Syllabus
CPSC 131, Data Structures - Spring 2020
Section 04 (13696)

Description & Objectives

Classical data structures: vector, linked list, stack, queue, binary search tree, and graph representations. Worst-case analysis, amortized analysis, and big-O notation. Object-oriented and recursive implementation of data structures. Self-resizing vectors and self-balancing trees. Empirical performance measurement.

Instructor

Professor Mehdi Peiravi

eMail: mepeiravi@fullerton.edu
Office: CS401
Office Hours:
- Mon-Wed
  12:45AM 2:15PM
- By appointment, coordinated at least 24 hours in advance
- During final exam week, office hours are by appointment only

Meeting Information

CPSC 131-04		
Room	Day	Time
Join Zoom Meeting	Tuesday	11:30AM - 12:45PM
https://cccconfer.zoom.us/j/750318034	Thursday	Zoom

Learning Goals

1. Analyze an algorithm or procedure and derive its time efficiency class in terms of asymptotic notation.
2. Design and/or implement software that makes effective and appropriate use of fundamental data structures (e.g. stack, queue, search tree, hash table).
3. Identify possible solutions to a problem and analyze their feasibility or trade-offs.
4. Write syntactically and semantically correct C++17 source code, making appropriate use of the Standard Template Library and fundamental constructs such as variables, branches, loops, functions, classes, and objects that solves a well-posed computational problem.

G.E. Requirements

This class does not meet any CSU General Education requirements.

Prerequisites

CPSC 121 or sufficient score on the Computer Science Placement Exam.

Important Dates

CSUF's Academic Calendar is posted online at http://apps.fullerton.edu/AcademicCalendar/. The Academic Calendar contains all the campus closures and holidays you should be aware of.

CSUF's Admissions Calendar is posted online at http://www.fullerton.edu/admissions/Resources/Calendars.asp. The Admissions Calendar contains all the major dates with respect to adding, dropping, and withdrawing from your classes.

The final exam schedule is determined by Admissions and Records. Makeup exams are only available by advance request for documented exceptional circumstances.

Tuesday, January 21	First day of class
Tuesday, February 4	Last day to drop class, first day to withdraw from class but serious and compelling reasons required beyond this point (rare[1])
Thursday, March 19	Midterm Exam
Friday, April 17	Final deadline to withdraw from class for any reason
Tuesday & Thursday, March 31 & April 2	Fall Recess - No Class
Thursday, May 7	Last class
Tuesday, May 12	Final Project Due

Textbooks

Required	Recommended	Optional
Title: Data Structures Essentials **Authors:** Roman Lysecky & Frank Vahid **Publisher:** zyBooks 1. Sign in or create an account at http://learn.zybooks.com 2. Enter zyBook code: **FULLERTONCPSC131Spring2020** 3. Subscribe	**Title:** The C++ Standard Library 2e, 2012 **Authors:** Nicolai Josuttis **Publisher:** Pearson Education ISBN: 0-321-62321-5	• Open Data Structures (in C++), Morin • Starting Out with C++: Early Objects, Gaddis et al. • CPPRefference.com • CPlusPlus.com

The textbook is a zyBook and can only be accessed online (though chapters can be printed). There will be participation activities - short tests mixed in with the reading - requiring you have an individual subscription to the zyBook. When you purchase the book, you will have to provide your @csu.fullerton.edu email, CWID, and section number. Josuttis' *The C++ Standard Library* is strongly recommended for students seeking a CS Major or Minor who program in C++.

Textbook material will be supplemented with classroom lectures and handouts posted on Titanium.

Many popular technical books may be read online through the campus's subscription to Safari Books Online. From outside of the campus network, the campus library's WWW proxy will grant you access, http://www.library.fullerton.edu/asp/ipcheck.aspx?url=http://proquest.safaribooksonline.com/ ?uicode=calstate. The Safari Books Online service can be accessed directly from any computer on the campus network, http://proquest.safaribooksonline.com/.

[1] Withdraw petitions are not signed unless serious and compelling reasons are well documented and supporting material attached. Switching majors, overwhelming workload, falling behind, or insufficient mastery of prerequisites do not meet the threshold of serious and compelling. Take this *last day to drop* date seriously.

