Recent Advances in Multi-Phase Flows

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Overview

Multi-phase flows is of paramount importance across various industries and applications including Oil& Gas exploration, conventional and nuclear power plants, process industries, thermal management of electronic devices, spec systems, etc. The need for enhancing the overall heat that can be transferred through such flows has been continuously challenged with the increasing trend of higher power requirements coupled with miniature/compact designs. This has necessitated the development of new methods and innovations from the heat transfer community to address these challenges. Surface modifications to improve localized heat transfer, micro and nanochannels, nanofluids are some of the recent techniques that have been investigated in the recent past. This has also been coupled with developments of advance and more efficient numerical techniques to complement the experimental research and provide further scientific insight to these complex flow processes. Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

Objectives

The objective of the course is to introduce students to the basic principles of two phase heat transfer both in stationary and flowing medium. The basic science of boiling and condensation heat transfer along with the different theories and instability analyses will be covered. This will be followed by focused lectures on the recent advances as outlined below in the course structure. The modern numerical techniques that have enabled better understanding of these processes will also be discussed. The classroom lectures will be supplemented with tutorials, Q&A session, open discussions and a tour of the Heat Transfer, Complex Fluids and Multi-phase Flow laboratory at IIT Kharagpur.

Modules	**A: Duration: June 25 - 29, 2018** **B: Venue: Indian Institute of Technology Kharagpur** **Number of participants for the course will be limited to 50.**
You Should Attend If…	▪ You are an engineer or scientist from petroleum and process industries working with complex and multi-phase flow systems ▪ You are an engineer or scientist from thermal and nuclear power sectors, Cryogenic and Space organizations ▪ you are a student (senior BTech/MTech/PhD) or faculty from academic institution engaged in or interested in research on two phase flow and heat transfer
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $500** **Participants from Industry: INR 12,000** **Faculty or Scientists of Research / Academic Institutions: INR 7,500** **Students of Academic Institutions: FREE** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr. free internet facility. The participants will be provided with accommodation and food on payment basis.

The Faculty

Prof. Debjyoti Banerjee received his Ph.D. in Mechanical Engineering (with minor in MEMS) in 1999 from the University of California, Los Angeles (UCLA). He received 13 US patents (~31 intellectual properties/IP, including:8 US provisional, 5 EP and 5 WO applications) from his prior research work at Applied Biosystems (LifeTechnologies), NanoInk, Ciphergen Biosystems, Coventor, Tata (India) and Texas A & M University (TAMU). He joined TAMU as an assistant professor in 2005 and was promoted to associate professor with tenure in 2011, followed by promotion to Professor in 2015. His research interests arein thermal-fluids sciences with emphasis on multiphase flows (boiling, condensation) for energy conservation/ energy conversion, MEMS, micro/nanofluidics, bio-nanotechnology (Dip-Pen Nanolithography/DPN, explosives sensing using nanocalorimetry, Step-Flash-Imprint nano-Lithography/SFIL) and renewable energy (solar thermal energy storage using nanofluids). At Texas A&M his sponsored research projects (with academic and industrial collaborators) exceeds $19 million, enabling 11 PhD and 17 MS students to graduate under his supervision, yielding more than 100 archival publications. He received various awards: “ASME-HTD Best Paper Award (2001)”, “TEES Select Young Faculty Award(2009)”. He was selected as “ASEE/AFOSR Summer Faculty Fellow” at AFRL (2006, 2007; Propulsion Directorate) and “ASEE/ONR Summer Faculty Fellow” at SPAWAR (2009; Advanced Technology Branch). He served as an Associate Editor and Advisory Board Member of the ASME Journal of Nanotechnology in Engineering and Medicine (JNEM).

Prof. Prasanta Kumar Das is a Professor of Mechanical Engineering and presently the Dean PG Studies and Research at IIT Kharagpur. His research interests lie in the broad area of thermal engineering with special emphasis on two phase flows. He possesses vast experience in teaching and research. He contributed actively in sponsored research and offered consultancy to different Government and private industries. He is fellows of Indian National Academy of Engineering and National Academy of Sciences India.

Dr. Anandaroop Bhattacharya is an Associate Professor of Mechanical Engineering at IIT Kharagpur. His research interests lie in the areas of electronics cooling, microfluidics, transport in porous media and gas turbine heat transfer. Prior to joining IIT in 2015, Anandaroop spent 12 years in the industry in USA and India working for Intel, General Motors and General Electric.

Course Coordinator

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