MANIPAL UNIVERSITY
JAIPUR

Faculty of Engineering (FOE)

Problem-Solving Using Computers Lab

|CS 1031 | 1 Credit | 0 0 2 1

Session: Jan-May 2024

Lab Experiments

Week	Topics	Session Outcome
1	Algorithms and Flow Charts	Describe the flowcharts and design of an algorithm
2	Working with Linux Commands	Use Unix commands tomanage files and develop programs,including multi-module programs
3	Formula-based CPrograms	Understand the fundamentals of C programming.
4	Control Structures: if statement	Choose the decision-making statements to solve the problem.
5	Control Structures: Switch	Choose the decision-making statements to solve the problem.
6	Control Structures: Loops	Choose the loop statements to solve theproblem
7	Control Structures: Nested Loops	Choose the loop statements to solve the problem
8	1-D Array	Implement different Operations on 1-D arrays.
9	2-D Arrays	Implement different Operations on 2-D arrays
10	Strings	Implementation of different Operations on strings
11	Functions	Use functions to solve thegiven Problem
12	Pointers	Understand and apply the concept of pointers in programming
13	Structures	Understand and apply the concept of Structure in programming

Lab 1. Algorithms and Flowcharts

1. To multiply to numbers.
2. To divide two numbers.
3. To check whether the given number is even or odd.
4. To swap two numbers.
5. To check whether the given number is lesser than 10 or not.
6. To convert Fahrenheit to Celsius.
7. To check the greater number in the given two numbers.
8. To calculate simple interest.
9. To check whether the given number is prime or not.
10. To calculate area of the given rectangle.

Lab 2. Working with Linux Commands

File Commands		
1.	ls	Directory listing
2.	ls -al	Formatted listing with hidden files
3.	ls -lt	Sorting the Formatted listing by time modification
4.	cd dir	Change directory to dir
5.	cd	Change to home directory
6.	pwd	Show current working directory
7.	mkdir dir	Creating a directory dir
8.	cat >file	Places the standard input into the file
9.	more file	Output the contents of the file
10.	head file	Output the first 10 lines of the file
11.	tail file	Output the last 10 lines of the file
12.	tail -f file	Output the contents of file as it grows,starting with the last 10 lines
13.	touch file	Create or update file
14.	rm file	Deleting the file
15.	rm -r dir	Deleting the directory
16.	rm -f file	Force to remove the file
17.	rm -rf dir	Force to remove the directory dir
18.	cp file1 file2	Copy the contents of file1 to file2
19.	cp -r dir1 dir2	Copy dir1 to dir2;create dir2 if not present
20.	mv file1 file2	Rename or move file1 to file2,if file2 is an existing directory
21.	ln -s file link	Create symbolic link link to file
22.	clear	Clear terminal
23.	ps	Display the processes in terminal
24.	man	Access manual for all Linux commands
25.	grep	Search for a specific string in an output
26.	echo	Display active processes on the terminal
27.	sort	sort the file content
28.	cal	View Calendar in terminal
29.	df	Check the details of the file system
30.	wc	Check the lines, word count, and characters in a file using different options

Lab 3. Formula based C Programs

1. Write a program to convert the time in seconds to hours, minutes, and seconds. (1 hr =3600 sec).
2. Write a program to find the sum of the digits of a four-digit number (ex. 1234 sum=10)(without using a loop).
3. Write a program to convert the temperature given in Fahrenheit to Centigrade andCentigrade to Fahrenheit. Hint: C=5/9(F-32)).
4. Write a program for converting distance in mm to cm, inch, feet (1 cm =10mm,1inch=2.5cm, 1 feet =12 inches).
5. Write a program to find out the distance between two points e.g. (x1, y1) and (x2, y2). *Hint: Distance=*$\sqrt{(x2-x1)^2 + (y2-y1)^2}$
6. Write a program to evaluate the area of the circle Area = Pi * R^2
7. Write a program to interchange the values of two variables using a third variable.
8. Write a program to interchange the values of two variables without using a third variable.

