Operations Research

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.

Midcourse Examination	30%
Final Examination	50%
Weekly Quizzes *(best ten)*	20%

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:
    - applied mathematics,
    - computer science,
    - economics,
    - industrial engineering, and
    - 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
    - objectives (for example, minimize cost or maximize profit),
    - alternative actions,
    - constraints on the solutions,
    - data requirements
- translate the problem from verbal and qualitative description into a *mathematical, quantitative model*
    - the model will be an abstraction or simplification of the real situation
    - 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—
    - is it reasonable?
    - 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