CE 402 CIVIL ENGINEERING SYSTEMS ANALYSIS
Required Course
Spring 2009

Instructor: 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):
CE 402 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:

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.
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<th>Week</th>
<th>Topics</th>
<th>Reading Assignment</th>
<th>Homework Assignment</th>
<th>Course Topics and Objectives</th>
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<td>1</td>
<td>Introduction to mathematical modeling. Linear Programming</td>
<td>Chapters 1,2,3</td>
<td>Homework I</td>
<td>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.</td>
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<td>2</td>
<td>Simplex Solution and C. Engg. Applications of Linear Programming</td>
<td>Chapter 4, Class Notes</td>
<td>Homework II</td>
<td>Simplex algorithm, feasible region, unbounded solution, an alternate solution, infeasible solution, the Tableau Method for Simplex Algorithm, sensitivity analysis.</td>
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<td>3</td>
<td>Additional Programming Linear Methods, Transportation and other Problems, Assignment Problem and Networks</td>
<td>Chapter 6</td>
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<td>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.</td>
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<td>5</td>
<td>Nonlinear Programming</td>
<td>Chapters 13</td>
<td>Homework IV</td>
<td>Nonlinear programming, Nonlinear optimization, Unconstrained optimization, Lagrange Multiplier, Newton-Raphson Approximation, Search Techniques</td>
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<td>6</td>
<td>Nonlinear Programming</td>
<td>Chapters 13</td>
<td>Midterm I (April 6th, 2009)</td>
<td>Search Techniques, Basic structure of queuing models, Queuing models</td>
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<td>7</td>
<td>Nonlinear Programming</td>
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<td>Lagrange Multiplier, Newton-Raphson Approximation, Search Techniques</td>
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<td>9</td>
<td>Critical Path Method, PC packages</td>
<td>Chapter 8</td>
<td>Homework V</td>
<td>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</td>
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<td>10</td>
<td>Engineering Economics I: Interest &amp; Equivalence (Time Value of Money), Choice Between Alternatives</td>
<td>Chapters 14, 15</td>
<td>Midterm II (May 6th, 2009)</td>
<td>Fuzzy sets and membership, Uncertainty and imprecision, Neural Networks.</td>
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<td>11</td>
<td>Fuzzy Logic and Applications in Civil Eng., Neural Networks and Applications in Civil Eng., Expert Systems and Applications in Civil Eng.</td>
<td>Class Notes</td>
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