Computer Science 5381
Analysis of Algorithms
Course Syllabus and Policy Statement
Spring 2021

Instructor: Dr. Lin Chen   **Email Address:** lin.chen@ttu.edu
Office: 211A   **Office Phone:** 8067423527
TA: TBD   **TA Office:__ _____TA E-mail:**

Office Hours: 2:00 – 3:30 MF or by appointment. (Tentative, any changes to office hours will be announced)
TA office hour: TBD

Catalogue Listing: A theoretical course focusing on techniques of designing algorithms for fundamental computer science problems. It will cover different techniques in the design of algorithms for various CS problems.

Texts (optional):
Algorithm Design, Jon Kleinberg and Éva Tardos

Course objectives:

Approaches to analyze algorithms, techniques for algorithms design, solutions for recurrences, functional operators and asymptotic methods in connection with important techniques in algorithmic design including binary search, greedy, divide and conquer, dynamic programming, etc.

Key Topics:

Algorithms for fundamental problems in computer science, including stable matching, sorting, shortest path, scheduling, knapsack, etc.

Course Prerequisites: Data structures and Algorithms and Discrete Mathematics

Expected Prior Knowledge and Skills: algorithm design experience

Learning Outcomes: Students who have completed this course should be

1. Ability to analyze algorithms with various methods: iteration, substitution, recursion tree and master theorem.
2. Familiar with different techniques for algorithm design.
3. Exposure to optimization techniques such as dynamic programming, and some elementary graph algorithms.
4. Able to apply the algorithmic techniques to solve new problems.

Assessment methods of all of the above: quizzes, exams, assignments, and/or projects

Homework Policy:
There will be multiple homework problems given during the course, and students are expected to form a group of size at most 3 to select and complete 2 homework problems, each homework problem counts for 20%. The problems are open, in the sense that there is no uniform standard answer. Students are expected to investigate into the problem, try to design algorithms with reasonable performance and running time, and write a report on that.

Homework reports due dates:
March 15
April 30

Grade Policy:

Policy on the exam: All exams will count towards the final grade; i.e. no exam grades will be "dropped".

Cheating on tests and assignments will not be tolerated. Any student caught cheating on an exam or assignment will receive a grade of 'F' for the course and will be reported to the Judicial Programs office for possible further sanctions from the University.

Course Average Determination:		Course Grade Division:	
30%	Mid-term Test 1	90 – 100	A
30%	Final	80 – 89	B
40%	Homework	70 – 79	C
		60 – 69	D
		0 – 59	F

Lecture Schedule: (subject to change as necessary)
- The dates of the mid-term test will be decided based on course progression and will be announced at *least* one week in advance. There will be an in class review the last class period before each test (including the final).
- Holidays
  - Feb 19   Job affairs
  - March 19   Spring break
  - Feb 26, April 5   No class
  - May 5   Individual study
- Final exam is: TBA

# of Lectures	Subject (in order given)
2	Introduction – Motivating problem egg drop
2	Stable Matching
2	Algorithm analysis – Landau notations
3	Graphic algorithms – Graphs, bipartiteness, connectivity
3	Greedy algorithms I – scheduling, caching
3	Greedy algorithms II – shortest path, minimum spanning tree, clustering
3	Divide and Conquer I – Sorting, selection
4	Divide and Conquer II – Matrix multiplication, FFT
4	Dynamic programming I – segmented least square, knapsack, RNA secondary structure
3	Dynamic programming II – sequence alignment, negative cycle
3	Network flow
1	Introduction to complexity – NP-hardness
6	Fun with algorithms – selected Leetcode questions (refueling stops, cat and mouse, strange printer, parallel courses)

Academic Conduct: Policy of the Department and the University will be followed. All work done in this course should conform to the *Statement of Academic Conduct for Engineering Students, College of Engineering, Texas Tech University*.

Attendance Policy:
• You are expected to be present for each class session.

