CSE 2320-002  Algorithms and Data Structures - Spring 2019

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Faculty Profile: http://vlm1.uta.edu/~alex/
Office Hours: Mon, Wed: 2:30 – 3pm, Tue,Thu: 12:30-1:30pm.

Time and Place of Class Meetings: Tue,Thu  11am – 12:20pm, WH 311

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, and other operations on data structures such as hash tables, trees, graphs, strings, and advanced data structures, dynamic programming and greedy approaches.

Student Learning Outcomes:

- Understanding of classic approaches to algorithm design (e.g. dynamic programming, greedy methods).
- Understanding of particular algorithms and data structures that have wide applicability.
- Being able to compare and choose the best algorithm that solves the problem under specific constraints (e.g. space or time limitation).
- Understanding of basic algorithm analysis concepts by applying math skills to worst-case and expected time using recurrences and asymptotic notation.
- Constructing counterexamples (both the data and ‘running’ the algorithm on that data) that show that an algorithm does not have a certain property (e.g. stable sort).
- Improved programming skills - especially on pointers, data structures, recursion, and graphs.
  - In particular, I require code with no memory errors. We will use Valgrind (already available on the Omega server) to check for these errors.

Required Textbooks and Other Course Materials:

  ISBN-10: 0201756080. ISBN-13: 978-0201756081. NOTE: this textbook is usually sold as two volumes, one for parts 1-4, and one for part 5. Most of the topics covered in class are from parts 1-4.

Prerequisites: All students are expected to have passed the courses Intermediate Programming (CSE 1320), and Discrete Structures (CSE 2315). *** Students are expected to know how to use the omega server and to write C programs that run on this server. Familiarity with a user-friendly C-debugger is required: students will need to, and should use a good debugger when coding.

Attendance: At The University of Texas at Arlington, taking attendance is not required. Rather, 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. As the instructor of this section, I have elected to take attendance, but will not factor attendance into the grade.

Video recording: The lectures should be recorded and available from Blackboard, but the course is not taught as a distance education course and thus the videos may not have all the information discussed in class (for example when writing on parts of the board that are not visible in the recording).

Other Requirements: 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.

Grading policy and descriptions of major assignments and examinations: Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels; see “Student Support Services” below.
Grading scheme:

<table>
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<tr>
<th>Percentage</th>
<th>Description</th>
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<tbody>
<tr>
<td>20%</td>
<td>Homework (6-9 assignments) Theoretical and programming problems</td>
</tr>
<tr>
<td>5%</td>
<td>Pre-lecture or post-lecture quizzes *</td>
</tr>
<tr>
<td>75%</td>
<td>Three exams with equal weight (two midterms and a final). Exams are not cumulative.</td>
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* Quizes may be posted with a 24 hours notice. Blackboard notification will be sent when a quiz is posted.

Exam grading:
- Restroom breaks during an exam: unless a medical note is provided, there will be a 2 point penalty per minute.
- Each exam answer must be justified, unless otherwise specified or a multiple choice question. (Note that even some multiple choice questions may have an explicit request for a justification)
- A completely wrong justification may result in a negative score. For example, if a question is worth 8 points and the justification is wrong, the score for that question may be -9 meaning that not only you do not get any points for that question, but you lost one extra point. (This policy is intended to prevent students from guessing, or just 'writing stuff' when they have no idea about the topic. It is NOT intended to penalize partially correct answers.)
- 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 I may be testing on the method, not on the problem.

Any request for re-grading (for an assignment or midterm exam) must be made within 5 days of receipt of that grade. In case of regrading, the instructor reserves the right to regrade the whole assignment or exam. Requests of regrading the final exam must be done within 1 day of receipt of that grade.

The exams are NOT cumulative, except in cases where a previous topic is part of the new topic.

Students must take the exam with their section.

The final grade will ideally be assigned based on the standard grading scheme: ≤90(A), ≤80(B), ≤70(C), ≤60(D). The instructor reserves the right to lower these thresholds, based on the distribution of final percentages. Sample past cutoffs: ≤78(A), ≤67(B), ≤52(C), ≤41(D).

IMPORTANT: It should be clear to every student that 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.

Submitted programs must run on omega. Note that your program may run on your machine, and still CRASH on omega. Programs that do not compile receive 0 credit. Programs that crash receive a penalty of 20%-100%. 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. Simpler/smaller programs may not receive partial credit.

Make-up Exams: Make-up exams or any other additional work towards "improving ones grade" will not be offered.

Class expectations: before coming to class, students should have reviewed and understood the previous lecture.
Coding requirements: 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.

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: http://catalog.uta.edu/academicregulations/grades/#undergraduatetext
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.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System Regents’ Rule 50101, §2.2, suspected violations of university’s standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University.

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, BOTH students are reported to the Office of Student Conduct. I simply report the case to this office and they will investigate and make a final decision.

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 held accountable together with the student who used your solution.

During exams, please look only at your page or the board. If you tend to look around, or somehow look aside, take a seat such that you will not be looking towards any another student(s).

If needed, I will take the following actions during an exam:
- Take pictures of the classroom in order to have proof and memory of the students seating. (Let me know if you have a problem with this.)
- Move to the front row any student that seems to look around. (This is a subjective call.) If you were moved for one exam, you will have to stay in the front row for the following exams as well.
- Mark an exam sheet if the student did something that was not allowed (e.g. look in notes in a closed book exam).

