



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

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

Course Outcomes:

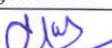
At the end of this course, the learner will be able to:

- 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
<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 	

Board Of Studies	Name	Signature
Chairman (HoD)	Ms. Ashwini Kulkarni	



● Types of <u>Linked List</u> –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
----------------------	----------

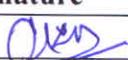
● Introduction ● Operations -init(), enqueue(), dequeue(), isEmpty(), isFull(), peek(), time complexity of operations, differences with stack. ● Implementation-Static and Dynamic with comparison ● Types of Queue-Linear Queue, Circular Queue(with implementation), Priority Queue, Double Ended Queue ● Applications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

***Contact Hours:12**

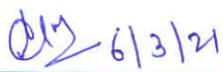
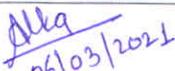
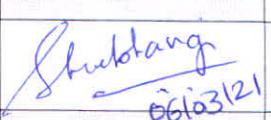
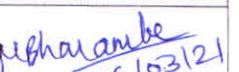
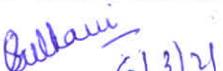
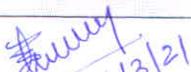
Recommended Books:	
---------------------------	--

● DebasisS.(2009). <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.	
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

Board Of Studies	Name	Signature
-------------------------	-------------	------------------

Chairman (HoD)	Ms. Ashwini Kulkarni	
----------------	----------------------	---------------------------------------------------------------------------------------



Board Of Studies	Name	Signature(In white cell)
Chairman (HoD)	Ms. Ashwini Kulkarni	 6/3/21
Faculty	Ms. Alka Kalhapure	 06/03/2021
Faculty	Ms. Shubhangi Jagtap	 06/03/21
Subject Expert (Outside SPPU)	Dr. Manisha Divate	 06/03/21
Subject Expert (Outside SPPU)	Mr. Aniket Nagane	 6/3/21
VC Nominee (SPPU)	Dr. Manisha Bharambe	 06/03/21
Industry Expert	Ms. Snehal Biyala	 6/3/21
Alumni	Ms. Mamta Choudhary	 6/3/21

Board Of Studies	Name	Signature
Chairman (HoD)	Ms. Ashwini Kulkarni	 6/3/21