Description: We are going to discuss algorithm complexity analysis, algorithm design technique (greedy methods, divide and conquer, dynamic programming) examples of efficient algorithms for various problems. We will discuss advanced data structure such as Hash Table, Binary Search tree, and graph algorithm.

Prerequisites: Computer Science II (COSC 220) and Discrete Mathematics (MATH 210), both completed with a grade of C or better.

Required Text: Data Structures with C++ using Stl, 2nd Edition

Mathematical Foundation for Analysis of Algorithms 2.0
Set Notation, Prove Methods (induction, contradiction, contra positive) Asymptotic Notations (Big-Θ, Big-O and Big-Ω, little-o, little-Ω̄ notations) Best-Case, Worst-Case, Average-Case Running Time

Sorting Algorithms and Analysis 2.0
Insertion Sort, Selection Sort, Bubble Sort, Shell Sort, Merge Sort, Heap Sort, Quick Sort, Radix Sort, Bucket Sort and Analysis of these Algorithms.

Selection Problems 1.0
Maximum, Minimum, MinMax, General Selection Problems

Advanced Data Structures 4.0
Binary Search Trees, various Balanced Binary Search Trees, Red-Black trees, Heap and Priority Queues, Disjoint Set Data Structures, Hashing and Analysis of Algorithms used these Data Structures.

Graph Algorithm 3.0
Representations of Graphs, Breadth-First Search, Depth-First Search, Minimum Spanning Tree, Shortest Path Algorithm, , Maximum Flow, and Analysis of theses Algorithms

NP-Completeness 1.0
Polynomial time, Polynomial time verification, NP-completeness and reducibility

Test 1.0
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14.0

EVALUATION
Tests & Final Exams: 70 %
Quiz, Lab, Programming: 30%

EAL/jlh 9/2013