**Monday June 16, 2pm to 7pm, room 5.4**  
**Introduction to Combinatorial Optimization**(tailored for students who did not follow an Operations Research course):  
Contents  
1. Introduction: Some easy examples  
2. Linear Programming  
3. Optimization problems  
4. Integer Linear Programming  
  
**Wednesday June 25, 2pm to 7pm, room 5.4**  
**Approximate Solution of Optimization Problems**

Contents  
1. Mathematical model of combinatorial optimization problems  
2. Approximation algorithms

3. Heuristic algorithms  
4. Metaheuristic algorithms

**Thursday November 20, 2pm to 7pm, room 1.5**  
**Thursday November 27, 2pm to 7pm, room 1.5**

**Thursday December 04, 2pm to 7pm, room 1.5**  
**Thursday December 11, 2pm to 7pm, room 1.5**

**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>  🡪 Courses 🡪 PhD courses

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

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