Introduction to Algorithms	**Approximate Syllabus**
CS 280 Fall 2000	**August 25, 2000**

This list of topics is meant to convey the course organization and the range of subjects covered in the course. With each topic we give a list of problems, applications, and sub-topics that we may discuss. The details and organization of the topics are subject to change.

1. Boolean formulas.
   - Circuits and decision rules.
   - Searching a game tree: a schematic view of computer game-playing.
2. Numbers.
   - Proofs by induction.
   - Divisibility, modular arithmetic, and Euclid's algorithm.
   - Prime numbers, RSA, and how to break an anonymous re-mailer.
3. Sets.
   - The pigeon-hole principle.
   - Counting arguments.
   - What's "market-basket data" and why does Wal-Mart have 100 Terabytes of it?
4. Graphs and Directed Graphs.
   - Connectivity, trees, and distances.
   - Graph coloring, planar graphs, and the notorious computer proof of the Four-Color Theorem
   - Directed graphs, strong connectivity, and the "giant component" of the World Wide Web.
5. Relations and Partial Orders
   - Symmetry, transitivity, and equivalence relations.
   - Partial orders, chains, and antichains: Towards a theory of parallel computing.
   - Total orders: How Ken Arrow proved the impossibility of a universal social choice function
6. Mathematical Logic
   - Countability and uncountability: How do we measure the "size" of an infinite set?
   - What are the obstacles to automating mathematics?
7. Probability
   - Independence, the union bound, and a randomized load-balancing heuristic.
   - Random variables and their expectations: How long do you need to collect baseball cards before you get every one?