I may report students for cheating in an exam, if I find suspiciously similar answers for students who sat next to each other.

Considering all these actions that I may take during an exam, if at any time you are concerned, please do not hesitate to ask me to clarify what is going on!

Important examination dates
Feb 21, Thursday – Midterm exam 1 – tentative date
April 4, Thursday – Midterm exam 2 – tentative date
May 7, Tue, 11am-1:30pm - Final exam – confirmed, room will be assigned by UTA (expected regular lecture room).
A detailed course schedule is posted on the course page.
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:
Jan 30 – Census Date
March 29 – Last Day to Drop
May 3rd – Last day of lectures
**Topics List:**
- Counting instructions, Summations
- Binary Search, Sorting Algorithms: insertion sort, selection sort
- Growth of functions
- Linked Lists
- Stacks, Stack Applications, Abstract Datatypes
- Queues
- Binary trees - math properties and terminology
- Queues, Binary trees - math properties and terminology
- Recursive functions
- Recurrences: Tree Method, Master Theorem, Induction Method
- Dynamic Programming: Fibonacci, Stair climbing, Knapsack (3 versions), Job Scheduling, Edit Distance, Memoization
- Greedy Algorithms
- Mergesort
- Quicksort
- Hash Tables
- Heaps, heapsort, top-k selection
- Search Trees: Binary Search (BST) [Randomized BST if time permits]
- 2-3-4 Search Tree
- Graphs
- Minimum-Cost Spanning Trees
- Shortest Paths
- Count sort, Radix Sort, Bucket Sort
- Extra topics: Network Flows, Min-Cuts, Bipartite Matchsing (if time permits)

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at [http://www.uta.edu/oit/cs/email/mavmail.php](http://www.uta.edu/oit/cs/email/mavmail.php).

I will use MyMav email and/or Blackboard for announcements (including homework and exam updates). Make sure you check both of these regularly.

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships ([http://wweb.uta.edu/aao/fao/](http://wweb.uta.edu/aao/fao/)).

**Disability Accommodations:** UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA), and Section 504 of the Rehabilitation Act. All instructors at UT Arlington are required by law to provide “reasonable accommodations” to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the Office for Students with Disabilities (OSD). Please provide this letter before Census Date and meet with the instructor in person to discuss the accommodations you need. Students who plan to take the exam with the ARC center should schedule the exam as soon as possible in order to be able to take it at the same time as the class.
Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

**The Office for Students with Disabilities, (OSD)** [www.uta.edu/disability](http://www.uta.edu/disability) or calling 817-272-3364.

**Counseling and Psychological Services, (CAPS)** [www.uta.edu/caps](http://www.uta.edu/caps) or calling 817-272-3671.

Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Title IX Policy:** The University of Texas at Arlington (“University”) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX)* or contact Ms. Jean Hood, Vice President and Title IX Coordinator at (817) 272-7091 or jmhood@uta.edu.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit [http://www.uta.edu/news/info/campus-carry/](http://www.uta.edu/news/info/campus-carry/)

**Active Threat Response Plan:**
- UTA Police Active Threat Resources page: [https://police.uta.edu/crime-prevention/active-shooter-resources.php](https://police.uta.edu/crime-prevention/active-shooter-resources.php)
- Faculty lesson plan: [https://police.uta.edu/ docs/Faculty%20lesson%20plan.pdf](https://police.uta.edu/ docs/Faculty%20lesson%20plan.pdf)
- Summary: [http://vlm1.uta.edu/~alex/courses/2320/Your%20Options%20to%20an%20Active%20Threat.pdf](http://vlm1.uta.edu/~alex/courses/2320/Your%20Options%20to%20an%20Active%20Threat.pdf)

**Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as “lecture,” “seminar,” or “laboratory” shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit [http://www.uta.edu/sfs](http://www.uta.edu/sfs).

**Final Review Week:** The last homework may be due in the Final Review Week. A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move towards one of the nearest exits. *See this map:* [https://www.uta.edu/campus-ops/ehs/fire/Evac_Maps_All/Evac_WH/Evac_WH_311.pdf](https://www.uta.edu/campus-ops/ehs/fire/Evac_Maps_All/Evac_WH/Evac_WH_311.pdf)

When exiting the building during an emergency, one should never take an elevator but should use the stairwells.

**Student Support Services:** 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, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at [http://www.uta.edu/universitycollege/resources/index.php](http://www.uta.edu/universitycollege/resources/index.php)
- **The IDEAS Center** (2nd Floor of Central Library) offers **free** tutoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. To schedule an appointment with a peer tutor or mentor email IDEAS@uta.edu or call (817) 272-6593.

- **SI Leader** – TBA.

**The English Writing Center (411LIBR)**: Hours are 9 am to 8 pm Mondays-Thursdays, 9 am to 3 pm Fridays and Noon to 5 pm Saturdays and Sundays. Walk In **Quick Hits** sessions during all open hours Mon-Thurs. Register and make appointments online at [http://uta.mywconline.com](http://uta.mywconline.com). Classroom Visits, Workshops, and advanced services for graduate students and faculty are also available. Please see [www.uta.edu/owl](http://www.uta.edu/owl) for detailed information.

**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**

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