



## *Dr. Madhukant Sharma*

### **Affiliation**

Assistant Professor (Mathematics),  
Indian Institute of Information Technology Dharwad,  
Hubli - 580029, Karnataka (India)  
Ph: +91-9963747090, +91-9025777409.  
E-mail: sharmamk003@gmail.com,  
madhukant.sharma@iiitdwd.ac.in.

### **Present Address**

Guest House No. 4, IIIT Dharwad,  
3rd floor, A Block,  
IT Park, Opp. Glass House  
Hubli - 580029,  
Dist. Dhwarwad,  
Karnataka, India.

### **Teaching Experience**

**03 Aug. 2018 - Till Date** (Indian Institute of Information Technology Dharwad):

Course Id	Course Title	Period(Year)
MA101	Mathematics - I (Calculus & Mathematical Analysis)	Aug. - Dec. (2018)

**12 Aug. 2015 - 31 Jul. 2018** (Mahindra École Centrale, Hyderabad):

Course Id	Course Title	Period(Year)
MA 203	Complex Analysis & Integral Transforms	Aug. - Nov. (2015)
MA 204	Computational Methods & Scientific Computing	Jan. - April (2016 & 2017)
MA 305	Probability, Statistics & Stochastic Processes	Aug. - Nov. (2016 & 2017)
CSD 204	Object Oriented Programming (C Labs)	Jan. - Feb. (2017)
MA 102	Linear Algebra & Applied Analysis	Feb. - April (2017)
CSD 216	Object Oriented Paradigm Lab	Aug. - Nov. (2017)
ME 121	Mathematics - II	Jan. - Apr. (2018)

**Jan. 2011 - Aug. 2015** (IIT Madras):

I have taken several tutorial classes and conducted lab classes as a teaching assistant in the basic core courses during doctoral study (2011 - 2015) at IIT Madras.

### **Academic Qualifications**

- 25 April 2015 - 11 Aug. 2015 Pre Doctoral Fellow,  
Dept. of Mathematics, IIT Madras.
- 11 Jan. 2011 - 19 Jun. 2015 PhD in Mathematics,  
Specialization: Fractional Functional Differential Equations,  
Dept. of Mathematics, IIT Madras.  
Marks in CGPA -  $8.25/10.0 = 77.50\%$ .
- July 2008 - May. 2010 M.Sc. (Mathematics),  
Dept. of Mathematics & Statistics, IIT Kanpur.  
Marks in CGPA -  $8.7/10.0 = 87.00\%$ .
- July 2003 - June 2006 Graduation in Arts with Mathematics,  
Vaish Post Graduate College, Bhiwani (Haryana).  
Marks in Percentage - 68.25% .
- July 2002 - June 2003 12<sup>th</sup> with Mathematics,  
TIT Senior Secondary School, Bhiwani (Haryana)  
Marks in Percentage - 68.80% .
- July 2000 - June 2001 10<sup>th</sup>,  
TIT Senior Secondary School, Bhiwani (Haryana).  
Marks in Percentage - 63.00% .

## Scholastic Achievements

- **Pre Doctoral Fellowship (PDF):** From 25th April 2015 - 11th August 2015.
- **Half Time Research Assistantship (HTRA):** From 11 January 2011 - 24th April 2015.
- University Grant Commission (**UGC**) Fellow for the Year (2010).
- Qualified twice in Graduate Aptitude Test in Engineering (**GATE**) - (2009 & 2010).
- **Merit Cum - Means Scholarship:** From July 2008 - May 2010 in M.Sc. (Mathematics).
- Qualified twice in Joint Admission Test to M.Sc. (**JAM**) - (2007 & 2008).

