SIR C.R.REDDY COLLEGE OF ENGINEERING, ELURU

DEPARTMENT OF INFORMATION TECHNOLOGY

LESSON PLAN

SUBJECT: **CSE 2.1.1 DATA STRUCTURES**

CLASS: II/IV B.Tech., 1ST SEMESTER, A.Y.2017-18

INSTRUCTOR: **G. PAVAN**

SIR C R REDDY COLLEGE OF ENGINEERING
DEPT. OF INFORMATION TECHNOLOGY

PROGRAMME **:** B.Tech

SEMESTER **:** II/IV 1ST Sem.

A.YEAR **:** 2017-18

Course **:** CSE 2.1.1 DATA STRUCTURES

Instructor **:** G. PAVAN

Course Contents

Category of Course	Course Title	Course Code	Credits- 4 C	Theory Paper
CSE 2.1.1	DATA STRUCTURS	CSE 2.1.1	L-3 T-1	Max.Marks-70 Duration-3hrs.

Course objectives:

1. Be familiar with basic techniques of algorithm analysis
2. Master the implementation of linked data structures such as linked lists and binary trees
3. Be familiar with advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure
4. Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort
5. Master analyzing problems and writing program solutions to problems using the above techniques

Course Outcomes:

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs Demonstrate different methods for traversing trees [ABET (a)].

4. Compare alternative implementations of data structures with respect to performance [ABET (a, b, c)].

5. Compare and contrast the benefits of dynamic and static data structures implementations [ABET (a, b, c)]. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack [ABET (a, c)].

6. Design and implement an appropriate hashing function for an application Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.

ONLINE REFERENCES:

http://btechsmartclass.com/DS/U1_T9.html
https://www.tutorialspoint.com/data_structures_algorithms/index.htm
http://www.studytonight.com/data-structures/
https://www.britannica.com/technology/data-structure
http://scanftree.com/Data_Structure/

Prerequisite: Organizing the data in computer system, basics about algorithms, flowcharts and C language.

Internal Assessment Details:

Attendance	:	5 Marks
Internal Test 1& 2	:	15 Marks
Assignment-1	:	5 Marks
Assignment-2	:	5 Marks

Total: 30 Marks

CSE 2.1.1 **DATA STRUCTURES** **Credits: 4**

Instruction: 3 Periods & 1 Tut/week Sessional Marks: 30 Univ.

Exam: 3 Hours Univ-Exam-Marks: 70

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1. **Introduction to Data Structures:** Review of C Programming, Recursive Definition and Processes, Recursion in C, Simulation of Recursion, Efficiency of Recursion, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.

2. **Stacks:** Stack as an Abstract Data Type, Primitive Operations, Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions. Queues: Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.

3. **Linked List**: Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists.

4. **Trees**: Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree; Topological Ordering of nodes; Operations on Disjoint Sets, Efficiency of Binary Search Tree operations.

5. **Searching**: Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.

6. **Sorting**: General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts , Shell Sort , Address calculation Sort , Merge and Radix Sorts.

7. **Graphs and Their Application**: Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Organizing the set of Graph Nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.

Textbooks:

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M.Tanenbaum, Prentice Hall Of India (2nd Edition)

2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

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DEPT. OF INFORMATION TECHNOLOGY

COURSE SCHEDULE

The schedule for the whole course/subject is:

Unit No	Description of the Chapter	Description of the Topics	Total no of periods (L+T)
1	Introduction to data Structures	Review of C Programming, Abstract Data Types, Meaning and Definition of Data Structures, Arrays.Recursive Definition and Processes, Recursion in C and Simulation of Recursion , Efficiency of Recursion	3+1
2	Stack	Stack as an Abstract Data Type, Primitive Operations, and Implementing Stack Operations using Arrays, Infix, Postfix and Prefix: Definitions, Evaluation and Conversions. Queue as an Abstract Data Type, Sequential Representation, Types of Queues, Operations, Implementation using Arrays.	6+2
3	Linked List	Operations, Implementation of Stacks, Queues and priority Queues using Linked Lists+, Circular Lists: Insertion, Deletion and Concatenation Operations, Stacks and Queues as Circular Lists, Doubly Linked Lists	7+3
4	Trees	Binary Trees - Definitions and Operations, Binary Tree Representation: Node Representation, Implicit array Representation, Binary Tree Traversal, Threaded Binary Trees and their Traversal, Trees and their Applications; Tree Searching: Insertion and Deletion of a node from a Binary Search Tree;	11+3

