Arghya Samanta

Assistant Professor
Department of Applied Mechanics
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Degrees and Academic Positions

- **Indian Institute of Technology Delhi, Delhi**
  Assistant Professor – Department of Applied Mechanics *2016 – Present*
- **Indian Institute of Technology Delhi, Delhi**
  Visiting Faculty – Department of Applied Mechanics *2015 – 2016*
- **KTH Royal Institute of Technology, Stockholm**
  Postdoctoral Fellow – Department of Mechanics *2014 – 2015*
- **Indian Institute of Science, Bangalore**
  Inspire Faculty – Chemical Engineering *2013 – 2014*
- **Indian Statistical Institute, Kolkata**
  Visiting Scientist– Physics and Applied Mathematics Unit *2012*
- **University of Pierre and Marie Curie, Lab. FAST, Paris**
  PhD – Mechanical Engineering *2009 – 2012*
  - Advisers: Prof. Christian Ruyer-Quil and Prof. Benoît Goyeau
  - Thesis: Falling film over a porous medium
  - Graduated with très honorable
  - Date: 1st June 2012
- **Indian Statistical Institute, Kolkata**
  Research Fellow – Physics and Applied Mathematics Unit *2006 – 2009*
- **University of Calcutta, Kolkata**
  MSc – Applied Mathematics *2003 – 2005*
- **University of Calcutta, Kolkata**
  BSc – Mathematics (Hons.) *2000 – 2003*

Awards, Grants & Honours

Sixth Position in BSc (Mathematics Hons.) 2003
First Position (joint) in MSc (Applied Mathematics) 2005
National Eligibility Test (Research Fellowship), NET CSIR, India 2005
Graduate Aptitude Test GATE, IIT, India 2006
Junior Research Fellowship JRF (Entrance exam.), Indian Statistical Institute 2006

Senior Research Fellowship, Indian Statistical Institute 2008
Marie Curie Fellow (ESR), France 2009
Inspire Faculty Award, DST, India 2013
Wenner-Gren Foundation Postdoctoral Fellowship, Stockholm, Sweden 2013
Postdoctoral Fellowship, Linné FLOW Centre, KTH, Stockholm, Sweden 2013

Teaching Experience

- **Engineering Math. and Com. (APL703, PG course)** IIT Delhi
  Lecture(L) and Practical(P) *2015LP*
- **Mechanics of Fluids (APL107, UG Course)** IIT Delhi
  Tutorial(T) *2015T, 2016T*
- **Engineering Mechanics (APL100, UG course)** IIT Delhi
  Lecture(L) and Tutorial(T) *2016LT,2017T*
- **Mechanics and Mathematics (APL701, DIIT course)** IIT Delhi
  Lecture(L) *2016,2017*
- **Advanced Fluid Mechanics (APL711, UG & PG course)** IIT Delhi
  Lecture(L) *2017*

Research Publications

Peer-Reviewed Journal Articles

1. B. S. Dandapat and **A. Samanta,** Bifurcation analysis of first and second order Benney equations for viscoelastic fluid flowing down a vertical plane. *J. Phys. D Appl. Phys.* 41, 2008, 095501 pdf
2. **A. Samanta,** Stability of liquid film flowing down a vertical non-uniformly heated wall. *Physica D.* 237, 2008, 2587-2598 pdf
3. **A. Samanta,** Stability of inertialess liquid film flowing down a heated inclined plane. *Physics Letters A.* 372, 2008, 6653-6657 pdf
4. **A. Samanta,** Effect of electric field on the stability of an oscillatory contaminated film flow. *Physics of Fluids.* 21, 2009, 114101.1-114101.8 pdf
5. **A. Samanta**, C. Ruyer-Quil and B. Goyeau, A falling film down a slippery inclined plane. *J. Fluid Mech.* 684, 2011, 353-383 pdf
6. **A. Samanta**, B. Goyeau and C. Ruyer-Quil, A falling film on a porous medium. *J. Fluid Mech.* 716, 2013, 414-444 pdf
7. **A. Samanta,** Effect of surfactant on two-layer channel flow. *J. Fluid Mech.* 735, 2013, 519-552 pdf
8. **A. Samanta,** Shear wave instability for electrified falling film. *Phys. Rev. E* 88, 2013, 053002.1-053002.7 pdf
9. **A. Samanta,** Shear imposed falling film. *J. Fluid Mech.* 753, 2014, 131-149 pdf

10. **A. Samanta,** Effect of surfactants on the instability of a two-layer film flow down an inclined plane. *Physics of Fluids* 26, 2014, 094105 pdf

11. **A. Samanta**, R. Vinuesa, I. Lashgari, P. Schlatter and L. Brandt, Enhanced secondary motion of the turbulent flow through a porous square duct. *J. Fluid Mech.* 784, 2015, 681-693 pdf

12. **A. Samanta,** Spatiotemporal instability of an electrified falling film. *Phys. Rev. E* 93, 2016, 013125.1-013125.8 pdf

