20IT3303- DATA STRUCTURES

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	20ES1103- Programming for Problem Solving	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Understand various techniques for searching, sorting and hashing													
	CO2	Demonstratethe operations on linear data structures like stack, queue and linked list.													
	CO3	Analyzevarious operations on nonlinear data structures – binary tree, binary search tree, AVL and B-trees.													
	CO4	Apply data structures to solve real-time problems efficiently													

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1	M												M	L
	CO2	M	M	M										L	L
	CO3		M	M										L	L
	CO4		H	H									M	H	M

Course Content	**UNIT I** **Basic Concepts**: Overview: System life cycle. Algorithm Specification, Data Abstraction, Performance Analysis, The Abstract Data Type. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis. **Sorting:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Performance and Comparison among all the methods. **Stacks:**Stacks, Evaluation of expressions: Infix to Postfix, Evaluating postfix expressions
	UNIT II **Queues:** ADT queue, Types of Queue: Simple Queue, Circular Queue using Dynamic Arrays, Applications of queues. **Linked Lists:** Single linked list and Chains, Linked Stacks and Queues, Doubly Linked List

	Polynomials: Polynomial representation, adding polynomials, Circular List representation of polynomials
	UNIT III **Introduction to Binary Trees:** Basic Tree Terminologies, Properties of binary trees, binary tree representations. Binary Tree Traversals: In order, Preorder, Post order, level order traversal. **Binary Search Trees:** Definition, searching a Binary Search Trees (BST), Insertion into a binary search tree, Deletion from a binary search tree. **Efficient Binary Search Trees:** AVL trees- definition, rotations, insertion.
	UNIT IV **Efficient Multi Search Trees:** Introduction to m-way Search Trees, B Trees-insertion in to a B tree, deletion from a B tree. **Heaps:** Priority queues, Definition of max heap, insertion into a max heap, deletion from a max heap, Heap Sort. **Hashing:** General idea, Hash Functions, separate chaining, open addressing, rehashing, extendable hashing.
Text books and Reference books	**Text Book(s):** [1]. Horowitz Sahni and Anderson-Freed, "Fundamentals of Data Structures in C", 2nd edition, Universities Press, 2011. [2]. Mark Allen Weiss, "Data structure and Algorithm Analysis in C", 2nd edition, Addison Wesley Publication, 2010. **Reference Books:** [1]. YedidyahLangsam, Moshe J. Augenstein and Aaron M. Tenenbaum, "Data Structures using C and C++", 2nd edition, Pearson Education, 1999. [2]. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", 2nd edition, McGraw Hill, 2008.
E-resources and other digital material	[1]. SudarshanIyengar: IIT Ropar, Data Structures and Algorithms, [NPTEL], (26, May, 2021) Available: http://nptel.ac.in/ [2]. Erik Demaine, Advanced Data Structures [MIT- OpenCourseWare], (26, May, 2021) Available: http://ocw.mit.edu/