CS 244: Data Structures
Section 004 — Fall 2022

JHSA 243, MTWH 2:30pm-3:25pm

Instructor - Dr. Alexi Brooks

Pronouns: They/Them
Office: JHSW 211
Email: brooksa@uwstout.edu
Office Hours: M-W 10am-11am, TH 1:20pm-2:20pm, H 3:35pm-4:35pm, F 2:30pm-4:30pm

SI Tutor Lab - JHSW 235

On Mondays and Wednesdays, we have a Supplemental Instructor in class to assist us. See the "Resources" section below for how to effectively make use of SI assistance. Any SI should be able to assist you in the Tutor Lab. Our specific SI has these Tutor Lab hours:

- Connor Donnelly (He/Him)
  - Monday 5:45pm-8:45pm
  - Wednesday 5:45pm-6:45pm
  - Thursday 6:45pm-8:45pm

Course Description

Concepts and foundations of data structures and algorithms. Introduction to analysis of algorithms and linear structures, vectors, linked lists, stacks, queues and priority queues. Non-linear data structures such as trees, tree traversals, binary trees, binary search trees and graphs. Advanced sorting and searching techniques. Hashing, heaps.

Course Prerequisite: CS-144, CS-145

Course Learning Objectives

After this course, you should be able to:

- Understand the structure, purposes and methods of the most commonly occurring data structures.
- Analyze the data structure needs of particular problems and the appropriate associated algorithms.
- Compare the efficiency of various implementations and algorithms, as well as the pros and cons of each implementation and algorithm.
- Recognize the mathematical aspects of discrete structures.

- Learn and apply object-oriented design principles for the purposes of data abstraction and encapsulation.
- Master the standard data structure library of a major programming language (e.g. standard template library in C++).
- Effectively implement collections and containers in modern software engineering applications.
- Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort, heap sort.
- Comprehend the theoretical aspects and practical applications of the non-linear structures and searching algorithms for these structures.

Resources

Course Website

We will be using **Canvas** as our course management system. Announcements, readings, assignments, lecture notes, and grades will all be posted here. You will also be expected to turn in some assignments through Canvas.

Office Hours

Posted office hours are times outside of class that I dedicate to my students. **You are always welcome to drop in with questions or just to talk; these are times that I guarantee I will be present in my office.**

Effective uses of office hours include, but are not limited to: Asking a question about a class topic. Asking a question about a non-class topic. Asking for help without a specific question in mind (key phrase: "I'm not sure what question to ask."). Showing off something you think you did well. Showing off something you think is cool. Letting me know about an upcoming performance or event (I would love to attend and support you!). Saying hi.

My regular office hours will be held in person as long as circumstances permit. My regular hours this semester will be Monday through Wednesday 10am-11am, Tuesday+Thursday 1:20pm-2:20pm, Thursday 3:35pm-4:35pm and Friday 2:30pm-4:30pm. Due to the ongoing pandemic, I will generally keep my office door closed except during scheduled office hours. I am likely still able to talk with you–just knock!

I am also available by appointment. The easiest ways to set up a meeting with me are to (1) email me suggesting two or three specific times that would work for you, or (2) speak to me in person before or after class.

If you would prefer to meet remotely, I can meet via **Zoom** or **Teams**. You don't need a specific reason to meet with me remotely. I can meet remotely during my regular office hours, but I rarely check my email during office hours–you will need to contact me in advance.

Supplemental Instruction

There is a supplemental instructor (SI) assigned to the course. SIs are experienced students hired to help support your learning.

Your SI leader is available to help during our class-time and during their posted SI Tutor Lab hours in JHSW 235. I highly recommend planning to attend the Tutor Lab at least once per week. The SI are a great resource for help reviewing class materials, getting questions answered, getting help on assignments, and so on.

During class, I will often "live-code" and ask you to follow along on your own laptops. If you need troubleshooting help during these activities or have a question you do not want to raise with the full class, you are welcome to ask the SI for 1-on-1 assistance. During in-class exercises, both the SI and myself will be available for 1-on-1 assistance.

Software

You will need to download and install Microsoft Visual Studio Community https://www.visualstudio.com/vs/community/ and select C++. If you have a non-Windows machine, you will need to go to the Help Desk for assistance getting this installed.

Textbook

Our textbook is **Data Structures and Algorithms in C++, by Goodrich, Tamassia, and Mount, 2nd Edition**.

