Operations Research

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Fall 2004
When sending an e-mail, please begin subject line with "OR".
Discussion Meeting
A weekly meeting will be scheduled at which time students may ask questions, discuss homework exercises, etc. Attendance at this meeting is optional.

Grading System
• There will be 2 examinations, one at the middle of the course, and one at the end.
• Homework will be assigned each week, but this will not be given to the instructor to be graded. Students are encouraged to work together on homework assignments.
• There will be a short (multiple choice) quiz each week which tests whether you have understood the homework assignment. Only the best 10 quizzes for each student will be used in computing the course grade.

<table>
<thead>
<tr>
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<th>Percentage</th>
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<tbody>
<tr>
<td>Midcourse Examination</td>
<td>30%</td>
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<tr>
<td>Final Examination</td>
<td>50%</td>
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<tr>
<td>Weekly Quizzes (best ten)</td>
<td>20%</td>
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What is “Operations Research”?

• other names: management science, decision science
• application of information technology for decision-making
• designing systems to operate in the most effective way or deciding how to allocate scarce human resources, money, equipment, or facilities
• closely related to several other fields:
  o applied mathematics,
  o computer science,
  o economics,
  o industrial engineering, and
  o systems engineering
Typical problems faced by an O.R. practitioner:

• In what sequence should parts be produced on a machine in order to minimize the change-over time?
• How can a dress manufacturer lay out its patterns on rolls of cloth to minimize wasted material?
• How many elevators should be installed in a new office building to achieve an acceptable expected waiting time?
• What's the most efficient route for a long-distance telephone call?
• What is the lowest-cost formula for chicken feed which will provide required quantities of necessary minerals and other nutrients?
The Problem-Solving Process

• formulate the problem—study the situation to identify
  o objectives (for example, minimize cost or maximize profit),
  o alternative actions,
  o constraints on the solutions,
  o data requirements
• translate the problem from verbal and qualitative description into a mathematical, quantitative model
  o the model will be an abstraction or simplification of the real situation
  o some elements (unimportant, we hope) may be ignored in order to simplify the model
• select a computational method to solve the model
• evaluate the validity of the solution—
  o is it reasonable?
  o have we ignored some important requirement?
Partly because the course is being taught in English, your greatest challenge will probably be the first two steps:

• formulating the problem in a verbal, quantitative statement, and

• translating that verbal statement into a mathematical statement

*These steps involve more “art” than “science”!*
Types of O.R. models to be studied in this course:

- (Continuous) linear programming
- Integer linear programming
- Network flow models
- Project scheduling
- Decision trees
- Dynamic programming

Other O.R. models

- Nonlinear programming
- Markov chains (for random processes)
- Queueing (waiting line) models
- Simulation models
- Game theory
- Inventory theory
- Reliability