CSE 3318: Algorithms and Data Structures

Fall 2023

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Instructor Information

Instructor(s):
Alexandra Stefan

Office Number:
ERB 625

Office Telephone Number:
817-272-3785 (CSE Department phone number)

Email Address:
astefan@uta.edu

Faculty Profile:
http://ranger.uta.edu/~alex/

Office Hours:
MoWe 2:40pm-3:10pm, TuTh 12:40-1:40 or by appointment. *Office hours will be in person in room ERB 625. During in-person office hours, students that are physically there will have priority. If I am free, I will check Teams and conduct online office hours (via Teams video call or chat).*
For the online office hours I will not have an ongoing open meeting for students to join due to privacy issues. Instead, I will have individual calls with students. Please send a chat message to indicate that you want to join office hours and we can continue as a chat or with a call. For calls during office hours I typically use video and I encourage you to use it as well, but you are free to use only voice or chat.

Course Information

Section Information, Time and Place of Class Meetings:
CSE 3318-001, TuTh 9:30am - 10:50am, face-to-face in UH 110 and online using Microsoft Teams meetings.
CSE 3318-002, TuTh 11am - 12:20pm, face-to-face in ARCH 204 and online using Microsoft Teams meetings.

Both sections are merged in Canvas under section 001. Thus students from section 002 will see the Canvas course with section 001 (not their respective section) but that is simply the name used. All students from both sections, 001 and 002, will be in that Canvas course and will have normal permissions to the course.

Course Webpage:
http://ranger.uta.edu/~alex/courses/3318/

Description of Course Content:
Design and analysis of algorithms with an emphasis on data structures. Approaches to analyzing lower bounds on problems and upper bounds on algorithms. Classical algorithm design techniques including algorithms for sorting, searching; other operations on data structures such as hash tables, trees, heaps, graphs, strings; and dynamic programming and greedy approaches to optimization problems.

Student Learning Outcomes:

- Understand classic approaches to algorithm design (e.g. dynamic programming, greedy methods).
- Understand particular algorithms and data structures that have wide applicability.

- Be able to compare and choose the best algorithm that solves the problem under specific constraints (e.g. space or time limitation).
- Apply math skills to compute the worst-case, best-case and average-case for space and time complexity of specific algorithms (e.g. worst-case time complexity of insertion sort)
- Know what asymptotic notation means and be able to use the correct one to describe an algorithm's performance (e.g. use the correct notation for the lower-bound of space complexity).
- Be able to solve recurrences.
- Construct counterexamples (both the data and 'running' the algorithm on that data) that show that an algorithm does not have a certain property (e.g. to show that a specific sorting algorithm is not stable).
- Improve programming skills - especially on pointers, data structures, recursion, and graphs.
    - Code should not have memory errors. We will use Valgrind (already available on the Omega server and the VM) to check for these errors.

Textbooks and Other Course Materials:
There is no required textbook for this class. All the information needed for assignments and tests will be provided in slides and/or presented during lectures.
Optional t*extbook:* ***Introduction to Algorithms****, by Thomas H. Cormen, Charles E. Leiserson, Ronald E. Rivest, Clifford Stein,3rd edition (CLRS). The 2nd edition is also fine. The textbook is not required. All the needed information will be provided in slides and online lectures.*

Prerequisites:
All students are expected to have passed the courses *Intermediate Programming* (CSE 1320), and *Discrete Structures* (CSE 2315).

Technology Requirements
The following online teaching tools will be used:
- Website - homework content, slides, links to additional resources
- Canvas – course announcements, online exams and quizzes, homework submission, supplemental videos
- Teams – online lectures, office hours (for both instructor and TAs), offline discussion and questions relevant to the entire class (e.g. clarification questions for homework). We recommend using the Microsoft Teams App.
- **Respondus Lockdown** - software that will block your browser when taking an online exam
- **A webcam (integrated in the laptop or external)** – will be needed during exams (for video recording and monitoring of the student taking the exam) and possibly for some assignments where students may need to record a video as part of the assignment.
- Headphones with microphone are encouraged, but not required.
- You can access tutorials on these tools by clicking the "Get Started" Box on your Canvas Homepage.

Other Requirements:
Students are expected to know how *to use the omega server, the VM from cse13xx or Ubuntu and to write C programs and run them on these systems, to ensure same behavior as during grading. Familiarity with a [user-friendly] C-debugger is required: students will need to, and should use a good debugger when coding. Students should frequently submit and run their code on the Unix system in order to fix bugs as they appear. Do NOT submit only at the end. There may be too many bugs at that point. Options for a Unix system: the omega server, the VM from cse13xx or the Ubuntu on Windows App.*

Course Schedule

See the course schedule at: https://ranger.uta.edu/~alex/courses/3318/Schedule_CSE3318.pdf

Grading Information

Make-up Exams:
Make-up exams or any other additional work towards "improving ones grade" *will not be offered*.
Some bonus points are available from early submission.

