLAB and SIMULINK) and Department of Computer Sc. & Engg., Rajiv Gandhi University, June 19, 2020.

Workshops/ Schools

- Pilot workshop on Gnuplot, Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching, May 22nd May 2021.
- Advanced Training School on Numerical PDEs and Inverse Problems, Department of Mathematics Statistics, IIT Tirupati, 9th to 20th December 2019.
- Science Academies Refresher Course on Analysis, Department of Mathematical Sciences, Tezpur University, 18th February to 2nd March 2019.
- Workshop on Advance Computational Techniques for Differential Equations with MATLAB (ACTDEM2018), Department of Mathematics, IIT Roorkee, 18th to 22nd September 2018.
- NCM workshop on New Directions in PDE Constrained Optimisation (2018), Department of Mathematics, IIT Bombay, 12th to 16th March 2018.

Teaching Assistant-ships(IITB)

- MA 207 *Differential Equations II: Autumn 2022-23*
- MA 214 *Introduction to Numerical Analysis: Spring 2022-23*
- MA 105 *Calculus: Autumn 2023-24*
- SI 416 *Optimization: Spring 2023-24*

Achievements

- NET *June 2016*

Awards

- 2019-2022 *Awarded INSPIRE Fellowship(SRF)*
- 2017-2019 *Awarded INSPIRE Fellowship(JRF)*
- 2012-2017 *Awarded INSPIRE Scholarship*

Languages

- Scripting Language LATEX, MS-Office
- Programming Language C, MATLAB, FreeFEM++, Python,
- Communicating Language Bengali, English, Hindi, Assamese

Personal Details

Father's name : Dulal Chandra Bir
Mother's name : Maya Bir
Nationality : Indian

Religion : Hindu
Caste : OBC-B
Sex : Male

Permanent Address

Vill.+ P.O- Dhulagaon, P.S- Falakata, Dist.- Alipurduar, W.B.- 735216, India

References

- Dr. Deepjyoti Goswami,
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Department of Mathematical Sciences,
Tezpur University, Sonitpur, Assam, India-784028.
Phone: +91-371-227-5521
Email: deepjyoti@tezu.ernet.in
- Prof. Amiya Kumar Pani,
Visiting Professor,
Department of Mathematics
Birla Institute of Technology & Science, Pilani KK Birla Goa Campus, NH 17
B, Zuarinagar, Goa-403726 (India)
Email: amiyap@goa.bits-pilani.ac.in
- Dr. Harsha Hutridurga,
Associate Professor,
Department of Mathematics,
Indian Institute of Technology Bombay, Powai, Mumbai, India-400076,
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