Goa University

Mathematics Discipline, School of Physical and Applied Sciences

Report on Two Day Workshop on Differential Equations and Mathematical Modelling

1. Title of the Event/Activity/program	Two Day Workshop on Differential Equations and Mathematical Modelling
2. Date and Time	13th – 14th December 2023
3. Mode of conduct (Physical/Online)	Physical
4. School/ Directorate/ Section	Mathematics Discipline, School of Physical and Applied Sciences
5. Collaborating Agency/School/Directorate	
6. Detail of the Resource Person (Brief biodata)	1. Prof. Saumya Bajpai, IIT Goa 2. Prof. Anupama Sharma, BITS Goa 3. Prof. Lok Pati Tripathi, IIT Goa 4. Prof. Manoj Pandey, BITS Goa
7. Number of Faculty attended/participated	05
8. Number of Student attended / participated	48
9. No. of external students/faculty/other participants	01
10. The objectives of the Program/activity/event	The main objective of the workshop is to give a platform to the participants to interact with the resource persons who are eminent researchers in the field, get to know about the recent research in the field of Modelling using

	differential equations which will help them for dissertation at 4th semester. MATLAB and MATHEMATICA sessions will be also conducted to have hands-on practice
11. Description of the Program/activity/event	The workshop was conducted for 2 days in four sessions. Each session was of 3hrs covering different research areas from differential equations and mathematical modelling. There were hands sessions also.
12. Benefit/Key outcomes of the Program/activity/event	Part 2 students of Mathematics SPAS got an exposure to talk to faculty members from BITS and IIT Goa. It was very helpful for then in order to choose the dissertation topic.
13. Enclosures with report	Brochure, Notice, Geo-tag photos, Attendance of students/faculty/external participants, Bio Data of resource person (if applicable), Any other information.

Signature: Mawas

Name of coordinator Dr. Mridini Gawas

Designation: Assistant Professor

Date: 22/12/2023

Signature Ramesh

Dean/Director/Head

Seal of the School/Directorate/University

Option 2 Format

Goa University

Mathematics Discipline, School of Physical and Applied Sciences

Report on Two Day Workshop on Differential Equations and Mathematical Modelling

The mathematics discipline, school of physical and Applied sciences, Goa University had organized a Two Day workshop on Differential Equations and Mathematical modelling on 13th – 14th December 2023.Dr. Mridini Mahadev Gawas co-ordinated the workshop under the guidance of Mathematics Program Director Dr. Tamba and dean SPAS Prof. Ramesh Pai. The main objective of the workshop was to give a platform to the participants to interact with the resource persons who are eminent researchers in the field, get to know about the recent research in the field of Modelling using differential equations which will help them for dissertation at 4th semester. MATLAB and MATHEMATICA sessions were also conducted to have hands-on practice.

Eminent researchers from BITS Goa and IIT Goa in the fields of mathematical modelling and Differential equations were invited as the resource person. 48 students from mathematics discipline attended the workshop. Five faculty members from the discipline and one student from IIT Bombay also attended the workshop. The workshop was conducted for 2 days in four sessions. Each session was of 3hrs covering different research areas from differential equations and mathematical modelling.

NOTICE

Date: 1st December 2023

Mathematics Discipline, School of Physical and Applied Sciences, Goa University is organizing a Two Day workshop on Differential equations and Mathematical Modelling on 13th – 14th December 2023. The main objective of the workshop is to give a platform to the participants to interact with the resource persons who are eminent researchers in the field, get to know about the recent research in the field of Modelling using differential equations which will help them for dissertation at 4th semester. Students who wish to participate in the workshop can confine their participation by filling the google form which will be shared with you on official whatsapp group.

Dr. Mridini Mahadev Gawas

Co-ordinator

Dr. Tamba

Program Director(Mathematics)

MATHEMATICS DISCIPLINE,
SPAS, GOA UNIVERSITY

TWO-DAY WORKSHOP ON DIFFERENTIAL EQUATIONS AND MATHEMATICAL MODELLING

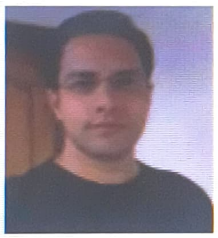
13-14th December 2023

THE SPEAKERS

Prof. Lok Pati Tripathi
IIT- Goa

Prof. Anupama Sharma
BITS - Goa

Prof. Saumya Bajpai
IIT - Goa



Prof. Manoj Pandey
BITS - Goa

Organizing Committee

Co-ordinator
Dr. Mridini Mahadev Gawas

Committee members
1. Dr. M. Tamba
2. Dr. M. Kunhanandan
3. Dr. Jessica Fernandes e Pereira
4. Mr. Brandon Fernandes

Contact details

8668858583
email : mridinigawas@unigoa.ac.in

Registration Link

https://forms.gle/JcCoArdGuxi17iz1A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12/13/2023 01:02 PM GMT+05:30
Note : Captured by GPS Map Camera


GPS Map Camera
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Lat 15.459685, Long 73.832286
12/13/2023 12:53 PM GMT+05:30
Note : Captured by GPS Map Camera


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Attendance for Two Day Workshop on Differential Equations and Mathematical Modelling.

