Georgia Tech, CS 4140 / CSE 6140
Computational Science & Engineering (CSE) Algorithms

Fall 2012
Tu/Th 3:05pm - 4:25pm, Classroom: Klaus 2443

Instructor: Prof. Alberto Apostolico, KACB 1310, 404-385-0004, axa@cc Office Hours:
Tuesday 4:25pm-5:25pm
Teaching Assistant 1: Zhaoming Yin, stplaydog@gmail.com TA1 Office Hours Monday/Wednesday
2:30pm-3:30pm, Klaus Room 1343
Teaching Assistant 2: Ravi Sastry, gmravi2003@gmail.com TA2 Office Hours: Friday 5-
6:30pm, Klaus Room 1315
Teaching Assistant 3: Nishant Mehta, niche@cc.gatech.edu TA3 Office Hours: Thursday
4:30pm - 6pm, Klaus Room 1315

Texts:
Required: Papers, Notes and other material posted on T-square
Recommended: Cormen, Leiserson, Rivest, and Stein, Introduction to Algorithms, Third
edition, MIT Press, 2010.

Course Description: This course will introduce students to designing algorithms for
selected computational science & engineering applications.

Pre-requisites: design and analysis of algorithms (CS 3510). Students (from the Sciences,
Engineering, and Computing) interested in algorithmic applications in science and engineer-
ing are encouraged to take this course. This course can be taken for satisfying the theory
breadth requirement by computer science graduate students (M.S. and non-theory Ph.D.
students). This course cannot be taken by ACO students to satisfy their core requirement
and theory Ph.D. students in computer science to satisfy the theory breadth requirement.

Grading: (25 %) Midterm (Oct 11) (25 %) Final (Dec 13, 11:30-2:20) (25 %) Project (20
%) Homework (5 %) Class participation

Tentative Schedule & Course Outline
    3 weeks - Analysis of algorithms, complexity, models of computation, recurrences, ran-
domization. (First 5 chapters or 120 pages in Cormen et a lii + supplemental posted material)
    3 weeks - Dynamic programming, matrix multiplication, general context free recognition,
finite automata, transitive closure and synthesis of regular expressions. (Chapter 15 in
Cormen et a lii + supplemental posted material)

3 weeks -Text processing, string searching, suffix trees and suffix arrays, data compression. (Posted material)

3 weeks - Graph algorithms, shortest paths single source and all pair, max flow. (Chapters 22-26 in Cormen + supplemental posted material)

3 weeks - Computational biology, edit distance and longest common subsequences, sequence alignment and multiple sequence alignment, post-genome bioinformatics. (Posted material)

1 week - Algorithm engineering and performance. (Posted material)