Texas Tech University
Department of Computer Science

Course Name: Design and Analysis of Algorithms Number: CS3364 Semester: Fall 2021

Instructor Name: **Tommy Dang**
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Class website: https://www.myweb.ttu.edu/tnhondan/CS3364/

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Catalogue Listing:

A theoretical course focusing on the design and analysis of computer algorithms.

Texts:

Algorithm Design, by Jon Kleinberg and Eva Tardos, Pearson, 1st Edition, ISBN: 9780321295354

Course objectives:

1. Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design)
2. Knowledge of algorithm design strategies
3. Familiarity with an assortment of important algorithms
4. Ability to analyze of time and space complexity

Key Topics:

Algorithm design strategies such as divide and conquer, dynamic programming and greedy algorithms. Computational complexity of sorting and searching algorithms. Graph algorithms. Asymptotic notations for complexity classes. Introduction to Theory of NP problems.

Course Prerequisites:

- CS 2413 - Data Structures
- CS 1382 - Discrete Computational Structures
- MATH 2360 - Linear Algebra

Please contact the instructor if you are unsure if you satisfy the prerequisites.

Expected Prior Knowledge and Skills In: Proficiency in a programming language, basic program design concepts (e.g., pseudocode), combinatorics and probability, proof techniques, familiarity with tree and graph data structures, familiarity with basic algorithms such as those for searching, and sorting.

Learning Outcomes: Students who have completed this course should be able to

1. Apply design principles and concepts to algorithm design (2)

2. Have the mathematical foundation in analysis of algorithms (6)
3. Understand different algorithmic design strategies (1)
4. Analyze the efficiency of algorithms using time and space complexity theory (2, 6)

Assessment methods of all of the above: quizzes, exams, assignments.

Grading Policy:

- Homework (35%), Random Class Quiz (15%), Midterm Exam (25%), Final Exam (25%).
- The grading scale: A (90-100), B (80-89), C (70-79), D (60-69), F (0-59).
- Homework submissions are via Blackboard. No submission will be accepted after the due date.
- The rules governing **academic conduct and Honesty** by TTU (http://www.depts.ttu.edu/opmanual/OP34.12.pdf) and College of Engineering should be strictly obeyed.
- Student evaluation of course learning outcomes.
- Everything you do for credit in this subject is supposed to be your own work. Whenever you have doubts about the problems in homework and assignment, **discussions** with other students and the instructor are **encouraged**. However, you need to write the solution **yourself** and list the contributions from other people.

Student with Disabilities:

- I would appreciate hearing from anyone who has a disability that may require special accommodations. I am sure we can work out whatever arrangements are necessary. Please see me during my office hours.
- Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

Course Schedule (Tentative)

Week	Topics
1 (Aug. 24)	Introduction
2 (Aug. 31)	Algorithm Analysis Basics
3 (Sep. 07) (Labor day, Sep 06)	Algorithm Design Basics
4 (Sep. 14)	Graphs
5 (Sep. 21) (Job fair, Sep 22)	Graphs
6 (Sep. 28)	Design Method: Divide and Conquer
7 (Oct. 05)	Design Method: Divide and Conquer
8 (Oct. 12)	Review & Midterm (Oct 14)
9 (Oct. 19)	Design Method: Greedy Method
10 (Oct. 26)	Design Method: Greedy Method
11 (Nov. 02)	Design Method: Dynamic Programming
12 (Nov. 09)	Design Method: Dynamic Programming
13 (Nov. 16)	Algorithm Analysis: NP-Complete
14 (Nov. 23) (Thanksgiving Vacation, Nov 24-28)	Computational Intractability
15 (Nov. 30) – one class	Review/Summary
16 (Sat, Dec 4)	7:30 p.m. to 10:00 p.m. – Final Exam

Lecture slides and presentation materials will be provided on the class website.

Topics and/or dates may be changed during the semester at the instructor's discretion because of scheduling issues, developments in the discipline, or other contingencies.

