

CSE5311 Design and Analysis of Algorithms

Administrivia
Introduction
Review of Basics

Course Description

- Design and Analysis of Algorithms is **THE** most important basic course in any graduate computer science and engineering curriculum.
- It is vital for every computer science student to be fluent with algorithms and their analysis.
- **ALGORITHMS ARE FUN**
- **ALGORITHM ANALYSIS is a NECESSARY TOOL;**
- **Students are encouraged to solve homework problems and discuss/solve problems in the class.**
- Typically, this course should be taken in the very first (or second) semester of your graduate study because
 - algorithms are used in
 - **Networks**
 - **Operating Systems**
 - **Databases, and**
 - **other (including advanced) courses.**

Course Objectives

- The objective of this course is to build a solid foundation of the most important fundamental subject in computer science
- **Creative thinking** is essential to algorithm design
- Algorithm analysis and verification demands sound mathematical acumen and programming skills.

Course Prerequisites

- Data Structures (CSE 2320) and
- Theoretical Concepts in Computer Science and Engineering (CSE 3315) OR Equivalent.
- Solve Problems **ASAP**
- Discuss with classmates, TA and Instructor
- Participate in the class
- Complete exercise problems
- Complete homework assignments
- Be creative

Mode of Teaching

- The class meets twice a week
 - Tuesdays and Thursdays 2:00 to 3:20 Pm
 - Tuesday class will be of lecture type
 - Thursday class will be of tutorial type.
- Power point slides and other lecture material will be used on Tuesdays.
- At the end of each topic, students MUST attempt to **solve** exercise problems.
- Exercise problems can be found on the course web page and in the text book.
- All students are expected to work on these problems and may be required to solve or at least discuss these in the class on Thursdays.

Instructor/GTA

- **Instructor:** Mohan Kumar, 333 Nedderman Hall
- **Email:** kumar@cse.uta.edu
- **Office Hours:** Thursdays 4 - 6 PM
- **Phone:** (817) 272-3610 or main office: (817) 272-3785;
- **WWW site:** <http://crystal.uta.edu/~kumar/cse5311>
- **GTA:** TBD

Course Syllabus

- Review of Asymptotic Analysis and Growth of Functions;
- Trees, Heaps, and Graphs; and Recurrences.
- Greedy Algorithms:
 - **Minimum spanning tree, Union-Find algorithms, Kruskal's Algorithm,**
 - **Clustering,**
 - **Huffman Codes, and**
 - **Multiphase greedy algorithms.**
- Dynamic Programming:
 - **Shortest paths, negative cycles, matrix chain multiplications, sequence alignment, RNA secondary structure, application examples.**
- Network Flow:
 - **Maximum flow problem, Ford-Fulkerson algorithm, augmenting paths, Bipartite matching problem, disjoint paths and application problems.**
- NP and Computational tractability:
 - **Polynomial time reductions; The Satisfiability problem; NP-Complete problems; and Extending limits of tractability.**
- Approximation Algorithms, Local Search and Randomized Algorithms

Text book/References

- Text: Algorithm Design
by [Jon Kleinberg](#), [Éva Tardos](#)
Pearson Addison-Wesley, ISBN 0-321-29535-8
- References:
 - [The Design and Analysis of Algorithms 1974](#)
AV Aho, JE Hopcroft and JD Ullman, Addison-Wesley Publishing Company
 - [Introduction to Algorithms: A Creative Approach](#), Reprinted 1989
Udi Manber, Addison-Wesley Publishing Company
 - [Introduction to Algorithms](#), Second Edition, 2001
T Cormen, C E Leiserson, R L Rivest and C Stein McGraw Hill and MIT Press
 - [Graph Algorithms](#), 1979
Shimon Even, Computer Science Press
 - [Introduction to the Theory of Computation](#), 1992
Michael Sipser, PWS Publishing Company
 - [The Art of Computer Programming](#), Vols. 1 and 3
Knuth, Addison Wesley Publishing Company

Assessment

- **Quizzes and class participation: 30%**
 - There will be 2 quizzes
 - Quiz 1 (15%) : February 15, 2007
 - Quiz 2 (15%) : April 26, 2007
- **Exams: 35%**
 - Comprehensive open book/ notes, exam lasting for about 3-4 hours
 - Date: March 22, 2007
- **Group Project/study : 35%** (group study or group project)
 - Project problem: write programs and run experiments
 - Group Study: research problem
 - presentation : May 1 and 3, 2007.

Missed Exams, Quizzes, and Makeup Work

If you miss an exam or quiz due to unavoidable circumstances (e.g., health), email the instructor for an appointment or meet with him during office hours.

Do NOT ask for make up exams or other components if you missed an exam or a project due to travel (except when you are required to travel to represent the university or the department).

- **Student Support Services Available**

The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

IMPORTANT

- **Americans With Disabilities Act**

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 -- The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans With Disabilities Act - (ADA), pursuant to section 504 of The Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide **"reasonable accommodation"** to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with **informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.**

Academic Dishonesty

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

"Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)