



SCHEME AND SYLLABUS - B.E. COMPUTER ENGINEERING

Principles of Counting: Principles of inclusion-exclusion, Pigeon hole principle, Permutations, Combinations.

Mathematical induction: proof by induction, Groups & rings, Recursion, Recurrence relation, Characteristic Polynomial. Generating Functions.

Logic: Propositional Logic, Logical Inference, First order logic, applications

Graphs: Graph isomorphism, Paths and Cycles, Graph coloring, Critical Path, Eulerian paths and circuits, Hamiltonian paths and circuits, Bipartite Graphs, Digraphs, Multigraphs.

Probability: Overview of probability theory, Discrete distributions.

SUGGESTED READINGS

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", TMH.
2. C.L. Liu, "Elements of Discrete Mathematics", TMH.
3. Kolman, Busby & Ross, "Discrete Mathematical Structures", PHI.
4. Narsingh Deo, "Graph Theory With Application to Engineering and Computer Science", PHI.
5. Charles S. Grimmstead, J. Laurie Snell "Introduction to Probability".
6. Kai Lai Chung, "A Course in probability theory".

| Course Code | Type | Subject | L | T | P | Credits | CA | MS | ES | CA | ES | Pre-requisites |
|-------------|------|-----------------|---|---|---|---------|----|----|----|----|----|----------------|
| CEC02 | CC | Data Structures | 3 | 0 | 2 | 4 | 15 | 15 | 40 | 15 | 15 | None |

COURSE OUTCOMES

1. Candidate will be able to choose the appropriate data structure for a specified problem and determine the same in different scenarios of real world problems.
2. Become familiar with writing recursive methods and reducing larger problems recursively in smaller problems with applications to practical problems.
3. Be able to understand the abstract properties of various data structures such as



SCHEME AND SYLLABUS - B.E. COMPUTER ENGINEERING

- stacks, queues, lists, trees and graphs and apply the same to real life problems of sorting, searching, traversals for skill enhancement in problem solving.
4. Be able to implement various data structures in more than one manner with the advantages and disadvantages of the different implementations for energy efficient by using efficient representation of problems.

COURSE CONTENT

Introduction: Basic Terminology: Elementary Data Organization, Data Structure Operations, Algorithms Complexity and Time-Space Trade off.

Arrays: Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing, Insertion And Deletion in Array, Single Dimensional Arrays, Two Dimensional Arrays, Bubble Sorting, Selection Sorting, Linear Search, Binary Search, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array.

Stacks and Queues: Introduction to Operations Associated with Stacks Push & Pop, Array representation of stacks, Operation associated with stacks: Create, Add, Delete, Application of stacks recursion polish expression and their compilation conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem, Representation of Queues, Operations of queues: Create, Add, Delete, Front, Empty, Priority Queues and Heaps, Dequeue.

Recursion: Recursive thinking, Recursive Definition of Mathematical Formulae, Recursive Array Search, Recursive Data Structure, Problem Solving With Recursion, Back Tracking

Linked Lists: More operations on linked list, polynomial addition, Header nodes, doubly linked list, generalized list, circular linked lists.

Trees: Trees – mathematical properties, Binary Search Trees and their representation, expression evaluation, Complete Binary trees, Extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, Complexity of searching algorithm, Path length, Huffman's algorithm, General trees, AVL trees, Threaded trees, B trees, Trie data structure

Sorting: Insertion Sort, Quick sort, two-way Merge sort, Heap sort, sorting on different keys, External sorting.

Graphs: Sequential representation of graphs, Adjacency matrices, Search and Traversal of graphs: Depth first, breadth first, topological sort.



SCHEME AND SYLLABUS - B.E. COMPUTER ENGINEERING

Outline of Practical Work:

- Programs based on sorting and searching, implementing stacks, queues , simple calculator using postfix expression, command line calculator changing infix to postfix, implementation of linked lists - a simple editor program, traversal of binary trees , binary search tree creation, insertion, deletion, traversal sorting. AVL tree creation and rotations, Traversal of graphs using BFS and DFS , implementation of topological sorting. Templates and Containers
Survey of new data structures.

1. Nell B Dale, "C++ data structures", ISBN-10: 1449646751, 5-th edition.
2. Freetextbooks.com. Algorithms and data structures.
Available : <http://www.fretechbooks.com/algorithms-and-data-structures-f11.html>
3. Robert Lafore, "Data structures in Java".