

Course Syllabus

Course Information

CS 4349-001: **Advanced Algorithm Design and Analysis**, Fall 2016

Professor Contact Information

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Office hours: Thursday 2:30-3:30pm. Additional office hours by request.

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

CS/SE 3345

Course Description

Asymptomatic analysis, recurrences, and graph algorithms. Algorithm design techniques such as greedy method, dynamic programming, and divide-and-conquer. Issues from computational complexity. Course emphasizes a theoretical approach.

Student Learning Objectives/Outcomes

Class learning objectives	CS outcome
Ability to use asymptotic notations, solve recurrences, algorithm analysis	a,e
Ability to design, analyze and prove correctness of algorithms using D&C	a,c,e
Ability to design, analyze and prove correctness of algorithms based on Greedy techniques	a,c,e,k
Ability to design, analyze and prove correctness of algorithms based on Dynamic Programming techniques	a,c,e,k
Ability to design, analyze and prove correctness of graph algorithms	a,c,e

CS Outcomes

- (a) an ability to apply knowledge of mathematics, science, and engineering;
- (b) an ability to design and conduct experiments as well as to analyze and interpret data;
- (c) an ability to design a system, component, or process to meet desired needs;
- (d) an ability to function on multidisciplinary teams;
- (e) an ability to identify, formulate, and solve engineering problems;
- (f) an understanding of professional and ethical responsibility;
- (g) an ability to communicate effectively;
- (h) the broad education necessary to understand the impact of engineering solutions in a global/societal context
- (i) a recognition of the need for and ability to engage in lifelong learning;
- (j) a knowledge of contemporary issues; and,
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Required Textbooks and Materials

Introduction to Algorithms, T.H. Cormen, C.E. Leiserson and R.L. Rivest, Third Edition, McGraw Hill.

Suggested Course Materials

Additional material will be provided in class or posted on the class web site.

Assignments & Academic Calendar

1. Introduction, recurrences and Master Theorem (Chapters 2-4).
2. Iterative, Divide-and-Conquer and Prune-and-Search algorithms
 - a. Linear time median selection algorithm.
 - b. Convex hull and closest pair of points in the plane.
3. Dynamic Programming
 - a. Chapter 15 and
 - b. All pairs shortest paths (Chapter 25) and other optimal path problems.
 - c. 0/1-knapsack problem.
4. Greedy Method
 - a. Chapter 16 and
 - b. Minimum spanning tree (MST).
 - c. Shortest Paths.
5. Graph algorithms and applications (Chapters 22-25)

1st Midterm examination: October 6.

2nd Midterm Examination: December 1.

Grading Policy

Homework: 20%, Midterm 1: 40%, Midterm 2: 40%. There might be quizzes, used to add up no more than 5 points to your midterm exams score.

Course & Instructor Policies

(make-up exams, extra credit, late work, special assignments, class attendance, classroom citizenship, etc.)

All homeworks should be submitted by their due date in order to be considered for full credit. Exceptions can be made for valid medical reasons. Late submissions are not permitted once the graded homework has been returned to students, or the solution to the homework has been provided (whichever is earlier). If a student is unable to take the examinations on their scheduled dates, he/she should inform the instructor well in advance. Makeup examinations will be scheduled only if the student has a valid medical excuse.

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

These descriptions and timelines are subject to change at the discretion of the Professor.