

CS 302: Data Structures

Spring 2023

Instructor: Beiyu Lin
Office: SEB 3251
Email: beiyu.lin@unlv.edu
Office hours: Tu/Th: 1pm-2:15pm
TA: Danyella Biacan, biacan@unlv.nevada.edu
TA Office hours: M/W: 1pm-3pm

Catalog Description

Introduction to sequential and linked structures. File access including sequential, indexed sequential and other file organizations. Internal structures including stacks, queues, trees, and graphs. Algorithms for implementing and manipulating structured objects. Big-O-notation. Prerequisites: CS 202 and MATH 181. This course is 3 credits.

Required Text:

- Data Structures and Algorithm Analysis, Edition 3.2 (C++ Version)
Clifford Shaffer (PDF available)

Student Outcomes Covered by This Course

- Outcome C: Apply computer science theory and mathematical models to comprehend the trade-offs involved in various design choices
 - **Course Objectives and Expected Learning Outcomes**
Upon completion of Computer Science 302, students will be able to understand:
 - Sorting and searching models and algorithms including the associated trade-offs and asymptotic complexity
 - Computer science theory of basic data structures (stacks, queues, trees, heaps, hash tables, and graphs)
 - In addition, for all courses involving programming, students should be able to:
 - Develop algorithmic solutions to problems and translate their algorithms into programs that meet a provided set of specifications
 - Demonstrate and use good programming style and adequately document programs

Prerequisites

To qualify for this course you must have earned a C or better in CS 202 (Computer Science II) and a C or better in MAT 181 (Calculus I).

Grading

| | | |
|------------------------------------|-------------|-----|
| Grades will be based on following: | Assignments | 60% |
| | Midterm | 20% |
| | Final Exam | 20% |

Grades will be posted throughout the semester.

Grading is as follows:

| A | A- | B+ | B | B- | C+ | C | C- | D | F |
|------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| >=93 | 92-90 | 89-87 | 86-84 | 82-80 | 79-77 | 76-74 | 73-70 | 69-60 | <=59 |

Exam Dates

- Midterm – Thursday March 9th
- Final – Tuesday May 9th class time.

Grading Criteria

- All programming assignments will need to compile and run on a Linux environment, Ubuntu 18.04 LTS or the remote host sally.cs.unlv.edu. You may use other compilers or environments for developing, just make sure they compile and run on Ubuntu 18.04 LTS or sally.cs.unlv.edu.
- A grade of 0 will be assigned if the program has major compiling issues
- All programming assignments must have proper documentation including block comments for each function (although smaller functions would require less documentation)
- Filenames must follow the naming convention on each assignment handout
- All code must follow K&R style or Allman Style
- Every assignment will have a 2% deduction for every hour the assignment late, if the assignment is 24 hours late, a grade of 0 will be assigned
- If you fixed the problems in the assignment within a week, half of the points will be restored in order to encourage you to keep practicing

Academic Misconduct

Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling at UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the Student Academic Misconduct Policy (approved December 9, 2005) located at: <https://www.unlv.edu/studentconduct/student-conduct>

Classroom Conduct

Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn or of instructors to teach. Use of electronic devices such as pagers, cellular phones, or recording devices, or potentially disruptive devices or activities, are permitted only with the prior explicit consent of the instructor. The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative drop.

Department of Computer Science Academic Integrity Policy

Each student enrolled in a course offered by the Department of Computer Science is expected to do his/her own work when preparing written or programming assignments, as well as, examinations. He/She must adhere to the academic integrity policy provided by his/her instructor and the university. It is also each student's responsibility to notify the instructor if he/she becomes aware of any activities that would violate the academic integrity policy of the class.

CS 302 Academic Integrity Policy

Each student is required to do his/her own work on examinations, written assignments, and programming projects without outside assistance except as noted below. It is also each student's responsibility to notify the instructor if he/she becomes aware of any activities that would violate the academic integrity policy of the class.

Assistance that is allowed in the preparation of coursework:

- information/code provided in the textbook
- information/code provided in the class notes (on the website)
- assistance provided by course instructor
- assistance provided by the College of Engineering Tutoring Center (as long as the tutor is not writing the code)
- use of the Internet to look up a formula that is needed to perform a calculation or to verify the accuracy of a calculation
- use of the Internet as a reference for additional C++ language details

Examples of **prohibited practices include, but are not limited to:**

- copying answers/code from a fellow student, friend, relative
- providing answers/code to a fellow student
- collaborating (sharing) answers/code
- using the Internet to develop a strategy for solving a problem (finding an algorithm)
- using the Internet to solicit a solution to an assignment
- asking and/or paying someone to complete your assignments

Consequences of violating the academic policy:

- an Alleged Academic Misconduct Report will be completed and a copy sent to the Office of Student Conduct
- 1st violation - student(s) will receive a grade of zero on the assignment/examination
- 2nd violation - a grade of F will be issued for the course; no further assignments/labs/exams can be completed for credit

Class Rules

1. All students are expected to do their own work on exercises, assignments and examinations. (See above policy statement.)

