Managing Data in C++
ITP 365 (3 Units)

Spring 2019

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

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

Optional 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 (http://piazza.com/) as an online question and discussion forum.

Course Structure

Topics covered during lecture will be applied to about 7 homework assignments spread throughout the semester. All homework assignments must be completed *individually* and outside of regularly scheduled class meetings.

Regular class meetings will feature a 60-minute lecture followed by an in-class lab assigned on Tuesdays and due the following Thursday. These "labs" must be completed *individually* and are due at the end of the class period. These "labs" will immediately apply material from lecture and serve as an introduction to the other programming assignments.

There is a midterm and cumulative final exam in this course

Grading

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

Homework	50%
Labs	10%
Midterm exam	20%
Final exam	20%
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-
67% - 69%	D+
64% - 66%	D
63% and below	F

Policies

Lab assignments

There will be lab assignments after some lectures. These assignments will be an immediate application of the material presented in lecture. These labs will be graded as credit/no-credit. For credit on each lab you must complete the assignment before the posted due date and time. Each lab assignment will contribute to your overall grade. A lab can only be made up with 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.

Submitting assignments

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 or lab hours facilitated by course staff 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.

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.

Course material

Do not reproduce, distribute, or post any lecture material, assignments, assignment solutions, or exams publicly without my written consent. You may take notes and make copies of course materials for your own use. You may not post course materials on sites like CourseHero. Doing so is a copyright violation and an academic integrity violation that will be dealt with accordingly.

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)."

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 Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. 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.

Support Systems:

Student Counseling Services (SCS) - *(213) 740-7711* *– 24/7 on call*
> Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. https://engemannshc.usc.edu/counseling/

National Suicide Prevention Lifeline - *1-800-273-8255*
> Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

Relationship & Sexual Violence Prevention Services (RSVP) - *(213) 740-4900* *- 24/7 on call*
> Free and confidential therapy services, workshops, and training for situations related to gender-based harm. https://engemannshc.usc.edu/rsvp/

Sexual Assault Resource Center
> For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website:http://sarc.usc.edu/

Office of Equity and Diversity (OED)/Title IX compliance – *(213) 740-5086*
> Works with faculty, staff, visitors, applicants, and students around issues of protected class. https://equity.usc.edu/

Bias Assessment Response and Support
> Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response.https://studentaffairs.usc.edu/bias-assessment-response-support/

Student Support & Advocacy – *(213) 821-4710*
> Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic.https://studentaffairs.usc.edu/ssa/

Diversity at USC – *https://diversity.usc.edu/*
> Tabs for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students

A Further Note on Plagiarism

All submissions will be compared with current, previous, and future students' submissions using 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.

You may discuss solutions to specific problems with other students, but you should not look through another's code. The code can be from an online forum or another student, the source is immaterial – all code submitted in this course must be your own. Do not share your code with anyone else in this or future sections of the course, as allowing someone to copy your code carries the same penalty as copying the code yourself.

Managing Data in C++
ITP 365 (3 Units)

Course Outline
Note: Schedule subject to change

W	Topic(s)	Assignment(s)
1	C++ Review; Creating Libraries	*Read*: Ch. 1, §2.1-2.7, §2.9; §5.1
	Stanford C++ Library; Using Vectors	*Do*: Lab #1, HW#1 (due end of W3)
2	Strings; Streams	*Read*: §3.1-3.2; §3.4-3.5; §4.3-4.4; §5.1-5.2
	Using Stacks and Queues	*Do*: Lab #2
3	Using Maps and Sets; Range-based for loops	*Read*: §5.4-5.5; §6.1-6.3
	Implementing Classes; Operator Overloading	*Do*: Lab #3, HW#2 (due end of W4)
4	More Classes and Operator Overloading; Recursion Basics	*Read*: §6.3-6.5; §7.1-7.2; §7.3
	More Recursion	*Do*: Lab #4, HW#3 (due end of W6)
5	Even More Recursion	*Read*: §7.7; §8.4; §7.4; §10.1-10.2; §10.4
	Searching and Algorithmic Analysis	*Do*: Lab #5
6	Sorting; const	*Read*: §11.1-11.3; §12.8
	STL Containers; Exceptions	*Do*: Lab #6
7	**<u>MIDTERM EXAM</u>**	*Do*: HW#4 (due end of W9)
	Dynamic Memory; Dynamic Memory and Classes	
8	Implementing Templates	*Read*: §12.1, §12.3; §14.1
	Implementing Vector	*Do*: Lab #7
9	Linked Lists	*Read*: §14.4, §12.6; §12.2
	Copying; More Linked Lists	*Do*: Lab #8, HW#5 (due end of W11)
10	Doubly Linked Lists	*Read*: §12.7; §14.2-14.3
	Iterators	*Do*: Lab #9
11	More Iterators	*Read*: §20.1; §15.2-15.4
	Hash Maps	*Do*: Lab #10, HW#6 (due end of W13) *Read*: §20.1; §15.2-15.4 *Do*: Lab #10, HW#6 (due end of W13)
12	Tree and Binary Search Trees	*Do*: Lab #11

	More Binary Search Trees	*Read*: §16.1-§16.2
		Do: Lab #11
13	Graph Basics	*Read*: §18.1-§18.2; §18.4
	More Graphs	*Do*: Lab #12, HW#7 (due end of W15)
14	Dijkstra's Algorithm (part 1)	*Read*: §18.6
	Dijkstra's Algorithm (part 2)	*Do*: Lab #13
15	Where to go from here?	
	Final Review	
FINAL EXAM – as according to the final exam schedule		