

Winter 2018

## Course description

### COMP 567 - Discrete Optimisation 2

#### Instructor

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#### 1. Objectives

This course is an introduction to

- deterministic discrete optimisation: linear programming, integer linear programming
- decomposition
- metaheuristics

It includes some of the basic mathematical principles required to understand different solution techniques introduced in the lectures. No prerequisites are required to follow the course, but we assume that the students have some mathematical maturity, and that they know basically linear algebra and analysis.

#### 2. Course content

##### Week 1 (Introduction)

- Introduction
- Introduction to discrete optimization (Components of a mathematical model, linear programming models, integer programming models, MIPs..)
- Classical problems in discrete optimization (knapsack, assignment problem, ...)

##### Week 2 (A review of linear programming)

- The simplex method (the algorithm, outcomes, cycling and degeneracy)

##### Week 3

- Duality (Dual formulation, Duality theorems, some uses of duality)
- Dual simplex method

##### Week 4 (Integer programming)

- Relaxations (motivation, definition, linear relaxation)
- Gomory's cutting plane methods

##### Week 5

- Branch and Bound (the algorithm, branching strategies, node selection)

**Week 6 (Decomposition)**

- Restriction approach
- Dantzig-Wolfe decomposition method and column generation

**Week 7**

- Relaxation approach
- Benders decomposition

**Week 8**

- Initial project presentations

**Week 9 (Metaheuristics)**

- Metaheuristics: Local search methods (Descent, Tabu search, Simulated annealing, Variable Neighborhood Search)
- Adaptive large neighborhood search

**Week 10**

- Metaheuristics: Population based methods (Genetic algorithm, Scatter Search, particle swarm)

**Week 11 (Stochastic programming)**

- Stochastic integer programming

**Week 12**

- Exam

**Week 13**

- Final project presentation

**3 Course grade**

- Grade distribution:
  - Project : 50%
  - Final : 50%
- Final : Final exam 3 hours
- Project : supervised by Roussos Dimitrakopoulos

**4 Schedule**

Thursday 13h35 – 16h25

Room: ENGMC 103

January 11 to April 12