Overview

Course Overview

In engineering and environmental fluid flows, the presence of multiple interacting phases is ubiquitous. One phase can be dispersed into another (e.g., solid grains in gas or liquid), or both phases can be continuous, separated by a phase interface (e.g., liquid-gas flow). In both cases, the resulting flow is often turbulent, spans many characteristics length and time scales, and exhibits complex non-linear dynamics such as particle clustering, interfacial instabilities, and droplet break-up and coalescence.

Objectives: This course will enable engineers and research specialists with knowledge of fluid mechanics and scientific computing to develop a comprehensive understanding of numerical modeling of multiphase flows. The course will cover both Eulerian and Lagrangian particle-laden flow modeling techniques, and techniques for two-phase flows with a deforming interface. Multiple examples of multiphase turbulence in real engineering systems will be explored.

International Faculty

Prof. Olivier Desjardins is the associate editor for the Journal *Atomization and Sprays* and a professor at School of Mechanical and Aerospace Engineering, Cornell University. His research interests include modelling of turbulent atomization using LES and DNS approaches, development of numerical methods and models to investigate the multi-scale and multi-physics problems such as triple phase flows, spray evaporation and combustion etc.

Course Coordinator

Dr. Santanu De

Assistant Professor, Mechanical Engineering

Indian Institute of Technology Kanpur

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Course website: home.iitk.ac.in/~sde/short_courses

Course Information

Eligibility

Executives, engineers and researchers from academia, industry and government organizations including R&D laboratories with a background in aerospace, automotive, mechanical, and chemical engineering. Postgraduate students (MSc/MTech/PhD) and faculty from reputed academic institutions.

Pre-requisite: Prior knowledge in Fluid Mechanics, Computational Fluid Dynamics is needed. Understanding/knowledge of Multiphase Flows and Turbulence is desirable.

Accommodation

Accommodation will be arranged at the IITK visitors hostel and students' hostels based on single/twin sharing basis depending on availability. The candidates will have to bear the boarding, food and other miscellaneous expenses.

How to apply

The candidates have to apply through the GIAN portal (www.gian.iitkgp.ac.in/GREGN/index) by paying a one-time registration fee of Rs. 500/- (non-refundable). Candidates will be selected based on their application at the GIAN portal and an offer letter will be issued by email only. Only the selected candidates are required to send the course fee by DD or online money transfer.

Course Fee

Participants from abroad: US $800

Industry/ Research Organizations: ₹ 40,000

Academic Institutions: ₹ 10,000 (faculty/staff), ₹ 4,000 (students)

The above fee includes all instructional materials, computer use for tutorials.

The course fee needs to be sent separately as a crossed demand draft in favor of "Registrar, IIT Kanpur" payable at Kanpur. Payment can also be made through ECS/Wire Transfer/Online Fund Transfer. Please see the bank account details here. Please send the filled application form along with the payment details to the course coordinator by post or email on or before **Oct 20, 2017**.

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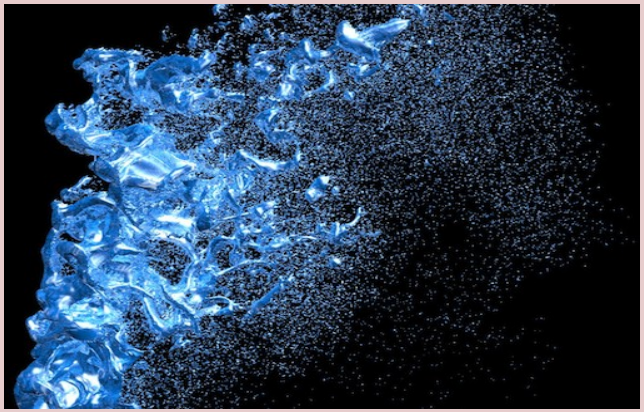
Ministry Of Human Resource Development

A short course

on

Numerical Modeling of Multiphase Flows

Oct 30 – Nov 10, 2017



International Faculty:

Prof. Olivier Desjardins

Mechanical and Aerospace Engineering, Cornell University

Associate Editor and Board Member, Atomization & Sprays

Organized by:

Department of Mechanical Engineering,
Indian Institute of Technology Kanpur

Course Modules

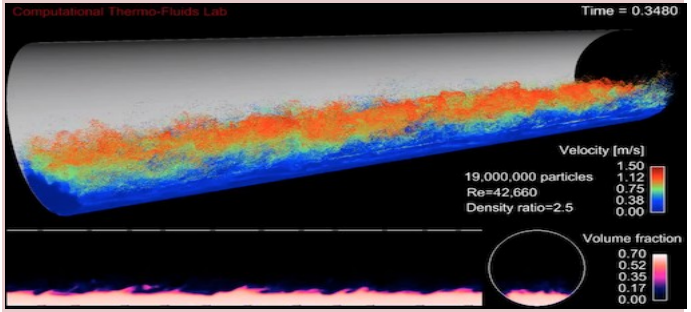
Four lectures of 1 hour will be conducted everyday. The lectures will be conducted by: The schedule for the lectures is as follows:

