CS 271: Data Structures

Term:	Fall 2019
Credits:	4
Lecture:	11:30 AM – 12:30 PM, Monday, Tuesday and Wednesday, in HS 212
Lab:	11:30 AM – 12:30 PM, Thursday in HS 101C
Prerequisites:	CS 262 with a grade of C or better.

Course description

A course surveying the fundamental methods of representing data and the algorithms that implement and use those data representation techniques. Data structures and algorithms include; linked lists, stacks, queues, trees, heaps, priority queues, hashing, searching, sorting, data compression, graphs, recursion. Analysis topics include: elementary big-O analysis, empirical measurements of performance, time/space trade-offs, and identifying differences among best, average, and worst case behaviors.

Instructor

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Office:	Halsey 220
Office hours:	(subject to change):

	Mon	Tues	Wed	Thu	Fri
9:00 AM					
10:00					
11:00					
12:00 PM					
1:00					
2:00					
3:00					

Course Website

The course website is Canvas: `https://uwosh.instructure.com/`. You should check Canvas on a regular basis, perhaps two or three times per day.

Required Textbook

We will be using an online "zyBook" textbook. Follow these instructions:

1. Sign in or create an account at `http://learn.zybooks.com/`.
2. Enter zyBook code **UWOSHCOMPSCI271SummersFall2019**.
3. Subscribe

A subscription is **$58**. Students may begin subscribing on Aug 21, 2019 and the cutoff to subscribe is Dec 7, 2019. Subscriptions will last until Jan 03, 2020.

Course Grade

Your final course grade will be based on the following components.

10% ZYBOOK ACTIVITIES
Throughout the semester, you will have to complete activities selected from the course textbook.

0% QUIZZES
You will be given at least one quiz potentially every week. Quizzes will be given after each lab session, to be completed before the next class. You should work each quiz in isolation, without the use of any kind of electronic aid. Quiz material will come from the lecture notes, textbook and homework assignments. The answers to each quiz will be discussed in the next lecture and will not be distributed online or in office hours, without making prior arrangements.

30% PROGRAMMING ASSIGNMENTS
There will be weekly programming assignments, given during each lab session. Each program is equally-weighted.

60% EXAMS
There will be three equally-weighted in-class exams. Exam material will come from the lecture notes, quizzes, textbook and programming assignments. There will be more information about each exam as it approaches. The actual exam dates will be announced in class at least one week before the exam. All exams will be taken during the regular class period.

If you are unable to take a scheduled exam, it may be possible to take a make-up exam provided that you do both of the following, which are then subject to my approval:

1. Make arrangements prior to the scheduled exam (for last minute emergencies, telephone me at 920-424-1324 or leave a message at the Computer Science office, 920-424-2068. **No after-the-fact notifications will be accepted**.
2. Have a written medical excuse signed by the attending physician OR have a note of justification from the Dean of Students Office.

If allowed, only one make-up exam will be given. It will be a comprehensive exam given at an arranged time during the last week of the semester.

Grading Scale

Grading will be on a plus/minus system. Grading may be done on a curve depending on the overall performance of the class. If no curve is used, then your grade will be computed based on the following:

Percentage	Grade
> 91	A
> 89 and ≤ 91	A-
> 87 and ≤ 89	B+
> 81 and ≤ 87	B
> 79 and ≤ 81	B-
> 77 and ≤ 79	C+
> 71 and ≤ 77	C
> 69 and ≤ 71	C-
> 67 and ≤ 69	D+
> 61 and ≤ 67	D
> 55 and ≤ 61	D-
≤ 55	F

Re-grading

If you believe a program or exam was graded incorrectly or unfairly and would like to have it re-graded, please let me know about it in writing within one week of receiving the program or exam back. I will re-grade the entire program or exam and you may gain or lose points.

Late Work

Late work will NOT be accepted. Late work is worth 0 points. Extensions may be granted at the discretion of the instructor and only in rare cases.

University Policy on Academic Integrity

The University of Wisconsin Oshkosh is committed to a standard of academic integrity for all students. The system guidelines state:"Students are responsible for the honest completion and representation of their work, for the appropriate citation of source, and for respect of others academic endeavors" (UWS 14.01, Wisconsin Administrative Code).

Often, students are not aware of the ways to identify and avoid plagiarism. Therefore, it is important to educate yourself about how to give proper credit to sources that you use in your assignments. For writing assignments, you can consult the Purdue Owl website on how to identify and avoid plagiarism: `https://owl.english.purdue.edu/owl/resource/589/02/` and `https://owl.english.purdue.edu/owl/resource/589/03/`. This website outlines the strategies for avoiding plagiarism in this course. However, other courses may demand knowing other ways to identify and avoid plagiarism. Therefore, I encourage you to consult with me if it is unclear to you how you give proper credit to your sources of information.

In sum, all material turned in for this course must be original. In this course, you may not re-use papers or projects from other sections of this course, from other courses you have completed, or other courses you are currently completing. This class is a specific event in your learning process. To learn, you must engage in the material and complete the work. Thus, work from other experiences is not acceptable. All work turned in that is plagiarized will receive a "0" in the course.

