UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS
Department of Combinatorics and Optimization

C&O Comprehensive Exam Syllabus for Discrete Optimization

Suggested References:

[CCPS] W. Cook, W. Cunningham, W. Pulleyblank and A. Schrijver, *Combinatorial Optimization*, Wiley, 1998.

[KT] J. Kleinberg and E. Tardos, *Algorithm Design*, Addison–Wesley Longman Publishing Co., 2005.

Topics:

1. Network Flow Theory. Shortest paths; maximum flows and minimum cuts, applications, augumenting path algorithms; minimum cost flows, characterization of optimal solutions. (p. 19-62, 91-101)
2. Matching. Maximum cardinality and optimal matchings, matching algorithms, matching polyhedra, optimal T-joins. ([CCPS] p. 127-182)
3. Integer Programming and Polyhedral Theory. Linear programming, polytopes, valid inequalities, facets, separation and optimization, integral polytopes, cutting planes, branch and bound. ([CCPS] p. 199-240, 325-335)
4. Matroid Optimization, Matroids and the greedy algorithm, matroid polytopes, matroid intersection min-max theorem and algorithm, matroid intersection polyhedra. ([CCPS] p. 273-300)
5. Complexity and NP-Completeness. The classes P and NP, NP-completeness. ([KT] p. 451–530)