Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad -500075.

ISO 9001:2008 REC-403

LESSON PLAN

Department**: Information Technology**
Class: **B.E. III Sem (CBCS) (H2 Section)**
Academic Year: **2017-2018**
Subject Code: **16ITC02**
Subject: **Data Structures and Algorithms**
No. of Periods: **3 hours/week + 1 Tutorial**
Commencement of Instruction:**28.06.2017**
Completion of Instructions: **21.10.2017**
Date of I-Mid Exam: **21.08.2017**
Date of II-Mid Exam: **19.10.2017**
Faculty: **Ms T Prathima**
Total no. of classes: **44**

Time Table of the Course:

Day	Monday	Wednesday	Thursday	Friday
Time	1:20 to 2:20 PM (1)	11.40 to 12.40 PM(1)	9.40 to 10.40 AM(1)	11.40 to 12.40 PM(1)

No. of Public Holiday during I semester in 2017-18:

Day	Monday		Wednesday		Thursday	Friday
Occasion & Date	Bonalu	10.07.2017	Bathukamma	20.09.2017	Durgashtami - 28.09.2017	Ganesh Chathurdi - 25.08.2017
	Krishna ashtami	14.08.2017	Deepavali	18.10.2017		
	Gandhi Jayanti	02.10.2017				

Mode of Teaching: Whiteboard, Power point presentations, Assignments

Course Objectives:
1. To develop proficiency in the specification, representation of various linear and nonlinear data structures.
2. To discuss applications of data structures.
3. To familiarize with various pattern matching algorithms and hashing.
4. To develop a base for advanced computer science study.

Course Outcomes:
Upon successful completion of this course, student will be able to
1. Learn the role of basic data structures arrays and linked lists.
2. Analyse time complexity of both iterative and recursive functions.
3. Define ADT necessary for solving problems based on Stacks and Queues.
4. Develop solutions using binary trees, advanced search trees, tries and graphs.
5. Understand hash functions and handle collisions.
6. Understand various kinds of sorting techniques and apply appropriate techniques for solving a given problem.

Prerequisites:
Programming and Problem Solving (16CSC01), Programming Laboratory (16CSC02)

Course Plan/schedule

S.No.	Topics / Sub. Topics /Experiments	No. of Classes Estimated	Remarks
	UNIT – I		
1.	Using Arrays, Storing Game Entries in an Array, Sorting an Array, Two-Dimensional Arrays.	01	
2.	Singly Linked Lists, Implementing a Singly Linked List, Insertion to the front of a Singly Linked List, Removal from the front of a Singly Linked List, Implementing a Generic Singly Linked List.	02	
3.	Doubly Linked Lists, Insertion into a Doubly Linked List, Removal from a Doubly Linked List, Circularly Linked Lists, Reversing a Linked List.	02	
4.	Recursion, Linear Recursion, Binary Recursion, Multiple Recursion, Analysis of Algorithms.	02	
	UNIT – II		
5.	Stacks, The Stack Abstract Data Type, The STL Stack, A C++ Stack Interface, A Simple Array-Based Stack Implementation, Implementing a Stack with a Generic Linked List.	02	
6.	Reversing a Vector Using a Stack, Matching Parentheses and HTML Tags, Queues, The Queue Abstract Data Type.	01	
7.	The STL Queue, A C++ Queue Interface, A Simple Array-Based Implementation, Implementing a Queue with a Circularly Linked List.	02	
8.	Double-Ended Queues, The Deque Abstract Data Type, The STL Deque, Implementing a Deque with a Doubly Linked List.	02	
9.	Lists, Node-Based Operations and Iterators, The List Abstract Data Type, STL Lists, STL Containers and Iterators.	01	
	UNIT – III		
10.	General Trees, Tree Definitions and Properties, Tree Functions, A C++ Tree Interface, A Linked Structure for General Trees, Tree Traversal Algorithms, Depth and Height, Preorder Traversal, Postorder Traversal, Binary Trees.	02	
11.	The Binary Tree ADT, A C++ Binary Tree Interface, Properties of Binary Trees, A Linked Structure for Binary Trees, A Vector-Based Structure for Binary Trees, Traversals of a Binary Tree, Representing General Trees with Binary Trees.	01	
12.	Pattern Matching Algorithms, Brute Force, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm.	02	
13.	Tries, Standard Tries, Compressed Tries, Suffix Tries.	02	
14.	Merge-Sort , Divide-and-Conquer, Merging Arrays and Lists, The Running Time of Merge-Sort , Merge-Sort and Recurrence Equations, Quick-Sort, Randomized Quick-Sort.	02	
15.	Studying Sorting through an Algorithmic Lens, A Lower Bound for Sorting, Linear-Time Sorting: Bucket-Sort and Radix-Sort, Comparing Sorting Algorithms.	02	

