Computer Science Paper-I
Data Structures and Algorithms-I
[CORE COURSE]

Semester – III	Credits: 2	Subject Code: BS32101	Lectures: 36

Course Outcomes:

At the end of this course, the learner will be able to:

- Illustrate different methods of organizing the large amount of data.
- Summarize well-organized data structures in solving various problems.
- Compare and contrast the usage of various data structures in problem solving.
- Demonstrate algorithms to solve problems using appropriate data structures.

Unit 1: Introduction to Data Structures and Algorithm Analysis	**4**

• Introduction
  ○ Need of Data Structure
  ○ Definitions -Data and information, Data type, Data object, ADT, Data Structure
  ○ Types of Data Structures
• Algorithm analysis
  ○ Space and time complexity, Graphical understanding of the relation between different functions of n, examples of linear loop, logarithmic, quadratic loop etc.
  ○ Best, Worst, Average case analysis, Asymptotic notations(Big O, Omega Ω, Theta Θ), Problems on time complexity calculation	

Unit 2: Array as a Data Structure	**10**

• ADT of an array, Operations
• Array applications -Searching
  ○ Sequential search, variations -Sentinel search, Probability search, ordered list search
  ○ Binary Search
  ○ Comparison of searching methods
• Sorting Terminology-Internal, External, Stable, In-place Sorting
  ○ Comparison Based Sorting-Lower bound on comparison based sorting, Methods-Bubble Sort, Insertion Sort, Selection Sort, Algorithm design strategies -Divide and Conquer strategy, Merge Sort, Quick Sort, complexity analysis of sorting methods.
  ○ Non Comparison Based Sorting: Counting Sort, Radix Sort, complexity analysis.
  ○ Comparison of sorting methods	

Unit 3: Linked List	**10**
• Introduction • Dynamic implementation of Linked List	

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• Types of Linked List –Singly, Doubly, Circular	

• Operations on Linked List -create, traverse, insert, delete, search, sort, reverse, concatenate, merge, time complexity of operations. • Applications of Linked List –polynomial representation, Addition of two polynomials • Generalized linked list –concept, representation, multiple-variable polynomial representation using generalized list.	

Unit 4: Stack	**6**
• Introduction • Operations –init(), push(), pop(), isEmpty(), isFull(), peek(), time complexity of operations. • Implementation-Static and Dynamic with comparison • Applications of stack • Function call and recursion, String reversal, palindrome checking • Expression types -infix, prefix and postfix, expression conversion and evaluation(implementation of infix to postfix, evaluation of postfix)	

Unit 5: Queue	**6**
• Introduction • Operations -init(), enqueue(), dequeue(), isEmpty(), isFull(), peek(),time complexity of operations, differences with stack. • Implementation-Static and Dynamic with comparison • Types of Queue-Linear Queue, Circular Queue(with implementation), Priority Queue, Double Ended Queue • Applications of Queue	

***Contact Hours:12**

Recommended Books:	
• DebasisS.(2009).*Classic Data Structures*. Prentice Hall India Pvt. Ltd. • Horowitz E., SahniS.,Anderson-Freed s. (2008).*Fundamentals of Data Structures in C* . Universities Press. • KamthaneA.N.(2009). *Introduction to Data Structures in C*.Pearson Education. • Wirth N. (1976).*Algorithms and Data Structures.* Pearson Education.	

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