ERE465/665: Environmental Systems Engineering

PROFESSOR:	Chuck Kroll cnkroll@esf.ed	402 Baker Lab u 470-6699		
OFFICE HOURS:	Will generally and by appoint	occur on the days before homework is due, ment		
MAILBOXES:	The course ma also have a ma	ilbox is located across from 402 Baker. I ilbox in 402 Baker.		
LECTURES:	Tues/Thurs: 9 Baker 437	30 am – 10:50 am		
RECOMMENDED TEXTS:	<i>Civil and Environment</i> and Wright. Available	<i>and Environmental Systems Engineering</i> , Revelle, Whitlatch, Wright. Available at the Orange Bookstore.		
	Water Resources Syste introduction to method and E. Van Beek, avai http://dspace.library.co [You can purchase a co http://publishing.uneso	<i>trms Planning and Management: An</i> <i>ls, models and applications</i> by D.P. Loucks lable for free in pdf form from ornell.edu/handle/1813/2799 opy for 50 ϵ at co.org/details.aspx?Code_Livre=4438]		
	Handbook of Hydrolog on Chapter 17: Freque	gy by D. Maidment, ed., with primary focus ency Analysis of Extreme Events.		
	Throughout the semes	ter readings will be distributed electronically		
PREREQUISITES:	At least 1 calculus cou At least 1 probability a Working knowledge o [Knowing computer pu helpful, it is not essent	rse and statistics course f Excel cogramming may be ial for this course.]		
COURSE SOFTWARE:				
	In this course we will p package built into EXC to use it, but the standa available from Frontlin very useful for solving it works. We may also (available for download calibration program (e	primarily use SOLVER, an optimization CEL. You will learn how it works and how and SOLVER is EXCEL (upgrades are the Systems) is rather unsophisticated and not complex problems and/or for learning how o use the computer program LINDO d at <u>http://www.lindo.com</u>), and a model ither UCODE or PEST) in this course.		

GRADING:

Exam 1:	Tentative Date => Oct	ober 18	25%
Exam 2:	Tentative Date => Dur	ring Finals Time Slot	25%
Homework Assignments			25%
Course Projects and Presentations			25%
Note: The format of the exams and project will be discussed later in the semester.			

COURSE OBJECTIVES:

This course will introduce students to mathematical models and methods to aid in management and decision making. These techniques can be applied to many different engineering and non-engineering situations, and class applications will involve a variety of environmental resources (water, forest, etc.), as well as issues with model calibration. The course will focus primarily on three subject areas:

- Engineering economic methods to compare competing alternatives with varying benefits and costs over time,
- Optimization techniques for developing planning and management strategies, as well as model calibration, and
- Simulation techniques for examining system uncertainty and sensitivity

Tentative Course Outline:

<u>Comparative Economics (15% of Course)</u>: Economic methods to compare competing alternatives with varying benefits and costs over time. Topics include:

Cash Flows, Interest, and Equivalence Nominal and Effective Interest Rates Net Present Worth and Annual Worth Analyses Benefit-Cost Ratio Analyses

Optimization (70% of Course): Systems analysis and numerical methods techniques, including unconstrained and constrained linear and constrained linear and nonlinear optimization. Topics include:

General Unconstrained and Constrained Optimization Lagrange Multipliers Linear Programming Simulated Annealing Genetic Algorithms Modern Heuristic Search Techniques

<u>Simulation (15% of Course)</u>: Techniques for examining system uncertainty, including frequency analyses, trend analyses, and regionalization and simulation techniques:

First-Order Error Analysis Frequency Analyses and Random Number Generation Monte Carlo, Bootstrap and Jackknife Simulation Trend Analyses