BCSE202L Data Structures and Algorithms L T P C 3 0 0 3
Pre-requisite NIL Syllabus version
1.0
Course Objectives
1. To impart basic concepts of data structures and algorithms.
2. To differentiate linear, non-linear data structures and their operations.
3. To comprehend the necessity of time complexity in algorithms.
Course Outcomes
On completion of this course, students should be able to:
1. Understand the fundamental analysis and time complexity for a given problem.
2. Articulate linear, non-linear data structures and legal operations permitted on them.
3. Identify and apply suitable algorithms for searching and sorting.
4. Discover various tree and graph traversals.
5. Explicate hashing, heaps and AVL trees and realize their applications.
Module:1 Algorithm Analysis 8 hours
Importance of algorithms and data structures - Fundamentals of algorithm analysis: Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth - Algorithm efficiency – best case, worst case, average case - Analysis of non-recursive and recursive algorithms - Asymptotic analysis for recurrence relation: Iteration Method, Substitution Method, Master Method and Recursive Tree Method.
Module:2 Linear Data Structures 7 hours
Arrays: 1D and 2D array- Stack - Applications of stack: Expression Evaluation, Conversion of Infix to postfix and prefix expression, Tower of Hanoi – Queue - Types of Queue: Circular Queue, Double Ended Queue (deQueue) - Applications – List: Singly linked lists, Doubly linked lists, Circular linked lists- Applications: Polynomial Manipulation.
Module:3 Searching and Sorting 7 hours
Searching: Linear Search and binary search – Applications.
Sorting: Insertion sort, Selection sort, Bubble sort, Counting sort, Quick sort, Merge sort - Analysis of sorting algorithms.
Module:4 Trees 6 hours
Introduction - Binary Tree: Definition and Properties - Tree Traversals- Expression Trees:- Binary Search Trees - Operations in BST: insertion, deletion, finding min and max, finding the k_{th} minimum element.
Module:5 Graphs 6 hours
Terminology – Representation of Graph – Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS) - Minimum Spanning Tree: Prim's, Kruskal's - Single Source Shortest Path: Dijkstra’s Algorithm.
Module:6 Hashing 4 hours
Hash functions - Separate chaining - Open hashing: Linear probing, Quadratic probing, Double hashing - Closed hashing - Random probing – Rehashing - Extendible hashing.
Module:7 Heaps and AVL Trees 5 hours
Heaps - Heap sort- Applications -Priority Queue using Heaps. AVL trees: Terminology, basic operations (rotation, insertion and deletion).
Module:8 Contemporary Issues 2 hours
Total Lecture hours: 45 hours
Text Book
1. Mark A. Weiss, Data Structures & Algorithm Analysis in C++, 4_{th} Edition, 2013, Pearson Education.
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Reference Books
1. Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, Data Structures and Algorithms, 1983, Pearson Education.

2. Horowitz, Sahni and S. Anderson-Freed, Fundamentals of Data Structures in C, 2008, 2nd Edition, Universities Press.
3. Thomas H. Cormen, C.E. Leiserson, R L. Rivest and C. Stein, Introduction to Algorithms, 2009, 3rd Edition, MIT Press.
Mode of Evaluation: CAT, Assignment, Quiz and FAT
Recommended by Board of Studies 04-03-2022
Approved by Academic Council No. 65 Date 17-03-2022

BCSE202P Data Structures and Algorithms Lab L T P C 0 0 2 1
Pre-requisite NIL Syllabus version
1.0
Course Objectives
1. To impart basic concepts of data structures and algorithms.
2. To differentiate linear, non-linear data structures and their operations.
3. To comprehend the necessity of time complexity in algorithms.
Course Outcomes
On completion of this course, students should be able to:
1. Apply appropriate data structures to find solutions to practical problems.
2. Identify suitable algorithms for solving the given problems.
Indicative Experiments
1. Implementation of stack data structure and its applications
2. Implementation of queue data structure and its applications
3. Implementation linked list and its application
4. Implementation of searching algorithms
5. Implementation of sorting algorithms
6. Binary Tree Traversal implementation
7. Binary Search Tree implementation
8. Graph Traversal – Depth First Search and Breadth First Search algorithm
9. Minimum Spanning Tree – Prim's and Kruskal's algorithm
10. Single Source Shortest Path Algorithm - Dijkstra's algorithm
Total Laboratory Hours 30 hours
Text Book
1. Mark A. Weiss, Data Structures & Algorithm Analysis in C++, 2013, 4th Edition, Pearson.
Reference Books
1. Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, Data Structures and Algorithms, 1983, Pearson Education.
2. Horowitz, Sahni and S. Anderson-Freed, Fundamentals of Data Structures in C, 2008, 2nd Edition, Universities Press.
3. Thomas H. Cormen, C.E. Leiserson, R L. Rivest and C. Stein, Introduction to Algorithms, 2009, 3rd Edition, MIT Press.
Mode of assessment: Continuous assessments and FAT.
Recommended by Board of Studies 04-03-2022
Approved by Academic Council No. 65 Date 17-03-2022