## Research Projects

### 1.) **M.Sc - Project** (Jan. 2010 - June 2010)

**Title:** Modeling and simulation of dispersed two phase flows of bubbles, drops and particles.

**Supervisor:** Prof. B. V. Rathish Kumar, Dept. of Mathematics & Statistics, IIT Kanpur.

**Abstract:** In this study, we analyzed an averaged two - fluid flow model for dispersed Two - Phase flows of Bubbles, Drops and Particles based on simple similarity criteria and mixture viscosity concept. Moreover, ordinary differential equations (ODEs) describing the relative velocities of liquid and gas phases together with the ODE for the density of gas phase are considered as Initial Value Problems (IVPs). The approximate solutions of IVPs have been investigated by different numerical schemes to identify a reasonably efficient numerical scheme for future practical considerations. Further, based on modified Ishii et al. (2011) model the effect of variation of void fraction and phase velocities of the fluids across the cross section of the pipe have been investigated. The equations of Kumar et al. (1976) are used to calculate the Bubble size at the mixer orifice exit. Void fraction and slip at different locations are determined for a model of nitrogen - mercury system set up, where the mass fluxes varying from  $0.125$  to  $2.302\text{kg/sm}^2$  for nitrogen and  $5.52 \times 10^3$  to  $12.26 \times 10^3 \text{ kg/sm}^2$  for mercury. Finally, the predicted values have been compared with the experimental data. Also, influence of pressure and mass flow rates on gas and liquid velocities, void fraction, density of gas, friction and drag coefficients have been investigated.

#### **Acknowledgement**

This work has been carried out under the project (2008/34/15-BRNS/4008) funded by BARC, Mumbai.

### 2.) **Doctoral Research** (Jan. 2011 - June 2015):

**Title:** An Investigation of Nonlocal Fractional Order Functional Differential Equations.

**Supervisor:** Dr. Shruti Dubey, Dept. of Mathematics, IIT Madras.

**Abstract:** This work is consecrated to study the qualitative and quantitative characteristics such as existence, uniqueness, regularity, continuous dependence on initial data and controllability of solutions to various type of nonlinear functional differential equations of fractional order in a Banach space along with a more general non-local condition. The presented constitutive approach demonstrates the pertinency of rich theory of functional analysis and classical semigroup theory to analyze such important features for fractional evolution systems.

#### **Acknowledgement**

I am thankful to IIT Madras for providing financial support.

### 3.) **Completed Project** (Nov. 2016 - March 2017):

**Title:** Qualitative Analysis of Fourth Order Partial Differential Equation Models in Image Denoising.

**Principal Investigators:** Dr. Madhukant Sharma, Dr. Mahipal Jetta, Dr. Manoj Kumar Yadav

#### **Objectives:**

- Propose a fourth order PDE which could retain the noise removing and edge preservation capability, and produces a speckle and splotchy artifacts free image.
- Use/develop an efficient and reliable numerical method for the proposed PDE. Also, show that the proposed numerical scheme is consistent and stable.

**Budget:** 1.66 Lakhs.

#### **Acknowledgement**

We are thankful to Mahindra École Centrale, Hyderabad for providing financial support.

#### **Research Papers Published**

- **Indira Mishra, Madhukant Sharma**, Approximate Controllability of a Non-Autonomous Differential Equation, Proceedings - Mathematical Sciences, Vol. **128** (3), <https://doi.org/10.1007/s12044-018-0391-6>.
- **Madhukant Sharma, Shruti Dubey**, Analysis of Fractional Functional Differential Equations of Neutral Type with Nonlocal Conditions, Differential Equations and Dynamical Systems, Vol. **25**, pp. 499-517, 2017, ISSN NO.: 0974-6870.
- **Madhukant Sharma, Shruti Dubey**, Controllability of Sobolev type Nonlinear Nonlocal Fractional Functional Integro-differential Equations, Progress in Fractional Differentiation and Applications, Vol. **1**, No. 4, pp. 281 - 293, 2015.
- **Madhukant Sharma, Shruti Dubey**, Controllability of Nonlocal Fractional Functional Differential Equations of Neutral Type, International Journal of Dynamical Systems and Differential Equations, Vol. **5**, No. 4, pp. 302 - 321, 2015.
- **Madhukant Sharma, B. V. Rathish Kumar, Vivek Sangwan, S. K. Murthy**, "Modeling and simulation of dispersed two - phase flows of bubbles, drops and particles", World Journal of Modelling and Simulation, Vol. **11**, No. 2, pp. 145 - 160, 2015.
- **Madhukant Sharma, Shruti Dubey**, "Asymptotic Behavior of Solutions to Nonlinear Nonlocal Fractional Functional Differential Equations", Journal of Nonlinear Evolution Equations and Applications, Vol. **2015**, No. 2, pp. 21 - 30, 2015.
- **Shruti Dubey, Madhukant Sharma**, "Solutions to Fractional Functional Differential Equations with Nonlocal Conditions", Fractional Calculus and Applied Analysis, Vol. **17**, No. 3, pp. 654 - 673, 2014.

