



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

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

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

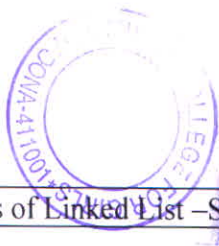
- Illustrate different methods of organizing the large amount of data.
- Summarize well-organized data structures in solving various problems.
- Compare and contrast the usage of various data structures in problem solving.
- Demonstrate algorithms to solve problems using appropriate data structures.

Unit 1: Introduction to Data Structures and Algorithm Analysis	4
<ul style="list-style-type: none"> ● Introduction <ul style="list-style-type: none"> ○ Need of Data Structure ○ Definitions -Data and information, Data type, Data object, ADT, Data Structure ○ Types of Data Structures ● Algorithm analysis <ul style="list-style-type: none"> ○ 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
<ul style="list-style-type: none"> ● ADT of an array, Operations ● Array applications -Searching <ul style="list-style-type: none"> ○ Sequential search, variations -Sentinel search, Probability search, ordered list search ○ Binary Search ○ Comparison of searching methods ● Sorting Terminology-Internal, External, Stable, In-place Sorting <ul style="list-style-type: none"> ○ 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
<ul style="list-style-type: none"> ● Introduction ● Dynamic implementation of Linked List 	

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● Types of Linked List –Singly, Doubly, Circular	
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<ul style="list-style-type: none"> ● 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. 	
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Unit 4: Stack	6
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<ul style="list-style-type: none"> ● 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) 	
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Unit 5: Queue	6
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<ul style="list-style-type: none"> ● 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 	
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***Contact Hours:12**

Recommended Books:	
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<ul style="list-style-type: none"> ● DebasisS.(2009).<i>Classic Data Structures</i>. Prentice Hall India Pvt. Ltd. ● Horowitz E., SahniS.,Anderson-Freed s. (2008).<i>Fundamentals of Data Structures in C</i> . Universities Press. ● KamthaneA.N.(2009). <i>Introduction to Data Structures in C</i>.Pearson Education. ● Wirth N. (1976).<i>Algorithms and Data Structures</i>. Pearson Education. 	
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