Course Syllabus

CS 6363.004	Design and Analysis of Computer Algorithms, Fall 2022.
	Credit Hours: 3. MW 8:30 am- 9:45 am, CR 1.202.
Instructor:	Bhadrachalam Chitturi
	https://personal.utdallas.edu/~chalam/
Office:	ECSN 3.604
Office hours:	Monday 11:30 am-12:30 pm. Additional time slots by appointment.
Telephone:	(972) 883-2136. Email: chalam@utdallas.edu
TA:	TBA

Course Pre-requisites, Co-requisites, and/or Other Restrictions

CS 5343 or equivalent (Data structures and algorithms); CS 5353: Discrete Mathematics or equivalent. Abstract data types: lists, stacks, queues, trees, heaps. Basic proof techniques. Bubble, selection, insertion, counting, radix, bucket, merge and quick sorts; binary search. Graphs: representation and algorithms.

Catalog Description

- Introduction, Asymptotic notation for Execution time analysis. Function hierarchy. Forming and solving recurrences. Recursion tree and substitution method. Master theorem. Amortized cost.
- Inversions and sorting. Sorting algorithms: bubble, selection, insertion, counting, radix, and bucket. A lower bound for sorting by comparison. Heap sort.
- Divide and conquer: merge sort, quick sort, binary search, linear time rank, Strassen's matrix multiplication, Closest pair of points in 2D.
- Dynamic programming: Fibonacci numbers, longest common substring, longest common subsequence, 0-1 Knapsack, matrix-chain multiplication, party planning and bitonic TSP.
- Greedy algorithms: Activity selection, Fractional Knapsack.
- Graphs: Representation. Graph explorations: DFS, BFS and their applications. Shortest paths: BFS, Dijkstra, Bellman-Ford, Floyd-Warshall. Minimum spanning trees: Prim's and Kruskal's.
- Maximum flow problems. Introduction, Ford Fulkerson method, Edmonds Karp algorithm, max flow min cut theorem. Applications.
- Introduction to NP-completeness. NP-Complete reductions 3SAT, clique, vertex Cover, maximum independent set.

Student Learning Objectives

Class learning objectives	CS oucomes
Asymptotic notations, solve recurrences, algorithm analysis	a, b, c
Divide and conquer algorithms	a, b, c
Greedy algorithms	a, b, c
Dynamic programming algorithms	a, b, c
Graph algorithms, network flows.	a, b, c
NP-completeness	a, b, c

CS Outcomes

a. an ability to understand advanced concepts in theory of computer science;
b. an ability to understand advanced concepts in applications of computer science;
c. an ability to apply knowledge of advanced computer science to formulate and analyze
problems in computing and solve them;
d. an ability to learn emerging concepts in theory and applications of computer science; and,
e. an ability to design and conduct experiments as well as to analyze and interpret data
f. an ability to function in teams and to communicate effectively

References

- Introduction to Algorithms, 3rd ed., Cormen, Leiserson, Rivest, and Stein. MIT Press.

- Brassard, Gilles, and Paul Bratley. Fundamentals of algorithmics. Vol. 524. Englewood Cliffs: Prentice Hall, 1996.
- Jon Kleinberg, Éva Tardos. Algorithm Design.
- Problems on algorithms. Ian Parberry.
- Dasgupta, Sanjoy, Christos H. Papadimitriou, and Umesh Virkumar Vazirani. Algorithms. McGraw-Hill Higher Education, 2008.

Additional Course Materials
The syllabus, assignments, and other course materials will be available at elearning.utdallas.edu during the valid period.
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Assignments & Academic Calendar

All assignments must be submitted in class. If an assignment is due on a particular class date then it is due in class at the beginning of the class. Turn in what is completed by the deadline for partial credit. If you are unable to submit hardcopy, then email the softcopy to TA before the deadline (or immediately after the deadline if you have valid reason to do so). Late submissions are not accepted in general, and they carry penalty even if accepted. You are allowed to form teams and cooperate on homework assignments. The maximum group size is 3 members. If you work as a team then entire team submits *only one copy* with the names of all students written on the front sheet. Regular class attendance and participation is expected and is the responsibility of each individual. There is a strong correlation between regular class attendance and performance. Students are responsible for the contents of the lectures.

Grading policy.
Your course average will be calculated as follows.
Exam 1: 30%, Exam 2: 35%, Exam 3: 15%. Total: 80%
Quizzes 1 and 2: 5% each.   Total: 10%
Homeworks and other assignments: 10%
Tentative dates for quizzes and exams:
Quiz 1: Sep 7   Quiz 2: Oct 19
Exam 1 Sep 28   Exam 2 Nov 7   Exam 3 Dec 5

Group study is encouraged. Exams and quizzes fall into category 1 and assignments fall into category 2. To receive a certain grade for the course, a minimum score is expected in each of the categories. Exams and quizzes have syllabus; however, familiarity with all the covered topics is expected. A quiz might be conducted along with the corresponding exam. The final grades will be awarded based on absolute performance and the natural clusters of the final scores. Thus, both the absolute score and the relative position matter.
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Course & Instructor Policies

Contact the instructor (TA) immediately if you have any question about quiz or exam (assignment) grading. Any incorrectly posted grade must be notified to the grader via official e-mail within a week of posting the grade. It is possible that your assignment, quiz, or exam grade may decrease when it is regraded. Students suspected of academic dishonesty are subject to disciplinary proceedings.

The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Respective procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*. As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the start of the next long semester. If the required work to complete the course is not submitted by the specified deadline, the incomplete grade is automatically converted into an F.

Student Conduct & Discipline

All University Guidelines apply.

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Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course; however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

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Class Attendance and participation

Regular class participation is expected. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

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Technical Requirements, Course Access and Navigation

Some technical requirements must be met for a good course experience. Please review the important technical requirements on the Getting Started with eLearning webpage.

The course can be accessed using your UT Dallas NetID account on the eLearning website. Please see the course access and navigation section of the Getting Started with eLearning webpage for more information. To become familiar with the eLearning tool, please see the Student eLearning Tutorials webpage. UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The eLearning Support Center includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service. Online tools are used for interaction and communication. Some external tools may be used. For more details, please visit the Student eLearning Tutorials .

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Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students. Please see http://go.utdallas.edu/academic-support-resources.

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UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please review the catalog sections regarding the credit/no credit or pass/fail grading option and withdrawal from class.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

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The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.