Sreenidhi Institute of Science and Technology
Department of Computer Science and Engineering
B.Tech Computer Science and Engineering

Name of the lab: Problem Solving using C Lab,
Data Structures (C,C++) Lab

Lab Number: 4215/4215A/4215B

Number of systems: 90

HARDWARE DETAILS

S.NO	NAME OF THE HARDWARE	MANUFACTURER
1	Make	HP
2	Model	HP 280 G3 MT
3	Memory	8 GB RAM
4	Processor	Intel® Core(TM) i5 7500 CPU@3.40GHz
5	Hard Disk (HDD)	1 TB HDD
6	SMPS	ATX Mercury
7	Monitor	HP V194(18.5")
8	Keyboard	HP
9	Mouse	HP

SOFTWARE DETAILS

S.NO	NAME OF THE SOFTWARE	SOURCE
1	UBUNTU 18.04.2 LTS	Open Source
2	PUTTY	Open Source

List of Experiments in Problem Solving using C Lab

1. **Unit I (Cycle 1)**
   1. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart.
   2. Write an algorithm to find the largest of three given numbers and draw a flowchart.
   3. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients.
   4. Write an algorithm and flowchart for finding the first n Fibonacci numbers, give n.

2. **Unit II (Cycle 2)**
   1. Write an algorithm, flowchart, and C program for:
   2. Finding the area and circumference of a circle of given radius.
   3. Finding the volume of a sphere of given radius.
   4. Finding the lateral surface area of a right circular cone of given base radius and height.
   5. Finding selling price of an item, given its cost price and profit percent.
   6. Finding the interest on a given principal for a given period of time at a given rate of per year.
   7. Write a C program to display all the sizes of data types in C.
   8. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number using %o and %x in printf function.

3. **Unit II (Cycle 3)**
   1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
   2. Write a C program for finding the largest of three given numbers.
   3. A salesman gets a commission of 5% on the sales he makes if his sales is below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, given his sales.

4. **Unit III (Cycle 4)**
   1. Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.

2. Write a C program to compute the sum of:
3. $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$, given x and n.
4. 1! + 2! + 3! + . . . + n!, given n.
5. $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! + \ldots$ to n terms where the n^{th} term becomes less than 0.0001.

5. Unit III (Cycle 5)

1. Write a C program in the menu driven style to perform the operations +, -, *, /, % between two given integers.

2. Write a C program to find the largest and the least of some numbers given by the user.

3. Write a C program to find the sum of the digits of a positive integer.

6. Unit III (Cycle 6)

1. Write C functions for the following:
   - **a)** A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
   - **b)** A function that takes a real number x and a positive integer n as arguments and returns x^n.
   - **c)** A function that takes a positive integer n as an argument and returns the n^{th} Fibonacci number.
2. Using recursion write C functions for the following:
   - **a)** Factorial of a non-negative integer n.
   - **b)** Number of combinations of n things taken r at a time.
   - **c)** Greatest Common Divisor of two integers.
   - **d)** Least Common Multiple of two integers.

7. Unit III (Cycle 7)

- **a)** Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.
- **b)** Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
  1. Larger of two numbers.
  2. Smaller of two numbers.
  3. Sum of the squares of two numbers.
- **c)** Write a program to generate Pascal's triangle.
- **d)** Write a program to count the number of letters, words, and lines in a given text.

8. Unit IV (Cycle 8)

1. Write a program to store the numbers given by the user in an array, and then to find the mean, deviations of the given values from the mean, and variance.
2. Write a C program to initially store user given numbers in an array, display them and then to insert a given number at a given location and to delete a number at a given location.
3. Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.

9. **Unit IV (Cycle 9)**
    1. Write a C program to implement the operations of matrices – addition, subtraction, multiplication.
    2. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.

10. **Unit V (Cycle 10)**
    1. Write a function to swap two numbers.
    2. Write a function to compute area and circumference of a circle, having area and circumference as pointer arguments and radius as an ordinary argument.

11. **Unit VI (Cycle 11)**
    1. Define a structure for complex number. Write functions on complex numbers (addition, subtraction, absolute value, multiplication, division, complex conjugate) and implement them in a menu driven style.
    2. Define a structure point. Write a program to find the distance between two points.
    3. Define a structure student having members roll no., name, class, section, marks. Create an array of 10 students give the data and find the average marks, section-wise.

12. **Unit VI (Cycle 12)**
    1. Write a program to:
        a) Create a file by the name given by the user or by command line argument and add the text given by the user to that file.
        b) Open the file created above and display the contents of the file.
        c) Copy a file into some other file, file names given by the user or by command line arguments.
        d) Append a user mentioned file to another file.
        e) Reverse the first n characters of a file.

List of Experiments in Data Structures (C,C++) Lab

1. Write a C program that implement stack and its operations using arrays

2. Write a C program that implement Queue and its operations using arrays.

3. Write a C program that implement Circular Queue and its operations using arrays.

4. Write a C program that uses Stack operations to perform the following
    i) Converting infix expression into postfix expression
    ii) Evaluating the postfix expression

5. Write a C program that uses functions to perform the following operations on singly linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal

6. Write a C program using functions to perform the following operations on circular singly linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal

7. Write a C program that uses functions to perform the following operations on doubly linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways

8. Write a C program to implement operations on the following Data Structures Using Singly linked list:

i) Stack ii) Queue

9. Write a C program that uses functions to perform the following:

ii) Creating a Binary Tree of integers

iii) Traversing the above binary tree in preorder, in order and post order.

10. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :
i) Linear search ii) Binary search

11. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
i) Bubble sort ii) Insertion sort iii) Selection Sort

12.Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
i) Quick sort ii) Merge sort iii) Heap Sort

13. Write a C++ program to read and display the details of student class with data members as name, rollno and 3 subjects' marks.

14. Write a C++ program to implement all types of constructors.

15. Write a C++ program to implement operator overloading for addition of two complex numbers.