COMBINATORIAL OPTIMIZATION FOR MSc students of Electrical Engineering Exam Topics — Fall Semester, 2014

- 1. Graph-theoretical data structures. Number of edges in trees. Kruskal's algorithm for minimum spanning trees.
- 2. Bipartite graphs. Definitions of $\nu(G)$ and $\tau(G)$. König's Theorem, Hall's Theorem. Algorithm for finding largest matchings in bipartite graphs.
- 3. Optimum Assignment Problem. Labeling of vertices. Egerváry's Algorithm for finding maximum weight perfect matchings in bipartite graphs. Proof of correctness.
- 4. Network, flow, *st*-cut. Residual graph. MFMC Theorem. Ford-Fulkerson algorithm for computing maximum flow, proof of correctness.
- 5. Linear programming, integer programming. Method for solving linear programs with two variables. Lemmas of Farkas.
- 6. Duality theorem. IP formulation of the largest matching problem and the maximum weight matching problem, meaning of the dual programs. LP formulation of the maximum flow problem. Minimum cost flow problem.