Course Outline and Reading Assignments

Subject to change

Week	Date	Topic	ZyBook
Part 0 - Introduction & Review			
1	1/21 1/23	• Introduction • Review: o C++ pointers, native arrays, references o C++ dynamic memory	Chapter 1
2	1/28	• Review: o OOP principles, C++ classes o C++ Operator Overloading o C++ Templates o C++ Exceptions	
	1/30	• Algorithm Analysis Overview o Linear & Binary searches o Big O Notation o Iterative & Recursive Algorithms	Chapter 2
Part 1 - Sequence Containers			
3	2/4 2/6	• **Arrays** • **Vectors** o Concept & Interface o Fixed & dynamically sized implementations o Amortized efficiency, complexity analysis	Chapter 3
4	2/11 2/13	• **Lists** o Concept & Interface o Singly linked list o Complexity analysis	Chapter 4
5	2/18 2/20	• Lists o Doubly linked list o Complexity analysis	
Part 2 - Iterators			
6	2/25 2/27	• Iterator Concepts o Concept & Interface o Pointers as iterators • Container Traversal Techniques o Iterative, recursive	
Part 3 - Container Adapters			
7	3/3 3/5	• **Stacks** o Concept & Interface o Array, Vector, List implementations o Complexity analysis	Chapter 5
8	3/10 3/12	• **Queues** o Concept & Interface o Array, Vector, List implementations o Complexity analysis	Chapter 5
9	3/17	Catchup / review	Part 0 - 3
	3/19	Midterm Exam	
Part 4 - Associative Containers			
10	3/24 3/26	• Non Instructional Day – 24th • Midterm Review- 26th • **Binary Trees** (*Sets/Multi Sets, Maps/Multi Maps*) o Concept & Interface o Binary search trees (BST) o Traversal techniques o Complexity analysis	Chapter 6
	3/31 4/2	*Spring Recess, no class*	
11	4/7 4/9	• Binary search trees (BST), BST insertion, BST removal, BST traversal, C++ SL map, set	Chapter 6
12	4/14 4/16	• balanced BST; AVL trees, AVL tree insert, remove, and restructuring, C++ SL map, set	Chapter 7
Part 5 - Unordered Containers			
13	4/21 4/23	• **Hash Tables** (*Unordered Set/Multi Set, Unordered Map/Multi Map*) o Concept & Interface o Hash Codes, Compression functions	Chapter 8
14	4/28 4/30	• Hash Tables o Collisions / Collision handling o Complexity analysis	

Week	Date	Topic	ZyBook
15	5/5 5/7	• **Graphs** o Concept & Interface o Adjacency list, adjacency matrix o Catchup o Review	Chapter 9

Week	Date	Topic	ZyBook
16	5/12	Final Project Due	

Technical Proficiency

Students are expected to be intimately familiar with their development platform of choice and be able to write and debug code in C++17 at a level of proficiency that corresponds to the prerequisites of the course. It is the responsibility of students without strong mastery, not just awareness, of the prerequisites to exert additional time and effort.

Technical proficiency with information technology, such as, but not limited to, the use of TITANium, web-based online services, sending and receiving electronic mail, and desktop computer file systems, is assumed.

Grading

Plus and minus grading is used when determining final grades. Final grades are computed by first finding the average score in each category described in the table below on the right. All scores are normalized to a scale of 0 to 100 before being averaged. The average score for each category is then used to compute the weighted average according to the weights in the table.

Grade	% of Total Points
A	93% ≤ X
A-	90% ≤ X < 93%
B+	87% ≤ X < 90%
B	83% ≤ X < 87%
B-	80% ≤ X < 83%
C+	77% ≤ X < 80%
C	73% ≤ X < 77%
C-	70% ≤ X < 73%
D+	67% ≤ X < 70%
D	60% ≤ X < 67%
F	X < 60%

Category	% of Final Grade
Participation	10%
Knowledge Checkpoint	25%
Homework	30%
Midterm	25%
Final Project	10%

Assignment grades are recorded in Titanium. Please check them for accuracy. Titanium calculates your grade automatically. These calculations are based only on the grades that are currently available. So, for example, the grade calculation will ignore the Homework category until the first homework is graded.

Too often I am approached at the end of the semester by students telling me how desperate they are to get a passing grade because they're graduating or on academic probation. In these cases, there's nothing that can be done. If this class is important to you and there is a lot riding on your grade, it is your burden to work hard, come get help when necessary, attend class, complete all the assignments, and do well on exams. Your obligation begins on day one. Please note that there is one syllabus for the course; all students are graded based on the requirements outlined in this syllabus, and nothing more. There are no special deals, relaxed standards or extra opportunities based on class standing or other factors. Your grade is a function of your graded work, and that alone. That's an essential part of a fair grading system.

