Midterm Exam Testing Range

Weiss's book: Chapter 1, 2, 3, 5, 7
Testing Range: 01/27-03/01 classes (including 03/01)
Particularly,

Mathematics Basics

- Basic Math Knowledge of Exponents and Logarithms
- Calculating/Simplifying of Summations. Memorize the sum of arithmetic series (e.g., formula of $\sum_{i=1}^{n} i$), the sum of geometric series (i.e., $\sum_{i=1}^{n} q^i$)
- Calculating Recursion using (backwards) iteration approach, including the proof by induction. Memorize the steps of the iteration approach: 1) make a couple of iterations and conclude a conjecture; 2) the three steps of induction proof (inductive basis, inductive hypothesis, and what is to be proved in the inductive step); 3) give the final simplified expression.

C++ Programming

- Basic knowledge of C++ programming.
- Give a C++ pseudocode, you can tell what is this algorithm for. If also given an input for this algorithm, you can conclude the output.

Algorithm Analysis

- How to count the total number of basic operations given an algorithm pseudocode?
- Use asymptotic notation to represent the number of operations in a simplified way. Remember, no constants or lower-order terms should be shown in an asymptotic notation. $\mathrm{O}(n)$, $\Theta(n)$ are correct, while $\mathrm{O}(2n)$, $\Theta(3n+1)$ are not good.

Maximum Subsequence Sum

- What is the maximum subsequence sum problem?
- How to solve this problem? (Need to know Algorithms 1 and 2 in slides.)

Hashing

- How to use hashing on different data types?
- Given a hashing function, how to use it on a given example and how many collisions could happen.
- Given a collision resolution method, how to use it on a given example.
- What are perfect hashing and Cuckoo hashing, how to use them in a given example.

Sorting

- Give an example, you should be able to use a particular sorting algorithm to sort it in order.
- Calculate best, average, worst cases of time complexity of a sorting algorithm for less complicated cases.
- Sorting algorithms are limited to Insertion Sort, Selection Sort, Bubble Sort in this exam. The other sorting algorithms will not be tested.