Lectures for the course: Foundations of Computing Systems (IT60101)

Week 1

Lecture 1 – 21/07/2005

- Introduction to the course
- Background knowledge of students
- Planned topics

Week 2

Lecture 2 – 25/07/2005

- Insertion Sort
- Loop Invariant

Lecture 3 (A+B) – 26/07/2005

- Time Complexity Analysis of Insertion Sort
- Selection Sort and Bubble Sort
- Assignments given on Time Invariant Definition of Selection Sort and Bubble Sort – due on 01/08/2005
- Assignments given on Implementation of Selection Sort and Bubble Sort on various data sets – due on 08/08/2005

Week 3

Lecture 4 (A+B) – 02/08/2005

- General Divide and Conquer technique
- Merge Sort
- Recurrence relation of Merge Sort
- Recurrence Tree construction
- Loop invariant in Merge Sort
- Growth of functions
- Theta Notation
- Time Complexity of algorithms in Theta Notations
- Assignment on Merge Sort given. Due date August 12th

Week 4
Lecture 5 (A+B) – 09/08/2005

• Time Complexity of algorithms in O and Ω Notations
• O and ω notations
• Reflexive, Transitive and Symmetric properties of the sets of functions in O, θ and Ω.

Week 5

Lecture 6 (A+B) – 16/08/2005

• Recurrence relations and methods of solving recurrences
• Substitution Method
• Recursion-Tree Method
• Master Theorem-based method

Week 6

Lecture 7 (A+B) – 23/08/2005

• Data Structures
• Stacks, Queues, Linked Lists
• Linked Structure representation of Binary Trees and k-ary trees

Week 7

Lecture 8 (A+B) – 30/08/2005

• Graphs – Basic Definitions
• Paths, Circuits and Cycles
• Tree
• Ordered Tree
• Binary Tree

Week 8

Lecture 9 (A+B) – 06/09/2005

• Full Binary Tree and Complete Binary Tree
• Heap
• MAX HEAP and MIN HEAP
• HEAPIFY Algorithm
• Build Heap Algorithm
• Heapsort
• Assignment on heapsort given

Week 9

Lecture 10 (A+B) – 13/09/2005

• Quicksort
• Counting Sort
• Assignment on Quicksort and Counting Sort given

Week 10

Lecture 11 (A+B) – 27/09/2005

• Radix Sort
• Binary Search Trees
• In-order, Pre-order and Post-order traversals
• Finding Min and Max
• Successors and Predecessors

Week 11

Lecture 12 (A+B) – 04/10/2005

• BST – Insert and Delete
• Graph Algorithms - BFS

Week 12

Lecture 13 (A+B) – 18/10/2005

• DFS
• Minimum Spanning Tree
• Kruskal’s Algorithm
• Prim’s Algorithm

Week 13

Lecture 14 (A+B) – 25/10/2005

• Shortest Paths
• Bellman-Ford Algorithm
• Dijkstra’s Algorithm
Class Test 2 was held on 07/11/2005

Week 14

Lecture 15 (A+B) – 08/11/2005

- Introduction to Dynamic Programming
- Basic definitions – P, NP and NP-complete
- Class test 2 scripts were shown
- Summary and feedback