		Topological Ordering of nodes; Operations on Disjoint Sets, Efficiency of Binary Search Tree operations.	
5	Searching	Basic Searching Techniques: Dictionary as an Abstract Data Type, Algorithmic Notation, Sequential Searching and its Efficiency, Binary Search, Interpolation Search.	5+2
6	Sorting	General Background: Efficiency, Asymptotic Notations, Efficiency of Sorting, Bubble Sort and Quick Sort and their Efficiency, Selection Sorting, Binary Tree Sort, Heap Sort, Insertion Sorts , Shell Sort , Address calculation Sort , Merge and Radix Sorts	8+2
7	Graphs and Their Applications	Definition of Graphs, Representation of Graphs, Transitive closure, Linked Representation of Graphs, Organizing the set of Graph Nodes, Graph Traversal and Spanning Forests, Undirected Graphs and their Traversals, Applications of Graphs, Minimal Spanning Trees.	8+3

Total no of instructional periods available for the course : 70 periods

Total no of estimated periods : 64 periods

Signature of the H.O.D **Signature of the Faculty**

Date:

	LECTURE PLAN
DEPARTMET	INFORMATION TECHNOLOGY
NAME OF LECTURER	G. PAVAN

Sl.No	**Topics to be covered**	**No. of Lecture**	**Teaching method**	**Outcomes**
1	Review of C Programming	1	BB	1,2,3,4,5,6
2	Abstract data type & Definition of Data Structure	1	BB	1,2,3,4,5,6
3	Recursive Definition and Processes, Recursion in	1	BB	1,2
4	Simulation of Recursion , Efficiency of Recursion	1	PPT with LCD	1,2,3
5	Stack as an Abstract Data Type	1	BB	1,2,3
6	Primitive Operations On stack	1	BB	1,2
7	Implementing Stack Operations using Arrays	1	BB	1,2,3,4
8	Infix, Postfix and Prefix: Definitions, Evaluation and Conversions	1	BB	1,2,3
9	Queue as an Abstract Data Type, Sequential Representation	1	BB	1,2,3
10	Primitive Operations On queue	1	BB	1,2,3
11	Types of Queues and its	1	PPT with	1,2,3

	Operations,		LCD	
12	Queue Implementation using Arrays.	1	BB	1,2,3
13	Linked list and its operations	1	BB	2,3,4
14	Implementation of stack using linked list	1	BB	2,3,4
15	Implementation of queue using linked list	1	BB	2,3,4
16	Priority queue using linked list	1	BB	2,3,4
17	Types of linked lists	1	PPT with LCD	2,3,4
18	Insertion, deletion and concatenation operations on singly linked list	1	BB	2,3,4
19	Insertion, deletion and concatenation operations on doubly linked list	1	BB	2,3,4
20	Insertion, deletion and concatenation operations on circular linked list	1	BB	2,3,4
21	Implementation of stack using linked list	1	BB	2,3,4
22	Implementation of queue using linked list	1	BB	2,3,4
23	Binary Trees - Definitions and Operations	1	BB	2,3,4
24	Binary Tree Representation: Node Representation	1	BB	1,2,4
25	Binary Tree Representation: Implicit array Representation	1	BB	1,2,4

26	Binary Tree Traversal – Inorder with an algorithm	1	BB	1,2,4
27	Binary Tree Traversal – Preorder with an algorithm	1	BB	1,2,4
28	Binary Tree Traversal –Post order with an algorithm	1	BB	1,2,4
29	Threaded binary tree	1	PPT with LCD	1,2,4
30	Threaded binary tree traversal	1	BB	1,2,4
31	Trees applications	1	PPT with LCD	1,2,4
32	Binary search Tree and construction of BST	1	BB	1,2,4
33	Insertion of a node on BST with an algorithm	1	BB	1,2,4
34	Deletion of a node from BST with an algorithm	1	BB	1,2,4
35	Operations on Disjoint sets	1	BB	1,2,4
36	Efficiency of BST operations	1	PPT with LCD	1,2,4
37	About Searching operation and types of searching	1	BB	3,6
38	Linear search	1	BB	3,6
39	Binary search	1	BB	3,6
40	Dictionary as an ADT	1	BB	3,6
41	Algorithmic notation	1	PPT with LCD	3,6
42	Efficiency comparison of linear search and binary search	1	PPT with LCD	3,6

43	Interpolation search	1	BB	3,6
44	About sorting and types of sorting techniques	1	BB	3,6
45	Asymptotic notations	1	BB	3,6
46	Bubble sort and its complexities	1	BB	3,6
47	selection sort and its complexities	1	BB	3,6
48	Quick sort and its complexities	1	BB	3,6
49	Heap sort and its complexities	1	BB	3,6
50	Radix sort and its complexities	1	BB	3,6
51	Shell sort and its complexities	1	BB	3,6
52	Merge sort and its complexities	1	BB	3,6
53	Address calculation sort	1	PPT with LCD	3,6
54	Graph and its terminology	1	BB	1,2,4
55	Representation of graphs - Adjacency Matrix	1	BB	1,2,4
56	Representation of graphs - Adjacency List	1	BB	1,2,4
57	Transitive closure of Graph	1	BB	1,2,4
58	Graph Traversals -DFS	1	BB	1,2,4
59	Graph Traversals -BFS	1	BB	1,2,4

