

Managing Game Data

ITP 365 (3 Units)

Spring 2014



Description

Overview of basic data structures and algorithms commonly used in games including linked lists, stacks, queues, binary trees, hash tables, and graphs.

Objective

This course is an overview of data structures commonly used in games. By the conclusion of the course, students will have:

1. Familiarity with several fundamental game data structures.
2. An understanding of big-O notation and time complexity.
3. Knowledge of several basic and advanced sorting algorithms.
4. Learn advanced object-oriented paradigms.

Concepts

Basic templates. Arrays/Vectors. Recursion. Sorting. Linked Lists. Stacks/Queues. Heaps.

Prerequisites

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

Instructor

Nathan Greenfield

Contacting the Instructor

nathan.greenfield@usc.edu

Office Hours

Listed on Blackboard under Contacts

Lab Assistants

Listed on Blackboard under Contacts

Lecture / Lab

One hour and 50 minutes, twice a week, for a total of 3 hours and 40 minutes.

10:00 am – 11:50 am, Monday and Wednesday

Required Textbooks

C++ Plus Data Structures. Nell Dale. Jones & Bartlett Learning. ISBN-13: 978-9781449646752. An electronic version of this text is available at CouseSmart (<http://www.coursesmart.com/>).

Optional Textbooks

Effective C++ (3rd Edition). Scott Meyers. Addison-Wesley. ISBN-13: 978-0321334879
Problem Solving with C++ (8th Edition). Walter Savitch. Addison-Wesley. ISBN-13: 978-0132162739.

Website

All course material will be on Blackboard (<http://blackboard.usc.edu>).

Grading

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

Lab assignments	50%
Midterm exam 1	15%
Midterm exam 2	15%
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

Exams

No make-up exams (except for documented medical or family emergencies) will be offered nor will there be any changes made to the Final Exam schedule.

There are three exams: two midterms and a final, and these exams are comprehensive of all topics covered.

Assignments

Each assignment must be completely *individually*. There are not any group projects in this class. The assignments will be posted on Blackboard under the “Assignments” section. Each lab assignment will include instructions, a due date, and a link for electronic submission. Labs must be submitted using this link.

It is your responsibility to submit your assignments on or before the due date. 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.

All assignments will be digitally submitted through Blackboard except where specifically specified. Do not email them to the lecturer or lab assistant.

If you have questions about any of the lab assignments, attend a lab session or send an email to the lab assistant/s assigned to the lab session in which you are registered. Do not send any email to the instructor regarding labs or ask specific lab questions during the lecture sessions. You are encouraged to attend the instructor’s office hours for lab-related questions.

Lab facilities

You are required to save your labs using a USB flash drive or a website such as <http://www.dropbox.com>. You must keep a copy of all labs. 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.

ITP will have open lab hours starting the second week of the semester. The open labs will not have a lab assistant for this specific class. These lab times are there in case you need extra time to complete a lab.

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 Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

In this class, all code submissions will be ran against current, previous, and future students using MOSS, which is a code plagiarism identification tool. If your code significantly matches another student’s submission, you will be reported to SJACS.

Generally, the rule of thumb is that it is acceptable to discuss solutions to problems with other students, but once you are looking at someone else’s code, it crosses over into the realm of cheating. It does not matter if this code is online or from a student you know, it is cheating in all situations. Do not share your code with anyone else in this or a future section of the course, as allowing someone else to copy off your code carries the same penalty as you copying the code yourself.

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to your course instructor (or TA) as early in the semester as possible. DSP is located in STU 301 and is open from 8:30am to 5:00pm, Monday through Friday. Website and contact information for DSP

http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu

Emergency Preparedness/Course Continuity in a Crisis

In case of emergency, when travel to campus is difficult, if not impossible, USC executive leadership will announce a digital way for instructors to teach students in their residence halls or homes using a combination of the Blackboard LMS (Learning Management System), teleconferencing, and other technologies. Instructors should be prepared to assign students a “Plan B” project that can be completed ‘at a distance.’ For additional information about maintaining your classes in an emergency, please access:

