Course Syllabus
Spring 2011

General Information

CS 245 – Data Structures and Algorithms
Spring Semester 2011

Harney Science Center · Room 235
Mondays & Wednesdays · 2:15pm – 4:35pm

Website:
http://www.cs.usfca.edu/~sjengle/courses/spring2011/cs245/
http://blackboard.usfca.edu/bin/common/course.pl?course_id=_40864_1

Mailing List:
cs245@cs.usfca.edu · https://cs.usfca.edu/mailman/listinfo/cs245

Announcements:
Announcements will be posted on Twitter account `sjengle` using hashtag `#cs245`. You may view these at http://twitter.com/#search?q=from%3Asjengle%20%23cs245 or on the course website.

Calendar:
Lectures, assignment deadlines, and exam dates will be posted on the public Google Calendar for this course. See the course website for more details.

Description:
In this class, students will learn, implement, and analyze several types of data structures and algorithms using a mix of programming and theory.

Pre-Requisites:
CS 112 – Introduction to Computer Science II, MATH 201 – Discrete Math

Required Materials

We will be using the book "A Practical Introduction to Data Structures and Algorithm Analysis" by Clifford A. Shaffer (Java Version, Edition 3.1), which is available to download for free at:

http://people.cs.vt.edu/~shaffer/Book/

Do *not* purchase the print edition of this book. We will be using the Java version of the newest edition, which is only available online.

Instructor

Professor Sophie Engle
sjengle@usfca.edu · http://www.cs.usfca.edu/~sjengle/

Office Hours:
Harney Science Center · Room 140B
Mondays & Wednesdays 4:45pm – 5:45pm
Tuesdays 11:45am – 12:45am *(or by appointment)*

Teacher Assistant

Shah N. El-Rahman · snelrahman@usfca.edu
Teacher assistant's office hours to be announced.

Topics and Schedule

We will cover several types of data structures and algorithms, including (in no specific order):

- Basic Data Structures
  Stacks, Queues, Arrays, Linked Lists, etc.
- Analysis of Algorithms
  Rates of Growth: $O(n)$, $\Omega(n)$, $\Theta(n)$, $o(n)$, $\omega(n)$, Run-Time Complexity, Space Complexity, $\mathcal{NP}$-Completeness (Time Permitting), etc.
- Sorting Algorithms
  Insertion Sort, Selection Sort, Merge Sort, Quicksort, Heapsort, Bucket Sort, Radix Sort, etc.
- Hash Tables
  Hash Functions, Open Hashing, Closed Hashing, etc.
- Trees
  Binary Trees, Binary Tree Manipulation, Ordered Binary Trees, Binary Search Trees, Heaps and Priority Queues, AVL Trees, B Trees, etc.
- Graphs and Graph Algorithms
  Dijkstra's Algorithm, Prim's Algorithm, Kruskal's Algorithm, Depth-First vs Breadth-First Search, Connected Components, Maximum Flow, etc.
- Dynamic Programming
  Knapsack Problem, All-Pairs Shortest Path, etc.

There will be either a homework assignment, project, or exam due every week. There are two midterm exams (on weeks 7 and 13) and one final exam.

This is subject to change at any time. Please see the schedule on the course website for the latest.

Learning Outcomes

At the end of this course, students should have the following knowledge and skills:

- Understand and analyze the time and space complexity of an algorithm
- Understand, implement, and compare fundamental data structures
- Understand and implement fundamental algorithms
  (including sorting algorithms, graph algorithms, and dynamic programming)
- Write larger and more complex Java applications

Grading

The final grade will be calculated as follows:

5% Participation
10% Homework
30% Projects
30% Midterm Exams (2)
25% Final Exam

Letter grades will be assigned according to the following scale:†

A+ $\geq$ 97.0%	C $\geq$ 73.0%
A $\geq$ 93.0%	C− $\geq$ 70.0%
A− $\geq$ 90.0%	D+ $\geq$ 67.0%
B+ $\geq$ 87.0%	D $\geq$ 63.0%
B $\geq$ 83.0%	D− $\geq$ 60.0%
B− $\geq$ 80.0%	F $<$ 60.0%
C+ $\geq$ 77.0%	

†*Note that this scale is subject to change at any time.*

Participation

Participation points may be earned by participating in discussions on the mailing list and in class.

Homework

There will be a mix of programming and written homework assignments, assigned every 1–2 weeks. Students may discuss the homework problems *at a high-level* (no sharing of code), but are expected to complete the homework assignments *individually*. See the **Academic Honesty** section for the penalties of copying work.

Projects

There will be approximately four projects. You must submit your source code to the proper subversion repository. Specific instructions will be provided with each project assignment. Failure to follow the submission instructions will result in point deductions.

There are two ways to receive a 0% on your projects: submitting your project late, or cheating. Late submissions are not accepted, so it is important to submit code to your svn repository often. Even if you are not finished with your project, be sure you have something submitted prior to the project deadline.

There is a zero tolerance cheating policy (detailed below). We will be running MOSS (http://theory.stanford.edu/~aiken/moss/) to check for cheating.

Exams

There will be two midterm exams and a final exam. These exams will be closed note and closed book. There will be a review session prior to each exam. The final exam date for this class is Monday, May 16, 2011 at 3:00pm in HR 235.

Attendance

Attendance is mandatory. Absences are only excused in cases of verified family or medical emergency. Topics that are discussed in class but are not available online are fair game for exams.

Late Policy

All deadlines are firm. Students are responsible for meeting all homework and project deadlines. Extensions will not be granted and late homework will not be accepted except in case of verified medical or family emergency. You must discuss your situation with me personally before the deadline to receive an extension. The same holds for all exams.

Academic Honesty

Simply put, do *not* cheat and do *not* plagiarize or copy (from other students *or* from the web). I expect all students to adhere to the academic honesty policies at USF. More information is available in the Fogcutter Student Handbook, available at http://www.usfca.edu/fogcutter/studentconduct/.

Students caught violating the academic honesty policy will face severe penalty. A first offense will result in a 0 on an assignment or exam, and a report to the Dean's office. Repeat offenses may result in an F for the course.

This syllabus is based off previous iterations of this course developed by Professor Galles. See http://www.cs.usfca.edu/~galles/cs245/ for more details.