

Syllabus

CPSC 131, Data Structures - Fall 2020

Section 06

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 Thomas L Bettens

Phone: 657-278-4999

eMail: TBettens@fullerton.edu

Office: CS 401

Office Hours: • Wednesdays..... 1:15 PM – 2:45 PM

• Thursdays..... 8:00AM – 9:30AM

- By appointment, coordinated at least 24 hours in advance
- During final exam week, office hours are by appointment only

Join Zoom Meeting

<https://fullerton.zoom.us/j/97653487217>

Call-in: 1 (669) 900-6833

Meeting ID: 976 5348 7217

You will be placed into a FIFO waiting queue.

Meeting Information

CPSC 131-06		
Room	Day	Time
Join Zoom Meeting https://fullerton.zoom.us/j/92469517663	Mondays	5:30 PM – 6:45 PM
Call-in: 1 (669) 900-6833 Meeting ID: 924 6951 7663	Wednesdays	

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 correct source code, making appropriate use of fundamental constructs such as variables, branches, loops, and functions that solves a well-posed computational problem.

G.E. Requirements

This class does not meet any CSU General Education requirements.



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Prerequisites

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

Important Dates

CSUF's Academic and Admissions Calendars are posted online. The Academic Calendar contains all the campus closures and holidays you should be aware of. 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.

- <http://apps.fullerton.edu/AcademicCalendar/>
- <http://www.fullerton.edu/admissions/Resources/Calendars.asp>
- <http://www.fullerton.edu/admissions/currentstudent/finalexaminations.asp>

Monday, August 24	First day of class
Tuesday, 8 September	Last day to <u>drop</u> class, first day to <u>withdraw</u> from class <i>serious and compelling reasons required beyond this point (rare¹)</i>
Wednesday, October 21	Midterm Exam
Friday, November 13	Final deadline to <u>withdraw</u> from class for any reason
Monday & Wednesday, November 23 & 25	Fall Recess - No Class
Wednesday, December 9	Last class
Monday, December 14	Final Exam / Project 5:00PM – 6:50PM

Textbooks

Required	Recommended	Optional
<p>Title: Open Data Structures (C++ edition)</p> <p>Authors: Pat Morin, et al.</p> <p>Publisher: opendatastructures.org</p> <p><i>The book and accompanying source code are free (libre and gratis) and are released under a Creative Commons Attribution License. Users are free to copy, distribute, use, and adapt the text and source code, even commercially. The book's LaTeX sources, Java/C++/Python sources, and build scripts are available through github (https://github.com/patmorin/ods)</i></p>	<p>Title: The C++ Standard Library 2e, 2012</p> <p>Authors: Nicolai Josuttis</p> <p>Publisher: Pearson Education ISBN: 0-321-62321-5</p>	<ul style="list-style-type: none"> • CPPReference.com • Starting Out with C++: Early Objects, Gaddis et al. • Cplusplus.com • C++ Primer, (6e, since Nov 2020) Lippman, Lajoie, and Moo 978-0135161791

Josuttis' *The C++ Standard Library* is strongly recommended for students seeking a CS Major or Minor who program in C++. I will reference content from this book often.

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

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/?unicode=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. <http://records.fullerton.edu/services/withdrawal.php>



Course Outline and Reading Assignments

Subject to change

Wk	Date	Topic	ODS Text
Part 0 - Introduction & Review			
1	8/24 – 8/30	<ul style="list-style-type: none">• Introduction• Review:<ul style="list-style-type: none">○ C++ pointers, native arrays, references○ C++ dynamic memory	Chapter 1 §1.3.3 is important, but the rest of §1.3 can be skimmed
2	8/31 – 9/6	<ul style="list-style-type: none">• Review:<ul style="list-style-type: none">○ OOP principles, C++ classes○ C++ Templates○ C++ Exceptions	
		<ul style="list-style-type: none">• Algorithm Analysis Overview<ul style="list-style-type: none">○ Linear & Binary searches○ Big O Notation○ Iterative & Recursive Algorithms	
Part 1 - Sequence Containers			
3	9/7	Labor Day, no class	
	9/8 – 9/13	<ul style="list-style-type: none">• Arrays• Vectors<ul style="list-style-type: none">○ Concept & Interface○ Fixed & dynamically sized implementations○ Amortized efficiency, complexity analysis	§2.1
4	9/14 – 9/20	<ul style="list-style-type: none">• Lists<ul style="list-style-type: none">○ Concept & Interface○ Singly linked list○ Complexity analysis	§2.1 §3, 3.1, 3.2
5	9/21 – 9/27	<ul style="list-style-type: none">• Lists<ul style="list-style-type: none">○ Doubly linked list○ Complexity analysis	
Part 2 - Iterators			
6	9/28 – 10/4	<ul style="list-style-type: none">• Iterator Concepts<ul style="list-style-type: none">○ Concept & Interface○ Pointers as iterators• Container Traversal Techniques<ul style="list-style-type: none">○ Iterative, recursive	

