CS 5381 Analysis of Algorithms

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Description: Approaches to analyze algorithms, techniques for algorithms design, solutions for recurrences, functional operators and asymptotic methods in connection with important algorithms for sorting and searching.
Prerequisites: Data structures, Algorithms and Discrete Mathematics
Course Objectives: To study paradigms and approaches used to analyze and design algorithms. To appreciate the impact of algorithm design in practice.
Tentative Topics: General concepts on analyzing running time of algorithms (via insertion sort, mergesort) and design techniques (e.g., incremental design, divide-and-conquer) Mathematical tools: asymptotic analysis and notation, recurrences, summations
Computational aspects and Analysis of
- Sorting algorithms: heapsort, priority queues, quicksort
- Greedy algorithms
- Graph algorithms: BFS, DFS, Minimum spanning trees (as time permits)
- Dynamic programming, knapsack problems
- NP-completeness and undecidable problems

Expected Learning Outcome:
1. Ability to analyze algorithms with various methods: iteration, substitution, recursion tree and master theorem (MS – 3; PhD – 2, 3)
2. Familiarity with various algorithm design techniques and concepts for proof of correctness using loop invariant (MS –3, 2)
3. Solid understanding of design and analysis of algorithms for sorting problems (MS – 4, 1; PhD – 1, 3)
4. Exposure to optimization techniques such as dynamic programming, and some elementary graph algorithms (MS – 3, 5; PhD – 3)
5. Basic understanding of limit of computation in the context of NP-complete problems. (MS – 3, 5; PhD – 2, 3; PhD - 3)

Methods of Assessment of Learning Outcomes:
Class homework assignments will assess their understanding of techniques for algorithm analysis and design, and algorithms for selected class of problems. Examinations will be used to assess their basic knowledge (70-80% of the questions) and creativity in all aspects of algorithms as mentioned in the expected learning outcomes.

Course Evaluation:
- HWs 25%
- Midterm 35%
- Final 40%
Homework:

Homework will be assigned regularly. The homework may include programming assignments and exercises to be graded, and exercises that are for your practice and not to be handed in. Late homework is not encouraged and will not be accepted after the homework has been graded and returned.

Writing homework: Try to be as clear and precise as possible in your presentations. Correctness and ease of understandability of the solution influence your scores. Sloppy and unnecessarily lengthy work will be likely to have fewer points.

Collaboration: You may collaborate with your peers in class (for homework but not exams). However, you must produce solutions on your own (not copying or do minor changing in your programs) and acknowledge your collaborators and sources for each solution (e.g., obtained solutions with help from another student or books).

Students with Disabilities

Reasonable accommodations are available for students who have a documented disability. Please notify the Professor during the first week of class regarding accommodations needed for the course. Late notification may cause the requested accommodations to be unavailable. Students needing accommodations must first have them approved through the AccessTech of the Student Affairs program (www.studentaffairs.ttu.edu/accesstech).

Academic Integrity

Exam, assignments, and projects are subject to the university academic integrity (See attached and Student Handbook: http://www.studentaffairs.ttu.edu/publications/student_handbook0405.pdf) and the statement of academic conduct for engineering students (included in the last page of the syllabus). Plagiarism and academic irregularities will not be tolerated and could result in failing the course. Consequences of dishonesty can be severe, and may include expulsion from the university.

Important Notes:

1. Be sure to regularly check at my website: http://www.cs.ttu.edu/~hewett/teach.html for class announcement and access to class handouts.
2. For students who are not on main-campus, if you have questions regarding the class delivery and administration (e.g., exam proctoring, not receiving the tapes of lectures in a timely matter), contact
   • Brent Guinn, director of distance learning (800) 692-6877 ext 249 or Brent.Guinn@ttu.edu. See http://www.de.ttu.edu/content/asp/contact_info.asp OR,
   • For Abilene site: Bill Davis (325) 677-1112 or Bill.Davis@ttu.edu. See http://www.cs.ttu.edu/people/#staff
Statement of Academic Conduct for
Engineering Students, College of Engineering
Texas Tech University

Preamble
The College's primary goal is to educate students to fill leadership roles as professionals aware of technology and its economic and political role in the world. Therefore, we strive to produce technically competent graduates who solve problems, are able to communicate and work well with others; are sensitive to the needs of society, are well-educated in the humanities as well as in the engineering disciplines, and maintain a high-level of ethical and professional conduct.

Policy
The College of Engineering fully subscribes to the Code of Student Conduct as published in the Texas Tech University's "Student Affairs Handbook." The Handbook states the following:

"The University is strongly committed to upholding standards of academic integrity. These standards require that students never present the work of others as their own. Any student found to have committed the following academic misconduct is subject to the disciplinary sanctions outlined in Part IX, Section D "Disciplinary Sanctions":

1. Cheating
This violation includes, but is not limited to: (1) use of any unauthorized assistance or assisting others in taking quizzes, tests, or examinations; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignment(s); (3) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff; (4) alteration of grade records; (5) bribing or attempting to bribe a faculty member to alter a grade.

2. Plagiarism
This violation includes, but is not limited to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also included the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

3. Instructor Responsibilities
The instructor in a course is responsible for initiating action in cases where there is an admitted act or convincing evidence of academic misconduct. Before taking such action, the instructor should attempt to discuss the matter with the student(s). If the suspected misconduct involved a final exam, the instructor should submit a grade of X until a reasonable attempt can be made to contact the student(s), after the end of the semester.

4. Instructor Sanctions
If academic misconduct is determined by the instructor, a failing grade shall be assigned to either the assignment in question or to the course grade. When a student is given a failing grade in a course as a result of academic misconduct, the instructor shall report in writing to the instructor's department chairperson the facts of the case and the action to be taken against the student. The chairperson shall provide a copy to the student, to his or her Academic Dean and to the Dean of Students Office.

5. Grade Appeal Procedure
The Grade Appeal Procedure (Part V, Section A) may be used to appeal a failing course grade, but not a failing grade given for a class assignment. The disciplinary penalty or grade of F shall not be implemented until the disciplinary procedures or grade appeal process has been exhausted. A student may continue the academic class and course work until a final decision is made."

6. Repeated Academic Dishonesty
In cases of repeated violations, either the instructor (through his or her department chairperson and/or Academic Dean's Office) or the Academic Dean may refer the case to the Dean of Students Office for further disciplinary action.