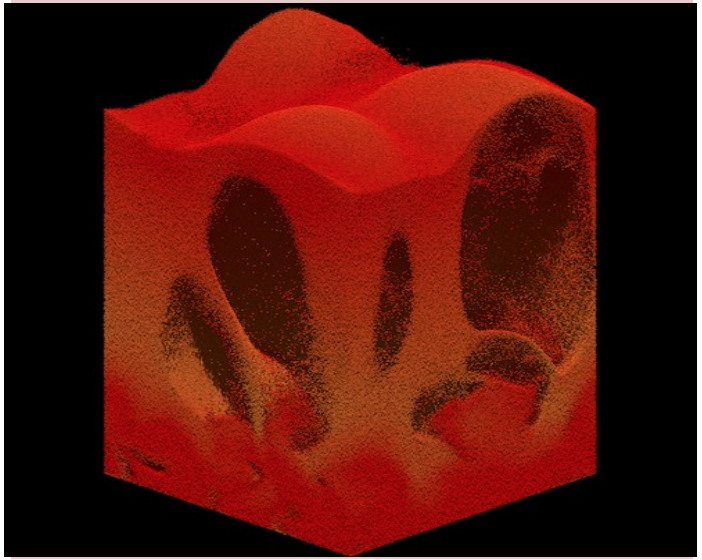
1. Introduction to Multiphase Flow Modeling (6 lectures)

Introduction to multiphase flows and their classifications; Governing equations for multiphase flows; Introduction to turbulence; Introduction to Computational Fluid Dynamics

2. Fundamentals of Particle-Laden Flow Simulations (12 lectures):

Lagrangian and Eulerian viewpoints, statistical representation of particles; Micro vs. meso vs. macro-scale models; Particle-resolved direct numerical simulations; Point-particle simulations; Two-fluid model, quadrature-based method of moment; Two-way interphase coupling, drag modeling; Particle collisions and four-way coupling





Course Modules

3. Fundamentals of Liquid-Gas Flow Simulations (12 lectures):

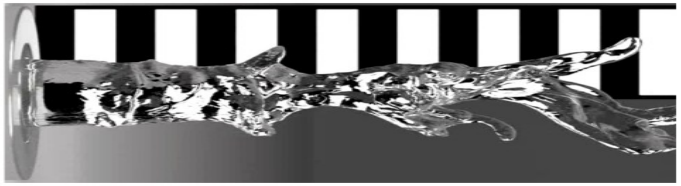
Interface representation and transport; Level Set methods; Conservative Level Set method; Volume-of-Fluid; Lagrangian methods; Curvature calculation; Ghost Fluid method; Mass and momentum conservation; Solution of discontinuous pressure equation; Compressible liquid-gas flows. Tutorials: Multiphase problems solving using Level Set, VOF method and GFM methods

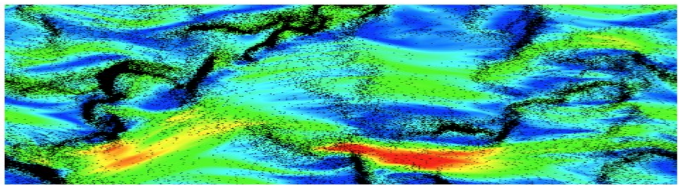
4. Computational Studies of Multiphase Turbulence (8 lectures)

Preferential concentration; Cluster-Induced Turbulence; RANS modeling for CIT and beyond; Interfaces in turbulence; Turbulent atomization, Tutorials: Simulating turbulent atomization

5. Special Topics in Multiphase Flows (6 lectures)

Contact line modeling; Three-phase flows; Evaporation and chemically reacting two-phase flows; Electrohydrodynamics for two-phase flows





Application Form

A short course on
Numerical Modelling of Multiphase Flows
(Oct 10 – Nov, 2017)

Name _____

Date of Birth_____ **Designation** _____

Organization _____

Address for Correspondence _____

_____

_____

Phone_____**Fax** _____

E-Mail _____

Accommodation: **Yes / No** **Gender: M / F**

Educational qualifications (reverse chronological order)

Research Interests _____

Degree (with specialization)	Year	University

Payment Details: DD No: _____

Amount: _____ **Drawn on:** _____

The information furnished above is true to best of my knowledge. Kindly register my name for the short course on "*Numerical Modelling of Multiphase Flows*" to be held at IIT Kanpur.

Place: _____

Date: _____ **Signature of the Applicant**