CE G7300: Surface Water Quality Modeling

Course Description: this course teaches basic techniques for modeling motions of contaminates in surface water problems and provides students with opportunity to learn and practice modeling programs. It introduces fundamental physical phenomena such as diffusion, advection, and chemical reaction kinetics, and presents their estimation using analytical approaches. The course discusses mathematical models for surface flow and pollution problems and their numerical methods, together with benefits and cautions of using numerical models. The students will simulate flow and water quality problems by running computer programs.

Course Goals:

1. Understanding fundaments of environmental pollutant phenomena
2. Understand the uses and limits of numerical models.
3. Develop an understanding of each component of water quality models for surface flow with the ability to predict the response to various external loadings and make improvements to these models.
4. Learn and practice widely used water quality computer models
5. Improve ability to communicate technical material in written form and orally.

Instructor: Prof. Hansong Tang
Time and Location: M, 6:50 - 9:20 pm, SH/204
Office Hours: M & W, 3:00 – 5:00 pm,
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Textbook Hydrodynamics and Transport for Water Quality Modeling, James L. Martin, Steven C. McCutcheon, CRC Press, 1999. ISBN 0-87371-612-4

Reference Book

Z-G Ji, Hydrodynamics and water quality, Wiley, 2008
S. C. Chapra, Surface water-quality modeling, McGraw-Hill Company, Inc., 1997
A. J. Fletcher, Computational Techniques for Fluid Dynamics, Vol. 1: Fundamental and General Techniques, 2nd ed, Springer, 1996
H. B. Fischer, et al. Mixing in Inland and Coastal Waters, Academic Press, 1979

Time Tables:

Week	topics
1	Nature of environmental pollutants Sediment, pathogens and toxics, eutrophication, …
2-3.	Basic phenomena (advection, diffusion/mixing, chemical reaction, biogeochemistry, etc)
4.	Governing equations (Navier-Stokes equations, transport equations, etc.)
5-6	Analytical and empirical approaches
7-8	Numerical methods (discretization, accuracy, scheme)
9--11	Surface water quality modeling using software (an EPA program, e.g., WASP) for river, lake, estuary problems
12-14	Project with computer modeling, presentation

Grades:

Homework:	20% (including 10% quiz)
Projects:	30%
Middle Term:	20%
Final:	30%