Wk	Date	Topic	ODS Text
Part 3 - Container Adapters			
7	10/5 – 10/11	<ul style="list-style-type: none">• Stacks<ul style="list-style-type: none">○ Concept & Interface○ Array, Vector, List implementations○ Complexity analysis	§1.2.1
8	10/12 – 10/18	<ul style="list-style-type: none">• Queues<ul style="list-style-type: none">○ Concept & Interface○ Array, Vector, List implementations○ Complexity analysis	§1.2.1 §2.3 §3.1.1
9	10/19 – 10/25	Catchup / review	Part 0 - 3
		Midterm Exam	
Part 4 - Associative Containers			
10	10/26 – 11/1	<ul style="list-style-type: none">• Binary Trees (<i>Sets/Multi Sets, Maps/Multi Maps</i>)<ul style="list-style-type: none">○ Concept & Interface○ Binary search trees (BST)○ Traversal techniques○ Complexity analysis	Chapter 6
11	11/2 – 11/8	<ul style="list-style-type: none">• Balanced Binary Trees (<i>Sets/Multi Sets, Maps/Multi Maps</i>)<ul style="list-style-type: none">○ AVL trees	
12	11/9 – 11/15	<ul style="list-style-type: none">○ AVL tree restructuring○ Complexity analysis	
Part 5 - Unordered Containers			
13	11/16 – 11/22	<ul style="list-style-type: none">• Hash Tables (<i>Unordered Set/Multi Set, Unordered Map/Multi Map</i>)<ul style="list-style-type: none">○ Concept & Interface○ Hash Codes, Compression functions○ Collisions / Collision handling○ Complexity analysis	Chapter 5
11/23 – 11/29 <i>Fall Recess, no class</i>			
14	11/30 – 12/6	<ul style="list-style-type: none">• Graphs<ul style="list-style-type: none">○ Concept & Interface○ Adjacency list, adjacency matrix	Chapter 12
15	12/7 – 12/13	<ul style="list-style-type: none">• Graphs<ul style="list-style-type: none">○ Traversals○ Searching○ Complexity analysis	
16	12/14 – 12/18	Final Exam / Project Monday, December 14 5:00PM – 6:50PM	Parts 0 - 5

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.

Technical proficiency with information technology, such as, but not limited to, the use of Canvas, 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	$93\% \leq X$
A-	$90\% \leq X < 93\%$
B+	$87\% \leq X < 90\%$
B	$83\% \leq X < 87\%$
B-	$80\% \leq X < 83\%$
C+	$77\% \leq X < 80\%$
C	$73\% \leq X < 77\%$
C-	$70\% \leq X < 73\%$
D+	$67\% \leq X < 70\%$
D	$60\% \leq X < 67\%$
F	$X < 60\%$

Category	% of Final Grade
Attendance	10%
Participation	5%
Knowledge Checks	15%
Projects	30%
Midterm	20%
Final	20%

Assignment grades are recorded in Canvas. Please check them for accuracy. Canvas 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 Project category until the first project 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 Canvas. 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.



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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
- 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 Checks
- 5 programming projects

Project 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

Unless specifically indicated, collaboration is *not* allowed on any exam, knowledge check, project, 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 Canvas.
- You must separate to develop your own detailed solution to the problem, and type in your own source code and report.
- 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 (i.e., miss 3 class meetings) during the semester without notifying the instructor or justifying the absence. This is intended to accommodate unforeseen issues. These allowed absences will not result in Attendance grade deductions, but you are still considered absent. 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 are responsible for catching up on what you missed from class and I am not obligated to give make-up lectures or activities for that day. Absences outside of the 3-class allowance will affect your final grade.

Experimental and subject to change - Attendance is primarily determined by Zoom meeting connection reports. The time you join and leave the meeting determine full, partial, or no attendance. Once a week or so the Zoom connection reports are scanned and Canvas's Attendance Activity Module is populated. It is your responsibility to sign in to Zoom using your CSUF SSO credentials to be recognized. Other factors also contribute to determining attendance. If you joined the Zoom meeting but did not participate in a class activity, for example, then you may still be considered absent; especially if that activity is how attendance is taken that day. Under no circumstances will attendance records be accepted after the class ends. Don't bother, for example, eMailing me claiming you were not able to join the Zoom meeting. I understand unforeseen things happen (internet, computer crash, cellphone reception, etc.), but that why only 90% attendance is required.

Missing class as part of a documented accommodation is guaranteed to be excused, but of course still absent. Excused absences allow the ADA accommodated student to initiate a request within 10 days of the missed class to either (at my sole discretion) make up the in-class activities or have those activities removed from contributing towards the final grade. 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 in-class and Canvas hosted participation activities
- Arriving to class prepared and on time.
- Taking notes.



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- 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.

Technical/computer requirements

- [Student: What are the technical/computer requirements to take an online course?](#)
- [Technical Recommendations](#)
- A personal computer with the requisite development tools or regular access to a computer lab
 - Zoom, internet, headset, webcam

[Long-Term Laptop Checkout](#) and other [Equipment Checkout](#) are available for anyone needing assistance.

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 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 a 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 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 Canvas site and their campus email address for any instructions and assignments that the instructor announces.

Extra Credit

There are no planned 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.
- Project, 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 CPSC 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 home page is <https://github.com/kevinwortman/tuffix>.

Community Slack Workspace

Students using Tuffix should join the [CSUF TUFFIX](https://csuf-tuffix.slack.com) slack workspace at <https://csuf-tuffix.slack.com>. Please use the #general channel to ask about troubleshooting installing and using Tuffix.