CBE 340
Mass Transfer and Separation Processes
Course Learning Objectives

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

1. Compare and contrast mass transfer by molecular diffusion and convection.
2. Calculate values for binary diffusion coefficients in gas and liquid phases at specified conditions using standard models and correlations.
3. Use Fick's Law of diffusion in a mass balance for a simple geometric configuration in order to estimate mass transport rates in a binary system at steady state.
4. Use graphs to estimate the time required for diffusive mass transfer to take place in simple geometries in binary systems.
5. Explain the difference between equimolar counter diffusion and unimolecular diffusion and identify physical situations that approximate these two conditions.
6. Use separation of variables to solve the diffusion equation for simple geometries.
7. Explain the concept of a "film model" for mass transfer.
8. Explain the difference between individual phase (i.e.; a gas phase or liquid phase) and overall mass transfer coefficients and between local and average mass transfer coefficients.
9. Calculate pressure as a function of composition at vapor/liquid equilibrium using fugacity and modified Raoult’s Law for non-ideal mixtures.
10. Construct the T-X diagram for a binary mixture given the vapor pressure as a function of temperature.
11. Calculate values for mass transfer coefficients for specified values of the Reynolds Number and Schmidt Number.
12. Use a one-dimensional material balance on an elemental volume to derive an equation for the steady mass transfer rate in a packed bed.
13. Explain the concept of stage-wise operation as applied to absorption, stripping, distillation, and liquid-liquid extraction.
14. Explain the height of transfer unit (HTU) and number of transfer units (NTU) concepts as applied to packed tower separation processes.
15. Design tray and packed towers for absorption or stripping processes.