Sr. No.	Name	Session 1 13/12/23	Session 2 13/12/23	Session 3 14/12/23	Session 4 14/12/23
1	Shashank Sunil Khanolkar				
2	Jowill Agnelo Dias				
3	Shivraj Chari				
4	Mohankumar lamani				
5	Amar Bhagat				
6	Sudha Chandrabhan Nishad				
7	Rutuja Dessai				
8	Almouiz Kamal Mohamed	A	A	A	A
9	Amol Ramesh Yedekar				
10	Megan Darlene Mascarenhas				
11	Deepa Velip				
12	Riddhi Mayenkar			A	A
13	Nidhi Salgaonkar				
14	Pranita Ravi Khanolkar			A	
15	SWIZLE GOMES				
16	Karina Velip				
17	Bento Fernandes			A	A
18	Saloni				
19	Chetali Damodar Naik				
20	Saish Kanolkar				
21	Bhavana. P. Gauns			A	A
22	Shramita Mangaldas Naik			A	A
23	~~Shramita Mangaldas Naik~~				

24	Clarisa Sarina Gonsalves				
25	Bhavana Vinod Khedekar				
26	Divya Ramkrishna Gaonkar				
27	Netravati Vantamuri				
28	Callista Valanka Cabral				
29	Frazer Fernandes				
30	Alisha Fabiola Fernandes				
31	Cyble Rebelo				
32	Nehali Digamber Xete Dhumasker				
33	Mitzi Sunita Dias				
34	Vidya Shrikant Shirodkar				
35	Tanya Shetye				
36	Maithili Mahadev Khandekar				
37	Adan				
38	Ashwita Pereira				
39	Veda Kush Naik				
40	Shivani Narvekar				
41	Samrudhi Uday Vaigankar				
42	Akansha Dhananjay Pednekar				
43	Aryaa Rege				
44	Kritali matonkar				
45	Nikhil kuttikar				
46	Shambhavi Manerikar				
47	Sanket Namdev Sinari				
48	Sonam Godkar				

49	Shrushtee Devidas Betodkar	A	A		
50	Gandhali Kambli				
51	Marie Nyusya Adriana Da Cunha			A	A
52	Swejal Shankar Kalangutkar			A	A
53	Pallavi Uttam Naik			A	A
54	Shreya Uday Dessai				

Dr. Jessica.

Dr. M. Kunhanandan

Dr. Tamba.

Dr. Mridini Gawas

Mr. Brandon.

Gawas

(Co-ordinator).

Curriculum Vitaé

Anupama Sharma

BITS Pilani Goa Campus
Zuarinagar – 403726,
Goa, India

Phone: +91 9453156104
Email: anupamas@goa.bits-pilani.ac.in
Google Scholar: https://scholar.google.co.in/citations

EMPLOYMENT

Mar, 2020 - present	:	**Assistant Professor**, BITS Pilani - K. K. Bilra Goa Campus
Oct, 2017 - Dec, 2019	:	**Postdoctoral Fellow**, University of Michigan, Ann Arbor
Sept 2015 - Sept, 2017	:	**Postdoctoral Fellow**, Institute of Mathematical Sciences, Chennai
Mar, 2014 - Sept, 2015	:	**NBHM - Postdoctoral Fellow**, Banaras Hindu University, Varanasi

EDUCATION

Ph.D. Mathematics, *Banaras Hindu University, Varanasi, India*	2014
M.Sc. Mathematics, *G.B. Pant University of Agri. & Tech., Pantnagar, India*	2009
B.Sc. Physics, Mathematics, IT, *Kumaun University, Nainital, India*	2007

RESEARCH INTERESTS

- Infectious disease modeling
- Behavioural epidemiology
- Antibiotic resistance
- Complex networks

RESEARCH GRANTS

1. Title: *Modelling and Forecasting the Effects of Long Term Interventions on COVID-19 using Network-based Approach*
   Funding agency: DST- SERB (MATRICS COVID19 Special Call)
   Role & Duration: Principal Investigator, 2020-2021

2. Title: *Modelling of Recurrent Infectious Diseases: Understanding the Sustained and Non-periodic Epidemic Patterns*
   Funding agency: DST- SERB (MATRICS Scheme)
   Role & Duration: Principal Investigator, 2020-2023

3. Title: *Modeling the Multi-scale Dynamics of Recurrent Infectious Diseases*
   S Funding agency: BITS Pilani (Research Initiation Grant)
   Role & Duration: Principal Investigator, 2020-2022

REPORTS

1. Snehal Shekatkar, Bhalchandra Pujari, Mihir Arjunwadkar, Dhiraj Kumar Hazra, Pinaki Chaudhuri, Sitabhra Sinha, Gautam I Menon, **Anupama Sharma,** Vishwesha Guttal, INDSCI-SIM: A state-level epidemiological model for India, *Study reports available at* https://indscicov.in/indscisim.

PUBLICATIONS

Refereed Journals

*denotes graduate supervisor as first author

1. **Anupama Sharma**, Kevin B. Wood, Spatial segregation and cooperation in radially expanding microbial colonies under antibiotic stress, *The ISME Journal,* https://doi.org/10.1038/s41396-021-00982-2 (2021).

2. **Anupama Sharma**, Quantifying the effect of demographic stochasticity on the smoking epidemic in the presence of economic stimulus, *Physica A: Statistical Mechanics and its Applications*, 549, 124412 (2020).

3. **Anupama Sharma**, Shakti N. Menon, V. Sasidevan, Sitabhra Sinha, Epidemic prevalence information on social networks can mediate emergent collective outcomes in voluntary vaccine schemes, *PLoS Computational Biology*, 15(5): e1006977 (2019).
[**This article was featured in** Phys.org, ScienceDaily, EurekAlert! and The Communication Initiative Network]

4. A. K. Misra*, **Anupama Sharma**, J. B. Shukla, Stability analysis and optimal control of an epidemic model with awareness programs by media, *Biosystems*, 138, 53–62 (2015).

5. A. K. Misra, Milan Tiwari, **Anupama Sharma**, Spatio-temporal patterns in a cholera transmission model, *Journal of Biological Systems*, 23, 471–484 (2015).

6. **Anupama Sharma**, A. K. Misra, Backward bifurcation in smoking cessation model with media campaigns, *Applied Mathematical Modelling*, 39, 1087–1098 (2015).

7. **Anupama Sharma**, A. K. Misra, Modeling the impact of awareness created by media campaigns on vaccination coverage in a variable population, *Journal of Biological Systems*, 22, 249–270 (2014).

