ISE330: Introduction to Operations Research

Fall 2002
University of Southern California
DJE-ISE Department

Handouts Today

- General Course Information
- Occupational Outlook
- Linear Algebra Quiz
Administrative Details

• Classes: TR 2:00pm-3:20pm
• Location: KAP 148
• Section: #35018D
• Instructor OH: T 3:30pm-5:30pm
• Help Sessions: Tan Xumei
• Website:  
  http://www-classes.usc.edu/engr/ise/330

Contact Information

• Instructor:  
  Elaine Chew <echew@usc.edu>  
  GER room 245 (tel: 213.8212414)
• Course Assistant:  
  Tan Xumei <xumeitan@usc.edu>  
  GER room 309
Textbook


Course Outline

- **Introduction** to Operations Research (today)
- Module 1: (Aug 29 – Oct 3) **Linear Programming**
- Module 2: (Oct 8 – Oct 31) **Network Optimization**
- Module 3: (Nov 5–7) **Game Theory**
- Module 4: (Nov 12–14) **Integer Programming**
- Module 5: (Nov 19–21) **Dynamic Programming**
- Module 6: (Nov 26–Dec 5) **Nonlinear Prog**
- **Review**
Grade Allocation

- Homework: 30%
- Quiz (Sep 12): 10%
- Midterm (Oct 24): 25%
- Final Exam (cumulative): 30%

Pre-Requisite: MATH 225

- Linear Algebra
- Differential Equations

- Pop Quiz
History of OR

• Britain, WWII (1938). Multi-disciplinary team of scientists explore how to use radar information to deploy and use fighter planes.
• United States. Mathematical models (Search Theory) used to develop optimal air search patterns for anti-submarine tactics.

Evolution of OR

• OR moves into industrial domain (1950’s), parallels computers’ growth as business planning/management tool.
• Focus on development of mathematical modeling techniques to improve or optimize real-world systems.
What is Operations Research?

- **Before**: application of mathematics and the scientific method to military operations.
- **Today**: scientific approach to decision making. Seeks to determine best way to design and operate system, usually requiring allocation of scarce resources.

Career Opportunities

- Accounting
- Actuarial Work
- Computer Services
- Corporate Planning
- Economic Analysis
- Financial Modeling
- Industrial Engineering
- Investment Analysis
- Logistics
- Manufacturing Services
- Management Consulting
- Management Training
- Market Research
- Operations Research
- Policy Planning
- Production Engineering
- Quantitative Methods
- Strategic Planning
- Systems Analysis
- Transportation
The OR Methodology

Formulate Problem

Observe System

Present Results to Organization

Verify model and use it for Prediction

Formulate a Mathematical Model of Problem

Select a Suitable Alternative

Implement and Evaluate Recommendations

Formulate, Gather Data

Present Results to Organization

Implement and Evaluate Recommendations
Mathematical Model

• An idealized representation of a real world problem
• Decision variables: \((x_1, x_2, \ldots, x_n)\)
• Objective function: \(z = c_1x_1 + c_2x_2 + \ldots + c_nx_n\)
• Constraints: \(a_{11}x_1 + a_{13}x_3 \leq b_1\)

• Goal: Choose values of the decision variables that maximize the objective function subject to the constraints.