

Multiphase Flow - Web course

COURSE OUTLINE

This course introduces the fundamental concepts, principles and application of multiphase flow.

The course opens with real life examples of such flow and its importance in process industries.

In connection with gas-liquid two phase flow, different flow regimes and flow regime maps are discussed. Next, various analytical models are introduced to understand the hydrodynamics of different flow regimes.

The phenomenon of choking is explained and relevant formulations are derived. The concept of bubble formation and bubble dynamics are presented.

The important aspects of hydrodynamics of solid-liquid and gas-solid flows are also discussed.

Hydrodynamics of three phase flows are analyzed and compared with two phase flow situations.

Lastly various measurement techniques used for measuring pressure drop, void fraction and identification of flow patterns are introduced.

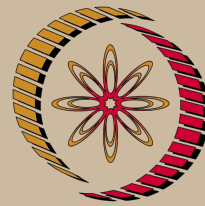
Contents:

Definition of multiphase flow, flow patterns, one dimensional steady homogenous equilibrium flow, one dimensional steady separated flow model, choking and critical flow rate.

General theory of drift flux model, Bubble formation and bubble dynamics, hydrodynamics of solid-liquid and gas-solid flow, hydrodynamics of three phase gas-liquid-liquid flows, Measurement techniques in multiphase flow.

COURSE DETAIL

S.No	Topics	No. of Hours
1	Introduction to multiphase flow, types and applications, Common terminologies, flow patterns and flow pattern maps.	5
2	One dimensional steady homogenous flow.	2
3	Concept of choking and critical flow phenomena.	2
4	One dimensional steady separated flow model.	
	1. Phases are considered together but their velocities differ.	3
	2. Phases are considered separately, flow with phase change.	3



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Chemical Engineering

Pre-requisites:

Course on basic fluid mechanics at the undergraduate level.

Additional Reading:

Current issues of International Journal of Multiphase Flow.

Coordinators:

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5	Flow in which inertia effects dominate, energy equations.	3
6	The separated flow model for stratified and annular flow.	2
7	General theory of drift flux model.	2
8	Application of drift flux model to bubbly and slug flow.	4
9	Hydrodynamics of solid-liquid and gas-solid flow. 1. Principles of hydraulic and pneumatic transportation.	4
10	An introduction to three phase flow.	2
11	Measurement techniques for multiphase flow. 1. Flow regime identification, pressure drop, void fraction and flow rate measurement.	6
Total		40

References:

1. One dimensional Two Phase Flow by G. B. Wallis.
2. Measurement of Two Phase Flow Parameters by G.F.Hewitt.
3. Flow of Complex Mixtures by Govier and Aziz.
4. Two Phase Flow by Butterworth and Hewitt.
5. Handbook of Multiphase systems by Hetsroni.