Grading and major Assignments and examinations:
Students are expected to keep track of their performance throughout the semester which Canvas facilitates, and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels; see "Student Support Services," below.
See the Final Grade Reports Schedule for dates and deadlines related to grades.

15%	Midterm and Final, in class, in person, on paper
25%	Online **ExamQuizzes** in Canvas. One online ExamQuiz with the lowest score will be dropped. The first ExamQuiz will be in the 2nd or 3rd week of classes and after that there will be an ExamQuiz every 1-2 weeks. The quizzes will be open for 48 hours, but once started they will have a time limit. **They WILL require a video camera and the Lockdown Browser.** ExamQuizzes will mainly be focused on the current content, but they will be cumulative. (They may include a few **high-level** questions on previous topics.) The quiz will close in 1 hour after you start it. Note that if you start it 30 minutes before the due date (or available date) you will only have 30 minutes, not an hour.
50%	**Homework** (about 7 assignments). There will be a homework every 1-2 weeks. Do not plagiarize or collude in the homework. A grade of 0 will be given for that entire assignment and with the large homework weight it may cause you to fail the class or to receive a lower letter grade. You should not look at any solution or part of a solution for any homework. In this class, looking at a solution for "inspiration" is cheating and is penalized with grade 0 and reposted to the UTA Office of Community Standards.
10%	**Weekly quizzes or activities**. These will be online. In the exceptional case that a graded activity or quiz will be given **during lecture time,** it will be announced in Canvas at least 5 days before that lecture.
100%	Total class score (sum of above assessments)

The final grade will be based on the standard scheme: A (90-100), B (80-89.5), C (70-79.5), D (60-69.5).

Late and Early Submission rules:
Early submission bonus for Coding Homework: students that submit a Coding Homework 24 hour or more before the DUE date receive 5 bonus points. There is no partial bonus if you submit less than 24 hours early (e.g. no bonus if you submit 20 hours before the deadline).
NO late submission for class work, except for Coding Assignments and Exam-Quizzes.
Coding Assignments and Exam-Quizzes can be submitted up to 24 hours after the DUE date with 4% penalty per missed deadline every hour:

a) In Canvas, an assignment that can be submitted late will have both a DUE date and an AVAILABLE date. The DUE date is the actual due date. The AVAILABLE date is 24 hours after the DUE date to allow late submission. **You cannot submit anything after the AVAILABLE date.** Coding homework or Exam-quizzes submitted after DUE date, but before AVAILABLE date will be.
b) Late penalty: 4% of the total points penalty for every missed deadline in one hour increments**. Note that this is a PERCENTAGE, not a fixed number of points. If a homework is worth 200 points, for each missed deadline you lose 8 points, not 4 points.**
c) You have 2 "extension days"
d) "one extension day" – allows you to submit late (between the DUE date and the AVAILABLE date) one coding homework or one ExamQuiz of your choice. It cannot be combined with the hourly late penalty.
e) No submission is allowed after 24 hours (the AVAILABLE date). You CANNOT use both extension days, or a combination of a extension day with late penalty to get more than 24 hour extension from the due date.
f) You can use both extension days for homework (or both for Exam-Quizzes), but not for the same one. E.g. you can use one extension day for Homework 1 and the other for Homework 4, but not both of them for Homework 1.
g) The TA can only remove the late penalty AFTER you submitted your homework or ExamQuiz. They will manually mark that assignment as not late in Canvas.
h) Example:
Coding Homework 5 shows DUE Wednesday 11:59pm and AVAILABLE until Thursday 11:59pm.
  i. Submission NOT accepted after Thursday 11:59pm.
  ii. Solution submitted before Tuesday 11:59 pm is early. It receives 5 bonus points.

iii. Solution submitted on Wednesday is on time (no bonus and no penalty).
iv. Solution submitted on Thursday is late.
    1. Solution submitted Thursday at 12:00 am – missed one deadline (one minute late from 11:59pm Wednesday) => 4% penalty
    2. Solution submitted 4:00am missed 5 deadlines (11:59pm, 12:59am, 1:59am,2:59am,3:59am) => 20% late penalty
    3. If the student chooses to use one "extension day" for this assignment, the late penalty will be removed. To use the first extension day, the student will submit a comment in Canvas under BOTH "Homework 5" AND "1st extension day" saying "use 1st extension day for homework 5".