8. A. K. Misra, Maitri Verma, **Anupama Sharma**, Capturing the interplay between malware and anti-malware in a computer network, *Applied Mathematics and Computation*, 229, 340–349, (2014).

9. A. K. Misra*, **Anupama Sharma**, Jia Li, A mathematical model for control of vector borne diseases through media campaigns, *Discrete and Continuous Dynamical Systems Series-B*, 18,1909–1927, (2013).

10. Sudip Samantha, Sourav Rana, **Anupama Sharma**, A. K. Misra, J. Chattopadhayay, Effect of awareness programs by media on epidemic outbreak: a mathematical model, *Applied Mathematics and Computation*, 219, 6965–6977 (2013) .

11. A. K. Misra*, **Anupama Sharma**, Vishal Singh, Effect of awareness programs in controlling the prevalence of an epidemic with time delay, *Journal of Biological Systems*, 19 , 389–402 (2011).

12. A. K. Misra*, **Anupama Sharma**, J. B. Shukla, Modeling and analysis of effects of awareness programs by media on the spread of infectious diseases, *Mathematical and Computer Modelling*, 53, 1221–1228 (2011) .

International Conference Proceedings

1. Anh Huynh, **Anupama Sharma**, Max De Jong, Kevin B. Wood Balancing spatial heterogeneity and migration to slow the evolution of resistance in a bacterial pathogen, *Bulletin of the American Physical Society*, L14.00013, 2021.

2. J. Deshmukh, R.P. Subbanarasimha, P. Bassin, V.S. Bitra, S. Srinivasa, **Anupama Sharma**, An interactive simulator for COVID-19 trend analysis, *CODS COMAD 2021: 8th ACM IKDD CODS and 26th COMAD*, 385–389, doi.org/10.1145/3430984.3430989, 2021.

In preparation

1. **Anupama Sharma** & Yuzuru Sato, Variation in vector population mediates major and minor peaks in malaria incidence, *In preparation.*

Curriculum Vitae

MANOJ KUMAR PANDEY

Associate Professor
Birla Institute of Technology and Science, Pilani K K Birla Goa Campus,
Zuarinagar - 403726, Goa, India.
Email: manojp@goa.bits-pilani.ac.in
manojpandey.iitb@gmail.com
Phone: +91 832-2580279 (O), 9011069426

EDUCATION

2001-2007	Ph.D. "On Certain Wave Propagation Problems Involving First Order Quasi-Linear Hyperbolic Systems of PDEs." **(Best Thesis Award)** Indian Institute of Technology Bombay, India. **Supervisor:** Professor V. D. Sharma
1998-2000	Master of Science (**With Scholarship**) Applied Mathematics The University of Roorkee (Indian Institute of Technology Roorkee), Roorkee
1995-1998	Bachelor of Science (Mathematics, Physics and Computer Science), Kurukshetra University

PUBLICATIONS

1. **Manoj Pandey**, V.D. Sharma, Interaction of a Characteristic Shock with a Weak Discontinuity in a Non-Ideal Gas, Wave Motion, 44(2007), 346-354.

2. **Manoj Pandey**, R. Radha, V.D. Sharma, Symmetry Analysis and Exact Solutions of Magnetogasdynamic Equations, Quarterly

Journal of Mechanics and Applied Mathematics, 61(2008), 291-310.

3. **Manoj Pandey,** V.D. Sharma, Kinematics of a Shock Wave of Arbitrary Strength in a Non-Ideal Gas, The Quarterly of Applied Mathematics, 67 (2009), 401-418.

4. **Manoj Pandey**, B. D. Pandey, V.D. Sharma, Symmetry Groups and Similarity Solutions for System of Equations for a Viscous Compressible Fluid, Applied Mathematics and Computation, 215(2009), 681-685.

5. **Manoj Pandey**, Group Theoretic Method for Analyzing Interaction of a DiscontinuityWave with a Strong Shock in an Ideal Gas, Z. Angew. Math. Phys. (ZAMP), 61 (2010), 87-94.

6. **Manoj Pandey, Exact** Solutions of the Shallow Water Equations, The International Journal of Nonlinear Science, 16 (2013), 334-339.

7. **Manoj Pandey,** Evolution of Weak Discontinuities in Non-ideal Magnetogasdynamic Equations, **Int. J. Appl. Comput. Math.**, DOI 10.1007/s40819-015-033-y, Springer (2015).

8. **Manoj Pandey**, Lie Symmetries and Exact Solutions of Shallow Water Equations with Variable Bottom, **International Journal of Nonlinear Sciences and Numerical Simulation** (IJNSNS), 16, (2015), 337-342, de Gruyter.

9. P.K. Pradhan and **Manoj Pandey**, Lie Symmetries, One-Dimensional Optimal System and Group Invariant Solutions for the Ripa System, **International Journal of Nonlinear Sciences and Numerical Simulation** (IJNSNS), 20, (2019), 713-7233, de Gruyter.

10. P.K. Pradhan and **Manoj Pandey**, Symmetry Analysis and Optimal System of Generalized Chaplygin Gas Equations with a Source Terms, **Mathematical Methods in The Applied Sciences,** 43, 2020, 6081-6092.

11. Sweta Govekar, P. K. Pradhan and **Manoj Pandey,** Evolution of Contact and Discontinuity Waves in Two Phase Drift Flux Model,

Int. J. Appl. Comput. Math., doi.org/10.1007/s40819-020-00883-6. (Accepted for Pub.)

12. Dia Zeidan, Sweta Govekar and **Manoj Pandey**, Discontinuity wave interactions in generalized magnetogasdynamics, Acta **Astronautica,** 180, 2021, 110-114.

13. Dia Zeidan, **Manoj Pandey** and Sweta Govekar, Interaction of shock and discontinuity waves at the stellar surfaces, **Physics of Fluids**, 34, 066111, 2022.

