SEMESTER 3

DATA STRUCTURES LAB

(Common to CS/CA/AD/CC)

Course Code	**24SJPCCSL307**	**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)	24SJGXEST204	**Course Type**	Lab

Course Objectives:

To give practical experience for learners on implementing different linear and non linear data structures, and algorithms for searching and sorting.

Expt. No.	Experiments
1	Find the sum of two polynomials using arrays
2	Find the sum of two sparse matrices and transpose the resultant matrix.
3	Convert infix expression to postfix (or prefix) and then evaluate using stack.
4	Implement Queue, DEQUEUE, and Circular Queue using arrays.
5	Implement Circular Queue using arrays.
6	Implement backward and forward navigation of visited web pages in a web browser (i.e. back and forward buttons) using doubly linked list operations.
7	Implement addition of polynomials using singly linked lists.
8	Create a binary tree for a given simple arithmetic expression and find the prefix / postfix equivalent.
9	Implement binary search trees by performing insertion, search and deletion of numbers using linked list.
10	Implement BFS using arrays.
11	Implement the find and replace feature in a text editor

12	Given an array of sorted items, implement an efficient algorithm to search for specific item in the array and also find the time and space complexities.
13	Implement Bubble sort, Insertion Sort, Quick Sort, and Merge Sort and compare the number of steps involved.
14	Simulation of a basic memory allocator and garbage collector using doubly linked list
15	The CSE dept is organizing a tech fest with so many exciting events. By participating in an event, you can claim for activity points as stipulated by KTU. Each event i gives you A[i] activity points where A is an array. If you are not allowed to participate in more than k events, what's the max number of points that you can earn?
16	You are given a hash table with 10 slots (indexed from 0 to 9). You are also provided with a set of integers that need to be inserted into the hash table using a hash function.

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	Model a real-world problem using suitable data structure and implement the solution.	**K3**
CO2	Compare efficiency of different data structures in terms of time and space complexity.	**K4**
CO3	Evaluate the time complexities of various searching and sorting algorithms.	**K4**
CO4	Differentiate static and dynamic data structures in terms of their advantages and application.	**K3**

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

CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	✓	✓	✓	✓				✓			✓
CO2	✓	✓	✓	✓				✓			✓
CO3	✓	✓	✓	✓				✓			✓
CO4	✓	✓	✓	✓				✓			✓

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	Fundamentals of Data Structures in C	Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed,	Universities Press,	2/e, 2007
2	Introduction to Algorithms	Thomas H Cormen, Charles Leisesrson, Ronald L Rivest, Clifford Stein	PHI	3/e, 2009

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Classic Data Structures	Samanta D.	Prentice Hall India.	2/e, 2018
2	Data Structures and Algorithms	Aho A. V., J. E. Hopcroft and J. D. Ullman	Pearson Publication.	1/e, 2003
3	Introduction to Data Structures with Applications	Tremblay J. P., P. G. Sorenson	Tata McGraw Hill.	2/e, 2017
4	Theory and Problems of Data Structures	Lipschutz S.	Schaum's Series	2/e, 2014

Video Links (NPTEL, SWAYAM…)	
No.	**Link ID**
1	https://nptel.ac.in/courses/106102064
2	https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/

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 questions
- 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