If you are surprised by your grade at the end of the semester, you have the right to ask if the grade was given in error. I am happy to check your scores to verify that no clerical error was made; these errors are extremely rare, but possible. In the exceptional circumstance of a clerical error, it will be corrected promptly. Note that final course grades are non-negotiable, and University policy establishes that grades are given at the sole discretion of the faculty member. If your grade was not given in error, that is your final, non-negotiable grade.

Assignments

Programming and written assignments will be posted on TITANium. All programming assignments must be written in the C++17 programming language, unless specified otherwise. Coding style must conform to professional norms. At a

minimum, code must be commented, have descriptive names for identifiers, and contain a comment with pertinent information such as the student's name, email address, and assignment name.

At the start of the semester, the instructor will detail the platform and tools used to grade student assignments. It is the student's responsibility to ensure that the assignments execute to his or her satisfaction on the instructor's grading platform.

The following kinds of assignments cannot be evaluated, and will be assigned a zero score:

- Late submissions
- eMail submissions
- Source code that cannot be compiled successfully (error AND warning free)
- Input/output that is falsified or does not match the submitted source code
- Submissions that are plagiarized or otherwise violate the collaboration guidelines

There are approximately:

- 14 Reading Assignments
- 6 Knowledge Checkpoints
- 5 programming homework assignments

Homework assignments are to be submitted through our course website on or before the posted due date and time. Late assignments are not accepted. This policy is enforced by our website. Under no circumstances are assignments accepted through eMail.

Collaboration

Collaboration is *not* allowed on any exam, knowledge checkpoint, homework, or textbook participation activities. You may work freely with your fellow classmates, but must limit the input you get:

- You may help each other understand the assignment and brainstorm general solutions, but each student must develop and submit their own distinct work.
- You may give each other technical support, for instance troubleshooting, installing Tuffix, or logging in to TITANium.
- You must separate to develop your own detailed solution to the problem, and type in your own source code and report. Do not share (provide or accept) source code.
- Given these requirements, any submissions with identical excerpts, or excerpts that are identical up to superficial rearrangements, will be considered highly suspect of plagiarism.

Supplemental Instruction (SI)

Supplemental Instruction (SI) study sessions are offered for this course. SI sessions meet two to three times a week, throughout the semester. Supplemental Instruction is an academic assistance program which provides peer-led group study sessions to assist students in traditionally difficult courses.

SI sessions are led by a SI leader who has already mastered the course material and has been trained to facilitate group sessions where students can meet to improve their understanding of course material, review and discuss important concepts, develop study strategies and prepare for exams. SI is for everyone, and open to all students enrolled in this class; not just those students who are struggling. Attendance at SI sessions is free and voluntary. Students, who attend SI sessions weekly typically earn higher final course and exam grades than students who do not participate in SI. Please bring your lecture notes, books, and questions with you.

Schedules can be found at http://www.fullerton.edu/si/schedule/schedules/ComputerScienceSchedule.pdf You may attend any section's SI sessions but preferably a session associated with your instructor. For additional information on the SI Program at CSUF, please visit our website at: http://www.fullerton.edu/SI

Attendance Policy

90% class attendance is mandatory. There are roughly 30 class meetings. This means you may choose to be absent three times (that is, choose to not attend 3 class meetings) during the semester without notifying the instructor or justifying the absence. This is intended to accommodate unforeseen issues.

Attendance is tracked via TITANium's Attendance Activity Module and via your participation in class or lab activities. If you logged your attendance through TITANium but did not participate in a class activity, for example, then you may still be considered absent. It is your responsibility to log your attendance for each class meeting. In the rare case you are unable to log your attendance, let the instructor know in writing during class so your attendance can be manually entered later. Under no circumstances will attendance records be accepted after the class ends. (Don't bother, for example, eMailing your instructor claiming you forgot to register your attendance.) To be processed, your written record of attendance must contain

1) Your full name
2) Your CWID
3) The date and time of class
4) Your Course and Section number (CPS 351-04 for example)

Smartphone checkout for logging course attendance is available to students upon faculty request. For more information, please visit the Student Genius Corner Equipment Checkout website.

Allowed absences will not result in participation grade deductions, but if you are absent for any reason you will not receive credit for the corresponding in-class quiz or lab exercise for the day of the absence. You will be responsible for catching up on what you missed from class and the instructor will not be obligated to give make-up lectures or activities for that day. Absences outside of the 3-class allowance will affect your grade.

