Fall 2014

Environmental Systems Analysis - Penn State, University Park

Douglas A. Haith
Penn State, dah13@cornell.edu

BEE 4750
FALL 2014

Fall Tues, Thurs 11:40–12:55 3 Credits
Prerequisites: BEE 2510 or BEE 2600 or permission of instructor D. A. Haith

Applications of mathematical modeling, simulation and optimization to environmental quality management. Fate and transport models for contaminants in air, water and soil. Optimization methods (search techniques, linear programming) to evaluate alternatives for water and air pollution control and municipal solid waste management. Introduction to hydrologic simulation. Software packages for watershed analyses of point and nonpoint source water pollution.

Topic	Lectures
Introduction: environmental systems, modeling & optimization; wastewater treatment example	2.5
Modeling of watersheds & lakes: eutrophication example; optimization methods	2.5
Model linearization; linear programming, forestry example	2.5
Location of waste disposal facilities, municipal solid wastes example; integer linear programming	2.0
Air pollution modeling: proportional rollback, Gaussian transport; emissions trading	2.5
Dissolved oxygen in streams and rivers; waste load allocation, TMDLs	1.5
Groundwater models: hydrologic processes & water balance; nitrate pollution of groundwater example	2.5
Groundwater models: leaching & transport of organic chemicals	2.5
Nonpoint source pollution: simulation of contaminants in runoff	2.0
Watershed modeling: simulation of water & chemicals balance in large watersheds	4.0
Other water resources applications: water allocation & reservoir operation; benefit estimation, fuzzy objectives	2.0

Instructor: Professor Douglas A. Haith
308 Riley-Robb
255-2802
dah13@cornell.edu
Office hr: Mon, Weds 2:30-4:00 PM
or by appointment

Web Site - Blackboard

The course web site can be accessed through http://blackboard.cornell.edu/. Lecture figures, sample problems, assignments and other materials will be available at the site. It is particularly important to download the appropriate lecture figures (as pdf files) and bring them to class.

Grades: Grades of F through A based on an absolute (uncurved) scale of 100:

< 60 = F
60-69 = D
70-79 = C
80-89 = B
90-100 = A

60% Assigned Projects.

Hard-copy project write-ups are due by the end of class on the assignment date. Late projects submitted prior to return of graded projects will be penalized 25%. No submissions will be accepted after graded returns. Students may work individually or in pairs (2 people). Partners are expected to participate more-or-less equally in the work for each project. Paired work should be submitted as a single write-up with both names. Students may not change partners during the semester unless they have permission of the instructor. They may, however, elect to submit some projects as individuals and some as (the same) partners. Pairs or individuals are expected to work reasonably independently. That is, each student or pair may discuss and compare their work with other students and/or pairs, but must be responsible for their own analyses, spreadsheets, software runs, and reports. Project solutions will be posted in the display case next to the elevator on Riley-Robb 3rd floor . Students who are unable to meet project deadlines due to verifiable family or health emergencies should consult with the instructor regarding possible make-ups.

25% In-class Quizzes.

Short (10-15 min) closed-book quizzes covering the assigned reading and lectures will be given each Thursday at the end of class. There will be no make-ups for these quizzes. However, the two lowest quiz grades will be dropped.

15% Final Exam.

A 2 1/2 hour final exam will be scheduled by the University during finals week. Make-up exams may be possible for students with verifiable health or family emergencies.