COP 5536 Advanced Data Structures

Fall 2012

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Office: E309 Computer Science and Engineering Building

Tentative Class Schedule:

Week 1(Aug 22 - Aug 24) : Lecture 1 - Lecture 2	
Week 2 (Aug 27 – Sep 31) : Lecture 3 - Lecture 5	
Week 3 (Sep 3 – Sep 7) : Lecture 6 - Lecture 7	Holiday: Sep 3
Week 4 (Sep 10 - Sep 14) : Lecture 8 - Lecture 10	
Week 5 (Sep 17 - Sep 21) : Lecture 11 - Lecture 13	
Week 6 (Sep 24 - Sep 28) : Lecture 14 - Lecture 16	Exam 1: Sep 27
Week 7 (Oct 1 – Oct5) : Lecture 17 - Lecture 19	
Week 8 (Oct 8 - Oct 12) : Lecture 20 - Lecture 22	
Week 9 (Oct 15 - Oct 19) : Lecture 23 - Lecture 25	
Week 10 (Oct 22 - Oct 26) : Lecture 26 - Lecture 28	
Week 11 (Oct 29 – Nov 2) : Lecture 29 - Lecture 31	Exam 2
Week 12 (Nov 5 – Nov 9) : Lecture 32 - Lecture 33	Holiday: Nov 9
Week 13 (Nov 12 – Nov 16) : Lecture 34 - Lecture 35	Holiday: Nov 12
Week 14 (Nov 19 – Nov 23) : Lecture 36	Holiday: Nov 21-23
Week 15 (Nov 26 – Nov 30) : Lecture 37 - Lecture 39	
Week 16 (Dec 3 – Dec 5) : Lecture 40	Exam 3(TBA)

Pre-requisites:
You should know the following:

1. C, C++, or Java. Since the text is in C++, you should at least be able to read C++.
2. Algorithm analysis methods (in particular asymptotic complexity).
3. Basic data structures such as stacks, queues, linked lists, trees, and graphs. Basic sorting methods such as insertion sort, heap sort, merge sort, and quick sort.

Course Requirements:
There will be two assignments and 3 exams The exams will be closed book exams. The programming assignment(s) may be done in any high level language. Some possibilities are C, C++, and Java. Please have the use of any other language approved by the instructor or the TA. C++ is the preferred language.

Grading and Tentative Dates:
Assignment 1: 20% grade
Assignment 2: 5%
Exam 1 Sep 27 25%
Exam 2 TBA 25%
Exam 3 TBA 25%

Course Outline

The specific topics and associated readings are:

1. Amortized complexity (Web)
2. External sorting & tournament trees (Sections 7.10.1, 7.10.2, and 5.8)
3. Buffering (Section 7.10.3)
4. Run generation & optimal merge patterns (Huffman trees) (Sections 7.10.4 and 7.10.5)
5. Priority queues and merging (Section 5.6)
6. Leftist trees, Binomial heaps and Fibonacci heaps (Sections 9.2, 9.3, and 9.4)
7. Pairing heaps (Section 9.5)
8. Double ended priority queues (Sections 9.6 and 9.7, Web)
9. Static and dynamic weighted binary search trees (Section 10.1)
10. AVL-trees (Section 10.2)
11. Red-black trees (Section 10.3)
12. Splay trees (Section 10.4)
13. B-, B+- and B*-trees (Sections 11.1-11.3)
14. Tries and digital search trees (Sections 12.1-12.3)
15. Tries and packet forwarding (Section 12.5)
16. Suffix trees (Section 12.4)
17. Bloom filters (Section 8.4)
18. Segment trees (readings)
19. Interval trees
20. Priority search trees (readings)
21. k-d trees (readings)
22. Quad and oct trees (readings)
23. BSP trees
24. R-trees

Lecture	Content	Reading
1	Amortized complexity.	Web resource.
2	Amortized Complexity.	Web resource.
3	Introduction to external sorting.	Section 7.10.1.

4	Introduction to external sorting.	Section 7.10.1.
5	Selection trees & k-way merging.	Sections 5.8 and 7.10.2.
6	Run generation.	Section 7.10.4.
7	Optimal merging of runs.	Section 7.10.5.
8	Buffering.	Sections 7.10.3.
9	Double-ended priority queues. General methods.	Sections 9.6, 9.7, and Web resource.
10	Double-ended priority queues. Interval heaps.	Sections 9.7.
11	Leftist trees.	Section 9.2.
12	Binomial heaps.	Section 9.3.
13	Binomial heaps.	Section 9.3.
14	Fibonacci heaps.	Section 9.4.
15	Pairing heaps.	Section 9.5.
16	Dictionaries.	Section 5.7.
17	Optimal binary search trees.	Section 10.1.
18	AVL trees.	Section 10.2.
19	AVL trees	Section 10.2.
20	Red-black trees.	Section 10.3.
21	Red-black trees.	Section 10.3.
22	B-Trees.	Sections 11.1 and 11.2
23	B-trees.	Sections 11.1 and 11.2.
24	B+ and B*-trees.	Section 11.3.
25	Splay Trees.	Section 10.4.
26	Splay Trees.	Section 10.4.
27	Binary Tries.	Section 12.1.
28	Compressed Binary Tries.	Section 12.2.
29	High-order Tries.	Sections 12.3 and Web Resource.
30	Tries and Packet Forwarding.	Section 12.5.
31	Suffix Trees.	Section 12.4.
32	Bloom Filters.	Section 8.4.
33	Segment Trees.	
34	Interval Trees.	
35	Priority Search Trees.	References.
36	Priority Search Trees.	References.
37	Multidimensional Search Trees.	References.
38	Quad Trees.	References.
39	BSP Trees.	
40	R-trees.	

Course Policies:

1. Every student is expected to follow the University of Florida Honor Code. (See www.dso.ufl.edu/STG/default.html)
2. Handouts, assignments, solutions, and others will be posted on Sakai. Students should check Sakai regularly, at least once per week.
3. When submitting homework for grading, your answers should be written neatly and contain an explanation that is clear and reasonably concise.
4. For distance students, you will have a 7 day window following the in-class exam date to schedule and complete exam with their proctor.