CSE 5311-006: ADVANCED ALGORITHMS

Spring 2016: TR 5:30 - 6:50 p.m., Pickard Hall 110

Instructor: Bob Weems, Associate Professor
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Hours: TR 1:00 - 3:00 p.m.

GTA: Amirhossein Herandi (amirhossein.herandi@mavs.uta.edu)

Textbook: Cormen, Leiserson, Rivest, Stein, *Introduction to Algorithms*, *3rd ed*., MIT Press, 2009. (Henceforth known as CLRS)

References: M. de Berg et.al., *Computational Geometry: Algorithms and Applications, 3rd ed*., Springer-Verlag, 2010. http://dx.doi.org.ezproxy.uta.edu/10.1007/978-3-540-77974-2

A. Borodin and R. El-Yaniv, *Online Computation and Competitive Analysis*, Cambridge Univ. Press, 1998.

L. Fortnow, *The Golden Ticket: P, NP, and the Search for the Impossible*, Princeton Univ. Press, 2013.

M.R. Garey and D.S. Johnson, *Computers and Intractability: A Guide to the Theory of NP-Completeness*, Freeman, 1979.

D.S. Hochbaum, ed., *Approximation Algorithms for NP-Hard Problems*, PWS, 1997.

R. Motwani and P. Raghavan, *Randomized Algorithms,* Cambridge Univ. Press, 1995.

J. O'Rourke, *Computational Geometry in C, 2nd ed.,* Cambridge Univ. Press, 1998.

C.H. Papadimitriou, *Computational Complexity*, Addison-Wesley, 1994.

Grade: Your grade will be based on the following weights:

Exams:	45% (Test 1: 20%; Test 2: 25%, Tuesday, May 10, 5:30 - 8:00 p.m)
Quizzes:	40% (8% x 5)
Project:	15%

Policies:

3. Homeworks, with solutions, are available from the web page.

Course Outline

Starred (*) topics are not in CLRS

11. Intractability (34, 35)
    - Sample Intractable Problems
    - Complexity Classes
    - Reductions
    - Polynomial-Time Approximation

13. Computational Geometry (33)
    - Fundamental Predicates
    - Closest Pairs
    - Convex Hulls
    - Sweepline Algorithms
    - Plane Partitions and Point Location
    - Euclidean MST/Voronoi Diagram/Delaunay Triangulation

Material on Randomized Algorithms will be taken from these notes:

1. Mathematical Preliminaries
    - Probability and Randomized Algorithms (5)

2. Binary Search Trees
    - Treaps (problem 13-4)
    - Self-Organizing Linear Search (Computing Surveys*, problem 17-5)???
    - Self-Adjusting Binary Search Trees (Splay trees/amortized analysis) (JACM)*???

5. Hashing
    - Bloom Filters*

6. Medians/Selection (9.3)
    - Quicksort analysis from 2320 Notes 8

Calendar - with subject numbers from course content

April				May			
				3	13. / Rand. Algs.	5	Rand. Algs.
		14	11.	10	Exam 2 (earlier topics' questions from Mehrab)		
19	11.	21	11.				
26	13.	28	Closed-Book Quiz on NP-Completeness				