

**ISyE 3231**  
**Deterministic Operations Research**  
**Winter 1998**

**Administrative Info**

**Instructor:** Anton J. Kleywegt  
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**Teaching Assistant:** To be announced

**Class Room:** IC211  
**Class Times:** Tuesdays & Thursdays 1:30–3:00pm

**Description:**

An introduction to deterministic operations research models and algorithms, emphasizing

- the formulation of a wide variety of engineering problems, including system design and operations problems, as operations research models;
- the different types of models, such as deterministic vs. stochastic, continuous vs. discrete, linear vs. nonlinear models, and their implications for complexity;
- the trade-offs between model realism and tractability, the role played by assumptions, and an understanding of factors affecting the usefulness of models;
- a number of general solution methods and algorithms.

The objectives are

- to develop skill in the modeling of engineering systems and operations;
- to understand the issues involved in model assumptions, realism, complexity, solution effort, and usefulness;
- to develop skill in applying a variety of techniques to solve operations research problems.

**Prerequisites:**

Engineering mathematics, including linear algebra and multivariate calculus. The first two quizzes will test you on this material.

**Textbook:**

- Rardin, Ronald L., *Optimization in Operations Research*, Prentice Hall, Upper Saddle River, NJ, 1998.

**References:**

- Winston, Wayne L., *Introduction to Mathematical Programming*, 2nd edition, Duxbury Press, Belmont, CA, 1995.
- Winston, Wayne L., *Operations Research*, 3rd edition, Duxbury Press, Belmont, CA, 1994.
- Hillier, and Lieberman, *Introduction to Operations Research*, 5th edition, McGraw-Hill, New York, NY, 1990.
- Taha, M. *Operations Research*, Macmillan, New York, NY, 1987.

**Topics Covered:**

- Modeling – Formulation and Model Types
- Improving Search
- Line Search
- Gradient Search
- Linear Programming Models
- Simplex Algorithm
- Some of the following:
  - Duality and Sensitivity Analysis
  - Shortest Path
  - Dynamic Programming
  - Network Flows
  - Discrete Optimization

**Grading:**

Grades will be assigned as follows:

- Homework: 20%
- Quizzes: 20%
- Midterm exam 1: 15%

- Midterm exam 2: 15%
- Final exam: 30%

**Homework:**

Homework will be assigned approximately once a week. Late homework will be accepted only in case of unavoidable occurrences, such as illness or death in the family. Students are encouraged to discuss homework and learn from each other, but each student must submit his/her own work. You should start working on each homework early; that way you will have time to ask (and understand) questions in class before the homework is due. Any queries on homework grades must be submitted in writing to the instructor, together with the homework in question.

**Quizzes:**

Quizzes will cover material discussed in class, in the text, and especially assigned in the homework. (Thus make sure you understand the homework solutions!) Quizzes may be given without prior notice.

**Exams:**

Exams will cover material discussed in class, as well as material in the text, homework and quizzes. Exams will be comprehensive. Exams will be closed book. Any queries on exam grades must be submitted in writing to the instructor, together with the exam in question. Make-up exams will be scheduled only in case of unavoidable occurrences. It is your responsibility to take the exams at the designated times. Travel arrangements are not sufficient reason to warrant a make-up exam or an incomplete grade.