14. Pabitra Kumar Pradhan, Dia Zeidan and **Manoj Pandey,** Multi-dimensional optimal system and conservation laws for Chaplygin gas Cargo-LeRoux model, **Journal of Mathematical Analysis and Applications (JMAA),** 521, 126912, 2023.

15. Sandhya Maurya, Dia Zeidan and Manoj Pandey, Symmetry Analysis, Optimal System, and Invariant Solutions for a (2+1)-dimensional Two-Phase Mass Flow Model, **International Journal of Non-Linear Mechanics**, 158, 104585, 2024.

16. Dia Zeidan, Pabitra Kumar Pradhan, and **Manoj Pandey**, Interaction of Discontinuity Wave with a Shock wave in a Real Gas. (communicated).

17. Sandhya Maurya, Dia Zeidan and **Manoj Pandey**, Lie symmetries, Optimal Systems and Conservation Laws in Real Gas. (Communicated)

PAPER PRESENTED at CONFERENCES

- **Manoj Pandey,** Exact Solutions of Magnetogasdynamic Equations, Presented at the International Conference on Special Functions & Their Applications (ICSFA 2014).

- Rajeev Kumar, Anupama Bansal, and **Manoj Pandey**, Some Exact Solutions of Fractional Order Burgers-Poisson Equation, Recent Advances in Theoretical and Computational Partial Differential

Equations with Applications (TCPDE- 2016), Punjab University, Chandigarh, Dec. 05-09, 2016.

- Anupama Bansal, Rajeev Kumar and **Manoj Pandey**, Lie Symmetries and Invariant Solutions of Nonlinear Time Fractional Hyperbolic Partial Differential Equation, Recent Advances in Theoretical and Computational Partial Differential Equations with Applications (TCPDE- 2016), Punjab University, Chandigarh, Dec. 05-09, 2016.

- Pabitra Pradhan and **Manoj Pandey**, Lie Symmetries and Exact Solutions of Shallow Water Equations with Horizontal Temperature Gradient, International Conference on Mathematical Modelling and Computations (ICMMC-2018), South Asian University New Delhi, 1-3 December 2018.

- Sweta Govekar and **Manoj Pandey**, Interaction of weak discontinuity with characteristic shock in generalized magnetogasdynamic equations, International Conference on Mathematical Computer Engineering - 2018 (ICMCE-2018) at Vellore Institute of Technology, Chennai, India.

- Pabitra Kumar Pradhan and **Manoj Pandey,** Lie symmetries, one-dimensional optimal system and group invariant solutions of generalized Chaplygin gas equations, ICIAM-2019, Valencia (Spain).

- Pabitra Kumar Pradhan and **Manoj Pandey,** Symmetry Analysis and optimal system of generalized Chaplygin gas equations, 85th Annual conference of Indian Mathematical Society, IMS-2019, IIT Kharagpur.

- Sweta Govekar, Pabitra Kumar Pradhan and **Manoj Pandey,** Evolution of contact and weak discontinuity waves in two-phase drift flux model, AUS-ICMS 2020, American University of Sharjah, UAE.

- Pabitra Kumar Pradhan and **Manoj Pandey**, Multi-dimensional optimal system for Chaplygin gas Cargo-LeRoux model, ICIAM-2023, Tokyo, Japan.

WORKSHOPS (Attended/Organized)

- Workshop for College/University Teacher: Teaching Strategies in Mathematics, April 28-29, 2017.

- Regional Workshop on Outcome-Based Learning Using Pedagogy Frame Work Model, Feb. 10-11, 2017, BITS Pilani K K Birla Goa Campus.

- Workshop on Effective Teaching & Learning, BITS Pilani K K Birla Goa Campus, July 18-20, 2015.

- Introductory Workshop on MATHEMATICA, Department of Mathematics, BITS Pilani K K Birla Goa Campus, 24-25 July 2013

- Introductory Workshop on SCILAB, Department of Mathematics, BITS Pilani K K Birla Goa Campus, 9-10 July 2012.

- Advances in Computational Partial Differential Equations, Department of Mathematics, BITS Pilani K K Birla Goa Campus, 7th Feb. - 5th March 2011.

- Recent Trends in Scientific Computations, Department of Mathematics, BITS Pilani K K Birla Goa Campus, 20-25 July 2009.

- Tutorial Instructor at the SERC School, Centre for Mathematical Sciences, Pala, Kerala, 10 -20 Sep. 2008.

- Instructional School on Computational PDEs (CPDE-05), Indian Institute of Technology Bombay, June 05- June 24, 2005.

- Scientific Computation, Numerical Analysis, and Applications, Indian Institute of Science, Bangalore, July 04-July 15 2005.

- International Conference on Mathematical Fluid Dynamics, held at the University of Hyderabad, Hyderabad, Dec. 01- 04 2004.

WORK EXPERIENCE

- July 2007 - December 2007
  Research Associate in the Department of Mathematics, Indian Institute of Technology Bombay.

- January 2008 - June 2008
  Lecturer, Thapar University (TIET), Patiala, Punjab.

- July 2008 - June 2009
  Assistant Professor, Centre for Mathematical Sciences, Pala Campus Kerala.

- July 2009 - 2022
  Assistant Professor, Birla Institute of Technology and Science, Pilani K K Birla Goa Campus.

- July 2022- to date
  Associate Professor, Birla Institute of Technology and Science, Pilani K K Birla Goa Campus.

TEACHING INTEREST

I have a keen teaching interest in fundamental mathematical topics, such as Ordinary and Partial Differential Equations, Linear Algebra, and Optimization. These subjects are crucial in mathematics and find diverse applications across various fields.

Teaching these subjects presents challenges and rewards, as it involves guiding students in cultivating problem-solving abilities and grasping fundamental mathematical concepts essential across various fields of study. A blend of theoretical explanations, practical examples, and real-world applications can captivate students' attention and ignite their curiosity in these subjects. Furthermore, offering hands-on opportunities for students to apply

these mathematical tools to solve problems can significantly enhance their learning.

