

## PCH113 PROCESS DEVELOPMENT AND SCALE-UP STUDIES

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Course Objective:

To learn the basics of process development and scale-up from bench scale to the production scale.

**Introduction:** Description and evolution of a process system, Fundamental principles of mathematical modeling, Dimensional analysis, Homogeneous reactor scale-up.

**Reactors for Fluid Phase Processes Catalyzed by Solids:** Pseudo-homogeneous and heterogeneous models, Two-dimensional models, Scale up considerations.

**Fluid-fluid Reactors:** Scale-up considerations in packed bed absorbers and bubble columns, Applicability of models to scale-up.

**Mixing Processes:** Scale-up relationships, Scale-up of polymerization units, Continuous stages gas-liquid slurry processes, Liquid-liquid emulsions.

**Fluidized Beds:** Major scale-up issues, Prediction of performance in large equipment, Practical commercial experience, Problem areas.

**Continuous Mass Transfer Operations:** Fundamental considerations, Scale-up procedure for distillation, absorption, stripping and extraction units.

**Solid-Liquid Separation Processes:** Fundamental considerations, Small scale studies for equipment design and selection, Scale-up techniques, Uncertainties.

### Course learning outcomes (CLOs):

The students will be able to

1. apply the basis of scale-up criteria
2. scale-up homogeneous and heterogeneous reactors
3. scale-up mixing and fluidization systems
4. scale-up mass transfer processes

### Recommended Books:

1. *Bisio, A., and Kabel, R.L., Scale up of Chemical Processes, John Wiley (1985).*
2. *Johnstone, R. E., and Thring, M. W., Pilot Plants, Models and Scale-up Methods in Chemical Engineering, McGraw-Hill (1957).*

### Evaluation Scheme:

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