Introduction

This course covers basic data structures and algorithms in Computer Science. Initially, we will provide some foundational information then proceed to describe various classical and efficient algorithms for storage, searching, sorting, and graphing. Knowledge and understanding of these data structures and algorithms is fundamental to your success in Computer Science. We encourage you to *understand* the data structures and algorithms as opposed to mechanically copying code fragments. The Internet today provides access to lots of programs and code fragments. However, by simply using them you will not learn the fundamental knowledge useful in your career. You will find there is much more to Computer Science than “just programming”; the sooner you learn to program well and understand the fundamentals, the sooner you can solve fascinating problems!

Organization

The course is organized into two lectures a week, multiple programming projects, written homeworks, a midterm exam and an end-of-semester exam. The pace of the course might be mild at the beginning, but once everybody is up to speed it will accelerate very rapidly. The course components are 5 homeworks (short written assignments on basic knowledge covered in class), 5 projects (short to medium-length programming projects to put concepts into practice), and 2 exams (a closed-book mid-semester exam and end-of-semester exam).

The homeworks and projects will be posted online (on course website). Projects will be put online at 9am on the “out date” and are due by 9am on the “due date” – all projects go out and are due on a Monday. Homeworks go out by 9pm on the “out date” and are due by 9pm on the “due date” – all homeworks go out and are due on a Friday (usually within one week). Programming assignments should be written in C++, unless otherwise noted. Homeworks should be clearly written either by hand or by using a word processor. Details will be provided in the assignment writeups. The contributions of each of the course components to your final grade are: homeworks – 25% (5% each), projects – 40% (1%, 7%, 8%, 12%, and 12%), and exams – 35% (15%, and 20%). Grades will be posted on Blackboard. If you think a grading error was made, or if you do not receive a homework assignment or exam back, you must talk to the TAs or the instructor within a week of when it was returned or graded.

All questions about assignments should be directed to course Piazza group. You may also email a TA directly, but Piazza is the preferred online discussion forum. If your concern cannot be handled by the TAs or Piazza, feel free to email the instructor directly.

In order to keep up with the pace, all homework’s and projects must be handed in on-time. However, each person will be allowed four days of extensions which can be applied to any combination of assignments during the semester without penalty. After that a late penalty of 33% per day will be assigned. For example, if your grade is 9 out of 10, and 2 days late, it
means you grade is 3 out of 10. Use of a partial day will be counted as a full day. Use of extension days (including number) must be stated explicitly in the subject line of an email to the corresponding TA, otherwise late penalties will apply. Extensions cannot be used after the final day of classes. Extension days cannot be rearranged after they are applied to a submission. Use them wisely! Assignments will NOT BE accepted if they are more than three days late (regardless of whether extension days will be applied to that particular assignment or not). Exams must be completed by the end of the exam time period. Additional extensions will be granted only due to serious and documented medical or family emergencies.

All homework’s, projects, and exams must be done individually and by your own effort. Solutions cannot be copied from textbooks, programs cannot be downloaded from the Internet, and code fragments obtained from any source are not allowed (except when explicitly stated in the assignment). You are also expected to take reasonable precautions to prevent others from using your work. Be aware that we will use a software tool called MOSS (http://theory.stanford.edu/~aiken/moss/) to check for copying among submitted assignments. Additionally, the instructors and TAs will be inspecting all submitted material to ensure honesty. Any case of academic dishonesty will be dealt with by a severe grade penalty in the overall class grade and referral to the office of the Dean of Students.

**Tentative Schedule**

**Week 1: Intro & Algorithm Analysis**
January 12 – Introduction, Graphics, C++
January 14 – Analysis
HW1 out (Analysis)

**Week 2 – Analysis & Stacks/Queues**
P1 out (Hello World)
January 19 – Analysis
January 21 – Stacks/Queues
HW1 due

**Week 3 – Lists, Trees, Heaps, Priority Queues**
P1 due, P2 out (Stacks/Queues)
January 26 – Lists, Trees
January 28 – Trees, Heaps, Using Trees

**Week 4 – Hashing and Sorting Basics**
February 2 -- Hashing
February 4 – Hashing, Sorting
HW 2 out (Hashing/Sorting)

**Week 5 – Searching**
P2 due, P3 out (Hashing, Heaps)
February 9 – Binary, 2-4
February 11 – 2-4, Red-Black
HW 2 due

**Week 6 – Sorting**
February 16 – Merge Sort, Quick Sort
February 18 – Selection Sort, Radix Sort

**Week 7 – Graphs**
February 23 – Representation
February 25 – Traversals

**Week 8 – Graphs**
P3 due, P4 out (Searching/Sorting)
March 1 – Directed Graphs,

March 3 – Shortest Path
HW3 out (Graphs)

**Week 9 – Midterm**
March 8 -- Review
March 10 -- Exam

**Week 10 – Spring Break**
March 14-18 -- No classes

**Week 11 – Graphs**
March 22 -- Minimum Spanning Trees
March 24 –Using Graphs, Graph Recap
HW3 due

**Week 12 – Strings**
P4 due, P5 out (Graphs)
March 29 -- Pattern Matching
March 31 - Pattern Matching

**Week 13 – Strings**
April 5 -- Compression
April 7 – Compression
HW4 out (Strings I)

**Week 14 – Strings**
April 12 -- Tries
April 14 – Tries
HW4 due, HW5 out (Strings II)

**Week 15 – TBA**

**Week 16 - Review**
P5 due
April 26
April 28