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Fall 2008

Systems Analysis of Resources Development - California State University, Sacramento

Kaveh Madani
California State University, Sacramento, k.madani@imperial.ac.uk

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CE250   **Systems Analysis of Resources Development**   Fall 2008
MW 6:00 pm – 7:15 pm   Instructor: Kaveh Madani
Location: Riverside Hall room 1006   Email: kmadani@csus.edu

OBJECTIVES
The course presents a variety of systems analysis techniques that can be used for resource planning and management in the civil engineering field. Simulation and optimization techniques (or mathematical programming) are emphasized as they apply to civil engineering problem solving.

By the end of the class, students should be able to:

- Understand the meanings of "Systems Theory", "Systems Analysis", and "Systems Behavior";
- Diagnose the applicability and limitation of different systems analysis approaches in solving various resource management problems;
- Identify and formulate the problem using different simulation and optimization (Operations Research) methods including System Dynamics, Game Theory (Conflict Resolution), Linear Programming, Dynamic Programming, and Multi-Criteria Decision Making.
- Solve basic linear programming optimization using Excel Solver, LINDO, and LINGO.

PREREQUISITES
Graduate student standing or permission from the instructor is required to take CE250.

COURSE TEXT
There is no required text for this course. Handouts will be distributed.

Recommended texts:

Hillier and Lieberman, Introduction to Operations Research, 6th or 7th edition.
Loucks and Van Beek, Water Resources Systems Planning and Management (you can ask the instructor for an electronic copy of this book or purchase the hard copy)
Simonovic, Managing Water Resources (under publication, you can order the hard copy at http://www.earthscan.co.uk/?tabid=4377. Some chapters of this book will be provided by the instructor with permission from the author)

GRADING POLICY
The class will consist of 10 homework assignments, 1 paper review, 1 term project and 1 examination. The grading policy is shown below.

Homework: 35%
Paper Review: 5%
Midterm: 25%
Final Project: 25%
Participation: 10%

EXAMINATION
The midterm is scheduled for Wednesday, November 12, 2008.

Final Project
The Final Project is due on December 22, 2008.

COLLABORATION
Please abide by the honor system for all work. Students may work together on homework assignments, unless otherwise noted. Each student must submit his/her own work. Please write the names of the students with which you collaborated on your homework assignment.

At the instructor's discretion, electronic copies of the homework may be required in addition to the paper hard copy.

All exams must be done individually.

Students are expected to follow the Academic Honesty policy and procedures. For more details see: http://www.csuc.edu/umanual/student/UMA00150.htm

COURSE SOFTWARE REQUIREMENTS
Students must have access to a Windows computer with Microsoft Excel, Vensim, GMCR II, LINDO, and LINGO.
Trial versions of LINDO and LINGO are available at
http://lindo.com/index.php?option=com_content&view=article&id=34&Itemid=15.
Vensim can be downloaded at http://www.vensim.com/freedownload.html
GMCR will be provided to students.

CONTACT INFORMATION
Office hours will be held after class.

Outside of class and office hours, email is the preferred method of contact. Please include 'CE250' in the subject line.

TENTATIVE SYLLABUS (Subject to Change)

Date		Topic	
Sept.	3	System, Systems Analysis, Models	
	8	Simulation and Optimization, Problem Formulation	
	10	System Dynamics	HW#1 Due
	15	System Dynamics, Cont.	
	17	VENSIM & Simulation in Excel (computer lab)	
	22	Optimizaion (Objectives, Constraints, & Calculus), Linear/Non-Linear	HW#2 Due
	24	Linear Programming, Network Flow Programming, Graphical Solution & Math Programming	
	29	Simplex Method	HW#3 Due
Oct.	1	Lagrange Multipliers & Sensitivity Analysis	
	6	Duality	HW#4 Due
	8	Non-Linear Programming	
	13	Columbus Day	
	15	LINDO and Excel Solver (computer lab)	HW#5 Due
	20	Dynamic Programming	
	22	Dynamic Programming, Cont.	HW#6 Due
	27	Student Presentations (Paper Discussion)	
	29	Student Presentations (Paper Discussion)	HW#7 Due
Nov.	3	Application of Systems Analysis in Research: Kaveh tells you about his PhD dissertation (Climate Change Effects on Hydropower Generation in California)	
	5	Multi-Criteria Decision Making	Paper Review Due
	10	Review Session	HW#8 Due
	12	MIDTERM	
	17	Guest Lecturer: TBA/ Application of Systems Analysis in Industry	
	19	Guest Lecturer: TBA/ Application of Systems Analysis in Large Scale Water Resources Modeling	
	24	Conflict Resolution/ Game Theory	Draft final project report* due
	26	Conflict Resolution/ Game Theory, Contd.	
	1	GMCR II (Computer Lab)	HW#9 due
Dec.	3	Guest Lecturer: TBA/ How to Use Game Theory in International Resources Conflict Resolution	
	8	Student Presentations (Final Projects)	HW#10 Due
	10	Student Presentations (Final Projects)	

*Final project report is due on Dec. 22