N J I T
New Jersey's Science & Technology University

A. V. GERBESSIOTIS

SEP 2, 2009

COURSE INFORMATION

CS 667-101

FALL 2009

HANDOUT 1

Sequential and parallel algorithms for numerical and combinatorial problems will be discussed. The use of randomization in the solution of algorithmic problems will be explored. Applications to be considered will include string matching, polynomials and FFT algorithms, sorting networks, algebraic computations and primality testing and factoring, matrix operations, randomized algorithms for sorting and selection, and data compression. Search-indexing data structures (inverted lists) will be examined. Web ranking algorithms such as Google's PageRank, and Kleinberg's HITS will also be discussed. Topics in computational geometry will be examined.

Contact Information

INSTRUCTOR:	Alex Gerbessiotis	E-MAIL:	alg667@cs.njit.edu
OFFICE:	GITC 4213, 4th floor	TEL:	(973)-596-3244
OFFICE HOURS:	Mon and Wed 10:00-11:00am, Mon 4:00-5:30pm		
OFFICE HOURS:	By appointment some other time on Mon/Tue/Wed		
ASSISTANT:	TBA on course web-page		
CLASS HOURS:	Wed 6-9:05pm, Room KUPF 103		

COURSE WEB PAGE: http://www.cs.njit.edu/∼alexg/courses/cs667/index.html

The following also works. http://web.njit.edu/∼alexg/courses/cs667/index.html

Print Handout 1 from Web-page and compare the printout to this document! They must be identical.

Course Administration

Prerequisites   CS 610 or an undergraduate course on algorithm equivalent to CS 435.

Textbook   T.C.Cormen, C.E.Leiserson, R.L.Rivest, and C. Stein. "Introduction to Algorithms", second edition, McGraw-Hill, ISBN : 0-07-013151-1. *We abbreviate in class this second edition as CLRS.*

Other   R. Motwani and P. Raghavan. " Randomized Algorithms", Cambridge University Press.

CourseWork: Five homeworks HW1 to HW5 each one worth 250 points. The best 4 of 5 only count, so you can miss one. Programming problems related to the material covered in class will be given; you can substitute points gained from programming for regular points. Bonus points can also be gained.

Grading scheme: 1000 points is the target maximum. You are to be given at least a C if you collect at least 500 points, at least a B if you collect 650 points, and an A if you collect at least 850 points. If more points are given, scale accordingly.

Exams   There are no exams.

Extra work   Bonus points and programming assignments can be used.

Due Dates   Written homeworks are due by the beginning of a class. Programs **must be received by email by midnight the same day.**

Late work   25% per day starting from 6:05pm for homeworks and 00:05 for programming assignments. No exceptions (only 4 of the 5 count towards the final grade). No emailing of late homework!

Tentative Course Calendar

Fall 2009				
Week	Wed	HW out	HW in	Comments
W1	9/ 2			
W2	9/ 9	HW1 out		
W3	9/16			
W4	9/23	HW2 out	HW1 in	
W5	9/30			HW1 returned
W6	10/ 7		HW2 in	
W7	10/14	HW3 out		HW2 returned
W8	10/21			
W9	10/28	HW4 out		
W10	11/ 4		HW3 in	
W11	11/11			HW3 returned
W12	11/18	HW5 out	HW4 in	
W13	11/25			No class
W14	12/2		HW5 in	HW4 returned
W15	12/9			HW5 returned

The following describes a tentative list of topics that is intended to be covered in class. The code Ti refers to a topic. A topic may spread over one or more lectures. The code ALi refers to the ACM Computing Curricula 2001 topic description code. In parentheses, we provide an approximate number of hours per topic. Hour coverage may change depending on demand and circumstances (eg. weather).