COVID-19 Related Issues

a. **Equipment.** This course is in a face-to-face format.
   i. Laptop: A laptop that meets the laptop requirements of the Whitacre College of Engineering found at https://www.depts.ttu.edu/coe/dean/engineeringitservices/buyingtherightcomputer.php
   ii. Proctorio: All students must review the syllabus and the requirements including the online terms and video testing requirements to determine if they wish to remain in the course. Enrollment in the course is an agreement to abide by and accept all terms. Any student may elect to drop or withdraw from this course before the end of the drop/add period. Online exams and quizzes within this course may require online proctoring. Therefore, students will be required to have a webcam (USB or internal) with a microphone when taking an exam or quiz. Students understand that this remote recording device is purchased and controlled by the student and that recordings from any private residence must be done with the permission of any person residing in the residence. To avoid any concerns in this regard, students should select private spaces for the testing. The University library and other academic sites at the University offer secure private settings for recordings and students with concerns may discuss location of an appropriate space for the recordings with their instructor or advisor. Students must ensure that any recordings do not invade any third party privacy rights and accept all responsibility and liability for violations of any third party privacy concerns. Setup information will be provided prior to taking the proctored exam. For additional information about online proctoring, you can visit the online proctoring student FAQ.

b. **Policy on absences resulting from illness (see Appendix A)**. Anticipate that some students may have extended absences. To avoid students feeling compelled to attend in-person class periods when having symptoms or feeling unwell, a standard policy is provided that holds students harmless for illness-related absences. This policy only dictates how absences will be counted. The work/exam makeup policy is up to each individual professor/instructor (IoR should include how they will handle makeup work).

c. **In the event a class member has a positive case**. The TTU System and University-wide guidance is given as a flowchart titled "COVID-19 Positive Student Test Notification and Protocol" at the end of this syllabus. Be prepared to review protocol and point students to sources of information so they will know what to expect should a member of the class have a positive case of COVID-19.

d. **Requesting accommodations as a result of personal health concerns.** Keep in mind the instructor must review the following criteria when considering an accommodation for a student: (1) whether the requested accommodation would make a substantive alteration of the course material or objectives; (2) whether the accommodation provides an equally effective alternative to the original objectives or activities of the class; and (3) whether the accommodation can be uniformly applied should more than one student request it. If the instructor can satisfactorily address these three requirements for accommodation, and is comfortable providing it, then it is appropriate to do so. If the instructor (IoR) feels unable to provide accommodation that satisfies these three criteria or is unsure how the requested accommodation can be provided, the IoR might suggest that the student work with SDS to provide a Letter of Accommodation (LOA).

Religious holyday statement

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for

that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

DISCRIMINATION, HARASSMENT, AND SEXUAL VIOLENCE STATEMENT:

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806- 742-3674, https://www.depts.ttu.edu/scc/(Provides confidential support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, https://www.depts.ttu.edu/rise/ (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742- 3931, http://www.depts.ttu.edu/ttpd/ (To report criminal activity that occurs on or near Texas Tech campus.)

CIVILITY IN THE CLASSROOM STATEMENT:

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).

LGBTQIA SUPPORT STATEMENT*:

I identify as an ally to the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community, and I am available to listen and support you in an affirming manner. I can assist in connecting you with resources on campus to address problems you may face pertaining to sexual orientation and/or gender identity that could interfere with your success at Texas Tech. Please note that additional resources are available through the Office of LGBTQIA within the Center for Campus Life, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433."

Within the Center for Campus Life, the Office serves the Texas Tech community through facilitation and leadership of programming and advocacy efforts. This work is aimed at strengthening the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community and sustaining an inclusive campus that welcomes people of all sexual orientations, gender identities, and gender expressions.

Appendix A: Illness-Based Absence Policy

If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, follow the steps below and do *not* attend face-to-face class meetings or events. The steps outlined below ***must*** be followed to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness.

1. If you are ill and think the symptoms might be COVID-19-related:
    a. Call Student Health Services at 806.743.2848 or your health care provider. After hours and

on weekends contact TTUHSC Nurse-on-Demand (After Hours/Weekends) at 806.743.2911.

b. Self-report immediately using the Dean of Students COVID-19 webpage (https://www.depts.ttu.edu/dos/COVID-19Absence.php). This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.
c. If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.
d. If your illness is determined not to be COVID-19-related, please follow steps 2.a-2.d below.

2. If you are ill and can attribute your symptoms to something other than COVID-19:
    a. If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note: that Student Health Services and your own and other health care providers may arrange virtual visits.
    b. During the health provider visit, request a "return to school" note;
    c. E-mail the instructor a picture of that note;
    d. *Return to class by the next class period after the date indicated on your note.*

Following the steps outlined above helps to keep your instructors informed about your absences and ensures your absence or missing an assignment due date because of illness will be marked excused. **You will still be responsible for following your specific professor/instructor guidelines for missed work.**