CS5329 - Algorithm Design and Analysis (Fall 2019)
Course Syllabus and Details

Instructor: Dr. Vangelis Metsis
Email Addr.: vmetsis@txstate.edu
Web Page: http://cs.txstate.edu/~v_m137/
Classroom: DERR 114 & AVRY 355
Lectures: Tu 6:30pm - 9:20pm
Office: Comal Building, Room 307F
Office Hours: TuWe 11:00am – 1:00pm

Course Description
Algorithm Design and Analysis 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. Typically, this course should be taken in the very first semester of graduate study because algorithms are used in Networks, Operating Systems, Databases, and other (including advanced) courses.

Algorithms are critical to your development as a computer scientist, a researcher, a creative thinker and/or a problem solver. This is a fundamental course - algorithms are extensively used in databases, networks, artificial intelligence, bioinformatics, pervasive and mobile computing, robotics, security, architecture, all engineering and science disciplines, finance, management, music, biology and indeed in everyday life.

Course Objectives
The principal objective of this course is to build a solid foundation in algorithms and their applications. Students completing this course are expected to appreciate the importance of algorithms in other areas including routing in networks, query processing in databases, collaboration in distributed computing, efficient caching in operating systems etc.

Course Prerequisites
C or higher in CS 3358: Data Structures OR Equivalent.

Mode of Teaching
The class meets once a week (Tuesday 6:30pm – 9:20pm). Power point slides, class notes and other lecture material will be available on TRACS. A combination of presentation slides and hand notes will be used in lectures. At the end of each topic, students must attempt to solve exercise problems. Solutions to exercise and homework problems will be discussed in class. All students are expected to work on these problems and participate in the class discussions. The midterm and final exams will be open-notes; all notes MUST be handwritten by the individual student. Exceptions will be made for persons with special abilities and requirements (please contact the instructor for more details). In this course you will be encouraged to think on your own and to discuss solutions with your peers. The course is not limited to any programming language. Students are strongly encouraged to use reference books and course material provided by the professor.

Course Topics
- Analysis of Algorithms, Insertion Sort, Merge-sort; Growth of Functions, Asymptotic Analysis, Recurrences; Divide-and-Conquer; Heapsort, Quicksort; Medians and Order Statistics; Hashing, Hash functions, Hash tables; Binary Search Trees; Red-Black Trees, 2-3 Trees, B-Trees; Dynamic Programming; Greedy Algorithms, Amortized Algorithms; Maximum Flow; Elementary Graph Algorithms; Minimum Spanning Trees; Single-Source Shortest Paths; All-Pairs Shortest Paths; NP-Completeness.

Textbook
- Introduction to Algorithms
References

- Class Notes, Powerpoint slides, and Exercise Problems
- Algorithm Design
  - Jon Kleinberg and Eva Tardos, Pearson Addison-Wesley, 2004 or Later Edition
- The Design and Analysis of Algorithms 1974
  - AV Aho, JE Hopcroft and JD Ullman, Addison-Wesley Publishing Company
  - Udi Manber, Addison-Wesley Publishing Company
- 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

Midterm exam: 30% (Tue, Oct 22)
Final Exam: 35% (Tue, Dec 10)
Homework and Quizzes: 15%
  - Up to five ‘10-minute’ quizzes (‘24-hours’ notice on TRACS)
  The structure of the quizzes will be discussed in class.

Programming Assignment: 20%

Class participation: ACTIVE Participation will prepare you well for the Exams. Students are expected to interact actively during lectures.
All students are expected to solve homework problems and discuss solutions in the class.
Missed Exams and Makeup Work: Talk to the instructor if you miss an exam or quiz due to unavoidable circumstances (e.g., health).
Attendance and Drop Policy: Attendance though not mandatory, is HIGHLY encouraged. Class participation is important to your grade in the 'Homework and Quizzes' component.
Grade Grievance Policy: If a student believes a mistake has been made in grading an assignment, the student has one week after an assignment is returned to resubmit an assignment for re-grading if they believe there is an error.
Drop Policy: You must follow the withdrawal and drop policy set up by the University and the College of Science. You are responsible for checking the drop deadlines and making sure that the drop process is complete. [Link]
Accommodations for students with disability: Any student with a special needs, requiring special accommodations, should inform me during the first two weeks of classes. The student should also contact the office of disability services at the LBJ student center.

Academic Honesty:
You are expected to adhere to both the University's Academic Honor Code as described here: [Link], as well as the Computer Science Department Honor Code, described here: [Link].

- Except where explicitly and specially allowed (such as group project), all work submitted in the class is expected to be your individual work. Plagiarism will not be tolerated and if detected will result in automatic "F" grade.
- Do not include code (or other materials) obtained from the Internet in your assignments (except what is provided or allowed by the instructor).
- Do not email your program to anyone (except your partner or the instructor).
The penalty for submitting a program that has been derived from the internet or any other non-approved source will be a 0 for that assignment. Violators will be reported to the Texas State Honor Code Council (http://www.txstate.edu/honorcodecouncil/).