

CE 650 CHEMICAL FATE AND TRANSPORT IN THE ENVIRONMENT

Fall Quarter 2004
MWF 1:10-2:00 Irvine 114
3 credits

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Course Content:

In this course you will learn about fundamental chemical transport processes and how they control the fate and distribution of organic and inorganic chemicals in the environment and engineered systems, such as water treatment plants. Processes discussed include advection, diffusion, dispersion, sorption, Henry's law and abiotic transformations. These will be incorporated into mathematic models using mass balance, completely-mixed, plug flow, plug flow plus dispersion, and advection-dispersion-reaction constructs. All of these concepts will be reinforced with environmental applications and a course-long project.

Text:

Schnoor, J. L. 1996. *Environmental Modeling*. John Wiley & Sons, New York, NY.

Grading:

Homework 15%, Project 30%, Midterm 25%, Final 30%

Project:

Over the quarter, you will be required to write a computer code that depicts the transport and/or partitioning of one or several chemicals in environmental media. These models will likely be two-dimensional (one spatial dimension plus time) and will be written in Matlab, unless you have a strong preference for another computer language.

Tentative Schedule:

Week Topics

1. Control volume, mass balance, equilibrium, steady-state
- 2., 3. Advection, diffusion, dispersion
4. Completely-mixed, plug flow, plug flow plus dispersion models
5. Reaction kinetics
6. Advection-dispersion-reaction equation and applications
7. Chemical equilibrium
8. Sorption: solvent partitioning, natural organic matter, clays
9. Sorption: isotherms, advanced sorption models, sorption kinetics
10. Vapor pressure, Henry's law, partial pressures, and boundary layer models

Reading Assignments (in Schnoor 1996)

- Ch. 1, p 1-16
Ch. 2, p 35-62
Ch. 2, p 62-87
Ch. 3, p 93-119
Ch. 9, p 455-484
Ch. 4, p 129-180
handout
Ch. 4, p 149-165
handout

Final Friday, November 19 at 2:30 pm