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ABOUT THIS COURSE

This is a second course in algorithms, where the first course refers to CSE310, which is a prerequisite of this course. The goal of this course is to teach you solid knowledge and techniques in design and analysis of algorithms. A feature of these algorithms is that the algorithms provide guaranteed performance. You will learn algorithm design techniques such as

Greedy Algorithms  
Divide-and-Conquer  
Dynamic Programming  
Approximation Algorithms

Before studying approximation algorithms, you will be exposed to the concept of NP-hardness. The design of approximation algorithms normally should be justified by the hardness of the problem.

You will learn these techniques from example algorithms and the corresponding analysis. You will also learn more advanced data structures which are necessary in the design of better algorithms.

This course requires a lot of work. Depending on different knowledge levels the students may have, all students may not be required to spend the same amount of time on this course. However, every student is encouraged to preview before the class and review immediately after the class.

Students are encouraged to ask questions in class, and to fully use the office hours of the instructor and the TA. Students may also ask questions via email to the instructor and/or the TA. However, the instructor and the TA may choose to ignore questions on topics well covered in class and from students not attending the lecture(s).

There will be closed book exams and several homework assignments. Homework assignments may involve theoretical contents as well as programming contents. The instructor will also assign suggested readings/exercises after each lecture. Students should work on these before the next lecture day but will not hand in the solutions to the exercises. Very often, solutions to these exercises can be found on the Internet. It is not cheating to get the solutions on the Internet. Discussions on these exercises are encouraged. However, you will gain only after you can understand the materials.
Web Material

You are required to make sure that you are enrolled at [http://myasucourses.asu.edu](http://myasucourses.asu.edu) by the end of first week of class. Also, it is your responsibility to make sure that your email address at myasucourses.asu.edu is the one you read every day. Students are required to check the Bulletin Board which can be reached from myasucourses.asu.edu by following the link to Discussion Board on the left-hand side of the screen every day. All course announcements will be posted on the bulletin board (some course announcements may actually be posted on the bulletin board only).

Tentative Schedule of Topics

- Introduction and Basic Algorithm Analysis (3 lectures)
- Graphs (3 lectures)
  - Basic Definitions and Graph Traversal
  - Testing Bipartiteness using BFS
  - Connectivity in Directed Graphs
  - DAGs and Topological Ordering
- Greedy Algorithms (3 lectures)
  - Scheduling
  - Optimal Caching
  - Shortest Paths and Minimum Spanning Trees
  - Huffman Codes
- Divide-and-Conquer (3 lectures)
  - Mergesort
  - Counting Inversions
  - Finding the Closest Pair of Points
  - Integer Multiplication
- Dynamic Programming (3 lectures)
  - Weighted Interval Scheduling
  - Segmented Least Squares
  - Subset Sums and Knapsacks
  - Sequence Alignment
  - Shortest paths
  - Distance Vector Routing
- Network Flow (3 lectures)
  - The Maximum-Flow Problem and the Ford-Fulkerson Method
  - Maximum Flows and Minimum Cuts in a Network
  - Karp's Maximum Flow Method
  - Bipartite Matching
- NP-completeness and Reductions (3 lectures)
  - NP, NP-hard and NP-complete
  - Reduction Examples
- Approximation Algorithms (5 lectures)
  - The Vertex-cover Problem
Steiner Minimum Trees
- The Subset-sum Problem
- Multi-constrained QoS Routing

Text book:


Prerequisites:

CSE310, MAT243. You should also be able to program in C or C++.

Grading Policy:

Assignments 40%
Midterm 30%
Final Exam 30%

All of the above are individual work.
All exams are closed-book exams. The date of midterm exams will be announced one week prior the exam.

You will receive an A if your weighted average is 90 or more, B if your weighted average is 80 or more, C if your weighted average is 70 or more, D if your weighted average is 60 or more, and E if your weighted average falls below 60.

Special Cases:

In describing the policies, there will be some special cases for assignments and/or exams. I will honor the following special cases (rules stated):

Medical Problems: Within two days, you need to submit a statement with the signature of the doctor and the seal of the hospital saying that you cannot come to class during a particular time.

Travel Accident: Within two days, you need to submit a police report stating that you are involved in an accident or your car broke down while you are traveling to school. Your car does not start at home is not a valid reason.

Death of Immediate Family Members: If you need to attend the funeral of an immediate family member (defined as grand parents, parents, spouse, sibling or child), you need the instructor's prior approval. Proof may be required.

Policy on Homework Assignments:
All homework should be typeset using LaTeX or Microsoft Word. Hand-written assignment will not be accepted. All homework assignments are due before the lecture on its due date. No late assignment will be accepted. If you fall into one of the special cases defined in this syllabus, you need to talk to the instructor immediately. It is the instructor's decision whether or not you can receive an extension.

**Grade Appealing:**

Your grades will be posted at the class website, available to you. Whenever the grade for a particular work is available, we will post an announcement. You will have one week to challenge the grade in writing. If you do not contact either the instructor or the TA within a week, there would be no change to your grade for that particular work. This applies to all of your graded work. It is your responsibility to keep the graded hardcopy of your work, except the final exam.

**Policy on Midterms and Final Exams:**

Final is pre-scheduled by the University and will not be changed. The dates of midterms will be announced in class one week before the test. In general, there will be no makeup test or exam. If you fall into one of the special cases defined in this syllabus, it is the instructor's decision whether or not you will have a makeup exam.

**Brief Summary of the University Policies on Cheating:**

Any incidence of cheating in this class will be severely dealt with. This applies to homework assignments and exams. The penalty ranges from receiving a zero on the particular work to receiving the grade XE and being reviewed by the university. Students are encouraged to discuss with others the materials covered in class. However students should not discuss problems in assignments/exams. One tends to get very suspicious if two identically wrong results show up in the homework assignment and/or exams.