

COMP 3170 - Analysis of Algorithms and Data Structures

Calendar Description: Fundamental Algorithms for sorting, searching, storage management, graphs, databases and computational geometry. Correctness and Analysis of those Algorithms using specific data structures. An introduction to lower bounds and intractability.

Prerequisites: COMP 2080 and COMP 2140.

This course is a prerequisite for: COMP 4340 and COMP 4420

Outline

- 1) Algorithms (Review) (3 weeks)
Worst Case and Average Case, Review Big Oh notation, Master Theorem, Divide and Conquer, Dynamic Programming (0-1 Knapsack), Principal of Optimality, Greedy Algorithms
- 4) Data Structures (3 weeks)
Arrays, Stacks, Queues, Lists, Graphs, Trees, Tables, Heaps and Binomial Heaps, Amortized Analysis
- 5) Backtracking Algorithms (3 weeks)
Branch & Bound, 8 Queens Problem, 0-1 Knapsack, Travelling Salesman Problem, Assignment Problem
- 6) Complexity Theory (3 weeks)
Lower Bounds & Adversary Arguments, 13 coins problem, Decision Problems, NP NP-complete, Polynomial Reduction & Satisfiability Problem, Other complexity classes, Approximation Algorithms
- 7) Randomized Algorithms (1 week)
Monte Carlo, Las Vegas, Other

Text: G. Brassard and P. Bratley, *Fundamentals of Algorithmics*, Prentice Hall