AWARDS/ FELLOWSHIPS

- Merit Scholarship for securing the second position during M.Sc, awarded by Indian Institute of Technology Roorkee (1998-2000)
- Graduate Aptitude Test in Engineering (GATE-2000), conducted by the Ministry of Human Resource and Development (MHRD), Govt. of India.
- **Prof. Prabhulal Bhatnagar Memorial** prize for outstanding performance during Ph.D. awarded by Indian Institute of Technology Bombay, 2008.
- **Ahlfors Seminar Award-2015**, Awarded by Department of Mathematics, BITS Pilani K K Birla Goa Campus.
- **Excellence in Teaching** award – 2022, Awarded by BITS Pilani K K Birla Goa Campus.

COMPUTER EXPOSER

Operating Systems:	Linux and Windows
Mathematical Software:	Mathematica and Matlab
Text Formatting:	LaTex and Microsoft Word
LMS:	Google Classroom, Moodle.

ADMINISTRATIVE EXPERIENCE

- Nucleus Member of the Teaching Learning Centre (2015 - 2019)
- Member of the Academic Counseling Board for Students

- Member of the Doctoral Advisory Committee (DAC)
- Member of the Department Research Committee (DRC) (2013 - 2018)
- BITSAT Coordinator for Mathematics
- Member of the Department Academic and Student Affairs Committee
- Member of the Department Recruitment Committee
- Warden for student hostel (2019 - 2022)
- Nucleus member Academic Under -Graduate Studies Division (2017- 2022)
- Faculty In-Charge Academic Graduate Studies and Research Division (2023- till date)
- Co-opted member of the Senate

CO-CURRICULAR ACTIVITIES

Department Representative (Placement), Department of Mathematics, University of Roorkee, Roorkee, year 1999-2000.

Sports Person of the Year award for outstanding performance in Sports for the years 2004-2005.

Won Gold Medal at PG Football Tournament at Indian Institute of Technology Bombay, year 2006.

Lok Pati Tripathi

Assistant Professor,
School of Mathematics and Computer Science,
Indian Institute of Technology Goa, Goa
Ponda - 403401, India

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Date of Birth : 1^{st} Feb 1986
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Phone : 0832 249 0120

Professional Experience

- **Assistant Professor**
  Mathematics, IIT Goa — *January 2018–present*
- **Post-doctral Fellow**
  Mathematics, IIT Bombay — *May 2016–December 2017*

Education

- **IIT Kanpur** — Kanpur, India
  Doctor of Philosophy (Ph.D.), Mathematics — *March 2016*
  ***Thesis Advisor**: Prof. Mohan Krishen Kadalbajoo*
  ***Thesis Title**: Robust numerical methods with error analysis for parabolic partial differential and integro-differential equations arising in finance.*
- **Dr. RML Avadh University** — Ayodhya, India
  Master of Science (M.Sc.), Mathematics and Statistics — *2007*

Research Interest

My research interests are broadly in *Numerical Analysis* and *Computational Finance*. In particular, I am interested in the following research areas:

- Numerical approximations of
  - partial differential/ integro-differential equations and inequalities arising in finance,
  - fractional partial differential equations, and
  - stochastic partial differential equations.
- Scientific machine learning with applications to finance.

Ph.D. Guidance

- **Aditi Tomar**: She is nearing completion of her thesis, which focuses on developing numerical methods for time fractional PDEs and PIDEs, specifically with an application in finance.
- **Jitendra Nath Naik**: He has successfully completed state of the art seminar on the numerical approximations of stochastic partial differential equations and has now begun working on the problem.

UG Students Guided For Bachelor Thesis Project (BTP)

- **Ashutosh Saxena, BTP Title**: Multi-asset option pricing using deep learning.
- **Shantanu Wagh, BTP Title**: Multi-asset option pricing using deep learning.

Selected Publications/Preprints

[5] Aditi Tomar, **Lok Pati Tripathi**, and Amiya K Pani. Optimal error analysis of a non-uniform IMEX-L1 finite element method for time fractional PDEs and PIDEs. *arXiv preprint arXiv:2302.05188*, **2023**.

[4] **Lok Pati Tripathi**, Amiya K. Pani, and Graeme Fairweather. A qualocation method for parabolic partial integro-differential equations in one space variable. *In: Dick J., Kuo F., Woźniakowski H. (eds)* ***Contemporary Computational Mathematics*** *- A Celebration of the 80th Birthday of Ian Sloan. Springer, Cham*, **2018**.

[3] Mohan K. Kadalbajoo, **Lok Pati Tripathi**, and Alpesh Kumar. An error analysis of a finite element method with IMEX-time semidiscretizations for some partial integro-differential inequalities arising in the pricing of American options. ***SIAM J. Numer. Anal.***, 55(2):869–891, **2017**.

[2] Mohan K. Kadalbajoo, **Lok Pati Tripathi**, and Alpesh Kumar. Second order accurate IMEX methods for option pricing under Merton and Kou jump-diffusion models. ***J. Sci. Comput.***, 65(3):979–1024, **2015**.

[1] Mohan K. Kadalbajoo, **Lok Pati Tripathi**, and Puneet Arora. A robust nonuniform B-spline collocation method for solving the generalized Black-Scholes equation. ***IMA J. Numer. Anal.***, 34(1):252–278, **2014**.