UNIT – IV			
16.	Binary Search Trees, Searching, Update Operations, C++ Implementation of a Binary Search Tree, AVL Trees, Update Operations,	02	
17.	Splay Trees, Splaying, When to Splay, Amortized Analysis of Splaying, Tree, Multi-Way Search Trees, Update Operations for (2,4) Tree, Red-Black Trees, Update Operations.	02	
18.	The Priority Queue Abstract Data Type, Keys, Priorities, and Total Order Relations, Comparators, The Priority Queue ADT, A C++ Priority Queue Interface, Sorting with a Priority Queue	02	
19.	The STL priority queue Class, Implementing a Priority Queue with a List, Selection-Sort and Insertion-Sort, Heaps, The Heap Data Structure.	02	
20.	Complete Binary Trees and Their Representation, Implementing a Priority Queue with a Heap, Bottom-Up Heap Construction.	02	
UNIT – V			
21.	Hash Tables, Bucket Arrays, Hash Functions, Hash Codes, Compression functions, Collision-Handling Schemes, Load Factors and Rehashing.	02	
22.	Graphs, The Graph ADT, Data Structures for Graphs, The Edge List Structure, The Adjacency List Structure, The Adjacency Matrix Structure, Graph Traversals, Depth-First Search.	02	
23.	Implementing Depth-First Search, Breadth-First Search, Directed Graphs, Traversing a Digraph, Transitive Closure, Directed Acyclic Graphs, Shortest Paths, Weighted Graphs	02	
24.	Dijkstra's Algorithm, Minimum Spanning Trees, Kruskal's Algorithm, The Prim-Jarn´ık Algorithm.	02	

Text Books:

1. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structure and Algorithms in C++", 2nd Edition, John Wiley, 2011.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", CareerMonk Publications, 2016.

Reference Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition Addison-Wesley, 2007.
2. Narasimha Karumanchi, "Data Structures and Algorithms for GATE", CareerMonk Publications, 2011.
3. D. Samantha, "Classic Data Structures", Prentice Hall India, 2nd Edition, 2013.

Web Resources:

1. NPTEL Videos: Introduction to data structures and algorithms - http://nptel.ac.in/courses/106102064/1
2. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
3. https://visualgo.net/en

Evaluation scheme:

ECN0	Evaluation Components	Nature of Component	Duration	Weightage	Date	Venue
1	Test – I	Closed Book	60 minutes	10 %	21.08.2017	**will be announced**
2	Test – 2	Closed Book	60 minutes	10 %	19.10.2017	
3	Assignments/ Slip Test	Open Book /Closed Book	1 week	10 %	Surprise / announced	
4	Final Exam	Closed Book	3 hours.	70 %	Will be announced	

General timings for consultation:

- Friday SFI hour (-03.20pm to 04.20pm)
- Saturday 09.40am to 12.40pm

Attendance Policy:

- 75% attendance is must
- It is the responsibility of the student to be regular and punctual to classes

Activity student has to do to achieve the objectives of the course:

- Students should attempt to write the programs on their own and execute them in laboratory.
- Students should discuss the issues/errors/difficulties faced while solving the problems.
- Assignments should be submitted in time.

