Measurement Technique in Multiphase Flows

Chemical Engineering

Instructor Name: Dr. Rajesh Kumar Upadhyay
Institute: IIT Guwahati
Department: Chemical Engineering

About Instructor: Dr. Rajesh Kumar Upadhyay is serving as Associate Professor in the Department of Chemical Engineering at Indian Institute of Technology Guwahati. He has joined the IIT Guwahati as an Assistant Professor in July 2010 after completing his from IIT Delhi. During his PhD he has worked on development of Radioactive particle tracking technique and implemented the same on different multiphase flow reactors like gas-liquid, gas-solids and gas-liquid-solids system. He has used several flow measurement techniques since he has joined IIT Guwahati and has expertise in radiation based technique.

Pre Requisites: : None
Core/Elective: : Elective
UG/PG: : Both
Industry Support : IOCL, BPCL, OIL, HPCL, ONGC

Course Intro: : Multiphase flow reactors are heart of many process industries. However, the flow dynamics of these reactors are not well understood mainly because of complex flow physics involved. In this course different technique available for monitoring and mapping of multiphase flow reactors will be discussed in detail. Techniques will be divided in two parts: Invasive, in which some probe will be intruded inside the vessel to measure the velocity and/or phase fraction and in Second part non-invasive techniques will be discussed in which measurement will be performed without disturbing the flow. The basic principle, equations, post processing methods, advantages and limitations of each technique will be discussed in detail.

COURSE PLAN

SL.NO	Week	Module Name
1	1	Introduction to Multiphase flow Measurement Techniques: Invasive and Non-Invasive
2	2	Invasive technique for volume fraction and velocity measurements: Pitot tube, Pressure probe, Hotwire Anemometry, Optical fiber probe
3	3	Invasive technique for volume fraction and velocity measurements: Laser Doppler Anemometry, Particle Image Velocimetry, Positron Emission Particle Tracking, Radioactive Particle Tracking
4	4	Non-invasive techniques for Volume fraction Measurements: Electrical Capacitance Tomography, Computed Tomography, Magnetic Resonance Imaging, Ultrasonic Methods