

ChE 3084 Mass Transfer
Required course for ChE program

Catalog Description: Diffusion, convective and interfacial mass transfer, and its application to continuous contact operations. Design of equilibrium-stage separation processes including distillation, gas-liquid absorption and stripping, liquid-liquid extraction, and humidification. Introduction to process simulation (HYSYS).

Co-requisites: none

Prerequisites: ChE 3063 (Equilibrium Thermodynamics), ChE 2003 (Stoichiometry).

Prerequisites by Topic: Equilibrium Thermodynamics: vapor-liquid equilibrium for ideal systems (e.g., Raoult's and Henry's laws) and non-ideal systems, calculation of vapor pressure, enthalpy changes, and enthalpy of vaporization. Stoichiometry: Mass and energy balances, lever principles, psychrometric chart use.

Recent Textbook: C. J. Geankoplis, "Transport Processes and Separation Process Principles", Prentice-Hall, 4th Edition, 2003, ISBN 0-13-101367-X

Other Required Material: None

Course Objectives: By the end of the course, students will be able to:

1. Describe and differentiate between the operation of separations processes (e.g. distillation, gas absorption columns, cooling towers, liquid-liquid extraction equipment).
2. Apply the basic principles of diffusion and convective mass transfer.
3. Design air-water cooling towers and humidification processes.
4. Rate and design equilibrium-stage separation processes (absorption and stripping columns, distillation columns) by hand and using modern computing tools as appropriate.

Major Topics Covered in the Course : Fick's law, use of diffusivity functions mass transfer coefficients, principles of stage processes, gas absorption and stripping, humidification, distillation using McCabe-Thiele methods, extraction, overview of other mass transfer and separation operations

Class/Laboratory Schedule: Lecture meets for four 50-minute sessions each week for 14 weeks. HYSYS computer laboratory sessions are held to assist the student's in learning about absorption and distillation column performance.

Professional Component Contribution: This course applies stoichiometry, thermodynamics, and transport phenomena to engineering applications of mass transfer and staged operations. Computer skills are extended in this course to numerical solution of separation problems, including graphical representation of equilibrium and operating curves, and ideal stages. A minimum of one design problem is assigned in this course. Throughout the course, safety and ethics are briefly emphasized.