Analysis of Algorithms

CMSC 641

Fall, 1990

Instructor:	Dr. Howard E. Motteler
Office:	TF 111, hours Tues & Thurs 3:45-5:00, and after class
Grader:	Kostas Kalpakis
Office:	TF 120, hours Tues 8:30–9:30 pm, Fri 10:00–11:00 am
Text:	Cormen, Leiserson & Rivest, *Introduction to Algorithms*

Course Outline

Topics to be covered, with CL&R chapters, are listed below. The time estimates are only approximations. We will proceed fairly quickly throught the first three sections (foundations, sorting, and data structures), as this is for the most part a review of material covered in the prerequisites. Starred sections will be covered only as time permits.

1. Mathematical Foundations — 2 weeks
   - Growth of Functions — (2)
   - Summations and Recurrences — (3,4)
   - Sets, Relations, Functions, Graphs, and Trees — (5)
   - Counting and Probability — (6)
2. Sorting and Order Statistics — 1 week
   - Heapsort, Quicksort — (7,8)
   - Lower Bounds for Sorting — (9)
   - Sorting in Linear time — (10)
   - Medians and Order Statistics* — (11)
3. Data Structures — 1 week
   - Stacks, lists, queues, and pointers — (12)
   - Hashing — (13)
   - Binary Search Trees — (14)
   - Red-Black Trees* — (15)
4. Design and Analysis Techniques — 2 weeks
   - Dynamic Programming — (17)
   - Greedy Algorithms — (18)
   - Amortized Analysis — (19)

5. More Data Structures 2 weeks
   - B-Trees (20)
   - Binomial and Fibonacci Heaps* (21, 22)
   - Disjoint-Set Union (23)
6. Graph Algorithms 2 weeks
   - Basic Graph Algorthms (24)
   - Spanning Trees (25)
   - Shortest Path Algorithms (26, 27)
   - Max Flow* (28)
7. Selected Topics 4 weeks
   - Matrix Operations* (31)
   - Number-Theoretic Algorithms* (33)
   - String Matching (35)
   - NP Complete Problems (37)
   - Approximation Algorithms (38)
   - Parallel Algorithms (31)

Grading

There will be two midterms and a final. There will be 5 or 6 homework problems sets, approximately one every two weeks. Each homework will be worth about 15–20 points, depending on difficulty. Late homeworks may be penalized. Points are assigned as follows.

Regular homework assignments	100
Midterm 1	100
Midterm 2	100
Final Exam	100
Total	400

If a majority of the class prefers more coding, we can substitute one moderate or two smaller projects for one of the midterms. (An example of a moderate project would be to implement B-tree insertion and deletion.)

Other books you may find helpful are as follows. Knuth's *Art of Computer Programming*, Vol. 1, is useful for discrete math and data structures, and Vol. 2 for numeric algorithms. Aho, Hopcroft and Ullman's *Design and Analysis of Computer Algorithms* is an earlier text covering much of the material in CL&R. Garey & Johnson's *Computers and Intractability* is the standard reference for NP completeness, and includes a good introduction to the topic.