Civil and Environmental Engineering 7620
Physical and Chemical Treatment Processes
University of Utah Spring 2005

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Office Hours: M,W; 10-noon or by appointment
Class Hours: T,H 6:00-7:20; MEB 1208

Texts: G. Tchobanoglous; F. Burton; Metcalf & Eddy, Wastewater Engineering-Treatment and Reuse. 4th Ed.
Matlab® 6.5.1 for students, The MathWorks.

Prerequisites: CVEEN 3610, 3620, 5610/6610; CE graduates

Scope and Objectives:
This course will discuss primarily physical and chemical treatment processes for water quality control with an emphasis on municipal wastewater. Related topics such as biological treatments and industrial water treatments not adequately dealt with here are covered by separate offerings of the Department. We will first identify wastewater characteristics and treatment objectives, and then study in detail the principles of various physical and chemical treatment methods. In addition to knowledge on designs based on empirical formulas and procedures, we will stress an understanding of the fundamentals necessary to implement new treatment operations and to improve treatment efficiency. Matlab computer software will be used to solve problems.

Topics: I. Introduction, Wastewater Characteristics, and Treatment Processes
- Introduction, Wastewater Characteristics
- Water Quality Parameters and Methods
- Process Analysis: Kinetics, Reactors, Material Balance
- Treatment Objectives, Process Selection and Design
- Regression Analysis of Experimental Data
- Introduction to use of Matlab

II. Physical Processes
- Screening; Flow Equalization; Mixing
- Sedimentation
- Gas Transfer
- Filtration
- Flotation
- Membrane Separation

III. Chemical Processes
- Acid-Base Chemistry
- Carbonate System and Equilibrium
- Adsorption- carbon adsorption
- Chemical Precipitation
- Disinfection
- Coagulation
- Oxidation-Reduction reactions, Redox potential
- Ion Exchange

IV. Brief Review on Biological Processes
- Activated Sludge Processes

V. Physical-chemical Treatment Processes for Hazardous Wastes
- Advanced Oxidation Processes for Organic Contaminants
- Chelation Extraction Technology for Heavy Metals
- Integrated Physical-Chemical Treatment Approach
- Site Remediation Techniques

VI. Review of Treatment Practice
- Review of Selected Articles; Format of reports to be discussed
- Special Projects & Presentations

Grade: Homework (10%); Examinations (20%, 20%, 30%); Reports/Presentation (20%). Final May 3.