A complete list of my publications can be obtained from the following links: (A) Google Scholar, (B) MATHSCINET

Publications under preparation

- Aditi Tomar, **Lok Pati Tripathi**, and Amiya K. Pani. *Optimal error analysis of a non-uniform IMEX-L1 mixed finite element method for time-fractional PDEs and PIDEs.*
- Aditi Tomar, **Lok Pati Tripathi**, and Amiya K. Pani. *A finite element method for time-fractional parabolic PDEs with non-smooth initial data: Applications to finance.*
- **Lok Pati Tripathi**, and Amiya K. Pani. *An H^1-Galerkin mixed FEM for evolution equations with non-smooth initial data: Applications to option pricing problems.*

Invited Talks

- **International Conference on Computational Partial Differential Equations & Applications, $6^{th} - 8^{th}$ Sept 2022, BML Munjal University, Gurgaon, India. Title of the talk**: An H^1-Galerkin Mixed FEM for Time Fractional Partial Differential Equations With An Application To Finance.
- **International Conference on Modelling, Analysis and Simulations of Multiscale Transport Phenomena, $25^{th} - 27^{th}$ Aug 2022, Indian Institute of Technology Kharagpur, India. Title of the talk**: An H^1-Galerkin mixed FEM for parabolic PDEs with non-smooth initial data: Application to Black-Scholes model.
- **Annual Math Symposium, $25^{th} - 26^{th}$ March 2022, IISER Bhopal, India. Title of the talk**: A Finite Element Method for Time Fractional Partial Differential Equations - An Application in Financial Modeling.
- **International Conference on Computational Sciences - Modelling, Computing and Soft Computing, $10^{th} - 12^{th}$ Sep 2020, National Institute of Technology Calicut, Kerala, India. Title of the talk**: An Efficient Finite Element Method for Pricing European Style Options.
- **International Conference on Recent Developments in Theory, Computation, and Application of Differential Equations, $21^{st} - 23^{rd}$ Jan 2019, South Asian University, New Delhi, India. Title of the talk**: A finite element method for pricing European style options under jump-diffusion models.
- **International Conference on Mathematical Modelling and Computations, $1^{st} - 3^{rd}$ Dec 2018, South Asian University, New Delhi, India. Title of the talk**: An H^1-Galerkin mixed finite element method for pricing options under a generalized Black-Scholes model.

Reviewer/Editor for Journals

Reviewer: Numerical Algorithms, Springer, and Journal of Scientific Computing, Springer.

Workshop/Conference Organized

High-End Workshop on Computational Finance: This Karyashala (High-End Workshop) on '*Computational Finance*' was conducted under Abhyaas (Skill Development) mission, a SERB initiative, in offline mode from July 10 to July 16, 2022, at the School of Mathematics and Computer Science, IIT Goa.

Teaching: (Courses taught at IIT Goa)

UG Courses: MA354: Computational Finance - An Introduction to Option Pricing, MA307: Stochastic Processes, MA305: Measure & Probability, MTH213: Numerical Analysis, MTH222: Linear Algebra and Applications, MTH1021: Linear Algebra, (MTH101: Calculus.

PG Courses: MA604: Measure Theory, MTH613: Fourier Analysis and Its Applications, MA608: Computational Finance - A PDE Approach, MA855: Topics in Numerical Analysis – I.

CURRICULUM VITAE

Saumya Bajpai
Assistant Professor (Grade-I),
School of Mathematics and Computer Science,
IIT Goa, Farmagudi,
Ponda - 403401,
Goa, India.

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Phone: +91-9624270938, +91-9537946694

RESEARCH INTEREST: Finite Element Methods, Numerical Analysis, Scientific Computing, Navier-Stokes equations, Viscoelastic fluid flows, Sobolev Equations, Coulpled Navier-Stokes models (Cahn-Hilliard- Navier-Stokes model, Boussinesq model).

PUBLICATIONS:

1. Ray, K., Goswami, D. and Bajpai, S., *A discontinuous Galerkin two-grid method for the transient Navier-Stokes equations*, Computational Methods in Applied Mathematics **(Accepted)**.

2. Bajpai, S. and Swain, D. K., *A priori error estimates of a three-steps two-level finite element Galerkin method for a 2D-Boussinesq system of equations*, **Computers & Mathematics with Applications**, **146** 2023, 137-164.

3. Bajpai, S., Goswami, D. and Ray, K., *A priori error estimates of a discontinuous Galerkin method for the Navier-Stokes equations*, **Numerical Algorithm**, (2023), https://doi.org/10.1007/s11075-023-01525-w.

4. Bajpai, S., Goswami, D. and Ray, K., *Fully discrete finite element error analysis of a discontinuous Galerkin method for the Kelvin-Voight viscoelastic fluid model*, **Computers & Mathematics with Applications**, **130** (2023), 69-97.

5. Pany, A. K., Bajpai, S. and Mishra, S, *Finite element Galerkin method for 2D Sobolev equations with Burgers' type nonlinearity*, **Applied Mathematics and Computation**, **387** (2020).

6. Bajpai, S. and Pany, A. K., *A priori error estimates of fully discrete finite element Galerkin method for Kelvin-Voigt viscoelastic fluid flow model*, **Computers & Mathematics with Applications**, **78** (2019), 3872-3895.

7. Bajpai, S. and Pani, A. K., *On a three level two-grid finite element method for the 2D-transient Navier-Stokes equations*, **Journal of Numerical Mathematics**, **25** (2017), 199-228.

8. Kundu, S., Pani, A. K. and Bajpai, S., *Asymptotic behavior and optimal error estimate of Kelvin-Voigt viscoelastic fluid flow model*, **Numerical Algorithms**, **75** (2017), 619-653.

9. Pany, A. K., Bajpai, S. and Pani, A. K., *Optimal error estimates for the semidiscrete Galerkin approximations to the equations of motion described by Kelvin-Voigt viscoelastic fluid flow model*, **Journal of Computational and Applied Mathematics**, **302** (2016), 234-257.

10. Bajpai, S. and Nataraj, N., *On a second order fully discrete two-grid finite element scheme for the equations of motion arising in Kelvin-Voigt model*, **Computers & Mathematics with Applications**, **68** (2014), 2277-2291.

11. Bajpai, S., Nataraj, N. and Pani, A. K., *On a two-grid finite element scheme for the equations of motion arising in Kelvin-Voigt model*, **Advances in Computational Mathematics**, **40** (2014), 1043-1071.

