



Indian Institute of Technology Delhi

Department of Mathematics

I Semester 2010-2011

MAL 609 Basic Computer Science

Instructor: Dr. B. S. Panda

Contacts: MZ 194, Phone: 1448, e-mail: bspanda@maths.iitd.ernet.in

Homepage: <http://web.iitd.ac.in/~bspanda/bcshomepage.html>

Course Handout

Dt. 26.7.2010

1. **Course Outline:** Introduction to Algorithms: Definition, Pseudo code; Concepts of Analysis of Algorithms: Time complexity, space complexity, worst-case, average-case, big Oh and other notations; Recursion and recurrence relation; Introduction to basic data structures: Stack, Queue, Linked list structures, Application of Stacks, Application of Linked list, Role of data structures in efficiency of algorithm; Introduction to Trees and Graphs, Binary Tree, Tree Traversal, Application of binary trees, Height balanced trees, heap, Sorting and searching algorithms; Algorithm design techniques: Greedy, Divide and Conquer, Dynamic programming, Backtracking and Branch and Bound.
2. **Course Objectives:** The objectives of the course are:
 - To continue developing a disciplined approach to the design, coding, and testing of programs written in a high-level language.
 - To introduce basic data structures other than those normally provided as basic types in programming languages; for example, linked lists, stacks, queues, and trees.
 - To provide an understanding of the different implementations of these data structures.
 - To introduce the analysis of algorithm and role of data structures in algorithm analysis
 - To introduce searching and sorting algorithms and their analysis.
 - To introduce various algorithm design paradigms; for example, Greedy, Divide and Conquer, Dynamic Programming etc.
3. **Books:**
 - **Y. Langsam, M. Augenstein, and A. Tanenbaum**, Data Structures Using C and C++, second Edition, PHI, 2001.
 - **Aho, Hopcroft, and Ullman**, Data Structures and Algorithms, AWL, 1987.
 - Kernighan and Ritchie, The C programming Language, Second Edition, PHI, 2001.

4 Lecture outline with topics and no. of lectures

Topics	No. of lectures
<ul style="list-style-type: none">• Introduction to big Oh and other notations• Running time of an Algorithm• Recursive procedures and Recurrence relations	6
<ul style="list-style-type: none">• Data types, ADT and Data Structures• Linked list	3
<ul style="list-style-type: none">• Stack and its Application	4
<ul style="list-style-type: none">• Queue and its Application	4
Trees: <ul style="list-style-type: none">• Binary trees and their properties• BST• Heap• Tree Traversal• Height Balance tree (AVL Tree)	10
Sorting and Searching	5
Graphs and Their applications	6
Introduction to Algorithm Design Techniques	4

Total: 42 Lectures

5. Evaluation Scheme:

SN	Component	Weightage
1	Assignment-I	10%
2	Minor-I	20%
3	Assignment II	10%
4	Minor-II	20%
5	Major	40%

(Dr. B.S. Panda)