



B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19

Autonomous Institute, Affiliated to VTU
DEPARTMENT OF CSE (Data Science)

Semester	III		
Course Title:	Data Structures		
Course Code:	23DC3PCDSC	Total Contact Hours: 40 hours	
L-T-P:	3-0-1	Total Credits:	4

Unit No.	Topics	Hours
1	Introduction To Data Structure: Data Management concepts, Data types – primitive and non-primitive, Types of Data Structures- Linear & Non-Linear Data Structures. Structures and pointers Dynamic memory allocation: allocating a block of memory: Malloc, allocating multiple blocks of memory: Calloc, Releasing the used space: Free Altering the size of memory: Realloc.	8
2	Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list, circularly linked lists- insertion, deletion and searching operations for circularly linked lists, <u>doubly linked list</u> implementation, insertion, deletion and searching operations, <u>maintaining directory of names</u> , <u>Manipulation of polynomials (addition)</u> , <u>representing sparse matrices</u> .	8
3	Stacks: Operations, array representations of stacks, stack applications - infix to postfix conversion, <u>postfix expression evaluation</u> , and <u>function call tracing</u> , <u>recursion</u> . Queues: Introduction, Basic concept, linear queue operations, circular queue, priority queues, double ended queues. Applications of Queues. Stack and queue implementation using linked lists	8
4	Trees: Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, binary tree implementation, Binary Search Tree operations and its implementation, applications of trees.	8
5	Balanced Trees: AVL Trees, Splay trees, Red- Black Trees – Definitions, Rotation and other basic operations.	8



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Prescribed Text Book					
Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Data Structures in C	Horowitz, Sahni, Anderson Freed	Second	Universities Press	2008
2.	Data Structures using C	Reema Thareja	Second	Oxford University press	2014
Reference Text Book					
Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures using C	Aaron M. Tenenbaum, Yedidiah Langsam, Moshe J. Augenstein	Fifth	Pearson Education	2007
2	Data Structures - A Pseudocode Approach with C	Richard F. Gilberg Behrouz A. Forouzan	First	Cengage Learning	2005

E-Book						
Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1.	Data Structures using C	E. Balaguruswamy		McGraw Hill	2013	https://dokumen.pub/data-structures-using-c-9781259029547-1259029549.html
2.	Data structures and program design in C	Robert L. Kruse, Clovis L. Tondo, Bruce P. Leung	Second	Prentice Hal	1997	https://cdn.preterhuman.net/texts/math/Data_Structure_And_Algorithms/Data%20Structures%20and%20Program%20Design%20in%20C++%20-%20Robert%20L.%20Kruse.pdf

MOOC Courses				
Sl. No.	Course name	Course Offered By	Year	URL
1	Data Structures	Coursera	2023	https://www.coursera.org/learn/data-structures
2	Data Structures and Algorithms	NPTEL	2023	https://nptel.ac.in/courses/106102064/



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Course Outcomes

At the end of the course the student will be able to

CO1	Apply the concept of linear and nonlinear data structures for computing problems.
CO2	Analyse the appropriate data structure operations for a given problem
CO3	Design and develop solutions using the linear and nonlinear data structure for a given specification.
CO4	Conduct experiments for demonstrating the operations of different data structures.

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		3										
CO3			3									
CO4			3		3					1		

Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	No. of Assessments	Marks
Internals	2	20
QUIZ/AAT	1	5
Lab Component	CIE+ Two Lab Tests	25
Total		50

Laboratory Plan

Instructions to Students to be followed in each lab:

1. Each Student should write down the program in the observation book and get it evaluated by the respective lab faculty in-charge and then execute the program.
2. Each Student should bring the lab record with the programs and output written for the programs completed in their respective previous week and get it evaluated by the lab faculty in-charge. In the record book students should - Handwrite the Program - Pasting of the printout of the Output or Handwriting of the Output (Output should be written for all the cases).



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3. Students have to practice following list of programs and additional programming exercises will also be given in lab. Students will be made to solve coding challenges on programming platforms like LeetCode and HackerRank.

Lab Program	Unit#	Program Details
1	2	Write a program to implement Singly Linked List with following operations a) Create a linked list. b) Insertion of a node at first position, at any position and at end of list. c) Display the contents of the linked list.
2	2	Write a program to Implement Singly Linked List with following operations a) Create a linked list. b) Deletion of first element, specified element and last element in the list. c) Display the contents of the linked list.
3	2	Write a program to Implement Singly Linked List with following operations a) Sort the linked list. b) Reverse the linked list. c) Concatenation of two linked lists
4	2	Write a program to Implement doubly linked list with primitive operations a) Create a doubly linked list. b) Insert a new node to the left of the node. c) Delete the node based on a specific value d) Display the contents of the list
5	3	Write a program to simulate the working of stack using an array with the following: a) Push b) Pop c) Display The program should print appropriate messages for stack overflow, stack underflow
6	3	Write a program to convert a given valid parenthesized infix arithmetic expression to postfix expression. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide)
7	3	Write a program to simulate the working of a queue of integers using an array. Provide the following operations a) Insert b) Delete c) Display The program should print appropriate messages for queue empty and queue overflow conditions
8	3	Write a program to simulate the working of a circular queue of integers using an array. Provide the following operations. a) Insert b) Delete c) Display The program should print appropriate messages for queue empty and queue overflow conditions



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9	3	Write a program to implement Stack & Queues using Linked Representation
10	4	Write a program a) To construct a binary Search tree. b) To traverse the tree using all the methods i.e., in-order, preorder and post order c) To display the elements in the tree.
11	4	Write a program a) To construct a binary search tree b) To implement iterative inorder traversal c) To delete a given element
12	5	Write a program to construct an AVL tree of integers

SEE Question paper format

Unit-1	Mandatory	One Question to be asked for 20 Marks
Unit-2	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-3	Mandatory	One Question to be asked for 20 Marks
Unit-4	Internal Choice	Two Questions to be asked for 20 Marks each
Unit-5	Mandatory	One Question to be asked for 20 Marks