12. Bajpai, S., Nataraj, N. and Pani, A. K., *On fully discrete finite element schemes for equations of motion of Kelvin-Voigt fluids*, **International Journal of Numerical Analysis and Modeling**, **10** (2013), 481-507.

13. Bajpai, S., Nataraj, N., Pani, A. K., Damazio, P. and Yuan, J. Y., *Semidiscrete Galerkin method for equations of motion arising in Kelvin-Voigt model of viscoelastic fluid flow*, **Numerical Methods for Partial Differential Equations**, **29** (2013), 857-883.

SUBMITTED/PREPRINT

1. Ray, K. , Goswami, D. and Bajpai, S., *A discontinuous Galerkin method for the equations of motion arising in the Oldroyd model of order one*, **(Communicated)**.

2. Bajpai, S. and Swain, D. K., *Discontinuous Galerkin finite element analysis for the Boussinesq system of equations*, **(Communicated)**.

3. Bajpai, S., Goswami, D., Ray, K. and Swain, D. K., *Finite Element Analysis for the discontinuous Galerkin two-grid method for the Sobolev equations* **(Preprint)**.

4. Bajpai, S. and and Swain, D. K, *Finite element penalty method for the Kelvin-Voigt viscoelastic fluid motion equations*, **(Preprint)**.

5. Bajpai, S., Goswami, D. and Ray, K., *A three-steps two-grid discontinuous Galerkin finite element method for the viscoelastic Oldroyd fluid of order one* **(Preprint)**.

Academic Qualification and Work Experience

Assistant Professor (Grade-I) March 2018 - till date

– **Department/Institute:** School of Mathematics and Computer Science, IIT Goa, Ponda - 403401, Goa, India.

Postdoc December 2017 - March 2018

– **Institute:** School of Engineering, IIT Mandi, Mandi, India.
– **Work Title:** Multi-scale modeling of heterogeneous materials.
– **Mentor**: Dr. Rajneesh Sharma.

Assistant Professor (AGP-8000) March 2016 - December 2017

– **Department/Institute:** Department of Mathematics, IITRAM, Ahmedabad - 380008, Gujarat, India.

Assistant Professor (AGP-7000) June 2015 - February 2016

– **Department/Institute:** Department of Mathematics, IITRAM, Ahmedabad - 380008, Gujarat, India.

Visiting Assistant Professor August 2014 - May 2015

– **Department/Institute:** Department of Mathematics, IITRAM, Ahmedabad - 380008, Gujarat, India.

Postdoc March 2013 - August 2014

– **Institute:** Tata Institute of Fundamental Research, Center for Applicable Mathematics, Bangalore, India.
– **Work Title:** Control and Stabilization of Navier-Stokes fluid flow coupled with heat equation.
– **Mentor**: Professor Mythily Ramaswamy.

Research Associate September 2012 - March 2013

– **Institute:** IIT Bombay, Mumbai, India.
– **Nature of duties:** Research and Teaching .
– **Supervisor(s)**: Professor Amiya K. Pani and Professor Neela Nataraj.

Ph.D. Mathematics January 2008 - September 2012

– **Institute:** IIT Bombay, Mumbai, India.

– **Thesis Title:** Finite Element Galerkin Methods for Equations of Motion Arising in the Kelvin-Voigt Model.
– **Thesis Supervisor(s)**: Professor Amiya K. Pani and Professor Neela Nataraj.

M.Sc. Mathematics 2004 - 2006

– **Institute:** IIT Madras, Chennai, India.

EXCELLENT TEACHING PERFORMANCE AWARDS:

1. Excellent Teaching Performance for the course Numeical analysis (MA214) (Tutorial) during the **Spring 2019-2020 semester** at IIT Goa.
2. Received the "Certificate of Excellence in Teaching" on the occasion of Teacher's Day 2021 for the excellent teaching performance in the B.Tech first year Ordinary Differential Equation course (MA103) for the **Spring 2020-2021 semester** at IIT Goa.
3. Received the "Certificate of Excellence in Teaching" on the occasion of Teacher's Day 2021, 2022 for the excellent teaching performance in Linear Algebra and Applications (MA206) for the **Autumn 2021-2022 semesters** at IIT Goa.
4. Received the "Certificate of Excellence in Teaching" on the occasion of Teacher's Day 2022 for the excellent teaching performance in the B.Tech first year Ordinary Differential Equation course (MA103) for the **Spring 2021-2022 semester** at IIT Goa.
5. Received the "Certificate of Excellence in Teaching" on the occasion of Teacher's Day 2021 for the excellent teaching performance in Linear Algebra and Applications (MA206) for the **Autumn 2022-2023 semester** at IIT Goa.

AWARDS/FELLOWSHIPS:

– I have received Travel Grant by the organizer as an invited speaker in "MAFELAP 2019, Conference on the Mathematics of Finite Elements and Applications" during June 18-21, 2019, at Brunel University, London.

– I have been invited to deliver lectures on Finite Element Methods in the Instructional school for Teachers (IST) on " Partial Differential Equations: From Theory to Computation" during June 3-15, 2019 at IIT Mandi.

– I have been selected for ICM2018 - Open Arms ICM 2018, Rio de travel Grant to attend ICM 2018, Brazil in 2018. (Not availed)

– I have been selected for "The European Aeronautic Defence and Space Company N.V. (EADS)" fellowship to work on an Indo-French project, 2014.

- I have received the NBHM post-doctoral fellowship at TIFR (CAM), Bangalore, India, from March 2013 - to August 2014.
- I have been awarded Prof. Prabhulal Bhatnagar memorial prize for 2012-2013 from IIT Bombay, India, being the most outstanding student during my Ph.D. in Mathematics.
- I have received Senior Research Fellowship From University Grants Commission (UGC), Govt. of India, for Ph.D. at IIT Bombay, January 2010 - December 2012.
- I have received Junior Research Fellowship From University Grants Commission (UGC), Govt. of India, for Ph.D. at IIT Bombay, January 2008 - December 2009.
- I have qualified joint CSIR-UGC Junior Research Fellowship (JRF) and Lectureship-National Eligibility Test (NET), which was held on June 18, 2006, in the subject of Mathematical Sciences.
- I have qualified GATE examination in 2006 with the subject Mathematical Sciences.