• If you are absent, it is your responsibility to obtain class notes and handouts (if any) from your classmates; I will not necessarily keep extra copies of materials after they are initially distributed;
• There are no makeup exams or tests for unexcused absences.
• Absence due to religious observance - "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.
• Whether an absence is excused or unexcused is determined solely by the instructor with the exception of absences due to religious observance and officially approved trips. The Center for Campus Life will notify faculty, at the student's request, when a student is absent for four consecutive days with appropriate verification of a health-related emergency. This notification does not excuse the student from class, it is provided as a courtesy. The service is explained as follows and can be found on the Center for Campus Life web site at: http://www.campuslife.ttu.edu/crisis/

General information:
   a. *This course will be conducted fully online. Students will need to have access to*
      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. P**olicy on absences resulting from illness (see Attachment 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.
   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).

e. **Face coverings are required**. Students are expected to enter the building wearing a face covering and keep it on throughout the class period and when walking through the building afterward. The Texas Tech University System has implemented a mandatory Facial Covering Policy to ensure a safe and healthy classroom experience. Current research on the COVID-19 virus suggests that there is a significant reduction in the potential for transmission of the virus from person to person by wearing a mask/facial covering that covers the nose and mouth areas. Because of the potential for transmission of the virus, and to be consistent with the University's requirement, students in this class are to wear a mask/facial covering before, during, and after class. Observing safe distancing practices within the classroom by spacing out and wearing a mask/facial covering will greatly improve our odds of having a safe and healthy in-person class experience. Any student choosing not to wear a mask/facial covering during class will be directed to leave the class and will be responsible to make up any missed class content or work.

f. **Seating assignments**. Students are expected to sit at a minimum of six feet apart. A required seating chart will be created once everyone is positioned with appropriate social distancing. There will also be an orderly procedure, designed to ensure social distancing, for exiting the classroom.

g. **Recorded lectures**. Given the current situation, lectures may be recorded. Be aware that the video recording may include partial or full view of students in the class along with audio if a question is asked. The recording equipment is set up to capture the professor and their computer setup so anything in that vicinity will appear in the recordings.

Required Information for Course Syllabi

Please reference <u>OP 32.06</u> for comprehensive information about syllabus requirements and faculty responsibility. Following is a brief summary of required and optional inclusions, but the <u>OP</u> provides broader context and explanation.

INSTITUTIONALLY REQUIRED INFORMATION TO INCLUDE IN ALL SYLLABI:

ADA STATEMENT:
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, please contact Student Disability Services in West Hall or call 806-742-2405.

ACADEMIC INTEGRITY STATEMENT:
Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University ("University") Quality Enhancement Plan, Academic Integrity Task Force, 2010]

RELIGIOUS HOLY DAY 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."

*If you prefer to list campus resources rather than a statement about ally status, you might include the following among other campus resources you wish to share:

Office of LGBTQIA, 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.

Attachment 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, <u>follow the steps below and do *not* attend face-to-face class meetings or events</u>. The steps outlined below should be followed to ensure your absence for illness will be excused. <u>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.</u>

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 <u>Dean of Students COVID-19 webpage</u> (<u>https://www.depts.ttu.edu/dos/COVID-19Absence.php</u>). 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, <u>request a "return to school" note</u>;
    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 to complete within a week of returning to class any assignments, quizzes, or exams you miss because of illness.**

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"It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. The attempt of students to present as their own any work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension."

"Scholastic dishonesty" includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

"Cheating" includes, but is not limited to, the following:
1. Copying from another student's test paper.
2. Using materials during a test that have not been authorized by the person giving the test.
3. Failing to comply with instructions given by the person administering the test.
4. Possessing materials during a test that are not authorized by the person giving the test, such as class notes or specifically designed "crib notes." The presence of textbooks constitutes a violation only if they have been specifically prohibited by the person administering the test.
5. Using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program.
6. Collaborating with or seeking aid or receiving assistance from another student or individual during a test or in conjunction with an assignment without authority.
7. Discussing the contents of an examination with another student who will take the examination.
8. Divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructor has designated that the examination is not to be removed from the examination room or not to be returned to or kept by the student.

9. Substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course related assignment.
10. Paying or offering money or other valuable thing to, or coercing another person to obtain an un-administered test, test key, homework solution, or computer program, or information about an un-administered test, test key, homework solution, or computer program.
11. Falsifying research data, laboratory reports, and/or other academic work offered for credit.
12. Taking, keeping, misplacing, or damaging the property of the university, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct.

"Plagiarism" includes, but is not limited to, the appropriation of, buying, receiving as a gift, or obtaining by any means material that is attributable in whole or in part to another source, including words, ideas, illustrations, structure, computer code, other expression and media, and presenting that material as one's own academic work being offered for credit. Any student who fails to give credit for quotations or for an essentially identical expression of material taken from books, encyclopedias, magazines, Internet documents, reference works or from the themes, reports, or other writings of a fellow student is guilty of plagiarism.

"Collusion" includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

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