Homework and ExamQuiz grading policy:

- *Problems (in homework and exam) must be solved with the specific methods covered in class*, unless prior permission from the instructor is granted to use a different method. The reason is that am testing your understanding of that method, not of the problem.
- *Global variables are not allowed. Macros (created with #define) used to define specific constants (e.g. max numbers of elements in an array or max number of characters in a line of text in a file) are allowed.*

Any request for re-grading (for an assignment or midterm exam) must be made within 5 business days of receipt of that grade. In case of regrading, the instructor reserves the right to regrade the whole assignment or exam.

IMPORTANT: Course grades will depend EXCLUSIVELY on the above grading criteria. Students should not request nor expect any other factor to be considered in computing the course grade. For example, factors that will NOT be considered are: need of a better grade to keep financial aid, to stay in the program, or to graduate. Students are expected to carefully monitor their own performance throughout the semester and seek guidance from available sources (including the instructor) if they are concerned about their performance and the course grade that they will earn. No make-up work is given at the end of the semester to "improve one's grade".

Coding requirements:

- Code written for a coding homework or an exam, must follow good coding style:
    - has proper and consistent indentation (3-5 spaces). Use only tabs or only spaces.
    - consistency in the placement of { }
    - good, meaningful, variable names
    - If these standards are not followed, a penalty of up to 5% will be applied or, if part of the grading criteria, the corresponding points are lost.
- Global, external or static variables are NOT allowed in any code (in homework, quiz or exam) in this class. Using such variables will result in losing 50%-100% of the credit for that problem.
- Submitted homework programs must run on omega, the VM from cse13xx, or the Ubuntu on Windows App. Note that your program may run on your machine, and still CRASH on omega or the VM.
- Programs that do not compile on one of the above systems receive 0 credit.
- Programs that crash may also receive 0 credit. If your program crashes at some point, only the functionality used before it crashed will be graded: no credit is given for code that cannot execute.
- We will test your programs with the data provided as an example AND WITH OTHER test files. You are responsible for testing your programs thoroughly.

Expectations for Out-of-Class Study:
Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend an additional **12 hours** per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc.

Before coming to class, students should have reviewed and understood the previous lecture especially in cases where the same topic is continued or the topics are related.

Grade Grievances:
Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog. See Undergraduate Grading Policies and Student Complaints.

Academic Integrity:

Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

> *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*
>
> *I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*
>
> *The penalty for cheating or collusion in a homework or exam is a grade of 0 for the entire exam or homework.*
>
> *In cases of collusion, ALL students involved are reported to the Office of Community Standards (even if one admits that he copied after the other). For example if one student wrote his/hers solution on his own, but shared it with a friend, BOTH students are reported and both are penalized with a grade of 0 for that assignment (even if one admits that he/she copied after the other student).*
>
> *During exams, you must remain seated, have the camera on at all times and not exit the exam (in Canvas) until you finished it. You take a full 360 degrees video of the environment (including the space behind the screen and the floor around the chair and desk). To test that the sound is working for your system, record a verbal statement at the beginning of the exam. Do not read out loud exam questions or your answers. Respondus Monitor software will record the video of you taking the exam and flag your video if suspicious behavior is detected. If after inspection I also find the behavior to be suspicious, I will report the student to the Office of Community Standards for cheating in an exam and apply a penalty of grade 0 for the entire exam. During an online exam quiz students must work on their own without any help from other classmates, friends and without using class materials, cheat sheets or web resources. They must remember the material and be able to answer questions and write code based on the knowledge they know.*
>
> *By default, the homework for this class is individual (no group projects) unless otherwise stated in the assignment.*
>
> *You are allowed (and encouraged) to discuss with classmates the homework requirements, but NOT specifics of the homework solution. You can practice and review concepts covered in class, programs covered in class, and other practice problems that are NOT part of the homework.*
>
> ***You are NOT allowed to work as a team and develop together the homework solution (or a significant/critical part of it), or let another classmate see or have access to your code.***
>
> *You should reference all the resources you used in preparing for a homework solution especially if they may have influenced your solution. REFRENCING MATERIAL DOES NOT JUSTIFY COPYING THAT MATERIAL. If you reverenced a source, but mainly copied the code from there, that is still a violation of Academic Integrity and the same penalty is applied (grade 0). You must solve the homework and exam problems yourself, using only the materials covered in this class. You should not search and/or look at any solution (from the web, or from a friend or classmate) for homework or exam problems or part of those problems. If you need help, you should contact the instructor or a TA. You are not allowed to look at, and get inspiration from, an existing solution.*
>
> *You should not store your code or homework solutions on any public, unsecure domain such as GitHub (I reported a case involving code posted on GitHub). You can use password protected cloud services such as Google Drive. Note that if you make your solutions available to others in such a way, and another student copies your solution, you will be reported together with the student who used your solution.*

Please do not hesitate to talk to me regarding any concerns you may have.

Institution Information

Please review the UTA Syllabus Institutional Policies page (https://resources.uta.edu/provost/course-related-info/institutional-policies.php) which covers the following policies and more. For questions, reach out to the specific office.

- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey

Additional Information

Attendance:
As the instructor of this section, I may take attendance sporadically but I will not factor it into the grade. However attendance is encouraged and class participation will be factored in the course grade.

At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

Emergency Exit Procedures:
Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, do not take an elevator but use the stairwells instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Student Success Programs:
UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring by appointment, supplemental instruction, academic coaching (time management, study skills, etc.), TRIO Student Support Services, and student success workshops. For additional information, please email resources@uta.edu, or view the Maverick Resources website.

The IDEAS Center (https://www.uta.edu/ideas/) **(**2nd Floor of Central Library) offers **FREE** tutoring and mentoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. Students can drop in or check the schedule of available peer tutors at www.uta.edu/IDEAS, or call (817) 272-6593.
Supplemental Instruction (SI) leader – to be determined if there will be an SI leader for this class.

The English Writing Center (411LIBR):
The Writing Center offers **FREE** tutoring in 15-, 30-, 45-, and 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Register and make appointments online at the Writing Center (https://uta.mywconline.com). Classroom visits, workshops, and specialized services for graduate students and faculty are also available. Please see Writing Center: OWL for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza (http://library.uta.edu/academic-plaza) offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation.

Librarian to Contact:

Each academic unit has access to Librarians by Academic Subject that can assist students with research projects, tutorials on plagiarism and citation references as well as support with databases and course reserves.

Emergency Phone Numbers

In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381

Library Information

Research or General Library Help
Ask for Help

- Academic Plaza Consultation Services (library.uta.edu/academic-plaza)
- Ask Us (ask.uta.edu/)
- Research Coaches (http://libguides.uta.edu/researchcoach)

Resources

- Library Tutorials (library.uta.edu/how-to)
- Subject and Course Research Guides (libguides.uta.edu)
- Librarians by Subject (library.uta.edu/subject-librarians)
- A to Z List of Library Databases (libguides.uta.edu/az.php)
- Course Reserves (https://uta.summon.serialssolutions.com/#!/course_reserves)
- Study Room Reservations (openroom.uta.edu/)

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				Fall 2023 Schedule - CSE 3318, 001 and 002 - Tentative
1	T	22	Aug	Introduction, Syllabus, (if there is time, Examples of Algorithms-insertion sort)
2	R	24	Aug	C Review
3	T	29	Aug	Linked Lists (Students should have reviewed pointers)
4	R	31	Sep	Time complexity
5	T	5	Sep	Time complexity
6	R	7	Sep	Sorting Algorithms continued, selection sort, indirect sorting, binary search
7	T	12	Sep	Growth of functions, Summations
8	R	14	Sep	Count sort, Radix Sort, Bucket Sort
9	T	19	Sep	Stacks, Queues
10	R	21	Sep	Heaps
11	T	26	Sep	Binary trees, BST (Binary Search Trees)
12	R	28	Sep	Leetcode problem solving
13	T	3	Oct	2-3-4 Search Tree
14	R	5	Oct	Hash Table
15	T	10	Oct	Hash Table
16	R	12	Oct	Optional (if time permits): Huffman Tree (Greedy Algorithms)
17	T	17	Oct	**Midterm**
18	R	19	Oct	Greedy Algorithm for Knapsack problem
19	T	24	Oct	DP: Knapsack
20	R	26	Oct	DP : Job Scheduling (Greedy,DP, brute force),
21	T	31	Oct	DP : LCS, LIS, ED (other: fewest coins, rod cutting, stair climbing); DP-Memoization
22	R	2	Nov	DP, Leetcode
23	T	7	Nov	Graphs
24	R	9	Nov	Minimum-Cost Spanning Trees
25	T	14	Nov	Shortest Paths, Graphs (Aplications of DS in Algorithms, Language Library discussions)
26	R	16	Nov	Merge sort,
27	T	21	Nov	Quicksort
	R	23	Nov	No class - Thanksgiving Holiday
28	T	28	Nov	Recurrences - Master Theorem
29	R	30	Nov	Recurrences - Master Theorem, tree method
30	T	5	Dec	Make-up class time, Leetcode - Applications of Algorithms in Problems
	R	**7**	**Dec**	**Section 002 FINAL Exam Thursday, ~~Dec 8~~ Dec 7, 11 am - 1 pm**
	T	**12**	**Dec**	**Section 001 FINAL Exam Tuesday, Dec 12, 8 am - 10 am**
				As the instructor for this course, I reserve the right to adjust the schedule in any way that serves the educational needs of the students enrolled in this course. – Alexandra Stefan

OTHER important dates

		4	Sep	Holiday - no school
		6	Sep	Census date
		27	Oct	Last day to drop
22	23	24	Nov	No classes
7	to	13	Dec	Final exams week