



# FLUIDIZATION ENGINEERING

## PROF. SUBRATA KUMAR MAJUMDAR

Department of Chemical Engineering  
IIT Guwahati

**INTENDED AUDIENCE :** UG and PG students of Electrical and Electronics Engineering/Engineering Physics/Physics

**INDUSTRY SUPPORT:** Petroleum industries

### COURSE OUTLINE :

This course is intended for learners who find themselves involved ranging from pure academic interest to direct industrial necessity in problems concerning the fluidized state. This course mainly covers the basic principles of fluidization phenomena and introduces the learner to the fundamental and practical aspects of basic fluidization operations for industrial application. This course may also be useful for who are doing research in multiphase system in chemical, metallurgical, and mining engineering programs.

### ABOUT INSTRUCTOR :

Prof. Subrata Kumar Majumder is a Professor in the Chemical Engineering Department, IIT Guwahati, India. His research interests include multiphase flow and reactor development, hydrodynamics in multiphase flow, mineral processing, process intensifications and micro-nano bubble science and technology and its applications. He is a Fellow of the International Society for Research and Development, 8A Kapteinsvigein, London, UK. He is also a recipient of various honours and awards like: Editor, Journal of Chemical Engineering Research Studies, Guest editor, American Journal of Fluid Dynamics, published by Scientific & Academic Publishing Co., CA, 91731, USA, Editorial board member of Scientific Journal of Materials Science, IIME Award on beneficitation from Indian Institute of Mineral Engineers (IIME), Editorial board Member of the Journal of Science and Technology, Scientific and Academic Publishing, USA, Advisory board member of Excelling Tech Publishers (ETP), London, UK. He is a life member of Indian Institute of Chemical Engineers, Indian Institute of Mineral Engineers, member of Institute of Engineers (India), Member of Asia-Pacific Chemical, Biological & Environmental Engineering Society (PCBEE), senior member of International Association of Engineers (IAE), Japan. He authored four books, five book chapters, and has more than 80 publications in several reputed international journals. Presently he is working in the field of Microbubble science and technology and its applications in mineral beneficiation, food processing and arsenic, ammonia and dye removal and process intensifications by developing ejector-induced gas aided extraction process.

### COURSE PLAN :

**Week - 1-2:** Introduction: The phenomenon of fluidization; Advantages and disadvantages of fluidized beds; Industrial applications of fluidized beds

**Week - 3:** Characteristics of solids: Classification of solids; Flow characteristics and its outline in the different types of fluidization.

**Week - 4-5:** Flow pattern of fluidization system: Flow patten, flow pattern transition, flow pattern map, Frictional pressure drop and its model to analyze, Solid movement, mixing, segregation and staging

**Week - 6:** Gas distribution: Type of gas distributors in small and large scale industries, Design of distributor

**Week - 7:** Bubbling fluidized beds: Gas dispersion and gas interchange in bubbling beds, mixing characteristics

**Week - 8:** Entrainment and elutriation from fluidized beds

**Week - 9:** Attrition: Attrition mechanism and its analysis by model

**Week - 10-11:** Mass transfer phenomena: Particle to gas mass transfer phenomena and its analysis by model in two and three phase system and modeling

**Week - 12:** Heat Transfer phenomena: Heat transfer between fluidized beds and surfaces and modeling

Design of fluidized bed reactors: Design for physical operation, catalytic and non-catalytic systems