Managing Data in C++

ITP 365 (3 Units)

USC Viterbi School of Engineering
Information Technology Program

Spring 2016

Description

Overview of basic data structures and algorithms including linked lists, stacks, queues, binary trees, and hash tables.

Objective

This course is an overview of core data structures, which are absolutely critical for further study in programming. By the conclusion of the course, students will have an understanding of:

1. How and when to use a variety of core data structures.
2. The process of how some of these data structures are implemented.
3. The mechanisms we can use to evaluate the performance of various algorithms.
4. Solving problems through recursion.

Concepts

Arrays/Vectors. Templates. Recursion. Sorting. Linked Lists. Stacks/Queues. Heaps.

Prerequisites

ITP 109x, ITP 115, ITP 165x, or equivalent experience.

Instructor	Listed on Blackboard under Contents
Office Hours	Listed on Blackboard under Contacts
Lab Assistants	Listed on Blackboard under Contacts
Lecture	See online schedule of classes

Textbook

Programming Abstractions in C++. Eric Roberts. Prentice Hall. ISBN-13: 978-0133454840.

Website

All course material will be posted on Blackboard (http://blackboard.usc.edu).
We will use Piazza for discussions/questions outside of class.

Grading

The following percentage breakdown will be used in determining the grade for the course.

Assignments (percentages vary)	50%
Midterm exam	25%
Final exam	25%
Total	**100%**

Grading Scale

The following shows the grading scale to be used to determine the letter grade.

93% and above	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	C
70% - 72%	C-
69%	D+
67% - 68%	D
66%	D-
65% and below	F

Policies

In class assignments

There will be lab practicals after most lectures. These practicals will be immediate application of the material presented in lecture. These practicals will be graded as pass/fail. For credit on each practical you must complete the practical before class time has ended. Each practical will contribute to your overall grade. There is no way to make up a missed practical, however a practical grade can be dropped provided either prior instructor approval or a documented emergency.

Homework assignments

Each assignment must be completely *individually*. There are no group projects in this class. The assignments will be posted on Blackboard in the "Assignments" section. Each assignment will include instructions, a due date, and a link for electronic submission. Assignments must be submitted using this link.

It is your responsibility to submit your assignments on or before the due date. Homework assignments turned in one day late will have 20% of the total points deducted from the graded score. Assignments turned in two days late will have 50% of the total points deducted from the graded score. After two days, submissions will not be accepted and you will receive a 0. Lab assignments must be submitted by the in class deadline for credit.

All assignments must be digitally submitted through Blackboard except when otherwise specified by the course staff. Do not email assignments to the instructor or lab assistant. Assignment questions should be posted to the online question forum. Do not send any email to the instructor regarding assignments or ask specific assignment questions during the lecture sessions. You are encouraged to attend the instructor's office hours for assignment related questions.

Exams

Make-ups are only allowed under extraordinary circumstances. Students must provide a satisfactory reason (as determined by the instructor) along with proper documentation. There are two exams: a midterm and a final. These exams are comprehensive of all topics covered.

Policies (continued)

Lab facilities

You are encouraged to save your work using a USB flash drive or a website such as Dropbox. You must keep a copy of all coursework. You will not be able to save your work on the ITP lab computers. Any work saved to the computer will be erased after restarting the computer.
ITP is not responsible for any work lost.
Furthermore, students will be able to install all of the necessary software on their own computers in order to be able to work on the homework at any time. Both Mac and PC are supported. Students without their own personal computers are able to utilize the 24-hour USC computing centers.

Incomplete and Missing Grades

Excerpts for this section have been taken from the University Grading Handbook, located at http://www.usc.edu/dept/ARR/grades/gradinghandbook/index.html. Please see the link for more details on this and any other grading concerns.
A grade of Missing Grade (MG) "should only be assigned in unique or unusual situations… for those cases in which a student does not complete work for the course before the semester ends. All missing grades must be resolved by the instructor through the Correction of Grade Process. One calendar year is allowed to resolve a MG. If an MG is not resolved [within] one year the grade is changed to [Unofficial Withdrawal] UW and will be calculated into the grade point average a zero grade points."
A grade of Incomplete (IN) "is assigned when work is no completed because of documented illness or other 'emergency' **occurring after the twelfth week** of the semester (or 12th week equivalency for any course scheduled for less than 15 weeks)."

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu/ or to the Department of Public Safety http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information http://emergency.usc.edu/ will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

A Further Note on Plagiarism

In this class, all homework submissions will be compared with current, previous, and future students' submissions using MOSS, which is a code plagiarism identification program. If your code significantly matches another student's submission, you will be reported to SJACS with the recommended penalty of an F in the course.

It is okay to discuss solutions to specific problems with other students, but it is not okay to look through another student's code. It does not matter if this code is online or from a student you know, it is cheating. Do not share your code with anyone else in this or a future section of the course, as allowing someone else to copy your code carries the same penalty as you copying the code yourself.

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Course Outline

Note: Schedule subject to change

W	Topic(s)	Reading	Homework
1	C++ Review; Creating Libraries	Ch. 1, §2.1-2.7	Homework 1
	Stanford C++ Library; Using Vectors	§2.9; §5.1	
2	**MLK Day / Open Lab**		
	Strings; Streams	§3.1-3.2; §3.4-3.5; §4.3-4.4	
3	Using Stacks and Queues	§5.1-5.2	Homework 2
	Using Maps and Sets; Range-based for loops	§5.4-5.5	
4	Implementing Classes; Operator Overloading	§6.1-6.3	Homework 3
	More Classes and Operator Overloading; Recursion Basics	§6.3-6.5; §7.1-7.2	
5	More Recursion	§7.3	
	Even More Recursion	§7.7; §8.4	
6	**Prez' Day / Open Lab**		Homework 4
	Searching and Algorithmic Analysis	§7.4; §10.1-10.2; §10.4	
7	Sorting; Memory and Pointer Basics	§11.1-11.3	
	Dynamic Memory; Dynamic Memory and Classes;	§12.1; §12.3	
8	**MIDTERM EXAM**		
	const; Implementing Templates	§12.8; §14.1	
9	Implementing Vector	§14.4; §12.6	Homework 5
	Pointer Arithmetic	§11.4	
SB	**Spring Recess**		
10	Linked Lists	§12.2	
	Copying; More Linked Lists	§12.7	
11	Doubly Linked Lists	§14.2-14.3	Homework 6
	STL Containers	§20.1	

12	Hash Maps	§15.2-15.4	
	Tree and Binary Search Trees	§16.1	
13	More Binary Search Trees	§16.2	Homework 7
	Graph Basics	§18.1-§18.2	
14	More Graphs	§18.4	
	Dijkstra's Algorithm	§18.6	
15	Where To Go From Here		
	Final Review		
	FINAL EXAM – as according to the final exam schedule		