Design and Analysis of Algorithms (DAA)

What is DAA?

- DAA = Designing step-by-step solutions for problems + analyzing how efficient they are.
- It combines logical thinking + performance analysis.

Applications

- Google Search: Ranking pages (Graph + Greedy)
- GPS & Maps: Shortest paths (Dijkstra's Algorithm)
- File compression (Huffman Coding)
- AI Decision Making (Dynamic Programming)
- Core for technical interviews
- Vital for CPP competitions

Contents.

1. Time complexity, Introduction to algorithms, Insertion sort
2. Recursion(recursion tree, master theoreom, substitiute method)
3. Divide and Conquer(Merge and Quick sort)
4. Trees, Priority Queues and heaps
5. Graphs (Terminology, DFS, BFS)
6. Greedy algorithms (Dijkstra's, Kruskal's, Prim's Algorithm)
7. Data compression(Introduction, types, Huffman,Hu-Tucker, Shanon Fano Algorithms)
8. String Matching (naïve string matching algorithm, Rabin-Karp Algorithm, Finite automata)
9. Dynamic Programming(Knapsack problem, Matrix multiplication)

Course Information.

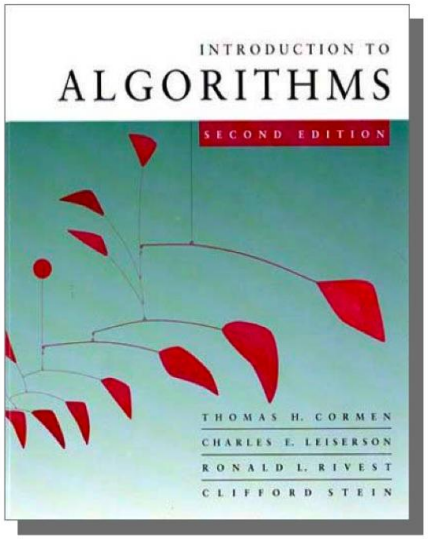
- Mid Terms (20%)- Time complexity, Recursion, Divide and Conquer algorithms
- In class Test(20%)- Greedy method and heaps and priority queues
- Final Examination (60%)- Dynamic Programming, String matching algorithms, heaps and priority queues,data compression algorithms
- No labs, No assignments

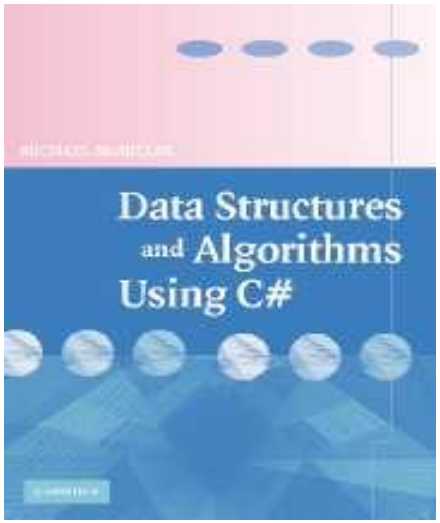
Resources

- **Introduction to Algorithms**

  by Cormen, Leiserson, Rivest and Stein (second edition)
- **Data Structures, Algorithms, and Applications in C++**

  by Sartaj Sahni
- **Youtube : Abdul Bari(understanding theory), William Fiset (visualization)**





Preparation

- Understanding of loops, arrays, functions, recursion, finite automata
- Revisit Time complexities from DSA
- Revisit Arrays, Queues Trees, Graphs from DM and DSA

Study Tips

- Understand the logic thoroughly
- No need to memorize the pseudo code.
- Practice problems, learn how to visualize the problems with a pen and paper
- **Always analyze the time complexity of each algorithm**
- If there are mathematical proving's learn how to prove them