CSE 5311: Design and Analysis of Algorithms
Fall 2020

Instructor Information

Instructor(s)
Dr. Allison K. Sullivan

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ERB 529

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Office Hours
By appointment. Please email and we will schedule a time for a Microsoft Teams meeting. In person office hours will not be held unless necessary due to Covid-19 concerns.

Course Information

Section Information
CSE 5311 - 003/203

Time and Place of Class Meetings
MW 1:00-2:20 pm – Hybrid 1, which has the following meaning for this course:
- All lectures will take place online in a Microsoft Teams (or similar) meeting. Lectures will be recorded and posted online.
- The first 15 minutes of most Wednesday lectures will be a timed quiz administered fully online. Please see the tentative schedule for quiz dates.
- Exams prior to thanksgiving break will be scheduled for in person examinations. Any exams scheduled after thanksgiving break will be online only. All exam dates are currently tentative, as exams will be scheduled by the university based on available space. If examinations cannot be safely scheduled on campus, all examinations will be moved to an online format.

Description of Course Content
Techniques for analyzing upper bounds for algorithms and lower bounds for problems. Topic areas include: review of asymptotic analysis and growth of functions, proofs by induction, sorting algorithms, graph algorithms and maximum flow networks, greedy algorithms, dynamic programming, NP completeness and reduction, approximation algorithms.

Student Learning Outcomes
At the end of this course you will be able to:
- be familiar with the algorithms and algorithmic techniques covered,
- be able to argue correctness and analyze the running time of a given algorithm,
- be able to design new algorithms for new situations, using as building blocks the algorithms and techniques learned,
- be able to prove a problem is NP-complete using reduction
Required Textbooks and Other Course Materials

Required Texts:
- J. Kleinberg, E. Tardos, Algorithm Design.

Suggested Readings/Texts:

Descriptions of major assignments and examinations

- Examinations: There will be 3 exams over the course of the semester (two midterms, one final). All exams are non-cumulative.

- Programming assignments: will be submitted electronically. Late assignments will not be accepted. In addition, each programming assignment will contain information about how to structure the solution to ensure that the test program will execute efficiently. Not following these instructions will result in a loss of some credit (specific to the assignment). Programming assignments will consist of four elements:
  - Design Document: 30%
  - Test Cases: 10%
  - Code: 50%
  - Reflection Document: 10%

- Quizzes: there will be weekly quizzes every Wednesday for the first 15 minutes of class time. These quizzes will be administered in a strictly online environment. No late quizzes. See grading policy for the drop policy for quizzes.

Other Requirements

- Homework assignments will be given out weekly. They will not be collected. Instead, a quiz of great similarity to the homework will be given every week. The intention is that, if you have done the homework assignment, the quiz should be straightforward. After the quiz, solutions to the entire homework assignment will be posted on Canvas. For this reason, no late quizzes will be administered. While the homework assignments are not collected and graded, you should do them on time and on your own. This will be essential to mastering the course material.

- Practice problem days: each major topic will have a day reserved for working on practice problems in small groups. Small break-out groups will be set up through Microsoft teams. The participation portion of a student’s grade will be based on their participation during the class day designated as a practice problem day.

Collaboration

- Written homework: you should try to solve the problems by yourself first. We recommend that you start early and get help in office hours if needed. You are encouraged to also form study groups, to try and work through the problems together. Conceptual collaboration and group problem solving is a part of computer science. However, make sure you are getting something out of a group study session, as the quizzes will be individual assignments.

- Programming assignments: these are to be done individually. You may discuss the problem and general concepts with other students, but there should be no sharing of code, and you should sit down to write your program independently. You may not submit code other than that which you write yourself or is provided with the assignment. This restriction specifically prohibits downloading code from the Internet. If any code you submit is in violation of this policy, you will receive no credit for the entire assignment. Plagiarism and other forms of cheating and academic dishonesty will be dealt with severely.
Grading Information

Grading
A student's grade in the class will be based on their performance on the exams, quizzes, programming assignments and participation on practice problem days. The final grade will be the weighted sum of all work using the following weights:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>15</td>
</tr>
<tr>
<td>Participation</td>
<td>10</td>
</tr>
<tr>
<td>Midterm 1</td>
<td>15</td>
</tr>
<tr>
<td>Midterm 2</td>
<td>15</td>
</tr>
<tr>
<td>Final Exam</td>
<td>15</td>
</tr>
<tr>
<td>Programming Assignments</td>
<td>30 (10% each)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Your quiz average will be computed by dropping the lowest 2 scores (e.g., if you miss a quiz, you will receive a 0, but you can drop that quiz; if you don't miss any quizzes, we will just drop the lowest scores). There will be no makeup quizzes.

