

PCH221 FLUIDIZATION ENGINEERING

L	T	P	Cr
3	1	0	3.5

Course Objective:

To learn the fluidization phenomena, industrial applications of fluidized beds and their operational and design aspects.

Introduction: The phenomena of fluidization, Liquid-like behaviour of fluidized beds, Comparison with other contacting methods, Fluidization quality.

Industrial Applications of Fluidized Beds: Physical operations, Synthesis reactions, Cracking of hydrocarbons, Combustion and incineration, Carbonization and gasification, Biofluidization.

Fluidization and Mapping of Regimes: Characterization of particles, Determination of effective sphericity, Fluidization without carryover of particles, Fluidization with carryover of particles, Mapping of fluidization regimes.

Dense Fluidized Beds: Distributors, Gas entry region, Gas jets, Pressure drop across distributors, Design of distributors, Bubbles in dense beds, Free-board behaviour, Estimation of TDH, entrainment and Elutriation from fluidized beds.

Bubbling Fluidized Beds: Estimation of bed properties, Heat and mass transfer, Flow models for bubbling beds, FCC and gasifier design for high and low density beds.

Course learning outcomes (CLOs):

The students will be able to

1. understand the fluidization phenomena and operational regimes
2. design various types of gas distributors for fluidized beds and determine effectiveness of gas mixing at the bottom region
3. estimate pressure drop, bubble size, TDH, voidage, heat and mass transfer rates for the fluidized beds
4. develop mathematical modeling for fluidized beds
5. design gas-solid fluidized bed reactors

Recommended Books:

1. Kunni, D., and Levenspiel, O., *Fluidization Engineering*, Butterworth-Heinemann (1991).
2. Yang, W., and Amin, N.D., *Fluidization Engineering: Fundamentals and Applications*, American Institute of Chemical Engineers (1988).
3. Fan, L.S., *Gas-Liquid-Solid Fluidization Engineering*, Butterworths (1989).
4. Yang, W.C., *Handbook of Fluidization and Fluid-particle Systems*, CRC Press (2003).

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	30
2.	EST	45
3.	Sessional (may include Assignments/Projects/Tutorials/Quizes/Lab valuations)	25