SEPARATION PROCESSES

Course Code : 13CH2110

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PREREQUISITES: The student should have knowledge of mass transfer operations.

Course Educational Objectives:

This Course introduces

1. Student the advanced mass transfer operations.
2. Equilibrium and rate based separation processes.

Course Outcomes:

After reading this course the student would be able to

1. Do thermodynamic analysis of any process.
2. Apply Rate based models.
3. Able to analyze and design any equipment for separation

UNIT-I

Characteristics of separation processes: Mass and energy agents, equilibrium processes and rate-governed processes. Selection of separation processes- Factors influencing the choice of a separation process, Degrees of freedom analysis for an absorber, two product distillation column, Patterns of change in concentrations and temperature distribution along the columns for binary and multicomponent multistage separations.

Thermodynamic analysis of processes: concept of availability and lost work, calculations on lost work for a simple two product distillation column.

UNIT-II

MESH models for computer solution (only teach how the equations are arranged to ease a computer solution, no simulation). Heat integrated and divided wall distillation columns to minimize energy consumption.

UNIT-III

Azeotropic distillation, extractive distillation and pressure swing distillation. How to select entrainers for azeotropic and extractive distillation. Industrial applications of these distillation techniques. Residue Curve Maps: Introduction, explaining the concepts using ternary diagrams, direct and indirect splits, distillation boundaries, identifying feasible and infeasible products in distillations, and their use in selecting entrainers for distillation.

UNIT-IV

Reactive Distillation: Introduction, industrial applications and mathematical model development (only the model development no simulation).

Batch distillation: Introduction, industrial applications and mathematical model development assuming Fenske assumption (only the model development no simulation).

UNIT-V

Rate based separation processes: Introduction, applications and mathematical model development (only the model development no simulation).

Introduction of adsorbers, Cryogenic separations, Supercritical fluid extraction, chromatographic separations, Membrane separations (qualitative treatment only), Membrane Reactors.

TEXTBOOKS:

1. Judson King C, *"Separation process"*, McGraw Hill, 1982.
2. Sieder J and Henley E.J *" Separation Processes Design"*, Wiley Publishers, 1998

REFERENCES

1. Perry *"Chemical Engineering Handbook",* 7th Edition, McGraw Hill, 1999.
2. Mulder M.H.V, *"Membrane Separations"*, Springer Publications, 2007.

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