The grade you are given on an exam, a quiz, an assignment, or as your final grade, is not the starting point of a negotiation. It is your grade unless a concrete error has been made. Do not come to the instructors or TAs to ask for a better grade because you want one or you feel you deserve it. Come only if you can document a specific error in grading or in recording your scores. Errors can certainly be made in grading, especially when many students are involved. But keep in mind that errors can be made either in your favor or not. So, it is possible that if you ask to have a piece of work re-graded your grade will go down rather than up.

Remember that the most important characteristic of any grading scheme is that it be fair. Keep this in mind if you are thinking of asking, for example, for more partial credit points on a problem. The important thing is not the exact number of points that were taken off for each kind of mistake. The important thing is that that number was the same for everyone. So, it can't easily be changed once the grading is done and the exams or assignments have been returned.

Final Grades
Final grades will be assigned according to the following standard criteria:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B</td>
<td>80-89</td>
</tr>
<tr>
<td>C</td>
<td>70-79</td>
</tr>
<tr>
<td>D</td>
<td>60-69</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60</td>
</tr>
</tbody>
</table>

Final class grades will be calculated to 2 decimal places and rounded to the nearest integer. 89.49 is a B. 89.50 is an A. The line has to be drawn somewhere, and no special allowances will be made for students whose final average falls near, but below the cutoff. There is a possibility of curves on the exam and quiz grades. There will not be a curve on programming assignments. Nonacademic explanations for poor class performance will have no bearing on the assignment of grades.

I reserve the right to curve the scale dependent on overall class scores at the end of the semester. Any curve will only ever make it easier to obtain a certain letter grade.

Make-up Exams
If you miss an exam or quiz due to unavoidable circumstances (e.g., health), you must notify the instructor via email or meeting with him as soon as possible and request a makeup approval. PLEASE let the
instructor know ahead of time! Do NOT ask for makeup exams or other components if you missed an exam or a project due to travel (except when you are required to travel to represent the university or the department). Attendance though not mandatory but is HIGHLY encouraged.

**Course Schedule**

*These descriptions and timelines are subject to change at the discretion of the Instructor.*

Legend:

<table>
<thead>
<tr>
<th>Course Topic</th>
<th>Exam Day</th>
<th>Holiday – No Class</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Subject</th>
<th>Assignment Out</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/26</td>
<td>Algorithmic Analysis</td>
<td>8/26 Introduction, Hybrid 1, Review Proofs</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8/31</td>
<td>What is an algorithm and why make efficient ones?</td>
<td>HW 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9/2</td>
<td>Big-O Notation</td>
<td>9/4 HW 1</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>3</td>
<td>9/7</td>
<td>LABOR DAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9/9</td>
<td>Algorithmic Analysis Practice Problems Day</td>
<td>HW 2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9/14</td>
<td>Divide and Conquer – Binary Search Based</td>
<td>HW 3</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>4</td>
<td>9/16</td>
<td>Divide and Conquer – Mergesort Based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9/21</td>
<td>Divide and Conquer Practice Problems Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9/23</td>
<td>Graphs: DFS and Applications</td>
<td>HW 4</td>
<td>Quiz 3</td>
</tr>
<tr>
<td>6</td>
<td>9/28</td>
<td>Graphs: BFS and Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>9/30</td>
<td>Fundamental Graph Practice Problems</td>
<td>RA 1</td>
<td>Quiz 4</td>
</tr>
<tr>
<td>7</td>
<td>10/5</td>
<td>Single-source Shortest Path: Dijkstra’s Algorithm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10/7</td>
<td>MIDTERM 1</td>
<td>HW 5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>10/12</td>
<td>Minimum Spanning Trees</td>
<td>HW 6</td>
<td>Quiz 5</td>
</tr>
<tr>
<td>8</td>
<td>10/14</td>
<td>Activity Selection</td>
<td>Program 2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10/19</td>
<td>Greedy Algorithm Practice Problems Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>10/26</td>
<td>Dynamic Programming</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### Institution Information

UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the [Institutional Information](https://resources.uta.edu/provost/course-related-info/institutional-policies.php) page which includes the following policies among others:

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

### Additional Information

**Attendance**

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. As
the instructor of this section, **attendance is not mandatory but highly encouraged.** 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.

Students should also be encouraged to subscribe to the MavAlert system that will send information in case of an emergency to their cell phones or email accounts. Anyone can subscribe at [Emergency Communication System](#).

**Student Success Programs**

For the design document and reflection document, you may utilize the below resource to help prepare your written content:

**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.

**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.