CS16: Introduction to Algorithms and Data Structures

`http://www.cs.brown.edu/courses/cs016/`

Spring 2008

Time & Place: TTh 10:30-11:50 (I hour)

Instructor: John "Spike" Hughes (`jfh`)

Head TAs: Patrick Doran (`pdoran`), Brian Moore (`bjmoore`)

Graduate TA: Casey Marks (`casey`)

Undergraduate TAs: Matthew Jacobs (`mjacobs`), Christina Salvatore (`cpsalvat`), Benjamin Cohen (`btcohen`), Borislav Hristov(`bhristov`), Samuel Potasznik (`spotaszn`), Lyla Fujiwara (`lfujiwar`), Douglas Kirschner (`dkirshcn`), Andrew Miller (`amiller`)

A Note on Notes

CS16 introduces students to algorithms and data structures that are fundamental to the development of applications. This course is more theoretical in nature than CS15 and may somewhat resemble a math course. As in any math course, the key to keeping up is attending lecture and taking good notes. Spike will be using PowerPoint lecture slides only as *supplemental* material so the burden is on you to *record* and *absorb*.

Course Prerequisites

The prerequisite for this course is CS15. If you did not take CS15 in Fall '07, '06, or '05, contact Spike to explore the possibility of a special arrangement. The following background is assumed: programming experience in Java; knowledge of basic binary arithmetic and elementary properties of polynomials, logarithms, and exponentials.

Student Agreement

To be officially enrolled in CS16, you must complete and return a signed copy of the CS16 Student Agreement. Please make sure you read and understand the CS16 collaboration policy. Questions regarding the policy should be directed to Spike or the Head TAs.

Reading Material

The textbook for this course is:

> Sanjoy Dasgupta, Christos Papadimitriou, and Umesh Vazirani; *Algorithms* (1st Edition). McGraw-Hill Higher Education, (2008).

It may be helpful to look at the previous course textbook when working on the programming assignments. This book is completely optional and is listed here only for reference:

> Michael T. Goodrich and Roberto Tamassia, *Data Structures and Algorithms in Java* (4th Edition). John Wiley & Sons, Inc. (2006).

Topics

Analysis of Algorithms: time complexity, asymptotic notation, amortization, recurrence relations

Elementary Data Structures: stacks, queues, sequences, trees, positions, locators

Searching: hash tables, skip lists, binary search trees, splay trees, 2–4 trees, red-black trees

Sorting: insertion sort, selection sort, heap sort, merge sort, quicksort, radix sort

Text Processing: tries, data compression

Geometric Algorithms: point inclusion, convex hull

Graph Algorithms: depth-first search, breadth-first search, shortest path, minimum spanning tree, topological sorting, maximum flow, transitive closure

Graded Work

- Five collaborative homeworks (25%)
- Two in-class exams (30%)
- Five programming assignments
  - Runtime / Matlab Sorting (5%)
  - Queue / Dance Dance Revolution (10%)
  - Heap / Fish Food (10%)
  - Convex Hull / Robot (10%)
  - Graph / SimBroadband (10%)

Announcements and Questions

The CS16 Web site (`http://www.cs.brown.edu/courses/cs016`) is the main source of information about the course. Check the website's `motd` regularly, as announcements, clarifications, questions, and answers are posted often, as well as other course related information. If you have questions about course material from lecture or assignments in progress, feel free to come to TA hours. If you have administrative questions, please email the TAs. Spike's hours are Thursday 3:30-4:30pm and by appointment (contact `laa@cs.brown.edu`).

Handins

All paper handins should be placed in the wooden CS16 handin bin outside room 271 of the CIT (aka the SebLab). Please follow the handin instructions on the homework handout. All program handins should be submitted via the `cs016_handin` script.

Exams

There will be two exams in CS 16. A week prior to the exam, problems which resemble those that will be on the exam will be distributed. The exam will consist of a subset of those problems.

Late Policy

As with most classes in the CS department, there is an official late policy for CS 16.

Homeworks: We do not accept late handins for homeworks. Please plan accordingly. However, your worst homework will be weighted half as much as the others.

Programs: Each program has a regular deadline which is specified on the program handout and an early handin 48 hours earlier. A handin two or more days early will receive a 4% bonus (a grade of 92% comes out a 96%). All programs handed in after the regular deadline are considered to be late. For every day late you will lose 10% of your grade (i.e. a grade of 92% two days late comes out a 72%).