<http://cst.usc.edu/services/emergencyprep.html>

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Course Outline

Note: Schedule subject to change

Week 1

1/13/2014 – C++ Primer

- Pass by value vs. reference
- Pointers and references
- Const correctness
- Separate compilation

Reading

Optional: Meyers: Item 20

Optional: Savitch: Chapters 1 – 9 and 12

Assignment

Lab 0 – Tool setup

1/15/13 – Classes & OOP

- Structures and classes
- Inheritance and polymorphism
- “Is-a” vs. “Has-a”

Reading

Required: Dale: Chapter 2

Optional: Meyers: Item 32

Optional: Savitch: Chapter 10, 15

Assignment

Project 1 – Candy shop (due 1/27/14)

Week 2

1/20/14 – Martin Luther King Day

- No class

1/22/14 – ADT & operator overloading

- Abstraction
- Overloading C++ operators

Reading

Optional: Meyers: Item 53

Optional: Savitch: Chapter 11

Week 3

1/27/14 – Exceptions & big-O

- C++ exception mechanism
- Orders of magnitude

1/29/14 – Basic ADTs & vectors

- ADT operations
- Vector ADT

Reading

Required: Dale: Chapter 3

Optional: Meyers: Item 7

Optional: Savitch: Chapter 8

Assignment

Project 2 – Shopping list (due 2/5/14)

Week 4

2/3/14 – Vectors

- Vector implementation

2/5/14 – Linked lists

- List ADT
- List operations

Week 5

2/10/14 – Linked lists

- Linked list implementations

Reading

Optional: Meyers: Item 5

Optional: Savitch: Chapter 13

Assignment

Project 3 – Candy pile (due 2/14/14)

2/12/14 – Linked lists

- Algorithm analysis

Week 6

2/17/14 – President's Day

- No class

2/19/14 – Midterm 1

- 15% of total grade

Week 7

2/24/14 – Templates

- Generic data types

Reading

Required: Dale: Chapter 6

Optional: Savitch: Chapter 17

Assignment

Project 4 – 52 card pickup (due 3/5/14)

2/26/14 – Intro to STL

- STL vectors
- STL linked lists
- STL iterators

Reading

Optional: Meyers: Item 4

Optional: Savitch: Chapter 18

Week 8

3/3/14 – Sorting algorithms

- Sorting a vector
- Sorting a list

Reading

Required: Dale: Chapter 10

3/5/14 – Other algorithms

- Searching
- Algorithm analysis

Week 9

3/10/14 – Stacks & queues

- As a vector
- As a linked list
- Ring buffers

Reading

Required: Dale: Chapter 5

Optional: Meyers: Item 38

Assignment

Project 5 – Solitaire (due 3/24/14)

3/12/14 – Hashing functions

- Introduction to hashing

Week 10

3/24/14 – Hashing functions

- Algorithm analysis

Reading

Optional: Meyers: Item 16

3/26/14 – Hash tables

- As a vector
- As an unordered map

Assignment

Project 6 – IMDB lookup (due 4/2/14)

Week 11

3/31/14 – Recursion

- Programming recursively

Reading

Required: Dale: Chapter 7

4/2/14 – Recursion

- Recursive ADT operations

Reading

Optional: Savitch: Chapter 14

Week 12

4/7/14 – Midterm 2

- 15% of total grade

4/9/14 – Quick sort

- Implementation
- Algorithm analysis

Reading

Required: Dale: Chapter 10

Optional: Meyers: Item 3

Assignment

Project 7 – TBD

Week 13

4/14/14 – Binary search trees

- Implementation

Reading

Optional: Dale: Chapter 8

4/16/14 – Binary search trees

- Implementation with recursion

Week 14

4/21/14 – Binary search trees

- Algorithm analysis

Assignment

Project 8 – Index search (due 4/30/14)

4/23/14 – Heaps

- Compared with binary search trees
- Heap sort

Reading

Required: Dale: Chapter 9

Week 15

4/28/14 – Advanced STL containers

- Map, set, and more

4/30/14 – STL algorithms

- Algorithm analysis

Final Exam

According to the final exam schedule on the Schedule of Classes