TWO PHASE FLOW AND HEAT TRANSFER

PROF. ARUP KUMAR DAS
Department of Mechanical and Industrial Engineering
IIT Roorkee

PRE-REQUISITES : Fluid Mechanics and Heat Transfer

INTENDED AUDIENCE : Bachelor students in Mechanical/Chemical/Aerospace/Civil Engineering,Middle level managers from related industry

INDUSTRIES APPLICABLE TO : General Electric, General Motors, Indian Oil, HPCL, BPCL.

COURSE OUTLINE :

Two phase flow with or without phase change is commonly encountered in a variety of engineering processes. The power generation, nuclear reactor technology, food production, chemical process, aerospace and automotive industries are all driving forces in this complex field. Due to its universality in applications, a thorough understanding of two phase flow is of utmost important. Present course is driven by this requirement and distributed broadly into two sub parts. The experimental part will provide knowledge on the selection, installation and use of modern gas-liquid measurement techniques and instruments, such as wire-mesh sensors, needle probes and process microscopy along with the application of data analysis tools. The numerical part will focus on finite-volume methods for Euler-Euler and Euler-Lagrange multiphase flow predictions, and on the associated mathematical models.

ABOUT INSTRUCTOR :

Prof. Arup Kumar Das is Assistant Professor in Department of Mechanical and Industrial Engineering at IIT Roorkee and actively involved in teaching and research in the direction of two phase flow for last ten years. His research interests are in the fundamental understanding of interfacial transport in macro and micro-scale confinements with applications in energy, environment, and bio-systems. He has authored and co-authored more than 35 peer-reviewed journal papers, which includes publications in Springer, Royal Society of Chemistry, American Chemical Society and Elsevier journals. He is also active in writing book chapter with reputed international publication house. For his contributions in engineering and sciences, he has been awarded by Indian National Science Academy (INSA), Indian National Academy of Engineers (INAE).

COURSE PLAN :

Week 1**:** Introduction, Flow Regimes, Homogeneous Flow, Drift Flux, Separated Flow

Week 2**:** Bubbly, Slug, Annular and Stratified Flow, Measurement of Void Fraction

Week 3**:** Signal Analysis, Two Fluid-Population Balance Technique, Volume of Fluid Method, Lattice Boltzmann Model, Smoothed Particle Hydrodynamics

Week 4**:** Molecular Dynamics, Boiling, Condensation, Solid-Liquid Flow, Gas-Solid-Flow