CE/ESR 479/579 Fate & Transport
Things to Know for the First MIDTERM Exam
(Key Concepts for Your Understanding)

- Know the definition of a control volume
- Know how to do a simple mass-balance analysis of a control volume (like Example 1-1 in the text)
- Definition of steady-state
- The difference between advective flux and diffusive (or dispersive) flux
- Fick's first law (J = ...), Fick's second law (dC/dT = ...), and their basic applications
- Know the elementary relationships in river or channel flow (like Q = uA, J = uC, m' = CQ) and be able to use them in a problem.
- .Know the vocabulary terms and related concepts that have been tested in the quizzes. Expect a similar question (such as a "match up" words and definitions).
- Be able to define the dimensionality of an ADE problem (1D, 2D, 3D, steady or unsteady) if given a description or a picture of the sources and boundary conditions.
- Given a picture of a pollutant source and information about its dimensionality, be able to describe how to handle no-flux boundary conditions and indicate where appropriate image source(s) would be located.
- Be able to recognize the difference between a no-flux boundary condition and a fixed-flux boundary condition, if I give you a physical description of a system. (For instance, think of the lecture discussion about oxygen diffusing into a water column from above and disappearing into the sediments at the bottom.
- Know the how to use the solutions to some of the simple 1-D advection-dispersion problems we have gone over (such as calculating the concentration curve or C_{max} after a point source, instantaneous injection into a river).
- Know the simple rules for estimating the longitudinal diffusion (Fickian transport) coefficient in an river (as found in the reading)
- Know how to include first order decay in a solution of a 1D river transport problem.
- Be able to do a simple estuarine mixing-curve problem. Be able to identify conservative vs. nonconservative mixing lines by inspection of a given graph.