NJIT New Jersey's Science & Technology University

A. V. Gerbessiotis — CS 610-101

Sep 4, 2008 — Fall 2008

Course Information — Handout 1

Intensive study of the fundamentals of data structures and algorithms. Presents the definitions, representations, processing algorithms for data structures, general design and analysis techniques for algorithms. Covers a broad variety of data structures, algorithms and their applications including linked lists, various tree organizations, hash tables, strings, storage allocation, algorithms for searching and sorting, and a selected collection of other algorithms.

Contact Information

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Office Hours:	Mon, Wed 10:00-11:00am, and Mon 4:00-5:30pm		
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Assistant:	TBA on course web-page		
Class Hours:	Wed 6:00-9:05pm, Room GITC 1400		

Course Web Page: `http://www.cs.njit.edu/~alexg/courses/cs610/index.html`

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

Course Administration

Prerequisites CS 505 or CS 335, and completion of all bridge course requirements.

Textbook Algorithm Design: Foundations, analysis, and internet examples. M. T. Goodrich and R. Tamassia. Wiley, 2001, ISBN 0-471-38365-1. *We abbreviate in class this second edition as GT.*

CourseWork: **3 exams (including the final)**. A variety of programming-based homeworks.

Grading scheme: 1000 points = HW(167) + Ex1 (167) + Ex2 (333) + Ex3(333). If a student collects 167 or more programming points, 167 points will be added to the total; 166 or fewer programming points will be discarded.

HW1-4 4 or more assignments will be handed out. Each one is worth 90 points. Although two of them can be done in Java or C or C++, at least two of the remaining ones will require the use of just C or C++. Plan accordingly if you only know Java. Doing all of them is not a requirement; you only need about 167 points which can be collected from two such assignments.

Practice PS Four comprehensive problem sets PS1-4 will be periodically posted along with their solutions. Exam 1 will be based on these problem sets; the other two exams might also borrow ideas from them.

Exams Dates in Course Calendar. Exam 1 is closed-everything. The other two exams are open-textbook only; you can bring your own copy of the textbook but you may not borrow one during the exam. Exam1 is on **Oct 1**, 1hour, 167 points. Exam2 is on **Oct 22**, 2hours, 333 points. Exam3 is on **Dec 17**, 2hours, 333 points.

Due Dates Programs **MUST be received by email before 6pm** the day they are due; 45 points subtracted every 24-hour period starting 6pm on Wednesday. We strongly recommend that you use an NJIT email account to email your code; if you do not use one, do not complain about potential loss of emails (or NJIT's blocking of them).

Tentative Course Calendar

Fall 2008				
Week	Wed	PS with Solutions	HW	Comments
W1	9/3	PS1*	HW1out	
W2	9/10			
W3	9/17		HW2out	
W4	9/24	PS2*	HW1in	
W5	10/1	**Exam1**		
W6	10/8		HW3out	
W7	10/15		HW2in	
W8	10/22	**Exam2**		
W9	10/29		HW4out	
W10	11/5	PS3*	HW3in	
W11	11/12			
W12	11/19	PS4*	HW4in	
W-	11/26			No class;Friday Schedule
W13	12/3			
W14	12/10			
W15	12/17	**Exam3**		

* Problem Sets (PS) with solutions are not for credit.

The following describes a tentative list of topics that is intended to be covered in class with indicative chapter pointers to GT. The lecture summaries contain detailed correspondence to chapters of the textbook.

Topics to be covered

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T1 :Ch1,5.2     : Introduction (insertion-sort, fibonacci sequences),
                 Algorithm Analysis (Asymptotic Growth of functions, recurrences)
T2 :Ch1,4.1,5.2 : Algorithm Design Techniques (Incremental, Divide-and-Conquer)
                 Sorting(selection-sort,bubble-sort,merge-sort).
T3 :Ch2.1-2.3   : Elementary Data Structures and Trees. Tree traverals.
   Ch4.2         Union-find operations.
T4 :Ch2.4,9.3   : Heaps and Priority Queues. Greedy Algorithms and Huffman coding.
T5 :Ch4         : Quick sort. Complexity of sorting. Sorting in linear time
                 (radix-sort, bucket/count-sort). Selection.
T5 :Ch2.5-2.7   : Hashing.
T6 :Ch3         : Binary Search Trees and Balanced Binary Search trees.
                  m-way trees, 2-3-4 trees, B-trees.
T7 :Ch5         : Integer operations (addition and multiplication).
                 Matrix operations (addition and multiplication). Strassen's method.
                 Dynamic Programming and chained matrix multiplication.
T8 :Ch6         : Graphs and their representation. Graph traversals (DFS,BFS).
                 Strongly connected components. Topological sorting.
T9 :Ch7         : Weighted graph problems. Shortest-path problems (Dijkstra's).
                 All-pairs shortest paths and transitive closure (Floyd-Warshall).
                 Spanning trees (Prim's and Kruskal's algorithms).
T10:Ch9         :String and Pattern matching algorithms.
T11:Ch10        :Fundamental algorithms involving numbers. RSA.FFT.
T12:Ch13        :P and NP. NP-completeness.
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Any modifications or deviations from these 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.

Written Work Handwritten or typed solutions must be readable, clear, concise and complete. This applies to all written work, exam or otherwise. DO NOT USE pencils to write down your solutions; if you decide to use a pencil do not complain later about grading.

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. 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. 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; it most likely will be an AFS machine. Do not expect partial credit if your code fails to run on all test instances and you do not provide clear documentation of its bugs. Read Handout 2 for programming guidelines.

Extensions **No extension** will be granted for the programming assignments for any reason other than the one described in the Due Dates section.

Grades 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 and completes the minimum programming requirements should expect a passing grade (C or better). 900 points or more are usually required for an A including robust programming work.

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. **Collaboration of any kind is NOT allowed in the in-class exams**. Open-textbook refers to the textbook by Goodrich and Tamassia (GT). Students are not allowed to exchange textbooks, or anything else including erasers, pencils, calculators etc, during the exams.

Internet assistance **Posting of class material on the Internet is prohibited. Class material is protected under US copyright laws. If you post a programming assignment to certain sites (eg. Rent-a-coder) for assistance this constitutes a violation of copyright laws; THIS IS THE CASE EVEN IF you cut-and-paste the text of the assignment to avoid detection or punishment**.

Mobile Devices Mobile phones/devices and/or laptops/notebooks MUST BE SWITCHED OFF before the class exams. Switch off noisy devices (eg mobile phones) before you enter the classroom for a lecture.

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 610` 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!