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SEMESTER S3

DATA STRUCTURES LAB

Course Code	PCITL308	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	ESE Marks	50
Credits	2	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	GXEST204: Programming in C	Course Type	Lab

Course Objectives:

1. Understand the importance of data structures, abstract data type, and their basic usability in different applications.
2. Implement basic searching, sorting, and hashing algorithms to efficiently solve data organization and retrieval problems.
3. Implement linear and non-linear data structures using arrays and linked lists.
4. Apply various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
5. Identify suitable data structures and algorithms to solve a real-world problem.

Experiment No.	Experiments
1	Implementation of Stack using array.
2	Utilize stack to perform the following tasks: i) Convert an infix expression to a postfix expression. ii) ii) Evaluate a given postfix expression
3	Representation of polynomials using arrays and perform polynomial addition.
4	Implementation of Queue and Circular Queue using arrays.
5	Implementation of various sorting algorithms – Bubble sort, Insertion sort, Selection sort, Quick sort, and Merge sort.
6	Implementation of basic searching algorithms – linear search and binary search.

7	Implementation of hash tables using various mapping functions and resolving collisions (if any) using various collision resolution schemes.
8	Implementation of Singly linked list operations- traversing, searching, insertion, deletion.
9	Implementation of Doubly linked list operations- traversing, searching, insertion, and deletion.
10	Representation of polynomials using linked lists and perform polynomial addition.
11	Implementation of Stack and Queue using linked list.
12	Implementation of preorder, in-order, and post-order traversals on binary trees using recursive algorithm.
13	Implementation of binary search trees – creation, insertion, deletion, searches.
14	Implementation of heap sort.
15	Representation of graph using adjacency list and adjacency matrix and compute various parameters (in degree, out-degree, etc.).
16	Implementation of BFS and DFS for each graph representation.
17	Implementation of Dijkstra's algorithm for finding the shortest path.
18	Any application program using trees.

Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	**Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)**	**Internal Examination**	**Total**
5	**25**	**20**	**50**

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- ***Submission of Record:*** *Students shall be allowed for the end semester examination only upon submitting the duly certified record.*
- ***Endorsement by External Examiner:*** *The external examiner shall endorse the record*

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Perform operations on fundamental data structures such as arrays, stacks, queues, linked lists, and hash tables.	**K3**
CO2	Implement and analyze various sorting (e.g., bubble, insertion, selection, quick, merge) and searching algorithms (linear and binary search), understanding their efficiency and use cases.	**K3**
CO3	Solve complex problems involving tree and graph data structures.	**K3**
CO4	Analyze and optimize the performance of data structure operations, including polynomial representation and addition, using both arrays and linked lists and different implementations of stacks and queues.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

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

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Classic Data Structures	Debasis Samantha	Prentice Hall	2nd Edition 2008
2	Data Structures Through C	Yashvanth Kanenthkar	BPB Publications	3rd Edition 2019

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Data Structures and Algorithms	A. Aho, J. Hopcroft, J. Ulman	Pearson Education	2nd Edition 2008
2	Introduction to Algorithms	T.H.Cormen, C.E. Leiserson, R.L. Rivest, C. Stein	MIT Press	4th Edition 2022
3	Introduction to Data Structures with Applications	Tremblay J. P. and P. G. Sorenson	Tata McGraw Hill	2nd Edition 2001
4	Fundamentals of Data Structures in C	E. Horwitz , S. Sahani, D. Mehta	University Press	2nd Edition 2008

Video Links (NPTEL, SWAYAM…)	
Link No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc24_cs96/preview

Continuous Assessment (25 Marks):

1. **Preparation and Pre-Lab Work (7 Marks)**
   - Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
   - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (7 Marks)**
   - Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
   - Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.

- Teamwork: Collaboration and participation in group experiments.

3. **Lab Reports and Record Keeping (6 Marks)**
   - Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
   - Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.
4. **Viva Voce (5 Marks)**
   - Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: *The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.*

Evaluation Pattern for End Semester Examination (50 Marks):

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**
   - Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
   - Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
   - Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
   - Creativity and logic in algorithm or experimental design.
2. **Conduct of Experiment/Execution of Work/Programming (15 Marks)**
   - Setup and Execution: Proper setup and accurate execution of the experiment or programming task.
3. **Result with Valid Inference/Quality of Output (10 Marks)**
   - Accuracy of Results: Precision and correctness of the obtained results.
   - Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.
4. **Viva Voce (10 Marks)**
   - Ability to explain the experiment, procedure results and answer related question.
   - Proficiency in answering questions related to theoretical and practical aspects of the subject.
5. **Record (5 Marks)**
   - Completeness, clarity, and accuracy of the lab record submitted

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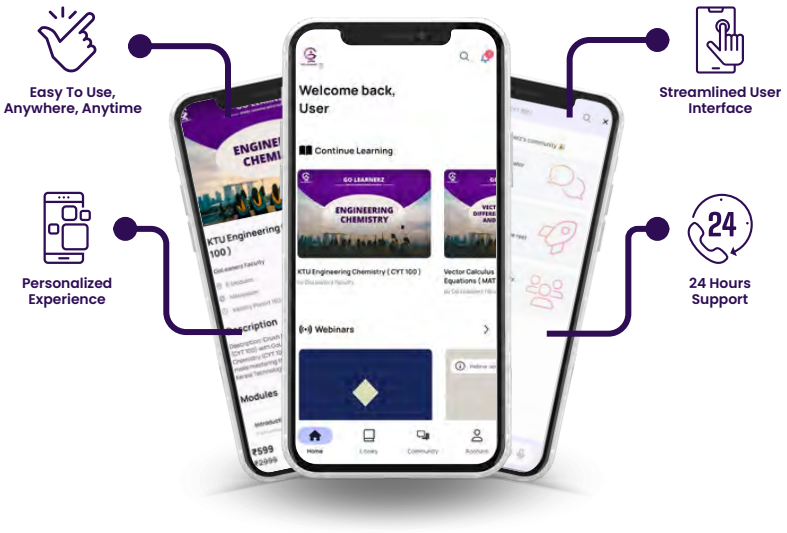

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