

Cleveland State University
Department of Chemical & Biomedical Engineering
CHE 508 – Advanced Separation Processes
Fall 2019
Syllabus

Catalog Description: CHE 508 Advanced Separation Processes (4-0-4).

Prerequisite: Graduate standing in chemical engineering or permission of instructor. Complex distillation processes such as azeotropic and extractive distillation, membrane separations processes and adsorption, ion exchange and chromatographic separations. M,W 6:00 – 7:50 PM

Text: Separation Process Engineering, Philip C. Wankat, Prentice-Hall, 4th Edition, 2016.

ACADEMIC CALENDER:

August	26, 28, 30
September	4, 9, 11, 16, 18, 23, 25, 30
October	2, 7, 9, 14, 16, 21, 23, 28, 30
November	4, 6, 13, 18, 20, 25, 27
December	2, 4

Exam: December 11, 6:00 – 8:00 PM

TENTATIVE COURSE CONTENT:

First Five Weeks

1. Review of Distillation
2. Steam Distillation
3. Complex Distillation Processes
4. Azeotropic Distillation
 - a. Heterogeneous Systems
 - b. Homogeneous Systems
 - c. Pressure Swing distillation?
5. Extractive Distillation with Entrainers

Second 5 Weeks

1. Membrane separation processes for gas mixtures
 - a. Membrane Structures
 - b. Transport across membranes
 - c. Different configurations of membranes
 - d. Modeling – product purity, yield

- e. Applications
- 2. Membrane separation processes for liquids
 - a. Dialysis
 - b. Liquid Extraction
 - c. Pervaporation
 - d. Reverse Osmosis
 - i. Concentration Polarization
 - ii. Pressure Drop

Third 5 Weeks

- 1. Adsorption, Ion Exchange, Chromatography
 - a. Adsorbents and adsorption Equilibrium
 - b. Solute movement analysis for linear systems
 - i. Basics & Application to Chromatography
 - ii. PSA, TSA, SMB
 - c. Nonlinear solute movement analysis
 - d. Mass and energy transfer
 - e. Solutions for linear systems
 - f. Nonlinear systems
 - g. LUB approach

GRADING:

Homeworks	15%
Project	15%
Midterm exams 2	20% each
Final	30%

EXAMINATIONS:

There will be two mid-term examinations one scheduled after the first 5 weeks and the second scheduled after the first 10 weeks. The final exam will be a comprehensive examination. A computer project will be assigned three weeks before the end of the term. A final report on the project will be due on the last day of the class.

Academic Honesty.

"Cheating" means intentionally misrepresenting the source, nature, or other conditions of academic work to receive undeserved credit. Cleveland State University affirms that acts of cheating debase the academic degree awarded, have no place in the University, and are severe offenses to academic goals, objectives and the rights of fellow students. CSU does not tolerate any type of cheating and will take disciplinary action up to and including expulsion.