Your Classmates

I've observed that students who talk to other students about code and computer science concepts typically do better in the course than students who do not. I encourage you to get to know your classmates and form study groups. That said, **please remember that solo assignments must be completed on your own**. Only you, me, or an SI should look directly at your assignment code. Only you should touch your keyboard when you are working on an assignment.

The Internet

Much of the content of this course is widely available on the internet. I strongly encourage you to **be careful** with this resource! The internet includes incorrect and outdated answers as well as correct ones. More importantly, this course is designed to help you develop and practice a set of skills that you will need both in future courses and in the workplace. The SIs and I are trained to guide you effectively. The internet is not. Treat internet sources like students in another section of the course: If code directly relates to an assignment, don't look at it or copy it.

Tentative Schedule

Week		Topic
1	Sep 7-8	C++ Review
2	Sep 12-15	C++ Review, continued
3	Sep 19-22	Containers
4	Sep 26-29	Algorithm Analysis
5	Oct 3-6	Linked Lists
6	Oct 10-13	Linked List Variations
7	Oct 17-20 3	Iterators
8	Oct 24-27*	Stacks and Queues
9	Oct 31-Nov 3	Inheritance
10	Nov 7-10	Search
11	Nov 14-17	Trees
12	Nov 21-24	Hashing
13	Nov 28-Dec 1	Heaps and Priority Queues
14	Dec 5-8	Graphs
15	Dec 12-14	Sorting

- October 25 is Advisement Day. No class.
- November 4 Alexi will be away at a conference. No office hours.
- November 23-27 is Fall Break. No class.
- December 20 is the last day of Evaluation Week. ALL work must be received by this day.

Expectations

What I Expect From You

Help me build an environment where you and your classmates can effectively learn. To do so...

- **Stay current on your email and your Canvas.** I will use campus email and Canvas announcements to contact you. Make sure you check both.
- **Participate.** Ask questions. Take part in class activities. Attendance and participation aren't part of your grade, but do I expect both.
- **Be considerate of your classmates.** Follow University guidelines for pandemic safety. This currently means taking a COVID test if you might have been exposed, and isolating if you test positive for COVID. Stay on task during class time; if you distract yourself with social media, you may distract the student sitting next to you as well.
- **Put in effort.** You can expect an average of 8 hours per week spent on this course *in addition to in-class time*. If you find yourself putting in significantly more, please let me know.

What You Can Expect From Me

I will support your learning. I will...

- Come to class prepared with material and participatory exercises.
- Regularly check my campus email and Canvas inbox. Anything sent to my campus email which contains "244" will receive an acknowledgement at least within 1 day (not counting weekends or holidays).
- Lead a positive learning-focused classroom. All of you belong in my class, and I will do my best to support your success in the course.
- Put in the effort to release and grade assignments in a timely fashion.

Assessment

During the course you will have many opportunities to demonstrate your mastery of the course content. Content is divided into **topics**. There will be multiple assignments on each topic, and in many cases you will only need to complete *one* assignment on each topic.

When an assignment is released, you will generally have one week to complete and submit it. You **may** and **should** submit partially completed work as you go. There is no limit to the number of times you may submit an assignment. I will evaluate your last submission. If you are unable to complete an assignment within the 1-week time frame, submit your partial work and include a note stating when you believe it will be ready for evaluation. Please speak to me before doing this if possible so that I can advise you.

Assignments will be listed as either *proficiency* assignments (stand-alone assignments designed to demonstrate your understanding of core material) or *challenge* assignments (designed to explore a topic in more depth). Proficiency assignments must be completed solo. Challenge assignments will specify whether they must be completed solo or may be completed with a partner. If completing a pair challenge assignment with a partner, both of you are expected to contribute equally to the assignment, and you will each complete a confidential partner evaluation form as part of the assignment.

Each assignment will be evaluated according to the following rubric:

Exceeds Expectations	The submission is of such quality that I might like to use it as an example in future classes. The difference between an Exceeds Expectations mark and a Complete mark is usually a matter of style. Work that Exceeds Expectations is well-documented and organized. Code runs efficiently. There are no non-trivial errors.
Complete	The submission demonstrates mastery of the topic. There are no significant gaps or errors. Documentation and code efficiency are within assignment parameters.
Revise and Resubmit	The submission demonstrates effort but not mastery. There are significant gaps or errors. The submission shows evidence of partial understanding.
No Credit	The submission does not demonstrate effort, or is otherwise no assessable.

I expect the vast majority of submissions to initially receive a Revise and Resubmit. There is no specific deadline on assignment revisions other than the end of the semester. However, I encourage you to complete revisions and resubmit within a week. Assignments which ultimately receive either an Exceeds Expectations or a Complete score receive full and equal credit, regardless of how many revision passes they went through. Submissions which receive No Credit are not eligible to be resubmitted.