RESEARCH GRANT:

- SEED Grant (2019/SG/SB/022) on "Theoretical and Computational Study of Boussinesq System of Equations Using Finite Element Galerkin Method" from IIT Goa in 2018 for three years. **Grant amount:** Rs. 5,00,000.
- SERB Core Research Grant (CRG/2021/008278) on "Control and Finite Element Analysis of Cahn-Hilliard-Navier-Stokes system" from Department of Science and Technology, Government of India for three years in the year 2022. **Grant amount:** Rs 18,30,400.

REVIEWER of:

- International Journal of Computer Mathematics, Numerical Algorithm, Mathematical Reviews, Computational Methods in Applied Mathematics, Computers & Mathematics with Applications, Mathematical Methods in the Applied Sciences, Journal of Computational and Applied Mathematics. .

CONFERENCES/LECTURES/WORKSHOPS PARTICIPATION:

- Invited speaker in "International Conference on Computational Partial Differential Equations and Applications (ICCPDEA-2022)" during September 6 - 8, 2022 at BML Munjal University, India.
- Session Chair at International Conference on Computational Partial Differential Equations & Applications (ICCPDEA-2022), BML Munjal University, September 6-8, 2022.

- Invited speaker in "9th International Conference on Computational Methods in Applied Mathematics (CMAM 2022)" during August 29 - September 2, 2022 at TU Wien, Vienna, Austria.
- Invited speaker in "Virtual Networking Workshop" held on 24th January 2022 at University of Strathclyde Glasgow, Scotland.
- Invited Speaker in "MAFELAP 2019, Conference on the Mathematics of Finite Elements and Applications" during June 18 - 21, 2019 at Brunel University London.
- Invited speaker in the Instructional school for Teachers (IST): I have been invited to deliver lectures on Finite Element Methods in the Instructional school for Teachers (IST) on "Partial Differential Equations: From Theory to Computation" during June 3-15, 2019 at IIT Mandi.
- Invited Speaker in "International Conference on recent developments in Theory and Computation & application of Differential Equations" during January 21-23, 2019 at South Asian University, New Delhi.
- Invited Speaker in "International Conference on Mathematical Modelling and Computations-2018" during December 1-3, 2018 at South Asian University, New Delhi.
- Invited speaker in "Current Trends in Theoretical and Computational Differential Equations with Applications" during December 1-5, 2017 at South Asian University, New Delhi
- Invited speaker in "International Conference on Current Trend in PDEs: Theory and Computations" during December 28-30, 2015 at South Asian University, New Delhi .
- Participated in "Workshop on optimization with PDE constraints" held at TIFR Center for Applicable Mathematics, Bangalore during November 25 - December 6, 2013.
- Presented a paper in "In-house symposium" held at TIFR Center for Applicable Mathematics, Bangalore during November 12-13, 2013.
- Participated in the workshop "Summer School on Numerics and Control of PDE" held at Indian Institute of Science, Bangalore during July 22, 2013 - August 2, 2013.
- Participated in "CIMPA-NPDE research school and pre-school" held at Indian Institute of Science, Bangalore during June 24, 2013 - July 19, 2013.
- Participated in the Advanced Workshop on "Non Standard Finite Element Methods" held in Indian Institute of Technology Bombay during February 11-15, 2013.
- Participated in an "International workshop on adaptive finite element methods" held at department of Mathematics, IIST during March 16-25, 2012.
- Participated in "Advances in Computational Partial Differential Equations (ACPDE 2011)" held at Department of Mathematics, BITS Goa campus during February 7-26, 2011.

– Presented a paper in "CWB2010-the Second Congress on Mathematics and its Applications" during December 6-10, 2010 at Curitiba, Brazil.

– Participated in " Workshop on Control and Inverse Problems" held at Indian Institute of Science, Bangalore during December 1-15, 2009.

– Participated in "International Conference on Control and Inverse Problems" held at Indian Institute of Science, Bangalore during December 16-18, 2009.

ADMINISTRATIVE SERVICE TO INSTITUTE (IIT GOA):

- Program coordinator of the Mathematics program of School of Mathematics and Computer Science, from September 1, 2022-till date.
- Chairman of Senate Undergraduate Committee (SUGC) for the academic year 2023-2024.
- Girls hostel warden from March 1, 2022- October 25, 2023.
- Member of the SUGC committee, from 2021-2023.
- Chair of Committee for celebration of the International Women's Day, 2023.
- Member of the Transport Management Committee at IIT Goa (Dec 2022 to Dec 2023).
- Served as an external member in the (SERB CRG project) JRF selection committee at IISER Trivendrum on 19th August, 2022.
- Member of the committee for the establishment of the Creche facility (Nov 2022)
- One of the judges for the poster presentation competition as a part of the implementation of the sexual harassment Act at the workplace, IIT Goa 2022.
- Observer of the selection committee for the recruitment of Network and System Administrator at IIT Goa.
- Member of the committee to design the academic calendar for the Academic Year 2022-23.
- Member of convocation Designs sub-committee for the year 2021, 2022, 2023.
- Member of the Committee for NIRF 2021.
- Intender for the "High performance computing" facility at IIT Goa.
- Served as a committee member for procurement of MATLAB at IIT Goa and IITRAM Ahmedabad.
- Served as a committee member in Mathematics and Computing curriculum development committee at IIT Goa.

- Served as an external member in the (SERB CRG project) JRF selection committee at BITS Pilani Goa on October 17, 2020.
- Member of (feedback) committee to improve the quality of the student feedback form 2019.
- Served as a committee member for Independence Day Celebration, 2019.