Texas Tech University
Department of Computer Science

Course Name: Data Structures **Number:** CS2413/002 **Semester:** Spring 2025

Instructor: Ying Liu **Office:** EC 306I **E-mail:** Y.Liu@ttu.edu
Instructor Office Hours: Mon. Wed. & Fri. 3:00 p.m. – 4:00 p.m. or by appointment

TA Name: TBA **Office:** TBA **E-mail:** TBA
TA Office Hours: TBA

Classroom: Room 00110, Fuller Petr Eng Research
Class Hours: 11:00 AM – 11:50 AM Mon. & Wed. & Fri.

Lab Hours: 2413-504 Engineering Center 204, 11:00 AM – 01:50 PM Tues.
2413-505 Engineering Center 204, 02:00 PM – 04:50 PM Tues.
2413-506 Engineering Center 204, 11:00 AM – 01:50 PM Thurs.

Course description:
Comparative study of the interaction of data and procedural abstractions. Data structures: array, linked list, stacks, queues, trees, heap, graphs. Algorithms: searching, sorting, hashing, graph traversals

Textbook (recommended):

- Reema Thareja, "Data Structures Using C", 2nd Edition, Oxford University Press, 2014, ISBN-10: 0-19-809930-4, ISBN-13: 978-0-19-809930-7
- Mark A. Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson, 2014, ISBN-13: 9780133404210
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT express, ISBN: 9780262046305, April 2022

Course objectives:

The objective of this course is to enable students to solve problems using appropriate data structures, and to implement major data structures.

Key Topics:
Note: *C is the programming language to be used for this course. Procedural C++ may be used in order to use its exception handling and stream I/O, however Object-Oriented Programing should not be used.*
TA needs to ask students to use Linux/Unix environment for all programming assignments.

1. Abstract data types
2. Basic complexity analysis
3. Implementations of linear containers such as stacks, queues, and hashed arrays
4. Algorithms on linear containers: Sorting, searching, and hashing
5. Low level representations of trees and graphs
6. Graph traversals and tree search
7. Solving problems using proper data structures

Course Prerequisites:
2.5 TTU GPA; C or better in CS 1412 Programming Principles

Learning Outcomes: Students who have completed this course should have the ability to:

1. Wisely choose data structures for a given application (6)
2. Implement data structures (such as stacks and trees) without using libraries (2)
3. Know the time and space complexity of basic operations on basic data structure (1)

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

Expected Prior Knowledge and Skills In: Competency in a programming language.

A tentative schedule: 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.

- Week 1 (01/15 – 01/19): Course Overview
- Week 2 (01/20 – 01/26): Complexity Analysis (RT 2)
- Week 3 (01/27 – 02/02): Array (RT 3), Linked Lists (RT 6)
- Week 4 (02/03 – 02/09): Linked Lists (RT 6), Stacks (RT 7)
- Week 5 (02/10 – 02/16): Recursion (RT 7.7.4), Queues (RT 8)
- Week 6 (02/17 – 02/23): Basics of Trees (RT 9.1&9.2), Review/Quiz I, Binary Tree Traversal (RT 9.4)
- Week 7 (02/24 – 03/02): Binary Search Tree (RT 10.1, 10.2), Midterm I (chapters 2, 3, 6 &7)
- Week 8 (03/03 – 03/09): AVL Trees (RT 10.4), Multi-Way Search Tree (RT 11)
- Week 9 (03/10 – 03/16): Binary Heaps (RT 12), Review/Quiz II
- Week 10 (03/17 – 03/23): Spring Break
- Week 11 (03/24 – 03/30): Graph (RT 13.1-13.5), Midterm II (chapters 8-10)
- Week 12 (03/31 – 04/06): BFS & DFS (RT 13.6), Topological Sorting (RT 13.7)
- Week 13 (04/07 – 04/13): No class, Shortest Path Algorithms (RT 13.8)
- Week 14 (04/14 – 04/20): Searching and Sorting (RT 14)
- Week 15 (04/21 – 04/27): Searching and Sorting (RT 14)
- Week 16 (04/28 – 05/04): Hashing (RT 15)
- Week 17 (05/05 – 05/13): Final Exam Review/Quiz III

Grading Policy:

- Midterm exam I: 15%, tentatively on Feb 28th (Friday) in class
- Midterm exam II: 15%, tentatively on March 28th (Friday) in class
- Homework/Lab: 40%
    - Assignments must be submitted to blackboard by the due date. Late submission may not be allowed and graded. – Late submission will not be accepted due to your computer crash or lost backup. You must email your homework to TA with CC to instructor immediately if you cannot submit your homework to blackboard because of blackboard's technical problems. – Check if you uploaded your homework to blackboard successfully after your submission.
- Final exam: 15%, May 8 (Thursday) 1:30 p.m. to 4:00 p.m. in classroom, no make-up exam
- Quiz/Review: 15%
    - Quiz/Review will be announced in advance.

