Analysis of Computer Algorithms
CSCE 5150

Course Information & Syllabus (Spring 2024)

Instructor: Dr. XUAN GUO
In-person Lectures: Thursdays 10:00 am – 12:50 pm, NTDP B155
Office Hours: Mondays 10:00 am – 11:30 am or Wednesdays by appointment
Office: NTDP F290
Contact: Message me on Canvas

TA: Arun Kunwar
Office: TBD, Hours: Thursdays 1 pm – 4 pm
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TA: Shiva Ebrahimi
Office: F296, Hours: Mondays 8 am – 11 am
E-mail: shivaebrahimi@my.unt.edu

Class Web Page: Canvas
Recommended Textbooks:

- Introduction to Algorithms. 3rd ed. Cormen, Thomas, Charles Leiserson, Ronald Rivest, and Clifford Stein. MIT Press, 2009

Prerequisites: CSCE 4110, or equivalent. Meanwhile, the following topics will be helpful for this course, Computer Programming (C, C++) and Data Structures.

Course Objective: The study of efficient algorithms for various computational problems. Topics include advanced techniques of algorithm design: divide-and-conquer, greedy methods, dynamic programming, search and traversal, backtracking, and branch-and-bound. Other topics include NP-Completeness theory, including lower bound theory, approximation algorithms, and probabilistic algorithms. The lectures will emphasize the theoretical aspects, whereas assignments will cover both theory and programming aspects. Course contents and topics may slightly vary at the instructor's discretion.
Topics include:

- Worst Case Analysis and Growth of Functions (Chapters 1, 2, 3)
- Recurrence Relations (Chapter 4)
- Divide and Conquer (Chapter 4)
- Lower Bounds (Chapter 8)
- Greedy Algorithms (Chapter 16)
- Dynamic Programming (Chapter 15)
- Graph Algorithms and Network Flows (Chapters 23, 24, 25, 26)

- Approximation Algorithms for NP hard problems, vertex cover, TSP, Set Cover (Chapter 35)
- Introduction to Linear Programming (Chapter 29: tentative)

Draft Schedule

Week 1-2:	Introduction, Analysis of algorithms
Week 2-3:	Divide-and-conquer
Week 3-4:	Greedy Algorithms
Week 5-6:	Dynamic Programming
Week 6-8:	Graph and Network Flow
Week 9:	Midterm Examination
Week 10-11:	Backtracking & Branch-and-Bound
Week 12-13:	NP-completeness, Approximation Algorithms
Week 14-15:	Probabilistic Algorithms
Week 15:	Review
Week 16:	Final Exam Week

You are expected to check https://canvas.unt.edu/ often for course material, homework assignments and grades.

Course outcomes:

- know the fundamentals of computer algorithms.
- know how to analyze a computer algorithm.
- know how to frame a problem and specify its solution with an appropriate algorithm.
- have a good understanding of computer programming, data structures, and computer algorithms.
- understand the key ideas behind divide and conquer, greedy algorithm, dynamic programming, graph algorithms, and backtracking.
- understand the theories behind branch and bound, and NP-Completeness.

Grading:

Homework assignments	30%
Mid-term Exam	35%
Final Exam	35%
In-class Pop Quizzes (Optional)	10%

- There will be at most ten homework assignments. Homework grade will be the average of all homework assignments after dropping the lowest graded one.
- Students should expect at most ten in-class pop quizzes. All in-class quizzes are optional.
- The mid-term exam will be during class on TBD. The final exam will be on TBD.
- If there are questions about posted grades, they must be discussed with the instructor within two weeks of the grades being posted. After two weeks, barring an exceptional circumstance, grades will not be altered.

Submission: All assignments, shall be turned in electronically using the Canvas. A late penalty of 10% will be applied to all late assignments for up to 3 calendar days. Assignments that are not turned in 3 days after the due date will not be accepted. All holidays and weekends will be counted as calendar days.

Make-up Work Policy: For most situations there will be no make-up work for any exams or quizzes in this course. However, in the event of an unavoidable absence for one of the reasons below, email the instructor as soon as possible so we can work out a solution. The following events are grounds for make-up work: being a participant in a conference in which you are presenting; being in an athletic or other UNT associated event in which you are an active participant; a family emergency; a severe illness; military duty; or in certain cases and with some restrictions a religious event. Additionally, in the case of a missed assignment due to illness, make-up work will only be allowed by providing the instructor with a physical copy of a signed doctor's note. See the UNT Attendance Policy for more information.

Attendance: Students are encouraged to attend all lectures to gain the full benefit of the course. While lecture slides would be posted to Canvas, they will not contain all the content discussed during class, nor the examples presented on the board. If you are not able to attend class, please message the instructor as soon as possible.

Acceptable Student Behavior: Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Center for Student Rights and Responsibilities to consider whether the student's conduct violated the Code of Student Conduct. The university's expectations for student conduct apply to all instructional forums, including university and electronic classroom, labs, discussion groups, field trips, etc.

Academic Integrity

UNT policy 06.003 defines the following breaches of academic integrity:

A. Cheating. The use of unauthorized assistance in an academic exercise, including but not limited to:
    a. use of any unauthorized assistance to take exams, tests, quizzes, or other assessments.
    b. usage of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; usage without permission, of tests, notes, or other academic materials belonging to instructors, staff members, or other students at the university.
    c. dual submission of a paper or project, or resubmission of a paper or project to a different class without express permission from the instructor.
    d. any other act designed to give a student an unfair advantage on an academic assignment.

B. Plagiarism. Use of another's thoughts or words without proper attribution in any academic exercise, regardless of the student's intent, including but not limited to:
    a. the knowing or negligent use by paraphrase or direct quotation of the published or unpublished work of another person without full and clear acknowledgement or citation.
    b. the knowing or negligent unacknowledged use of materials prepared by another person or by an agency engaged in selling term papers or other academic materials.
C. Forgery. Altering a score, grade, or official academic university record; or forging the signature of an instructor or other student.
D. Fabrication. Falsifying or inventing any information, data, or research as part of an academic exercise.
E. Facilitating Academic Dishonesty. Helping or assisting another in the commission of academic dishonesty.
F. Sabotage. Acting to prevent others from completing their work or willfully disrupting the academic work of others.

Cheating of any sort will not be tolerated in this course. All submissions must be your own original work. Taking information from the internet or other students is considered a breach of academic integrity. Failure to adhere to these strict standards will be cause for disciplinary action that could be as severe as expulsion from the university. If it is determined a student cheated on any assignment in this course, they will receive an F for their final course grade and an academic integrity report will be filed with the Office of Academic Integrity. Further, UNT is now maintaining a database recording any acts of academic dishonesty that is available to employers.
For more information see the UNT Student Academic Integrity Policy.

Disability Accommodation: The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

Syllabus Revisions: This syllabus may be modified as the course progresses should the instructor deem it necessary. Notice of changes to the syllabus shall be made through Canvas and/or in-class announcements.