Notices:

- All notices will be sent to the class group and displayed on 2/4 Notice Board.

Instructor's Contact details:
Ms T. Prathima(Course Coordinator), Assistant Professor, Dept of IT
Mobile : 94410 44722 Email: prathimareddy.t@gmail.com

Signature of Faculty

Signature of HoD

Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad - 500075.

ISO 9001:2008 REC-403

Subject: **Data Structures and Algorithms Lab**

LESSON PLAN

Department**: Information Technology**
Academic Year: **2017-2018**
Subject: **Data Structures and Algorithms Lab**
Commencement of Instruction:**28.06.2017**
Faculty: **Ms T. Prathima**

Class: **B.E. 2/4, I-Sem (H2)**
Subject Code: **16ITC05**
No. of Periods: **42**
Completion of Instructions: **21.10.2017**
Total no. of classes:**42**

Batch	Date of I-Mid Exam:	Date of II-Mid Exam:
Batch #1	**29.08.2017**	**10.10.2017**
Batch #2	**31.08.2017**	**12.10.2017**
Batch #3	**01.09.2017**	**13.10.2017**

Time Table of the Course:

Day	Tuesday (B1)	Thursday (B2)	Friday (B3)
Time	9.40am to 12.40pm	01.20pm to 04.20pm	01.20pm to 04.20pm

No. of Public Holidays during I Semester in 2017-18:

Day	Tuesday	Thursday	Friday
Occasion & Date	Independence Day - 15.08.2017	Durgashtami - 28.09.2017	Ganesh Chathurdi - 25.08.2017

Course Objectives:

1. To introduce basic data structures and algorithms.
2. To introduce Non-linear data structures.
3. To familiarise students with graph operations and algorithms.
4. To familiarise students with advanced tree structures like AVL and Tries.

Course Outcomes:

Student will be able to

1. Implement various data structures using arrays, linked lists
2. Develop ADT necessary for solving problems based on Stacks and Queues.
3. Implement binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Implement tries.
5. Implement hash functions and handle collisions.
6. Implement various kinds of sorting techniques and apply appropriate techniques for solving a given problem.

Prerequisites:

Programming and Problem Solving (16CSC01), Programming Laboratory (16CSC02)

Course Plan/Schedule

S.No.	Topics / Sub. Topics /Experiments	No. of Classes
1.	Define Single Linked List ADT and implement its operations.	3
2.	Define Double Linked List ADT and implement its operations.	3
3.	Implement Stack ADT and perform Infix to Postfix Conversion.	3
4.	Perform evaluation of postfix expression using Stack ADT.	3
5.	Implement Queues, Circular Queues and Deques.	3
6.	Define String ADT and implement Boyer Moore pattern matching algorithm.	3
7.	Implement Tries.	3
8.	Implement the following: Insertion Sort, Bubble Sort, Selection Sort, and Shell Sort.	3
9.	Implement the following: Merge Sort, Quick Sort, Heap Sort, and Binary Search.	3
10.	Construct a Binary Search Tree and implement Tree Traversals.	3
11.	Implement AVL Tree.	3
12.	Implement Hashing with chaining.	3
13.	Implement BFS Traversal on Graph.	3
14.	Implement DFS Traversal on Graph.	3

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2. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
3. https://visualgo.net/en

Evaluation scheme:

ECN0	Evaluation Components	Nature of Component	Duration	Weightage	Date	Venue
1	Test – I	Closed Book	3 hours	17 %	29.08.2017(B1) 31.08.2017(B2) 01.09.2017(B3)	Respective labs
2	Test – 2	Closed Book	3 hours	17 %	10.10.2017(B1) 12.10.2017(B2) 13.10.2017(B3)	Respective labs
3	Final Exams	Closed Book	3 hours	66%	Will be announced	Will be announced

General timings for consultation:

- Within Lab hours
- Friday SFI hour (-03.20pm to 04.20pm)
- Saturday 09.40am to 12.40pm

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Signature of Faculty Signature of HoD