Lab 4. Control Structures: If statement

1. Write a program to check whether the given number is odd or even.
2. Write a program to check whether a given year is a leap year or not.
3. Write a program to find the roots of a quadratic equation.
    a. Hint: root = -b +/- sqrt(b^2-4ac)/2a
4. Write a program to find the total no. of days for a given number of months countingfrom January month.
    a. Example: m=3, days=31+ (28 0r 29) + 31.
5. Write a program to take two numbers as an input and find whether one number is amultiple of the other or not.
6. Write a program that returns a letter grade based on a quiz score. The input will be theinteger score from a ten-point quiz.
    a. The letter grades are assigned by:
    b. 9-10“A”7-8“B”5-6“C”3-4“D”<3“F”
7. Write a program that takes three sides of a triangle input and calculates its area, if theseconditions are satisfied a+b>c, b+c>a, a+c>b, calculate area=(a+b+c)/2
8. Write a program to check whether the given character is a vowel, consonant, or digit.

Lab 5. Control Structures: Switch

1. Write a program to program to calculate an area of a circle, a rectangle, or a triangle depending on the user’s choice.
2. Write a program to remove all the break statements from Ex-1 (with switch-case construct) and try to execute the program with a few inputs. Observe the difference.
3. Write a program to program to input the number of week’s days (1-7) and translate to its equivalent name of the day of the week (e.g., 1 to Sunday, 2 to Monday)
4. Write a program to design a calculator that performs addition, subtraction, minus, and division operation. This program inputs two operands and an operator and then displays the calculated results.
5. Write a program to calculate a bill for internet browsing. The conditions are givenbelow:

Minimum Rs. 200 for up to 100 calls.
Plus, Rs. 0.60 per call for the next 50 calls. Plus, Rs. 0.50 per call for the next 50 calls.
Plus, Rs. 0.40 per call for any call beyond 200 calls

6. Write a program to calculate an amount of a telephone bill for the following criteria. (Without Loop)

Calls	charge per call (Rs.)
1-150	0
151-250	.9
251-400	1.2
401 onwards	1.5

7. Write a program to calculate the amount of an electricity bill for the followingcriteria. (Without Loop)

Units	charge per unit (Rs.)
First, 1-100 up to	0
Next, 101-200 up to	1.5
Next, 201-400 up to	2.5
401 onwards	3.5

8. Write a program to calculate the discount in rupees for the following criterion. (Without Loop)

Cost price	discount
>=800	25%
500-800	20%
<500	no discount (0%)

Lab 6. Control Structures: Loops

1. Write a program to take N as input and print the odd numbers in descending order.
2. Write a program to print the Fibonacci number.

   Hint: (Fibonacci series is 0, 1, 1, 2, 3, 5, 8,)
3. Write a program to find whether the given number is prime or not.
4. Write a program to convert the decimal number into

   binary todecimal. *Ex: 1101 = 1*2 ^{3} + 1 * 2 ^{2} + 0 * 2 ^{1} + 1* 2 ^{0} =13*
5. Write a program to reverse a given number
   Ex: 1234 reverse=4*10 ^{3} +3 * 10 ^{2} + 2 * 10 ^{1} + 1 * 10 ^{0} =4321
6. Write a program to find the sum of n terms of the sin series $\sin(x) = x - x^3 + x^5 - x^7$
7. Write a program to check whether a given integer no. is palindrome or not.
8. Write a program to check whether the given number is Armstrong or not. An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number since 33 + 73 + 13 = 371.

Lab 7. Control Structures: Nested Loops

1. Write a program to print different patterns using nestedloops.

```
2    3
4    5    6
7    8    9    10
11   12   13   14   15
```

```
1
2    2
3    3    3
4    4    4    4
5    5    5    5    5    5

5    5    5    5    5
4    4    4    4
3    3    3
2    2
1
```

```
1
2    4
3    5    7
6    8    10   12
9    11   13   15   17
```

5. Write a program to generate the multiplication table for n numbers up to k terms (nested loops).
6. Write a program to print the Fibonacci numbers that fall in the given range.
7. Write a program to print the N^{th} the prime number.
8. Write a program to print the N^{th} the Armstrong number.

