CS 681 Fall 1999 – Approximate Syllabus

This list of topics is meant to convey the range of possible subject matter in the course. The exact coverage of the course is subject to change.

The topics are organized around six fundamental themes in the area of algorithms. Many of these themes also appear in CS 482, the undergraduate algorithms course; the coverage here will focus on more advanced, research-oriented issues, and will involve very little overlap with 482 on specific topics.

1. **Greedy algorithms**
   - minimum spanning trees
   - arborescences
   - matroids
2. **Advanced data structures**
   - binomial heaps
   - Fibonacci heaps
   - self-organizing data structures
3. **Network flow**
   - maximum and minimum-cost network flow
   - multicommodity flow
   - applications to matching, scheduling, and on-line algorithms
4. **NP-completeness**
   - computationally intractable problems
   - approximation algorithms
5. **Dynamic programming**
   - tree decompositions and tree-width
   - algorithms for NP-complete problems on graphs of bounded tree-width
6. **Randomized algorithms**
   - basic techniques from discrete probability
   - applications of randomized heuristics to optimization, distributed computation, and packet routing