Department of Computer Science
National University of Computer and Emerging Sciences
Lahore Campus

Course Name: Design and Analysis of Algorithms Level: Grad **U**

Taught in Semester: Spring Year: 2017

Textbook:

- *Introduction to Algorithms* by Cormen, Leiserson, Rivest, and Stein, 3rd Ed., MIT Press, 2001.

Reference Books:

- *Algorithms in C++* by Robert Sedgewick, Addison-Wesley, 1992.
- *Data Structures and Algorithms* by Aho, Hopcroft, and Ullman.
- *Computer Algorithms: Introduction to Design and Analysis* by Sara Baase, and Allen Van Gelder, 3rd Ed., Addison-Wesley, 2000.

Percentage Grade Distribution:

QUIZZES	**10**
MIDTERMS	**28**
FINAL	**50**
ASSIGNMENTS	**6**
HOMEWORKS	**6**

Course Contents

- Introduction to analysis of Algorithms,
  Asymptotic notation, Insertion Sort
  Worst Case Analysis of Insertion Sort using Theta Notation,
  Analysis of Merge Sort using Recursion Tree
  Θ, Ω, and O notations,
  O(n lg n) Algorithm for finding number of inversions
  Loop Invariant

- Quick sort
  -Partition routine,
  -dry run of example
  -proof of correctness of partition routine using loop invariant

-proof of correctness of Quicksort using induction
Quick sort Analysis

- Binary heap reviewed
  Analysis of Build Heap operation
  Heap Sort Analysis

- Count Sort
  Radix Sort

- B trees
  Structure (minimum and maximum degree)
  Analysis of worst case height
  Top down operations on search and its time analysis
  B Tree insertion
  B trees Deletion

- Greedy Algorithms (Activity Selection Problem)
  Greedy Algorithms (Fractional Knapsack)

- Dynamic Programming (0-1 Knapsack)
  Dynamic Programming (Longest Common Subsequence)

- Graph traversal algorithm
  Applications of DFS
  Topological sort

- Optimization problem - Minimal spanning tree
  Prim's algorithm and its time analysis
  Kruskal's algorithms and its time analysis

- Single source shortest path
  Dijkstra's algorithm Time analysis and limitations

- All Pairs shortest path algorithm
  Floyd Warshall Algorithm
  Time and space analysis