CO 759: Computational Discrete Optimization, Winter 2015

William Cook
bico@uwaterloo.ca
Office: MC 6314
Web: http://www.math.uwaterloo.ca/~bico/

Tentative Outline of Topics

Week 1: *Need for speed.* Tiny TSP.
The Setting (Applegate, Cook, Dash, Johnson).
Week 2: *Large-scale graphs I.* Spanning trees.
Data Structures and Network Algorithms (Robert Tarjan), Chapter 6.
Assignment 1: Implementation of MST algorithms.
Week 3: *Large-scale graphs II.* Perfect matchings.
Computing Minimum-Weight Perfect Matchings (Cook, Rohe).
Week 4: *Heuristic search.* TSP, graph coloring.
Experimental Analysis of Heuristics for the STSP (Johnson, McGeoch).
Assignment 2: Implementation of Lin-Kernighan for TSP or local-opt for colouring.
Week 5: *Geometric data.* Nearest neighbors, MST, TSP.
K-d trees for semidynamic point sets (Jon Bentley).
Week 6: *Linear and mixed-integer programming.* CPLEX, Gurobi, QSopt_ex.
A Brief History of LP and MIP Computation (Robert Bixby).
Assignment 3: Select final project topics.
Week 7: *Week of coding.* No lectures.
The C Programming Language (Kernighan, Ritchie).
Week 8: *Cutting planes.* TSP.
TSP: A Computational Study (Applegate, Bixby, Chvátal, Cook), Chapters 5/6.
Week 9: *Column generation.* Cutting-stock problem.
A Primer in Column Generation (Desrosiers, Lübbecke).
Week 10: *Branch and price.* Graph colouring.
A Column Generation Approach for Graph Coloring (Mehrotra, Trick).
Week 11: *Dynamic programming.* TSP, knapsack problem.
DP Chapter (Applegate, Cook, Dash, Johnson).
Week 12: *Project Presentations.* 20-minute presentations.