13. **A. Samanta,** Linear stability of a viscoelastic liquid flow on an oscillating plane. *J. Fluid Mech.* 822, 2017, 170-185 pdf

Research Interest

- **Falling film instability**
  Studies of wave dynamics on the surface of a falling film are of special interest because of the prevalence of such films in chemical and technological processes. For instance, the formation of wave on the surface of a coating film degrades the quality of a final product and, indeed, plays a crucial role in the coating technology. An interesting characteristic of a falling liquid film is the appearance of instability in the form of a surface wave whose typical wavelength is much larger than the depth of the film. This surface wave propagates downstream with increasing speed and amplitude through a sequence of nonlinear events including solitary waves, transverse secondary instability and complex disordered pattern. Due to the convective nature of instability, disturbances are induced by an external forcing at the inlet. High frequency disturbances lead to saturated periodic waves, whereas low frequency disturbances evolve directly to a large amplitude solitary wave. In general, the surface wave amplifies due to the competition between kinematic and dynamic waves, and an instability appears when the kinematic wave speed exceeds the speed of dynamic waves.

- **Flow transport through porous media**
  In general, a porous medium characterized by porosity and permeability is defined as a medium interconnected with pores through which liquid flows. In the microscopic sense, flow is possible only through pores, and thereby, Navier-Stokes equations can be employed only in the liquid phase. Therefore, it is essential to develop a modified form of the governing equations that are valid not only in the liquid phase but also in the solid phase. The derivation of the macroscopic equations is performed by the method of volume averaging. Various types of models can be formed based on the governing equations. The derivations of accurate governing equations and associated boundary conditions valid in all possible flows are still challenging problems in this field. Recently, this field is extended to the poroelastic media because of its several applications in the biomedical field, such as, flow through the blood vessels which can be considered as poroelastic media. The transport of blood through the vessels plays an important role in maintaining the metabolism of the human body. In addition, the elastic behaviour of the solid phase makes the problem cumbersome even numerically.

- **Surfactant transports on two-layer liquid flows**
  Over the last few decades, extensive theoretical and experimental studies have been devoted to the development of two-layer channel flow because of its industrial and biomedical applications. These types of problems are often encountered in many applied and physical situations, for instance, oil recovery, lubricated pipelining, and the obstruction to air flow in the small airways of the lungs. Due to the viscosity contrast, or varying flow rate, instability may appear at the liquid-liquid interface and evolves slowly downstream through a sequence of nonlinear events. This surface instability is strongly influenced by the insoluble surfactants.

- **Oscillatory free surface flow**
  The studies of liquid film flow on an oscillating plane are of special interest in the biomedical field and industrial processes. For example, a detailed understanding of blood flow in the cardiovascular system plays an essential role in the treatment of the vascular diseases. Further, investigations of such problems are more relevant in aiding the development of lab on a chip microfluidic devices. Besides, a few studies were performed in this context due to the unsteady base flow that makes the problem cumbersome to tackle even numerically. The interesting fact is that such flows exhibit instability on account of an oscillation of the plane. In the long-wave regime, the U-shaped unstable regions appear only in the separated bandwidths of the imposed frequency. However, the finite wavelength neutral curves appear through the branch points detected on the long-wave U- shaped neutral curves. Therefore, the long-wavelength analysis is not sufficient to predict unstable frequency ranges in the parameter space.

Academic Service and Contributions

- Service as a referee of the following journals:
  - Applied Mathematical Modelling
  - Archives of Mechanics
  - Chinese Physics Letters
  - European Journal of Mechanics B Fluids
  - Journal of Fluid Mechanics
  - International Journal of Heat and Mass Transfer
  - International Journal of Nonlinear Mechanics
  - Physics of Fluids
  - Sadhana
  - ZAMP
- Member of the American Physical Society.
  November 2010 – 2015

Technical Skills

- Markup Languages
  - LaTeX
- Programming Languages
  - C, Fortran
- Specialized Software
  - Mathematica, Matlab, AUTO 07p, Gerris, Nek5000

Presentations: Poster and Talk

- **Int. Conference on the Recent Development in Theoretical Physics, ISI, Kolkata**
  Talk *2007*
- **Bifurcations and Instabilities in Interfacial Complex Fluid Flow, Spain**
  Poster *2010*
- **Multiscale Complex Fluid Flows and Interfacial Phenomena, Brussel**
  Poster *2010*
- **63rd Annual Meeting of the APS Division of Fluid Dynamics, California**
  Talk *2010*
- **64th Annual Meeting of the APS Division of Fluid Dynamics, Maryland**
  Talk *2011*
- **GDR, University of Pierre and Marie Curie, France**
  Talk *2011*
- **GDR, Center Paul Langevin d'Aussois, France**
  Talk *2011*
- **Institut Jean le Rond d'Alembert, France**
  Talk *2011*
- **IUTAM Symposium, JNCASR, IISc, Bangalore**
  Talk *2014*

Communicative Language

- Bengali
- Hindi
- English
- French (Primary level)

Home Address

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