CSCI 230 Topical Outline

Data Structures II

*Data Structures and Algorithm Analysis*

by C. Shaffer, Third Edition, Dover 2011

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| **Topics** | **Sections** | **Time** |
| Internal Sorting: O(n2) sorting algorithms (insertion, bubble, and selection), shell sort, O(n logn) sorting algorithms (quick sort, merge sort, and heap sort), special sorting algorithms (bin sort and radix sort), empirical comparison of sorting algorithms, lower bound for sorting | * 1. - 7.9 | 8 hours |
| File Processing and External Sorting: primary vs. secondary storage, disk drive architecture and disk access costs, buffers and buffer pools, programmer’s view of files, sequential access files vs. random access files, simple external sort, replacement selection, multiway merging | 8.1 - 8.8 | 7hours |
| Searching: sequential search and interpolation search, self-organizing lists, searching in sets, hashing, hash functions, open hashing, closed hashing, primary clustering and secondary clustering, linear probing, double hashing | 9.1 - 9.4 | 6 hours |
| Indexing: linear indexing, ISAM, tree indexing, 2-3 trees, B-trees, B+-trees, B-tree analysis | 10.1 - 10.5 | 4 hours |
| Graphs: terminology, applications, representations (adjacency matrix and adjacency list), graph implementations, graph traversals (depth first search and breadth first search), topological sort, shortest path problems, single-source shortest paths (Dijkstra’s algorithm), minimum-cost spanning trees, Prim’s algorithm, Kruskal’s algorithm, Skip list, all-pairs shortest paths (Floyd’s algorithm), | 11.1 - 11.5  16.1 -16.2 | 8 hours |
| Lists and Arrays: multi-list, matrix representations, memory management dynamic storage allocation, failure policies, and garbage collection | 12.1 - 12.3 | 2 hours |
| Analysis Techniques: summation techniques, recurrence relations, estimating upper and lower bounds, expanding recurrences, divide and conquer recurrences, amortized analysis | 14.1 - 14.3 | 3 hours |
| Lower bounds, adversarial lower bound proofs  Limits to Computation: reductions, hard problems, NP-completeness, impossible problems | 15.1, 15.4  17.1 - 17.3 | 3 hours |

Notes:

* 1 week: 3 lecture hours
* The above outline allows 1 week for review and exams, not counting holidays. Keep in mind that most holidays affect MW or MWF classes, so this timeline NOT the topical outline may need adjustment