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AL3 : Fundamental Computing Algorithms   (15 hours)
AL8 : Advanced Algorithmic Analysis      (10 hours)
AL6 : Complexity                         ( 3 hours)
AL9 : Cryptographic Algorithms           ( 5 hours)
Al10: Geometric algorithms               ( 3 hours)
AL11: Parallel algorithms                ( 6 hours)
```

Topics to be covered

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T1 : AL3  : Representation of Polynomials, Polynomial evaluation with and without preprocessing.
            Lower bounds for polynomial evaluation. Exponentiation. Polynomial algorithms for multiplication (Karatsuba's Algorithm).
T2 : AL8  : Polynomial Interpolation and Convolution. DFT and FFT and FFT implementations. Applications to information hiding.
T3 :AL8/9 : Arithmetic algorithms (eg. Euclid's algorithm) and the bit model, solution of modular equations,
            Chinese Remainder Theorem, Power raising through repeated squaring, primality testing (Miller-Rabin algorithm),
            Pollard's rho method for integer factorization.  Public key cryptography and the RSA cryptosystem.
T4 : AL11 : Comparison networks, zero-one principle for sorting, bitonic and odd-even merge sort.
T5 : AL11 : The PRAM model for parallel computation. Parallel algorithms for arithmetic problems and sorting. Parallel prefix.
T6 : AL3  : Matrix operations, Strassen's algorithm for matrix multiplication, boolean matrix multiplication,
            solution of linear equations and matrix inversion. Complexity Results.
T7 : AL3  : Algorithms for string matching. Rabin-Karp. Knuth-Morris-Pratt. Boyer-Moore.
T8 : AL9  : Randomization and its application: Sorting, Selection and Number Theory
T9 : AL3  : Data Compression (Huffman coding).
T10: AL8  : A quick overview on hashing.
T11: AL6  : Complexity classes (P,NP,RP,BPP,ZPP)
T12: AL10 : Geometric Algorithms
T13: AL8  : Google's PageRank and Kleinberg's HITS algorithms; Inverted Indexes.
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Any modifications or deviations from the posted dates, will be done in consultation with the attending students and will be posted on the course Web-page. It is imperative that students check the Course Web-page regularly and frequently.

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Sep 2, 2009

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Course Syllabus: Course Policies

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Written Work   Handwritten or typed solutions must be readable, clear, concise and complete for the homeworks. DO NOT USE pencils to write down your solutions; if you decide to use a pencil do not complain about grading.

Programs   Code must be ANSI compliant and compile on the test platform/compiler, otherwise the assigned grade will be 0. Check relevant handout for more information on the programming assignments.

Grading   Written work will be graded for conciseness and correctness. Use formal arguments. Be brief and to the point. Label solutions with problem/subproblem number clearly. Programming problems will be graded based on test instances decided by the grader on a test platform (Windows PC or Unix machine) of his choice. Do not expect partial credit if your code fails to run on all test instances. Do not expect partial credit if your code does not compile.

Extension policies   Discussed on page 1. Note that 4 out of 5 homeworks only count.

Grade questions   Check the marks in a written work and report errors promptly. **Make sure you report such problems to the grader or the instructor within two weeks from receipt** but **no later than the Reading Day**. If you believe a grade you received for the solution of a problem is not representative of your effort talk to the grader first and then to the instructor (if different).

Final Grade   The final grade is decided based on the 0 to 1000 point performance with an adjustment made based on programming assignment performance. A student who collects at least 500 points should expect a passing grade. A student who collects at least 850 points will definitely get an A. The instructor reserves the right to push a student's grade up based on that student's quality of his/her effort and/or quality of homework solutions.

Collaboration   Students who turn in solutions (programming or otherwise) that are derived from solution outlines of past assignments/homeworks, were obtained through the Internet, or are a product of another student's work, risk severe punishment, as outlined by the University. The work you turn in MUST BE your own personal work, composed and written by you. If you talk a problem with a fellow student cite this clearly in your homework (name the fellow student before the solution of the problem in question). Your work will then be compared to the other student's work to verify that your solution was written by you and reflect your own personal effort. If you don't report it, it will be considered a violation of the course rules. You are not allowed to exchange code for the programming part of a homework.

Mobile Devices   Mobile phones/devices and/or laptops/notebooks MUST BE SWITCHED OFF during class or be made noise-free.

Email/SPAM   Send email from an NJIT email address. NJIT spam filters or us will filter other email address origins. Do not send course email to the instructor's email address unless there is a good reason (eg. you don't want the grader to read the email). Include `CS 667` in the subject line then. ∎.

The NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students. Read this handout carefully!