

CEE 577 - SURFACE WATER QUALITY MODELING

Fall Semester 2017

MWF 8:00

Catalog Description

CEE 577: Surface Water Quality Modeling. Credit 3. Evaluation and control of water quality in streams, lakes, and estuaries. Mathematical analyses of patterns of water movement and their relation to water quality. Prerequisite: CEE 370.

Required Text:

Chapra, Surface Water Quality Modeling, Paperback: Waveland Press, 2008, or Hardbound: McGraw Hill, 1997.

References:

Reckhow & Chapra, Engineering Approaches for Lake Management, Volumes 1&2, Butterworths Publ., 1983
Thomann & Mueller, Principles of Surface Water Quality Modeling and Control, Harper & Row Publ., 1987.
Schnoor, Environmental Modeling, J. Wiley & Sons., 1996.

Instructor:

David A. Reckhow, Professor of CEE
3rd floor Elab II, or 16c Marston
Office Hours: MWF 11-12:30, or as posted

Goals¹:

1. To provide a fundamental understanding of the means by which water quality models are formulated so that the students are able to adapt existing models to new situations.
2. To provide the students with some direct exposure to models currently used in environmental engineering practice for predicting water quality in rivers and lakes. This will equip them with the knowledge to apply such models to solve simple wasteload allocation problems..
3. To instruct as to how water quality data can be analyzed and interpreted
4. To show how water quality models may be calibrated, verified, and applied to environmental engineering problems, such as total maximum daily loads or fate and transport modeling of toxic organic chemicals.
5. To further develop the students' skills at working in teams, and presenting results in the form of written engineering reports and oral presentations to clients or to the public.
6. To acquaint the student with current issues in surface water quality; and to make them aware of the technical, political, ethical and sociological components of these issues.

¹ Similar to ABET's "outcomes".

Prerequisites by Topic:

1. College Calculus.
2. Elementary Differential Equations.
3. Basic Knowledge of Water Quality Parameters and Wastewater Treatment

Topics:

1. Completely mixed Systems
 - CSTR, waste loadings, steady state and time variable solutions
2. Incompletely mixed Systems
 - PFR, mixed-flow, diffusion, dispersion
3. Water Quality Environments
 - Rivers, lakes, estuaries
4. Dissolved Oxygen and Pathogens
 - Streeter-Phelps, BOD, DO, Nitrogen
5. Eutrophication and Temperature
 - Algal growth, heat budgets, light effects
6. Computer Mechanistic Models
 - QUAL2E, EXAMS
7. Stochastic Models
 - Export coefficients, phosphorous loading functions
8. Chemical Modeling
 - Heavy metals, toxic organics, pharmaceutically-active compounds

ABET Category Content:

Engineering Science: 2 credits or 67%
Engineering Design: 1 credit or 33%

Estimated Grading Criteria

Exams (2)	40%	
Written Homework	25%	
Class Participation	10%	(attendance is required)
Design\Modeling Problems	<u>25%</u>	
	100%	

CEE 577 Website:

<http://www.ecs.umass.edu/cee/reckhow/courses/577/>