

# Course Learning Objectives - CBE 445

## Separation Process Technology (3)

At the conclusion of this course, the student should be able to:

1. Calculate bubble and flash points for binary and multi-component mixtures.
2. Use the McCabe-Thiele method to design a stage-wise distillation process for a binary mixture by specifying the reflux rate, feed tray location, number of trays, and est. pressure drop.
3. Explain the advantages and disadvantages of various tray designs (bubble cap, sieve, and valve).
4. Design a distillation process using a packed column by specifying the required column height, feed location, and est. pressure drop.
5. Explain the advantages and appropriate uses of trayed vs. packed columns.
6. Use a short-cut method for the preliminary design of a distillation column for a specified component split between two key compounds.
7. Use process simulation software to develop an optimized, detailed process design for a distillation process for separating a multi-component system into two streams of specified purities, recoveries, and/or flow rates.
8. Determine the duration, mean composition, and product volume for batch distillation process by simple distillation and for fixed overhead composition or fixed reflux ratio.
9. Fit experimental adsorption data to Langmuir, Freundlich, and linear isotherm models and determine the most appropriate model.
10. Use the BET method to estimate the specific area of an adsorbent from experimental data on adsorption as a function of partial pressure.
11. Determine the component fluxes and stream compositions for the separation of a binary mixture of gases using a polymer membrane.
12. Explain concentration polarization and estimate its significance in a given membrane application.
13. Calculate the equilibrium concentrations in the aqueous and resin phases for separation of salts by ion exchange.
14. Develop and evaluate a flow sheet for separating a given hydrocarbon stream into its pure components, write a group report, and present the results orally to the class.