UNIVERSITY OF MICHIGAN

Department of Civil & Environmental Engineering

Stream, Lake and Estuarine Analysis - CEE 590

WINTER 2009

Instructor: Nikolaos D. Katopodes
Lecture: TuTh 9:30-11:00, 185 EWRE
Office Hours: TuTh 1:30-3:00, 121 EWRE
email: ndk@umich.edu

Text: *Free-Surface Flow* (e-book) by ndk

Course Web Page: https://ctools.umich.edu/

Grading: Homework 50%; Two exams 25%.

Honor Code:

The honor Code is based on integrity, a characteristic that is built into the profession. It is reflected in the original and reliable work of all good engineers. When students accept the Honor Code, they acknowledge that it is dishonorable to receive credit for work which is not the result of their own efforts.

All exams will be "closed-book" and will cover both theory and applications. You may use, however, one sheet (two pages) of information that may be helpful in the examination.

Homework sets are due **at the beginning** of the lecture period, one week following assignment. Late homework will be penalized 20% for each day it is overdue.

COURSE OUTLINE

Month	Day	Topic
January	8	Concept of Continuum; Conservation and Constitutive Laws
	13	Mass Transport Phenomena; Diffusional Mass Transport
	15	Unit Impulse Response
	20	Continuous Injection of Mass at a Point
	22	Evolution of Background Concentration; Spatially Distributed Sources
	27	Specified Concentration History
	29	Diffusion Coupled with Reaction or Adsorption
February	3	Boundary Conditions; Method of Images
	5	Advective Mass Transport; Asymptotic Approximations
	10	Multi-Dimensional Flows; Plumes in Streams and Rivers
	12	Numerical Modeling of Advection and Diffusion
	17	Stability, Accuracy and Consistency of Modeling
	19	**Exam #1**
	24	**Spring Break**
	26	**Spring Break**
March	3	Scales of Turbulence; Temporal and Spatial Averaging of Flow
	5	Turbulent Diffusion; Integral Time Scales; Movement of particles
	7	Turbulent Diffusion at Small, Intermediate and Long Times
	10	Turbulent Transport in Shear Flow
	12	Turbulent Mixing in Streams
	17	Dispersion in Depth-Averaged Flow; Principal Directions
	19	Vertically Averaged Models; Three-Dimensional Models
	24	Water Quality Modeling for Rivers; Streeter-Phelps Equation
	26	Transport of Cohesive Sediments
	31	Dynamics of an Estuary; Salinity Intrusion
April	2	Tidal Pumping and Trapping; Flushing Time
	7	Basic Concepts of Lake Circulation; Thermal Stratification
	9	Wind Stresses and Seiche; Three-Dimensional Lake Models
	14	**Exam #2**
	16	Sensitivity Analysis
	21	Source Inversion and Effluent Control