The usual grading scale will be used: **A (90-100%), B (80-89%), C (70-79%), D (60-69%), F (0-59%)**. This scale may be subject to class performance.

Late Work: Assignments are due when specified but will be accepted late (with a 10-20% penalty) until graded work is returned. If you know you will be absent ahead of time, turn your assignment in early.

Grade Review: Students should review their assignments, quizzes, exams, and projects with the TA within one week after the release of the grades, if they have any questions. After this period, the grades will be considered final, and no objections will be accepted.

Valid Proof of Absence for Exams: You must provide one of the following documents for approval of your absence: 1) a documented proof of a hospitalization or emergency (i.e., a doctor's note that specifies that you were unable to take the exam on the specific test date). ***Your doctor saying you are sick, or you email me saying you feel sick IS NOT A VALID EXCUSE. 2) or the relevant official documentation (i.e., flight tickets) noting your absence for official business, such as a business trip, a team activity, or a family visit (i.e., marriage, funeral). And

you must contact the instructor a week in advance. Failure to provide valid proof will result in a late penalty of 10-20%.

Ethical Conduct: Although students are encouraged to discuss ideas and problems with the TA, instructor, and other students, academic dishonesty will not be tolerated. Unless stated otherwise by the instructor, you are not allowed to share code or answers. It is your responsibility to educate yourself about actions that constitute academic dishonesty. If you are not sure whether a specific action is allowed, talk to the instructor and the TA before you indulge in it. All submitted code and assignments will be randomly checked for plagiarism. Do not share exam and quiz questions to the students who has not yet taken exams and quizzes. Academic dishonesty of any kind, if discovered, will result in one or more of the following sanctions: a grade of 0 for the corresponding graded item, a grade of "F" in the course, and further action according to the TTU operating procedures: https://www.depts.ttu.edu/opmanual/op34.12.php.

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.

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.

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.

Student with Disabilities, Accommodations: The university is committed to the principle that in no aspect of its programs, shall there be differences in the treatment of persons because of race, creed, national origin, age, sex, or disability and that equal opportunity and access to facilities shall be available to all. If you require special accommodations to participate, please contact the instructor during office hours or by e-mail Y.Liu@ttu.edu. Students should present appropriate verification from Student Disability Services. No requirement exists those accommodations be made prior to completion of this approved university process.

Safety and Wellness: The Texas Tech University (TTU) and Edward E. Whitacre Jr. College of Engineering are committed to the safety and wellness of our students by providing various services and resources.

Make sure you register with Tech Alert to get emergency notification by phone call, text, or email. You are encouraged to review the Emergency Action Plans (EAPs) and watch the videos of Know What To Do In Emergency Events and Surviving an Active Shooter Event Training to be prepared for those emergency situations. Additionally, due to the nature of laboratory or design courses, it is mandatory for you to follow the university safety policies and any additional safety protocols required by the course instructor(s).

For your wellbeing, various services are available at Student Counseling Center and Student Health Services. The Student Wellness Center provides convenient walk-in services M-F from 8 AM to 5 PM. Furthermore, the Texas Tech Crisis HelpLine (806-742-5555) provides 24/7/365 assistance for students experiencing a crisis or distress.

Emergency/Crisis Phone Number

TTU Police (UPD) Emergency	911
TTU Police (UPD) Non-Emergency	806.742.3931
TTU Emergency Maintenance	806.742.4OPS (4677)
TTU EHS (M-F, 8 am – 5 pm)	806.742.3876
SafeRide	806.742.RIDE (7433)
TTU Crisis HelpLine	806.742.5555
Student Wellness Center (From Urgent Care to a Full-Service Pharmacy on site)	806.742.2848
Title IX Reporting	806.742.7233
The Dean of Students	806.742.2984

Holidays and Vocation Days:

MLK Day	January 20, 2025
Spring Vacation	March 15, 2025 – March 23, 2025
No Classes	April 21, 2024
Last Day of Classes	May 13, 2024

Final Notes:
The syllabus is subject to change. Any changes will be announced in the class and (or) posted on blackboard.