

# COURSE OUTLINE FOR MATH. 418: INTRODUCTION TO OPERATIONS RESEARCH

Text: Taha, Operations Research, Macmillan

CHAPTER 1 .5 weeks  
Decision Making in Operations Research

This serves as an introduction to operations research. Watch out for an error in the formulation of the problem of Section 1.2. Some discussion of the history of operations research would be appropriate.

CHAPTER 2 2.5 weeks  
Linear Programming: Formulations and Graphical Solution

Continue with formulations throughout the course. Introduce postoptimality considerations here. You could introduce the software here too (or Chapter 3).

CHAPTER 3 3 weeks  
Linear Programming: The Simplex Method

An overview is needed but don't get bogged down in details. Be sure to cover the special cases, and include sensitivity analysis. Software use is essential. The (exponential) computational complexity of the simplex method should be mentioned.

CHAPTER 5  
Linear Programming: Duality, Sensitivity, and Parametric Analysis.

CHAPTER 7 1 week  
Linear Programming: Additional Topics

These chapters, along with Chapter 4, are more mathematically oriented and require some background in linear algebra. Try to explain how postoptimality conditions are implied by the final simplex tableaus. Students should be aware of the ideas behind duality and the new Karmarkar algorithm, but computational details need not be covered. More details in these chapters can be covered at the instructor's discretion after the core material is covered.

CHAPTER 6 2 weeks  
Linear Programming: Transportation Model

Do all, including the special algorithms for the transportation, assignment and transshipment models.

CHAPTER 8

1 week

Network Models

Do 8.1 (Network Definitions) and 8.2 (Minimal Spanning Tree Problem). Don't do 8.3 (Shortest-Route Problem) in order to avoid some overlap with Math.336, but cover 8.4 (Maximal-Flow Problems).

CHAPTER 13

1.5 weeks

Project Scheduling by PERT-CPM

Avoid Section 13.4, which is probability-based.

OTHER TOPICS

The above constitutes the core requirement. For the last two weeks it is left to the instructor's judgment what other topics are to be included. Additional time can be spent

in Chapters 4/5/7 as indicated above (theoretically oriented), but what is recommended is material from:

CHAPTER 12

Decision Theory and Games

Though this chapter uses probability language, it was taught in earlier editions where probability considerations were kept very simple (as in mixed strategies in two-person games).

CHAPTER 9

Integer Linear Programming

CHAPTER 10

Dynamic (Multistage) Programming

CHAPTER 15

Queueing Models (The probability can be avoided.)

One possibility is for the instructor to the end with a survey of some or all of these chapters, letting the students know what kinds of problems they are about. For example, in Chapter 9 one can quickly show that rounding off the continuous solution does not necessarily give an optimum integer solution, and the idea behind the “branch-and-bound” algorithm can be explained.

Testing and Review

1 week