



### Multiphase Microfluidics

Chemical Engineering

**Instructor Name:** Dr. Raghvendra Gupta

**Institute:** IIT Guwahati

**Department:** Chemical Engineering

**About Instructor:** Dr. Raghvendra Gupta is assistant professor in Department of Chemical Engineering at Indian Institute of technology Guwahati, India. His research interests are in the area of multiphase flows, microfluidics and biofluid mechanics.

**Pre Requisites:** : A basic course in Fluid Mechanics

**Core/Elective:** : Elective

**UG/PG:** : Both

**Industry Support** : Thermax, General Electric, Syrris, Blacktrace/Dolomite

**Course Intro:** : With the advancement in manufacturing technology in past few decades, the trend towards miniaturization has accelerated in several industries. In chemical process industries, the viability of compact heat exchangers, microreactors for process intensification is being explored because of small diffusion lengths, high interfacial area density and relatively safe operation. Most of these equipments involve multiphase flows and their design requires a fundamental understanding of heat, mass and momentum transport in multiphase flow in microchannels. This course is aimed at introducing the students with the fundamental principles as well as recent developments in the area of multiphase flow at the small scale.

#### COURSE PLAN

SL.NO	Week	Module Name
1	1	Introduction: Motivation, applications, definitions, size effects
2	2	Interfacial Phenomena: Capillarity, wetting and dewetting behavior, Contact line dynamics
3	3	Gas liquid and liquid-liquid flow in microchannels: Flow regimes; pressure drop and phase distribution
4	4	Transport processes in Taylor Flow in microchannels: Mass Balance, Bubble Velocity, Analytical models for bubble shape and film thickness; Mechanism of heat and mass Transfer; Models for heat and mass transfer
5	5	Bubble and droplet generation; annular and slug-annular flow regimes
6	6	Gas-solid flow in microchannels; Inertial microfluidics; multiphase microreactors
7	7	Condesation, evaporation and boiling in microchannels



8	8	Experimental and computational techniques to study multiphase flow in microchannels
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