

Fluidization Engineering

- 1.1 Course Number: CH543
 1.2 Contact Hours: 3-0-0 Credits: 9
 1.3 Semester-offered: 4th Year-Odd
 1.4 Prerequisite: NA

2. **Objective:** This course mainly covers the basic principles of fluidization phenomena and introduces 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.

3. **Course Content:**

Unit wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Introduction	Importance of fluidization in process industry, comparison of fluidized beds with other modes of contacting, advantages and disadvantage, industrial applications	3
2	Fluidization and Mapping of Regimes	Fixed beds of particles of one and mixed size, pressure drop through packed bed, fluidization with and without carry-over of particles, minimum fluidization, terminal velocity of particles, pneumatic transport of solids, mapping of regimes, distributors for dense beds, types and design, power consumption for fluidized beds	7
3	Bubble Behavior and Bed Properties	Single rising bubble models, wake region and solids within bubbles, interaction and coalescence of bubbles	5
4	Bubbling Fluidized Beds	Emulsions phase, gas flow-bubble properties, entrainment and elutriation from fluidized beds, free board behavior, gas outlet location, entrainment from tall and short vessels, turbulent fluidized beds, fast fluidization, pressure drop in turbulent and fast fluidization	7
5	Gas interchange in fluidized bed	Gas dispersion and gas interchange in bubbling bed, estimation of gas interchange coefficients, heat and mass transfer in fluidized bed, catalytic reactions in fluidized bed	6

6	Circulation System	Circuits for the circulation of solids, pressure balance, flow of gas solids mixtures in downcomers, flow in pneumatic transport lines	5
7	Design for Physical and Chemical Operations	Design of single- and multi-stage systems, fluidized bed drier, fluidized bed catalytic cracking, fluidized bed combustion	7
Total			40

4. Readings

4.1 Text Books:

1. Kunii, D. and Levenspiel, O., Fluidization Engineering, 2nd Ed., Butterworth-Heinemann Wiley, New York, 1991.
2. Davidson, J. F. and Harrison, D., Fluidization, Academic, New York, 1985.
3. Zeng, F. A. and Othmer, D. F., Fluidization and Fluid Particle Systems, Reinhold, New York, 1960.

5. **Outcome of the Course:** The students will have a deep understanding about handling of straight-run products from a crude distillation tower, various products which can be produced from a refinery along with their respective properties, separation, conversion and upgradation processes involved in the refinery.