CE 402 CIVIL ENGINEERING SYSTEMS ANALYSIS
Required Course
Spring 2009

Instructor: *Name:* Ilgın Yaşar
Office Hours: M 6 7 W 1 2 Th 1 2
Course Data: Hours: MM 34, T 5
Room: M2171

Course Description (Catalog):
CE402 Civil Engineering Systems Analysis (3+0+0)3
Techniques commonly associated with systems engineering. New techniques applicable to design and operations of civil engineering systems. Linear optimization, linear programming, transportation and assignment problems, network analysis; queuing theory; simulation techniques; decision analysis; nonlinear optimization; critical path method; applications of fuzzy logic, expert systems, neural networks in civil engineering.
Prerequisite: CE 202 Introduction to Probability and Statistics for Civil Engineers
Course Objectives (Learning Outcomes):
To furnish the junior year students with the elementary techniques about decision making in conjunction with the systematic approach as applied to engineering.
To provide students with exposure to the essentials of resource optimization and allocation in the presence of constraints and uncertainties constitute the main body of the course.
To establish a bridge to the higher level of design, engineering management, and environmental engineering courses with the elementary linear algebra and probability and statistics, in order to form students as short-and long-term decision makers.
Textbook:
Revelle, C.S., E.E. Whitlatch and J.R. Right, "Civil and Environmental Systems Engineering", Prentice Hall, New Jersey, 2004.
Curricular Context
This required course provides the junior year students with the elementary techniques about decision making in conjunction with the systematic approach as applied to engineering.
Laboratory and Computer Usage: N/A
Class Policies:
Attendance, Homework, Quizzes: More than 6 hours (two weeks) of absenteeism will not receive any points. Homework questions to be assigned from each chapter. Random quizzes to be held. Quizzes will be based on homework assignments. 10% of the course grade.
Term project: The selected topics should be cleared with the instructor by March 16th, 10% of the course grade
Midterm exams: Two exams, each 25% of the course grade.
Final exam: Comprehensive exam at the end of the semester, 30% of the course grade.
Contribution of the Course to Program Outcomes:
(a) An ability to apply knowledge of mathematics, science and engineering
(e) An ability to identify, formulate and solve engineering problems
(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context
(j) A knowledge of contemporary issues
(k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
Course Assessment:
Course will be assessed on the basis of the accomplishments regarding the course objectives and the contributions to the program outcomes. The evaluation will consist mainly of the responses from the students, who will provide their comments to various course related questions in the final week of the semester.

Week	Topics	Reading Assignment	Homework Assignment	Course Topics and Objectives
1	Introduction to mathematical modeling. Linear Programming	Chapters 1,2,3	Homework I	Methodology, System analysis and modeling, Scales of measurement, Model construction, Symbolic models, Linear programming, Some examples: Applications of LP, Sample decision model settings, Models in Civil and Env. Engg., Graphical solutions.
2			Homework II	
3	Simplex Solution and C. Engg. Applications of Linear Programming Introduction of PC programs	Chapter 4, Class Notes	Homework III	Simplex algorithm, feasible region, unbounded solution, an alternate solution, infeasible solution, the Tableau Method for Simplex Algorithm, sensitivity analysis.
4	Additional Programming Linear Methods. Transportation and other Problems, Assignment Problem and Networks	Chapter 6		Linear programming models of network flow, shortest path problem, mixed integer program, network formulations, relation of transshipment, transportation and shortest path problem, max flow problem, traveling salesman problem, assignment problem
5	Integer Programming and its Applications REVIEW QUESTIONS	Chapter 7		Integer Programming and ITS Applications, The terminal selection problem, The location set covering problem, The plant location problem.
6	Nonlinear Programming	Chapters 13	Homework IV	Nonlinear programming, Nonlinear optimization, Unconstrained optimization, Lagrange Multiplier, Newton-Raphson Approximation, Search Techniques
7	Nonlinear Programming	Chapters 13		Lagrange Multiplier, Newton-Raphson Approximation, Search Techniques
8	Nonlinear Programming, Queuing Theory and Simulation Techniques	Class Notes	Midterm I (April 6th, 2009)	Search Techniques, Basic structure of queuing models, Queuing models
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10	Critical Path Method, PC packages	Chapter 8	Homework V	Scheduling problems, Critical Path problem, Arrow diagram, Node numbering, Scheduling models, Critical path method, Arrow format, Diagram sparsity and flow, Use of dummy activities, Activity schedule, Forward pass/backward pass, Categories of float time, Project compression, Activity progress curves, Time Scaled Arrow Diagram, Resource Leveling, Cost duration curves.
11	Engineering Economics I: Interest & Equivalence (Time Value of Money), Choice Between Alternatives	Chapters 14, 15	Midterm II (May 6th, 2009)	Compound interest: Single payment, Nominal and effective interest rate, Continuous compounding, Standard cash flow series, Capitalized cost, The analysis methods: Present worth, annual cash flow, incremental B/C ratio, incremental rate of return, payback period analysis
12	Fuzzy Logic and Applications in Civil Eng., Neural Networks and Applications in Civil Eng., Expert Systems and Applications in Civil Eng.	Class Notes		Fuzzy sets and membership, Uncertainity and imprecision, Neural Networks.
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