Missing class as part of a documented accommodation is guaranteed to be excused. The ADA accommodated student must make a reasonable effort to coordinate any absences with the instructor.

Administrative drops

Any student who misses the first class meeting may be dropped from the class, unless they contact the instructor or Computer Science department within 24 hours.

Make Up Policy

Exams and quizzes cannot be taken after they have been given in class. Due to an act of nature, personal medical emergency, a family crisis, an act of terrorism, severe civil unrest, etc. students have 10 calendar days to petition the instructor to retake any exam/quiz or submit an assignment without late penalty.

If exceptions are made (rare), they will be considered on a case by case basis given enough time and evidence to weigh the merits of the application.

Communication

You have a CSUF-supplied email account, and that is the only way I have of reaching you outside class. Check that account daily for important class announcements and individual messages. I try to respond to all emails within two working days, but occasionally may take longer than that. Plan accordingly, especially around deadlines.

Course Participation

In the context of this course, participation is defined as the following:

- Completing the Textbook Participation Activities
- Arriving to class prepared and on time.
- Taking notes.
- Actively listening to the lecture and asking questions when appropriate.
- Annotating code listings and handouts.
- Bringing any required materials to class.
- When needed/desired, seeking assistance to complete assignments.
- Barring an emergency, not leaving the class session early unless the instructor consents.
- Not distracting oneself or others with smartphones, games, online diversions, etc.
- Respecting and treating the instructor and the student's peers civilly.

Required Material

- A writing instrument
- A notebook
- A personal computer with the requisite development tools or regular access to a computer lab

Academic Dishonesty

By submitting work for evaluation, the student acknowledges that he/she has adhered to the spirit of the university's academic honesty policy and that his/her submission is an original work done by the student unless otherwise directed to work in groups. You are expected to review and uphold the Academic Dishonesty Policy (UPS 300.021) and Student Code of Conduct (Title V). The Student Handbook also provides a detailed description of Academic Dishonesty . You may also find the UPS 300.021 and the Student Code of Conduct at the following link http://www.fullerton.edu/integrity/policies/.

Academic dishonesty includes such things as cheating, inventing false information or citations, plagiarism, and helping someone else commit an act of academic dishonesty. It usually involves an attempt by a student to show possession of a level of knowledge or skill, which he/she in fact does not possess. Cheating is defined as the act of obtaining or attempting to obtain credit for work using any dishonest, deceptive, fraudulent or unauthorized means. Examples of cheating include, but are not limited to using notes or aids or help of other students on tests and examinations in the ways other than those expressly permitted by the instructor, plagiarism as defined below, tampering with grading procedure, and collaborating with others on any assignment where such collaboration is expressly forbidden by the instructor. Plagiarism is defined as the act of taking the specific substance of another and offering it as one's own without giving credit to the source (e.g., copying another person's program).

When you use sources, you must acknowledge the original author or source following standard scholarly practice. You are not allowed to use any material from any website that provide solutions to the assignments given in class for a fee or free of charge. Failure to follow the spirit of the academic honesty policy will result in a severely negative evaluation of your work in question. Each offense will be reported to the Department Chair and to the Dean of Students office, Student Conduct. A first offense will result in a zero score on the offending assignment. A subsequent offense will result in an F in the course.

ADA Accommodations

Any student who, because of a disability, may require special arrangements in order to meet course requirements must register with the Office of Disability Support Services within the first week of classes. The Office of Disability Support Services' website is http://www.fullerton.edu/DSS/. They can be reached by phone at 657-278-3117 or TDD at 657-278-2786. Their email address is dsservices@fullerton.edu. Their office is in University Hall, room 101. The instructor may

request verification of need from the Dean of Students Office. Students requesting accommodations shall inform their instructors during the first week of classes about any disability or special needs that may require specific arrangements/accommodations related to attending class sessions, completing course assignments, writing papers or quizzes, tests or examinations.

Emergency Procedures

For your own safety and the safety of others, each student is expected to read and understand the guidelines published at http://prepare.fullerton.edu/campuspreparedness/. Should an emergency occur, follow the instructions given to you by faculty, staff, and public safety officials. An emergency information recording is available by calling the Campus Operation and Emergency Closure line at 657-278-4444.

