

# Discrete Optimization

Moshe Rosenfeld  
University of Washington  
Tacoma Washington, USA  
moishe@u.washington.edu

## 1 Introduction

What is Discrete Optimization?

Discrete optimization, or combinatorial optimization is a relatively new branch of Mathematics-Computer Science-Operations Research. In a nut shell, it deals with choosing an optimal object from a finite collection of objects.

Many of these problems sound simple and have a very simple solution: *Try all objects and select the best.* As we learn more, we shall quickly understand why this is not a practical approach.

Class presentations will be a mixture of blackboard and Power Point slides. Prior to most classes you will be asked to solve a simple problem related to the class topic. The class will start with a discussion of your solutions. Slides used in class, assignments and all other class related information will be posted on the class web site:

**[http://www. faculty.washington.edu/moishe/hanoi-2011/DO-2011](http://www.faculty.washington.edu/moishe/hanoi-2011/DO-2011)**

The file **lecturenotes.pdf** in the class web site will include further information, announcements and background review material.

Your grade will be determined as follows:

1. Assignments: 15%
2. Projects: 15%
3. Mid Term: 20%
4. Final: 50%

### **Office hours**

My office is in the media center office number 505.

Office hours:

Wednesday: 1:00 - 2:30

Friday: 1:00 - 2:30

Please feel free to stop by any time.

There are many textbooks for Discrete Optimization. Most books on algorithms also include examples of combinatorial optimization problems. Below please find a small list of books available in our department library. These books were bought from funds given to us by the Vietnam education Foundation to whom we are grateful.

1. A. Schrijver: Combinatorial optimization (A, B, C) - polyhedra and efficiency
2. B. Korte and J. Vygen: Combinatorial optimization
3. Papadimitriou and Steiglitz: Combinatorial Optimization Algorithms and Complexity
4. Jon Lee: A First Course in Combinatorial Optimization (Cambridge Texts in Applied Mathematics)
5. Vijay V. Vazirani: Approximation Algorithms
6. J. Kleinberg and E. Tardos: Algorithm Design.

## **1.1 Topics**

1. Introduction to Combinatorial Optimization: the assignment problem and the traveling salesman problem.
2. Graph concepts (review)
3. Minimum cost spanning trees, shortest path algorithms.
4. Matchings.
5. Linear programming and Integer programming.
6. Matroids.

All topics will include examples of related applications.

## **1.2 AIMMS**

In our computer lab we installed a program called AIMMS. We will use this program in class for solving linear programming problems. You will be expected to use for your project to be described in a separate file.