

Advanced Algorithm Design - Approximate Syllabus

CSCI 6964

This course teaches general techniques for designing and analyzing algorithms. The exact coverage is subject to change. A lot of these themes appear in undergraduate algorithms courses, such as in CSCI 4020. The coverage here will focus on more advanced topics, and will involve little overlap with CSCI 4020, although it also counts for the Algorithms qualifying exam.

Greedy Algorithms: center selection, spanning trees

Flows: max-flow min-cut and applications

NP-Completeness

Approximation Algorithms

Intro: vertex cover, TSP, scheduling

Greedy Approximation algorithms

Dynamic Programming: quick review and knapsack

Intro to Linear Programming

Approximation Algorithms – Randomized Rounding: vertex cover, max sat

Intro to LP Duality

Primal-Dual Methods: Steiner Forest, Facility location, min-cost arborescence

Metric Methods: Multicut, Balanced cut, Multicommodity flow

Other topics which we may not have time for:

- More thorough review of dynamic programming
- Advanced data structures, e.g., binomial heaps and splay trees
- Semidefinite Programming (SDP)