Instructional Continuity

Due to an event such as an epidemic or a natural disaster that disrupts normal campus operations, students must monitor the course Titanium site and their campus email address for any instructions and assignments that the instructor announces. This syllabus has been updated in response to the Coronavirus Pandemic.

Extra Credit

There are no opportunities for extra credit. Please do not ask for extra credit.

Recording & Transcription of Class Content

Recording class content is governed by UPS 330.230, http://www.fullerton.edu/senate/documents/PDF/300/UPS330-230.pdf. In summary, unless otherwise mandated, recordings of all kinds are strictly forbidden including but not limited to photographs, video recordings, audio recordings, scanning, and screen capture.

Note however, the instructor must permit class content to be recorded or transcribed by students when mandated to do so by the Americans with Disabilities Act or by other federal or state laws. See Students with Special Needs above for guidance navigating the university's policies and procedures. In any event, any recording of class content is for private use and study and shall not be made publicly accessible, including sharing with other students, without the written consent of the instructor and students in the class.

Course Rules & Classroom Management

Unless an agreement or accommodation is reached between the student and the instructor, these rules must be followed.

- Attendance at all regularly scheduled lecture and discussion section is mandatory.
- Do not eat during lecture.
- If it makes noise, silence it.
- Portable computer use is not allowed in lecture except for taking notes.
- The student is responsible to be aware of any course announcements including changes to due dates and requirements.
- Homework, programming assignments, etc. may not be submitted late.
- Third party work (code, artwork, etc.) may not be used in student work without prior instructor consent. Failure to gain and document instructor consent will be construed as willful academic dishonesty.
- When a third party's work is incorporated into student work after gaining instructor consent, failure to wholly document the work's origin, copyright and license will be construed as willful academic dishonesty.

Appendix A – Development Tool Resources

Students enrolled in CSPC 120, CPSC 121, and CPSC 131 are recommended to use the Computer Science Department's official GNU/Linux development environment, Tuffix. Tuffix is Tuffy the Titan's Linux distribution.

Instructions on how to install Tuffix or a Tuffix based VM are online at http://csufcs.com/tuffixinstall. The Tuffix Titanium Community for Students, https://communities.fullerton.edu/course/view.php?id=1547 is the best venue to receive help with Tuffix.

Students may self-enroll in the community; first login to your portal, then navigate to *Titanium communities*, next under the dashboard to the left – click *Site home*, then click *Search Courses* on the right, search for 'Tuffix', in the results click *Tuffix Students*, under the gear in the upper right select *Enroll me in this course*, finally click on the button *Enroll me*. You may unenroll at any time.

The Tuffix home page is https://github.com/kevinwortman/tuffix. Instructors are encouraged to join the Tuffix Titanium Community for Instructors. Please contact Kevin Wortman for access.

Students interested in using Microsoft® development tools may request a Dreamspark account at http://dsreqform.ecs.fullerton.edu/. A student may, at no monetary cost, download full featured versions of Microsoft Visual Studio.

Students interested in using Apple® development tools can freely download Xcode through the App Store application bundled with macOS. Students may download Xcode directly from «https://developer.apple.com/xcode/».

A CentOS (Linux) shell server is available through secure shell (ssh) and secure file transfer protocol (sftp). The hostname is ecs.fullerton.edu. If your email address is taylor@csu.fullerton.edu, then your username is taylor. If you are using a command-line ssh client, then your command to connect to ecs.fullerton.edu will be `ssh taylor@ecs.fullerton.edu`. Your password is the same password as your CSUF Portal password. (Faculty members can login in as well if you specify your Active Directory domain. For example, if your email address is kai@fullerton.edu, then your username is 'AD\kai; thus the command will be `ssh 'AD\kai@ecs.fullerton.edu`.)

Please consider adopting a package management system for your personal computer to facilitate adding, updating and removing the various software development tools you may wish to use.

- Apple OS X
  - MacPorts «http://www.macports.org/» (recommended)
  - Fink «http://www.finkproject.org/»
  - Homebrew «http://brew.sh/»
- Microsoft Windows
  - Chocolatey NuGet «https://chocolatey.org/»
  - Microsoft OneGet «https://github.com/OneGet/oneget»
  - Cygwin «http://www.cygwin.com/»
  - Npackd «https://npackd.appspot.com/»
- GNU/Linux OS
  - dpkg «https://www.debian.org/doc/manuals/debian-faq/ch-pkgtools.en.html»
  - rpm «http://fedoranews.org/alex/tutorial/rpm/»
  - yum «http://yum.baseurl.org/»