2. All programs must be able to **compile and run** on the using the Ubuntu operating system (64-bit, version 16=18.04 LTS).
3. All student's are expected to check the class website regularly (Moodle at: osserver.cs.unlv.edu/moodle)
4. Communications regarding the class will be sent to via the webCampus.
5. If questions or concerns, please email me directly (beiyu.lin@unlv.edu) or email the TA directly. (I can not get notifications from webcampus when you left a message. So that best and most effective way to reach out to me is via email).

Drop Policy

The last day to drop the course is Monday, Jan 23rd, 2023.

Copyright

The University requires all members of the University Community to familiarize themselves with and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you, nor assume any responsibility for employee or student violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: <http://www.unlv.edu/provost/copyright>.

Disability Resource Center (DRC)

The UNLV Disability Resource Center (SSC-A 143, <http://drc.unlv.edu/>, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Final Examinations

The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. The general schedule is typically available at the start of the semester, and the classroom locations are available about a month before the end of the semester. See the schedule at: <http://www.unlv.edu/registrar/calendars>.

Incomplete Grades

The grade of "I", Incomplete, can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student's control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. Graduate students receiving "I" grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the time indicated, a grade of "F" will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the "I" grade.

Library Resources

Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the Libraries' Research Consultation website:

<http://guides.library.unlv.edu/appointments/librarian>. You can also ask questions via chat and text message at <http://ask.library.unlv.edu/>.

Missed Classwork

Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor within the first 14 calendar days of the course for fall and spring courses (excepting modular courses), or within the first 7 calendar days of the course for summer and modular courses, of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: <http://catalog.unlv.edu/content.php?catoid=6&navoid=531>.

In accordance with the UNLV Faculty Senate-approved policy regarding class time and assignments missed, students who represent UNLV in any official extracurricular activity shall also have the opportunity to make up assignments, provided that the student provides official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy is to offer fair and equitable opportunities to all students, including those representing the university in extracurricular activities. Instructors should consider, for example, that in courses which offer a "drop one" option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate's policy, and an infringement on the student's right to complete all work and fairly earn her or his grade in the course.

This policy shall not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the university that could reasonably have been avoided. There should be a good faith effort by both faculty and student to come to a reasonable resolution. When disagreements regarding this policy do arise, they can be appealed to the department chair/unit director, college/school dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to: fine arts activities, competitive intercollegiate athletics, science and engineering competitions, liberal arts competitions, academic recruitment activities, and any other event or activity sanctioned by a college/school dean, and/or the Executive Vice President and Provost.

Transparency in Learning and Teaching

The University encourages students to use a transparency template to discuss with their instructors how assignments and course activities benefit student success:

https://www.unlv.edu/sites/default/files/page_files/27/TILT-Framework-Students.pdf.

Tutoring and Coaching

The Academic Success Center (ASC) provides tutoring, academic success coaching and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring

times, and other ASC programs and services, visit <http://www.unlv.edu/asc> or call 702-895-3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of SSC A (ASC Coaching Spot). Drop-in tutoring is located on the second floor of the Lied Library and College of Engineering TBE second floor.

UNLV Writing Center

One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The student's Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: <http://writingcenter.unlv.edu/>.

Tentative Schedule:

The tentative schedule is shown below.

| | |
|---------|---|
| Week 1 | CS202 Review |
| Week 2 | Asymptotic Classes (Big O, Big Θ , Big Ω) |
| Week 3 | Sorting (Insertion sort, merge sort, quick sort) |
| Week 4 | Threads |
| Week 5 | Binary Trees |
| Week 6 | Binary search trees AVL Trees |
| Week 7 | Hashing Chaining Opening Addressing |
| Week 8 | Midterm |
| Week 9 | Perfect Hashing Cuckoo Hashing Hopscotch Hashing |
| Week 10 | Priority Queues |
| Week 11 | Heap sort |
| Week 12 | Introduction to graph theory Storing a graph (Adjacency List vs Adjacency List) Graph traversals (DFS, BFS) |
| Week 13 | Dijkstra's Minimum Weight Path (Shortest Path) Algorithm Kruskal's Minimum Weight Spanning Tree Algorithm |
| Week 14 | Extra |
| Week 15 | Final Exam Review |
| Week 16 | Final Exam |