CE245: DATA STRUCTURE AND ALGORITHMS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	
Marks	100	50	-	150	4

Pre-requisite courses:

- Programming Language

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Data Structure.	04
2.	Linear Data Structure	12
3.	Non Linear Data Structure	16
4.	Sorting	10
5.	Searching	01
6.	Dictionaries	02
	Total hours (Theory) :	45
	Total hours (Lab) :	30
	Total hours :	75

Detailed Syllabus:

1.	Introduction	04 Hours	08%
	Introduction to data structure (Types of data structure), Introduction to algorithms. Algorithm Analysis and Big O notation, Memory representation of Array: Row Order and Column Order, Abstract Data Types(ADT)		
2.	Linear Data Structure	12 Hours	27%
	Stack: Operations: push, pop, peep, change, Applications of Stack: Recursion: Recursive Function Tracing, Principles of recursion, Tail recursion, Removal of Recursion, Tower of Hanoi, Conversion: Infix to Postfix, Infix to Prefix. Evaluation: Prefix and Postfix expression,		

	Queue Simple Queue: Insert and Delete operation, Circular Queue: Insert and Delete operation, Concepts of: Priority Queue, Double-ended Queue, Applications of Queue, **Linked List:** Memory Representation of LL, Singly Linked List, Doubly Linked List ,Circular Linked List ,Applications of Linked List		
3.	**Non Linear Data Structure**	16 Hours	36%
	Tree: Tree Concepts, Tree Traversal Techniques: Pre-order, Post-order and In-order (Recursive and Iterative), Binary Search Tree: Iterative and Recursive, Balanced Trees (AVL Trees, Applications of Tree, **Heaps**: priority queues and Binary Heaps, **Graph:** Graph concepts, Memory Representation of Graph, BFS and DFS, Applications of Graph		
4.	**Sorting**	10 Hours	23%
	Sorting (concepts, Selection Sort, Bubble Sort, Merge Sort, Radix Sort, Insertion Sort, Heap Sort, Quick Sort)		
5.	**Searching**	01 Hours	02%
	Sequential Search, Binary Search		
6.	**Dictionaries**	02 Hours	04%
	Hashing, Hashing Functions, Collision-Resolution Techniques, Applications		

Course Outcome (COs):

At the end of the course, the students will be able to:

CO1	Understand and Implement Algorithms and core Data Structures such as stack, queue, hash table, priority queue, binary search tree and graph in programming language.
CO2	Analyse data structures in storage, retrieval and computation of ordered or unordered data.
CO3	Compare alternative implementations of data structures with respect to demand and performance.
CO4	Describe and evaluate the properties, operations, applications, strengths and weaknesses of different data structures.
CO5	Apply and select the most suitable data structures to solve programming challenges.
CO6	Discover advantages and disadvantages of specific algorithms.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	-	-	-	-	-	-	-	-	3	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	-	-	-	-	-	-	-	-	2	-
CO4	-	1	-	1	2	-	-	-	-	-	-	-	2	-
CO5	2	2	2	2	-	-	-	-	-	-	-	2	3	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-	2	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-".

Recommended Study Material:

❖ **Text book:**

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson, McGraw-Hill.

2. Data structure with C, Lipschutz, TMH

3. Introduction to Algorithms: Cormen, Leiserson, Rivest and Stein: Prentice Hall of India

4. Data Structures and Algorithms: Aho, Hopcroft and Ullmann: Addison Wesley.

❖ **Reference book:**

1. Classic Data structures, D.Samanta, Prentice-Hall International.0

2. Data Structures using C & C++, Ten Baum, Prentice-Hall International.

3. Data Structures: A Pseudo-code approach with C, Gilberg & Forouzan, Thomson Learning.

4. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, W. H. Freeman.

5. "A Practical Introduction to Data Structures and Algorithm Analysis" by Clifford A. Shaffer

6. Data Structures and Algorithm in Java: Goodrich and Tamassia: John Wiley and Sons.

❖ **Web material:**

1. http://www.leda-tutorial.org/en/official/ch02s02s03.html
2. http://www.leda-tutorial.org/en/official/ch02s02s03.html
3. http://www.softpanorama.org/Algorithms/sorting.shtml