

Operations Research

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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.

Midcourse Examination	30%
Final Examination	50%
Weekly Quizzes (<i>best ten</i>)	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