60	Application of Graphs	1	PPT with LCD	1,2,4
61	Spanning Tree and minimal spanning tree	1	PPT with LCD	1,2,4
62	Minimal spanning tree using Prims's algorithm	1	BB	1,2,4
63	Minimal spanning tree using kruskal's algorithm	1	BB	1,2,4
64	Dijkstra’s algorithm to find the shortest path between nodes	1	BB	1,2,4
	Total classes	**64**		

UNIT WISE QUESTIONS
(Short and essay)

Unit -1

Short answers

1. Differentiate between Information and data?
2. What is a data structure and what are types?
3. Explain how 3D arrays are represented?
4. What is a pointer?
5. What is ADT?
6. Applications of Data Structures?

Essay Questions

1. Write a short note on row major order column major order implementation?
2. Explain In detail all the types of data structures with examples?
3. Describe representation of numbers and characters in memory?
4. Explain the 3D array with an example?

UNIT- 2

Short Questions

1. What is a stack?
2. What are the primitive operations?
3. What are overflow and underflow errors?
4. What are applications of stacks?
5. What are the types of expressions?
6. What are the conditions for ADT?

Essay Questions

1. Explain the stack as abstract data type and implement the operations?
2. Write an algorithm for postfix evaluation?
3. Write an algorithm for infix to postfix conversion?
4. Write an algorithm for matching of nested parenthesis?

5. Write an algorithm for infix to prefix conversion?

Unit- 3

Short Questions

1. What is recursion?
2. What are the types in recursion?
3. Write code for recursive version of binary search?
4. Write about simulation and efficiency of recursion?

Essay Questions

1. Write an algorithm for Binary search and explain it with an example ?
2. Explain about the Towers Hanoi problem with example?
3. Explain about the simulation of factorial in detail?
4. What are the difference of iteration

Unit- 4

Short Questions

1. What are Queues? What are the types?
2. What are limitations of a queue?
3. What are limitations of a circular queue?
4. What are the applications of dequeue?
5. What are the applications of priority queue?
6. What is a linked list ? What are the types in it?
7. What are the advantages of LL over an array?
8. Write any three applications of CDLL?
9. What are the main differences of SLL and DLL?

Essay Questions

1. Explain the Queue as abstract data type and implement the operations of queue?
2. Explain the circular queue operations in detail?
3. Explain the dequeue operations in detail?
4. Write about the types of priority queue and implement the operations of it?
5. How stacks are implemented using linked list and how it differs from an array?

6. How Queues are implemented using linked list and how it differs from an array?

Unit -5

Short Questions

1. What is a tree? What are its applications?
2. What is a binary tree?
3. What is a binary search tree?
4. What are difference between complete binary tree almost complete binary tree?
5. What is the threaded binary tree and its applications?
6. What tree traversing methods?
7. How trees are represented?

Essay Questions

1. Explain Binary search tree construction process in detail?
2. Write about the threaded binary tree traversing method in detail?
3. Explain about tree traversing methods in detail with example?
4. Write an algorithm to insert an element and delete an element in a binary search tree?
5. Write an algorithm to search an element in a binary search tree?

Unit -6

Short Questions

1. What is Big O notation?
2. What is meant by efficiency of sorting?
3. What is best, average, and worst case analysis?
4. What is the efficiency of heap sort for all cases?

Essay Questions

1. Explain the quick sort with an example?
2. Explain the heap sort with an example?
3. Explain the radix sort with an example?
4. Explain the selection sort with an example?
5. Explain the Bubble sort with an example?

6. Explain the Binary tree sort with an example?
7. Explain the Merge sort with an example?
8. Explain the Address calculation sort with an example?
9. Explain the shell sort with an example?
10. Explain the Insertion sort with an example?

Unit -7

Short Questions

1. What is meant by searching?
2. What is the efficiency of different searching techniques?
3. What is meant by dictionary?
4. Explain the dictionary as an ADT?

Essay Questions

1. Explain linear searching technique with an example?
2. Explain binary searching technique with an example?
3. Explain Interpolation searching technique with an example?

Unit -8

Short Questions

1. What is a Graph?
2. What are the applications of the graph?
3. What is BFS and DFS?
4. What is meant by minimum spanning tree?
5. What is meant by transitive closure?

Essay Questions

1. Explain the graph traversing techniques with an example?
2. Explain the prims algorithm with an example?
3. Explain the Kruskals algorithm with an example?
4. Explain dijkstra's algorithm with an example?
5. Explain the single source shortest path algorithm with an example?