#### **Research Papers Communicated**

- **Madhukant Sharma, Shruti Dubey**, "Existence and Controllability of Nonlinear Fractional Functional Differential Equations with Nonlocal Conditions".
- **Madhukant Sharma, Shruti Dubey**, "Existence of Solutions to Nonlocal Nonlinear Fractional Functional Integro-differential Equations of Sobolev Type".

#### **Contributed Talks**

- Presented paper entitled "Existence of Solutions to Nonlocal Nonlinear Fractional Functional Integrodifferential Equations of Sobolev Type" in **International Conference on Nonlinear Differential Equations - Theory, Modeling and Computation** (Dec. 8 - Dec. 9, 2017) at SRM, Chennai.
- Presented paper entitled "Solutions to Fractional Functional Differential Equations in a Banach Space" in the conference on **Latest Advances in Computational and Applied Mathematics** (Dec. 15 - Dec. 17, 2016) at Mahindra École Centrale, Hyderabad.
- Presented paper entitled "Asymptotic Behavior of Solutions to Nonlinear Nonlocal Fractional Functional Differential Equations" in **10th AIMS Conference on Dynamical Systems, Differential Equations and Applications** (July 07 - July 11, 2014) at Madrid, Spain.
- Presented paper entitled "Exact Null Controllability of Nonlinear Fractional Functional Differential Equations with Nonlocal Conditions" in **ICRAM - 2014** (20 - 23rd January 2014) at Nagpur.

#### **Attended Programme**

- Attended a GIAN Workshop on **Current advances in numerical techniques for PDEs with random input data** (8 - 13th December 2016) which was held in Department of Mathematics, IIT Bhubaneswar.

- Attended the International workshop on **Advances in PDE Modelling and Computation** (21 - 25th October 2013) which was held in Department of Mathematics, IIT Madras.
- Attended the national workshop entitled **NPDE - TCA PG Level Training Program on Differential Equations, Numerics and Modeling** (May 20 - June 8, 2013) which was held in Department of Mathematics, IIT Madras.
- Attended the national workshop on **Recent Trends in Partial Differential Equations and Applications** (18 - 19th March 2012) which was held in Department of Mathematics & Statistics, University of Hyderabad.
- Attended **Summer Programme in Mathematics - 2009** (1 - 19th June 2009) which was held in the Department of Mathematics, Harischandra Research Institute Allahabad.

### Computational Proficiency

Operating Systems : Windows, Linux.  
 Programming Languages : Python, Fortran 90, C, C++.  
 Mathematical softwares : Matlab.  
 Typing software : LaTeX, MS - Office.

### Personal Information

Date of Birth : 04 Sept. 1986  
 Nationality : Indian.  
 Gender : Male.  
 Father's Name : Sh. Murari Lal Sharma.  
 Mother's Name : Smt. Bimlesh Sharma.  
 Spouse's Name : Dr. Purabi Kar  
 Marital Status : Married.  
 Languages Known : English, Hindi, German.

### Academic References

- **Dr. Shruti Dubey**  
 Department of Mathematics,  
 Indian Institute of Technology Madras,  
 Chennai - 600 036, India.  
 Tel: +91 - 44 - 22574639.  
 Email: sdubey@iitm.ac.in.
- **Prof. S Sundar**  
 Department of Mathematics,  
 Indian Institute of Technology Madras,  
 Chennai - 600 036, India.  
 Tel: +91 - 44 - 22574618.  
 Email: slnt@iitm.ac.in.
- **Prof. B V Rathish Kumar**  
 Department of Mathematics & Statistics,  
 Indian Institute of Technology Kanpur,  
 Kanpur - 208 016, India.  
 Tel: +91 - 51 - 22597660.  
 Email: bvrk@iitk.ac.in.
- **Prof. Dharendra Bahuguna**  
 Department of Mathematics & Statistics,  
 Indian Institute of Technology Kanpur,  
 Kanpur - 208 016, India.  
 Tel: +91 - 51 - 22597053.  
 Email: dhiren@iitk.ac.in.

### DECLARATION

I confirm that all the above stated particulars in this Curriculum Vitae are true to the best of my knowledge and that I can provide documentary evidence to verify all the given information.

*(Madhukant Sharma)*