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## PhD Courses 2017

**Thursday May 18, 2017, 2pm to 7pm, room 6.1**

### Approximate Solution of Optimization Problems

#### Contents

1. Mathematical models of combinatorial optimization problems
2. Approximation algorithms
3. Heuristic algorithms
4. Metaheuristic algorithms

**Thursday November 30, 2017, 2:30pm- 7:30pm, room 5.6**

**Thursday December 7, 2017, 2:30pm- 7:30pm, room 5.6**

**Thursday December 14, 2017, 3:00pm- 7:30pm, room 5.1**

**Tuesday December 19, 2017, 2:30pm- 7:30pm, room 5.2**

### Models and Algorithms for Matching and Assignment Problems (4 lectures, 5 hours each)

#### Contents

1. **Introduction:** matching, assignment, graphs, bipartite graphs, adjacency matrix, incidence matrix;
2. **Theoretical foundations:** matching problems, Hall's marriage theorem, Koenig's algorithm, augmenting path, complexity, stable marriage problem;
3. **Maximum matching applications:** vehicle scheduling, time slot assignment (TDMA), open shop scheduling;
4. **Linear sum assignment problem:** weighted matching, constraint matrix, unimodularity, duality, Egervary's theorem, initialization algorithms;
5. **The Hungarian algorithm:** main structure, rooted alternating tree, complexity, Kuhn's algorithm, Jacobi's theorem;
6. **Non-Hungarian algorithms:** Dinic-Kronrod's algorithm, primal simplex algorithms, Egervary's algorithm, Birkhoff-Von Neumann theorem;
7. **Other linear assignment problems:** k-cardinality assignment, bottleneck assignment, threshold algorithm, balanced assignment;
8. **Quadratic assignment problems:** combinatorial formulation, complexity, integer quadratic formulation, inner product formulation, trace formulation, exact solution, heuristics.

**The slides of each lecture will be available few days in advance at my web page:**

[http://www.or.deis.unibo.it/staff\\_pages/martello/cvitae.html](http://www.or.deis.unibo.it/staff_pages/martello/cvitae.html) → Courses → PhD courses

**It is recommended to print the slides.**

**LAPTOPS, SMART/CELL PHONES, etc must be switched off during lectures.**