CSCI 235
Algorithms
College of the Holy Cross, Fall 2015

Topics for Midterm Exam
The exam will cover topics from the first half of the course. It will be closed book, however you may bring one 8.5 x 11" sheet of paper with notes on one side. The exam will cover through lecture 17 (Linear Sorting algorithms, including Bucket Sort) and chapters 1-4, 6-8, and Appendices A.1 and C.1-3. The following is a list of topics that may appear on the exam:

Asymptotic analysis
- Definitions of O, o, Θ, Ω, ω
- Comparing the rate of growth of two functions
- Working with logarithms and exponents
- Standard summations (geometric and arithmetic)

Analyzing running time of algorithms
- Computing the running time of iterative algorithms
- Computing the running time of recursive algorithms
- Solving recurrence equations.

Probability
- Permutations and Combinations
- Sample Spaces and Events
- Computing probability of Events
- Probability distribution
- Conditional Probability and Independence
- Discrete Random Variables
- Probability Density Function
- Expected Value

Elementary Sorting Algorithms
- Calculating the running time in Best, Worst, Average Cases
- Analyzing Stability and whether a sorting algorithm is in place
- Selection Sort, Insertion Sort, Merge Sort, Bubble Sort
- Advantages and disadvantages of each algorithm

Heap Sort
- Heap properties
- Heap functions: Heapify, Build-Heap, Heap-Sort, Heap-Extract-Max
- Analyzing Heap Sort
- Using a Heap as a Priority Queue

Quick Sort
- Algorithm for Quick Sort
- Two finger partition algorithm
- Analysis of Quick Sort—Best Case, Worst Case, Alternating best and worst, Lower bound for comparison based Sorting algorithms

Linear Sorts
- Counting Sort, Radix Sort and Bucket Sort
- Assumptions made in order to sort in linear time
- Know whether they are stable and in-place