Course Objectives

At conclusion of the course, students will be able to:

1. Given a non-recursive algorithm, the student will be able to examine its loop structures and infer its asymptotic runtime using big-O notation.
2. Given a recursive algorithm, the student will be able to examine its recursive structure, determine the corresponding recurrence relation (from a small collection of commonly occurring recurrence relations), and use the recurrence relation in determining the asymptotic runtime of the algorithm using big-O notation.
3. Given the description of a computational problem requiring a mixture of search, insertion, and/or deletion operations on collections of data, the student will be able to compare the relative advantages of using arrays and linked lists in solving the problem efficiently.
4. Given a classical computational problem (e.g., infix-to-postfix conversion, postfix-expression evaluation, path planning, minimum-spanning tree computation), the student will be able to trace a solution to the problem using appropriate data structures (e.g., stacks, queues, binary trees, binary search trees, red-black trees, graphs) and to predict the asymptotic runtime of the solution based on the selected data structures.
5. Given a collection of unordered data, the student will be able to trace the execution of an advanced sorting algorithm (such as quick sort and heap sort) on this data set.
6. Given a set of data keys, the student will be able to trace through a sequence of key insertions, searches and deletions on a balanced tree structure. The student will also be able to discuss the relationship between the number of keys and the execution time of these operations.
7. Given a set of data keys, a hash function, a table size, and a collision-handling strategy, the student will be able to trace through a sequence of key insertions and searches, and to discuss how varying the table size, hash function or collision-handling would affect the execution time of these operations.
8. Given a graph data structure, the student will be able to implement it using either adjacency lists or an adjacency matrix, to traverse it using either a depth-first or breadth-first strategy, to identify its structural properties (whether it is directed, cyclic, connected, complete), and to trace the execution of one or more classical graph algorithms (e.g., Dijkstra's shortest path, topological sort or minimum-spanning tree computation).
9. Given a problem requiring the efficient use of a variety of data structures, the student will be able to apply object-oriented design principles in implementing and testing a solution to that problem in an appropriate object-oriented language.

Students' Rights and Responsibilities: Course Policies

WELCOME STUDENTS!

As a University of Wisconsin–Oshkosh student, you have rights and responsibilities regarding your relationship with both the classroom and university community. The policies in the course specifically as well as at UW–Oshkosh generally are in place to foster an equitable and safe classroom and campus climate. The primary goal of all policies is to create a classroom and campus community in which all students can access learning, achieve success and reach their goals. Your rights and responsibilities are important to know both so that you can enhance your learning experience and contribute positively to the campus climate. Specific policies and procedures can be accessed through the Student Affairs Policies and Procedures webpage

(https://www.uwosh.edu/stuaff/policies-procedures).

INCLUSION STATEMENT

Building relationships and community is one of the most important goals of the course. The only way to build community in this course is to honor each person in terms of their identity. Each student in the course will conceive of their identity in different ways; aspects of identity important to students in the course may include race, ethnicity, ability, sex, sexuality, gender, gender expression, gender identity, religious beliefs, political affiliations, and/or class. Thus, each of us, myself included, must honor each student's identity in all its complexity. We need to work on taking up perspectives unlike our own, challenging our assumptions and finding a route toward understanding the similarities and differences between ourselves and others.

STUDENTS WITH DISABILITIES

Most importantly, students with disabilities are welcome in this course! If you need alternative/additional instructional structure for this class due to specific individual learning needs, please talk to me and we can work together. I am committed to creating an environment conducive to learning for all students.

UNIVERSITY POLICY ON TYPES OF EXCUSED ABSENCES

There are several forms of absences that are excused under University policy: "Students are excused from class for participation in all-University events [GEN 4.B.10 (1)(b)] and for circumstances beyond the students' control including, but not limited to medical or family emergencies (medical care for pregnancy, illness, child care issues, death or serious health problem of family member), court appearance, required military service not to exceed two (2) weeks unless special permission is granted by the instructor or chair, jury duty, etc." Student responsibility: "Students are responsible for notifying the instructor. . . as far in advance as possible and may not be penalized for such absences as long as appropriate documentation is provided in a timely fashion to the instructor to verify the reason for the absence." Instructor responsibility: "Instructors are responsible for providing reasonable accommodation or opportunities to make up course obligations that have an impact on the course grade."

RELIGIOUS ACCOMMODATION FOR STUDENTS

Both University policy and state policy requires that instructors honor students sincerely held religious and faith traditions by making accommodations for religious holidays or other days of special religious significance. If there is a scheduling conflict for you between attending a course session and/or completing coursework on a day of religious observance, then, it is necessary to "notify the instructor within the first three weeks of the beginning of classes of the specific days or dates on which you will request relief from an examination or academic requirement."

CREATING A SPACE FREE FROM SEXUAL HARASSMENT

The University policy on sexual harassment is very clear: it will not be tolerated anywhere on campus, including the classroom. Sexual harassment is defined by the University of Wisconsin Oshkosh as follows: "Sexual harassment is a form of sex discrimination. It [is] . . . the inappropriate introduction of sexual activities or comments into the work, learning, or living situation. Such behavior is not acceptable at the UW–Oshkosh and will result in disciplinary action."

ATTENDANCE

I am dedicated to your success and know that attendance is crucial to achieving improvement in your skills

and abilities and, thus, your success in the course. Therefore, I may keep track of attendance weekly. Missing two weeks or more of the course may result in a failing final course grade. In turn, if I receive no communication from you for two weeks, I reserve the right to withdraw you from the course.

If you experience difficulties such as illness or death in the family or other significant disruptions in your life as discussed in the section on excused absences above, then, please communicate with me about your situation and we will forge a plan on how to best catch you up in the course.

DROPBOX

Odd things happen in cyberspace-emails get lost, servers disconnect temporarily, and logins fail. Due to this challenge, you should anticipate possible mishaps and complete your work with enough time to meet the deadline. In turn, timely communication aids success: reply to emails received and check for replies to your sent emails. With these strategies, you will be able to meet my expectations of getting work in on time.

Policy on Electronic Cigarettes

The use of electronic cigarettes (e-cigarettes) of any kind within the classroom is strictly prohibited.