Lab 8. 1-D Array

1. Write a program to find the largest and smallest element in an array.
2. Write a program to find the sum of odd index numbers in an array.
3. Write a program to print the subarray that lies between the two indexes.
4. Write a program to find the number of positive numbers, negative numbers, oddnumbers, even numbers, and the number of 0 of an array.
5. Write a program to reverse an array with an auxiliary array.
6. Write a program to check whether an array is sorted or not.
7. Write a program to arrange the elements of an array in ascending order by a simple sorting method. (Selection sort/bubble sort)
8. Write a program to take an array of 10 elements. Split it into the middle and store theelements in two different arrays. E.g.- Initial array:

58	**24**	**13**	**15**	**63**	**9**	**8**	**81**	**1**	**78**

After splitting:

58	**24**	**13**	**15**	**63**

9	**8**	**81**	**1**	**78**

Lab 9. 2-D Arrays

1. Write a program to take 3 student marks in 5 subjects. Print the total marks of eachstudent and the average marks of each subject.
2. Write a program for searching for an element in the matrix and counting the number of occurrences of that element.
3. Write a program to multiply two matrices.
4. Write a program to check if the given matrix is a magic square or not.
5. Write a program to find whether a given matrix is symmetric or not.

   Hint: $A = A^T$
6. Write a program to find the trace and norm of a given square matrix.

   Hint: Trace = sum of principal diagonal elements

   Norm = sort (sum of squares of the individual elements of an array)

Lab 10. Strings

1. Write a program to change all lower-case letters into upper case in a sentence.
2. Write a program to find the last occurrence of a particular character.
3. Write a program to concatenate/length/copy two strings using the library function.
4. Write a program to count the number of words in a sentence.
5. Write a program to reverse a string.
6. Write a program to find the string length of a string without using the predefined function.
7. Write a program to find the substring of a given string.
8. Write a program to check if the given string is a palindrome or not.

Lab 11. Functions

1. Write a program to find the factorial of a number using a function. (Ex: 5! =5*4*3*2*1. Use a function Fact to evaluate factorial & print the result).
2. Write a program to find the maximum of a given set of numbers using functions. (Use a function Max and return the result to the main function)
3. Write a program to find the GCD of two numbers recursively. (Ex: GCD of 9, 24 is 3)
4. Write a program to check whether the given number is prime or not. Using this function generates first n prime numbers using the above function.
5. Write a function to generate the n^{th} Fibonacci term using recursion. Print first N Fibonacci terms using this function. Hint: (Fibonacci series is 0, 1, 1, 2, 3, 5, 8,)
6. Write a program to check if the given string is a palindrome or not, using the stringhandling function.
7. Write a function **Sort** for sorting a list of names which will use a function **compare** to compare two names. (Selection /bubble Sort may be used).

Lab 12. Pointers

1. Write a program to access two integers using pointers and add them.
2. Write a program to find out the greatest and the smallest among the three numbers usingpointers.
3. Write a program to determine the length of a character string using a pointer.
4. Write a program to compute the sum of all elements stored in an array using a pointer.
5. Write a program to determine whether a substring (string 1) is in the main string or not.If present, return the pointer of the first occurrence.

Lab 13. Structures

1. Write a program to define a structure personal that would contain the person's name, date of joining, and salary. Using this structure write a program to read this information for one person from the keyboard and print the same on the screen.
2. Write a program to create an array of student structures to store the roll no., name, and marks in 3 subjects. Input the details of N students into the array and display roll no., name, and total marks of each student in decreasing order of total marks.
3. Write a program to create an array of employee structures to store emp-no, name, basic salary, and HRA. Input the details of N employees and display emp-no, name, basic, HRA, and net salary. Display the details of all employees whose net salary is more than the average net salary of all employees.
4. Write a program to create a structure named Date having day, month, and year as its elements. Store the current date in the structure. Now add 45 days to the current date anddisplay the final date.

Lab 14. End-term Exam