Data Structure and Algorithm (PCC CS391)

Laboratory Instructor's Manual

Last Revised

June, 2022

Dept. of CSE
Techno Main, Salt Lake

General Instructions for Students

1. Do not enter into the Laboratory without prior permission.
2. Switch off your mobile during Lab schedule and maintain silence.
3. Save your file only on the specific destination as instructed.
4. Do not play games, view movies, chat and listen music.
5. Do not change desktop setting, screen saver or any other system settings.
6. Do not use any external storage device without prior permission.
7. Do not install any software without prior permission.
8. Do not browse any restricted, illegal or spam sites.

Instructions for Laboratory Teachers

1. Submission related to lab assignments, which are completed, should be done during the next lab session.
2. The promptness of submission should been courage by way of marking and evaluation patterns that will benefit the sincere students.

Program Outcomes (POs)

PO1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural and engineering sciences.

PO3. **Design/Development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety and the cultural societal and environmental considerations.

PO4. **Conduct investigations of complex problems:** Use research based knowledge including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to access societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

PO10. **Communications:** Communicate effectively with the engineering community and with the society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.

PO11. **Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: Ability to develop the solutions for scientific, analytical and research-oriented problems in the area of Computer Science and Engineering.

PSO2: Ability to apply suitable programming skills integrated with professional competence to develop applications catering to the industrial and societal needs in the field of Computer Science and Engineering and its allied areas.

NAME OF THE PROGRAM: *CSE*	**DEGREE:** *B. Tech*
COURSE NAME: *Data Structure and Algorithm*	**SEMESTER:** *3rd*
COURSE CODE: *PCC-CS391*	**COURSE CREDIT:** *2*
COURSE TYPE: *LAB/PRACTICAL*	**CONTACT HOURS:** *4P*

Syllabus

Implementation of array operations:

Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements Merging Problem:

Evaluation of expressions operations on multiple stacks & queues:

Implementation of linked lists: inserting, deleting, and inverting a linked list. Implementation of stacks & queues using linked lists:

Polynomial addition, Polynomial multiplication

Sparse Matrices: Multiplication, addition.

Recursive and Non-recursive traversal of Trees

Threaded binary tree traversal. AVL tree implementation

Application of Trees. Application of sorting and searching algorithms

Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Course Outcomes (COs)

After this course student will be able to

CO1	**Make use of** different linear and non-linear data structures for solving various engineering problems.
CO2	**Application** of different searching / sorting / traversal / manipulation algorithm.
CO3	Compile suitable computer programs in LINUX GCC working as an individual or in a team.
CO4	Write well documented algorithm, code and output in an informative way.

List of Experiment

Exp. No.	List of Experiments	CO Mapping	PO Mapping	PSO Mapping
1.	a) Implement Linear search on a List using Array in C. b) The classic way to evaluate a polynomial is Horner's Rule. Horner's rule can be stated recursively in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1, PSO2
2.	a) Write a program in C to implement a menu driven stack application. b) Write a program in C to evaluate a postfix expression. c) Write a C program to convert a given infix expression to postfix expression. d) Convert a prefix expression to postfix in C. e) Implement Tower of Hanoi recursively in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1, PSO2
3.	a) Write a menu driven C program to implement circular queue using array. b) Write a menu driven C program to implement double ended queue.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1
4.	a) Implement Singly Linked List and related operations like insertion, deletion, display, reverse and sort in C. b) Write a C program to add and multiply two polynomials. c) Implement queue using Circular linked list and demonstrate JOSEPHUS problem in C. d) Implement Doubly Linked List and perform insertion, deletion, display and reverse in C.	CO1 CO3 CO4 CO4	PO1 PO5, PO9 PO10 PO10	PSO1, PSO2
5.	Create binary search tree and implement Preorder, Inorder and Postorder traversal non-recursively in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1
6.	Write a program to implement AVL tree with suitable operations in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1
7.	Implement Expression tree in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1, PSO2
8.	Create Priority Queue and implement enqueue and dequeue operations in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1
9.	a) Write a program to implement DFS in C. b) Write a program to implement BFS in C.	CO1 CO3 CO4	PO1 PO5, PO9 PO10	PSO1
10.	a) Write a program to sort an array using Insertion sort in C. b) Write a program to sort an array using Merge sort in C.	CO2 CO3 CO4	PO2 PO5, PO9 PO10	PSO1
11.	Implement Linear, Binary and Interpolation search in C.	CO2 CO3 CO4	PO2 PO5, PO9 PO10	PSO1
12.		CO2	PO2	

Exp. No.	List of Experiments	CO Mapping	PO Mapping	PSO Mapping
	Write a C program for Collision avoidance in Hash table using Linear Probing.	CO3	PO5, PO9	PSO1, PSO2
		CO4	PO10	

Rubrics for Lab

Criteria / Score	Excellent (10-8)	Good (7-6)	Average (5-4)	Poor (3-1)	CO Mapping	PO/PSO Mapping
Lab Participation (Following Procedure +Lab Techniques+ Subject Knowledge + Contribution)	Student demonstrates an accurate understanding of the lab assignments. The student can correctly answer questions and if appropriate, can explain concepts to fellow classmates. Student is eager to develop new ideas and assists when needed.	Student arrives on time to lab, but may be underprepared. Answers to questions are basic and superficial suggesting that concepts are not fully grasped. Able to follow the instruction and somehow managed to execute the program.	Student unpreparedness makes it impossible to fully participate. If able to participate, student has difficulty explaining key lab concepts.	There was no attempt to make prior arrangements to make up the lab. Attendance is not regular. Not able to run the program even after getting help from the peers.	**CO1/ CO2**	**PO1/ PO2/ PO3** **PSO1 PSO2**
Interaction with Group (Team work)	Very good participation with a good leadership quality; is respectful of others and their point of view; makes sure that everyone gets a turn; conscious of time	Good participation; appears interested; enthusiastic but talks over teammates; try to help group complete tasks; somewhat conscious of time	Minimal participation; shows little interest; doesn't pay attention to other group members; may argue to get point across; helps group only when asked; little emphasis on time	No participation; sits on the sidelines with no interaction; disinterested; no stake in time management	**CO3**	**PO9** **PSO2**
Execution and Debugging (Modern tool usage)	Follow the logical ideas; can develop suitable program from specific algorithm;	Can develop suitable program from specific algorithm with the help of the instructor;	Can develop suitable program from specific algorithm with the help of the	Not be able to develop suitable program from specific algorithm; need	**CO3**	**PO5** **PSO2**

Criteria / Score	Excellent (10-8)	Good (7-6)	Average (5-4)	Poor (3-1)	CO Mapping	PO/PSO Mapping
	debug the program with proficiency; Able to check the reliability	debug the program with proficiency; Able to check the reliability	instructor; debug the program with the help of technical assistant; Not able to check the reliability.	assistance to debug the program. Not able to check the reliability		
Lab Report	Student demonstrates an accurate understanding of the lab concepts. Questions are answered completely and correctly. Output of each program is neat, creative and includes complete titles. Errors, if any are minimal	Student has a basic knowledge of content, but may lack some understanding of some concepts. Questions are answered fairly well and/or output could have been done more neatly, accurately or with more complete information	Student has problems with both the output and the answers. Student appears to have not fully grasped the lab content and the code possess multiple errors	Student turns in lab report late or the report is so incomplete and/or so inaccurate that it is unacceptable.	**CO4**	**PO10** **PSO1**