Grades

The list of graded topics tentatively consists of the following:

1. Algorithm Analysis
2. Linked Lists
3. Linked List Variations
4. Iterators
5. Stacks & Queues
6. Inheritance
7. Linear & Binary Search
8. Hashing
9. Trees
10. Heaps & Priority Queues

If the circumstances of the semester prevent us from covering all of these topics, I will adjust the grade thresholds. Given the expected time crunch at the end of the semester, there will be limited time for revisions on the last topic we cover.

"Stretch goals" are specific elements of some challenge problems that aren't directly related to course topics, but involve useful skills that you will likely apply in the future. The tentative list of stretch goals includes: completing a challenge problem with a partner, evaluating peer work, collaborating with a partner using a version control tool, creating a formal project proposal or report using LATEX, writing a test suite, and presenting to the class on a relevant computing topic. I may expand this list at my discretion. I will indicate some challenge assignments as natural fits for meeting a stretch goal–speak to me *in advance* if you plan to meet a stretch goal in a way I have not indicated.

A	Complete a proficiency assignment for all topics. Complete at least five challenge problems (at least two of them solo). Among the challenge problems you complete, include at least two stretch goals.
B	Complete a proficiency assignment for all topics. Complete at least three challenge problems (at least one of them solo). Among the challenge problems you complete, include at least one stretch goal.
C	Complete a proficiency assignment for all but one topic. Complete at least one challenge problem *solo*.
D	Complete a proficiency assignment for all but three topics.

CS major, AMCS major, and CS minor students must achieve a C or better for

credit towards their program.

Policies

Academic Misconduct

Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Students who violate these standards must be confronted and must accept the consequences of their actions. The disciplinary procedures can be found on the Student Academic Misconduct/Academic Discipline Procedure website.

Inclusive Environment

UW-Stout strives for an inclusive learning environment. If you anticipate or experience any barriers related to the format or requirements of this course, please meet with me so that we can discuss ways to ensure full access. If you determine that additional disability-related accommodations are necessary please contact the Disability Services office (120 RSSLLC, 232-2995, http://www.uwstout.edu/disability).

Sexual Misconduct and Title IX

Title IX prohibits sex discrimination that includes sexual misconduct: harassment, domestic and dating violence, sexual assault, and stalking. If you or someone you know has been sexually harassed or assaulted, you can report the behavior on-line or to the Title IX Coordinator in the Dean of Students Office. As "Responsible Employees" faculty members are required to report sexual misconduct to the Title IX Coordinator.

Non-Discrimination

The University of Wisconsin-Stout is committed to maintaining a learning and working environment that is free of bias, prejudice, and harassment-an environment that supports, nurtures, and rewards career and educational advancement based on ability and performance. See the Discrimination, Harassment, and Retaliation Policy for more information.

Veterans and Active Military Members

Veterans and active duty military personnel with special circumstances (e.g., drill requirements) are encouraged to communicate these in advance to their instructors. Students who may need short-or long-term absence for military active duty should consult the Student Military Leave policy for more information. Veterans and active duty military personnel who have a documented disability and may qualify for academic accommodations should contact the Disability Services, located in the library.

Definition of a Credit Hour

UW-Stout defines a "semester credit hour" as an amount of work represented in intended learning outcomes and verified by evidence of student achievement that reasonably approximates:

- At least 750 minutes of classroom or direct faculty instruction and a minimum of 1500 minutes of out-of-class student work for one semester credit hour, or the equivalent amount of work over a different amount of time (e.g. compressed courses); or
- At least an equivalent amount of work as required in paragraph (i) of this definition for other academic activities as established by UW-Stout, including distance education, online, hybrid, or other indirect faculty instruction, laboratory work, internships, co-op experiences, studio work, and other academic work leading to the award of credit hours. UW-Stout's definition of the semester credit hour applies to all academic credit bearing activities at all levels (graduate and undergraduate.)

Chair Contact Info

Students are encouraged to address their questions or concerns with me directly during my office hours. However, if you are not satisfied with the outcome of the meeting, or if you are not comfortable meeting with me, I encourage you to take your questions or concerns to MSCS chair Nelu Ghenciu. Nelu can be reached at ghenciup@uwstout.edu.

Syllabus Change Policy

The instructor reserves the right to make changes throughout the semester to the syllabus and schedule if necessary. It is each student's responsibility to be present and regularly review the course management system for updates.

Last revised: September 6, 2022