

**H. N. G. University , Patan**  
**M.C.A – Semester - III**  
**MCA-33: Introduction to Algorithms**

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- Unit: 1** **[25%]**  
**Basic Concepts of Algorithms, Mathematical Aspects and Analysis of Algorithms**  
o Introduction – Algorithm- Basic Concepts of Flowchart– Notion of Algorithm – Fundamentals of Algorithmic Solving –Asymptotic Notations  
o Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization
- Unit: 2** **[25%]**  
**Searching and Sorting**  
o Searching :Linear Search and Binary Search.  
o Sorting: Bubble Sort, Quick Sort, Selection Sort, Heap Sort, Insertion Sort, Shell Sort, Merge Sort, Radix Sort
- Unit: 3** **[25%]**  
**Linear Data structures with applications:**  
Data types , ADT, data structure: Definition & classification  
o **Array data structure:** storage, mapping, applications (sparse matrix, polynomial representation, strings)  
o **List:** Introduction, implementation using array & linked list (singly, doubly, circular, multi-list), Applications: Polynomial representation, Sparse matrix  
o **Stack:** Introduction, implementation using array & linked list, Applications: Function call, Recursion, balancing of parenthesis, Polish Notation: infix to postfix conversion and evaluation of postfix expression  
o **Queue:** Introduction (queue, circular queue, deque, priority queue), implementation using array & linked list, Applications: Job Scheduling
- Unit: 4** **[25%]**  
**Non Linear data structures:**  
o **Tree:** Introduction and representation, Forest, Tree traversal, Binary Tree (representation using array and links): Binary tree traversal (recursive & non-recursive implementation)  
o **Graph:** Introduction, representations, Traversal(BFS, DFS), Applications: Shortest path (Single source-all destinations), Minimal spanning –Definitions only

**Text Books :-**

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.

**Reference Book :**

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2001
2. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis" Pearson Education Asia, 2003.
3. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis Of Computer Algorithms", Pearson Education Asia, 2003.
4. An Introduction to Data Structures with Application By Tremblay & Sorenson McGraw-Hill 1984
5. Data Structure using C and C++ By Tenenbaum, Prentice Hall India. 2nd Edition 1997. Sorting and Sort Systems By H. Lorin Addison-wesley 1975
6. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 1998.
7. Aho, J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson education Asia, 1983.