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SARVAJANIK UNIVERSITY

SARVAJANIK COLLEGE OF ENGINEERING AND TECHNOLOGY

BACHELOR OF TECHNOLOGY

B.Tech	1	Semester	1/2	Teaching Scheme				Evaluation Scheme	
Subject Name	Programming for Problem Solving - Lab			**L**	**T**	**P**	**Credits**	**CCE**	**SEE**
Subject Code	BTCO22104			-	-	**2**	1	25	25
Type of course	Engineering Science Course			CCE : Continuous and Comprehensive Evaluation SEE : Semester End Evaluation					
Prerequisite	No prerequisite								
Rationale	To develop an understanding of C programming languages. Introduce and build the required skills for problem-solving through logical thinking. To achieve proficiency in necessary skills for problem solving using C programming language.								

Course Outcomes (COs): At the end of the course, students will be able to		**Marks % Weightage**
CO – 1	Develop the ability to design algorithms, flowcharts, and pseudocode to effectively analyze and solve mathematical and logical problems.	10
CO – 2	Demonstrate an understanding of syntax, semantics, data types, conditional statements, and control structures in the C programming language.	35
CO – 3	Apply the concepts of arrays and strings to solve computational problems in C.	20
CO – 4	Implement fundamental procedural programming concepts using functions, structures, and unions to develop efficient and maintainable C programs.	30
CO - 5	Utilize pointers for efficient memory management and file handling to optimize program performance..	05

List of Laboratory Practical

1 Write a program to read one number and display it.

2 Read two integer variables (a and b) and two floating point variables (c and d). Write a program to print the result of the following expressions.

(A)	a+b	**(F)**	c+d
(B)	a-b	**(G)**	c-d
(C)	a*b	**(H)**	c*d
(D)	a/b	**(I)**	c/d
(E)	a%b		

3 Write a program that will obtain the length and width of a rectangle from user and calculate its area, perimeter and diagonal.

4 Write a program to interchange the values of two variables.

5 Write a program to read the price of item in decimal form (e.g. 12.50). Separate rupees and paisa from the given value (e.g. 12 rupees and 50 paisa).

6 The cost of one type of mobile service is Rs. 250 plus Rs. 1.25 for each call made over and above 100 calls. Write a program to read number of calls made to calculate and print the amount to be paid.

7 Write a program to check if the given number is odd or even.

8 Write a program to find that the accepted number is negative, or positive or zero.

9 Write a program to calculate the roots of a quadratic equation. Take all cases into consideration.

10 Write a program to read marks from keyboard and display equivalent grade according to the following table.

Marks	Grade
>= 80 and <=100	Distinction
>= 60 and <80	First class
>= 35 and <60	Second class
>= 0 and <35	Fail

11 Write a program (using switch statement) to make a simple calculator that performs arithmetic operations (+, -, *, /). The program should display a menu showing the different options available.

12 Write a program to convert the case of a given input character (i.e. upper to lower and vice versa) (Note : Use getchar and putchar functions)

13 Write a program to find maximum and minimum of three numbers using nested if and also using the ternary (conditional) operator.

14 Write a program to print 1st n natural numbers and their sum and avg.

15 Write a program to print individual values of the series for the input values of x and n: -1, x, $-x^2$, x^3, $-x^4$, ... (For example, if input values are, x = 2 and n = 5, then output will be, -1, 2, -4, 8, -16, 32).

16 Write a program to calculate the factorial of a number.

17 Write a program,
- **(A)** to find sum of digits of a given number.
- **(B)** to reverse a given input number.

18 Write a program to print 1^{st} n numbers of the fibonacci series (i.e. 0, 1, 1, 2, 3, 5, 8, 13, ...).

19 Write a program to check whether the given number is,
- **(A)** perfect or not. (Note: A perfect number is a positive integer that is equal to the sum of all its positive divisors, excluding the number itself. For example, 6, 28, 496, 8128, etc.)
- **(B)** prime or not.
- **(C)** armstrong or not. (Note: An Armstrong number is a positive integer that is equal to the sum of its digits, each raised to the power of the number of digits. For example, 0, 1, 153, 370, 371, 407, 1634, 8208, 9474, 54748, 92727, etc., 153 is an Armstrong number as 1^3 + 5^3 + 3^3 = 153, 9474: is an Armstrong number as 9^4 + 4^4 + 7^4 + 4^4 = 9474, 92727: is an Armstrong number as 9^5 + 2^5 + 7^5 + 2^5 + 7^5 = 92727)

20 Write a program to evaluate the series $1^2 + 2^2 + 3^2 + \ldots\ldots + n^2$ (without using any library function).

21 Write a program to print following patterns for the input value of n (where, n represents number of lines to be printed). (Note: Following patterns are generated for the value of n = 4)

(A)

```
*
* *
* * *
* * * *
```

(B)

```
      A
    B C
  D E F
G H I J
```

(C)

```
      *
    #   #
  *   *   *
#   #   #   #
```

(D)

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

22 Write a program to print following patterns for the input value of n (where, n represents number of lines to be printed). (Note: Following patterns are generated for the value of n = 4)

(A)

```
* * * *
* * *
* *
*
```

(B)

```
    * * * *
      * * *
        * *
          *
```

(C)

```
*   *   *   *
  *   *   *
    *   *
      *
```

(D)

```
      *
    * *
  *   *
*   *   *
  *   *
    * *
      *
```

(E)

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

23 Write a program to input n numbers in 1-D array and also print these numbers, their sum and avg.

24 Write a program to count positive numbers, negative numbers, and zeros from list of n numbers using a 1-D array.

25 Write a program to sort given 1-D array in ascending order.

26 Write a program to print the largest values from each row of 2-D array of the size m × n.

27 Write a program to perform the matrix multiplication of two 2-D arrays of the size m × n.

28 Write a program to print Pascal triangle.

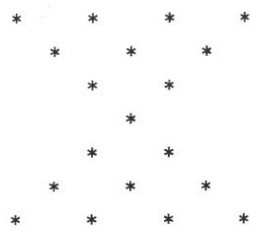
29	Write a program to demonstrate the use of string library functions - strlen(), strcpy(), strcat(), strrev(), strcmp(), toupper(), tolower(), etc.
30	Write a program to take a string from the user as an input and find the length of the string without using any string library function.
31	Write a program to take a string from the user as an input and copy its contents into another string without using any string library function.
32	Write a program to take a string from the user as an input and reverse its contents into another string without using any string library function.
33	Write a program to take two strings from the user as an input and concatenate them into another string without using any string library function.
34	Write a program to take two strings from the user as an input and compare them without using any string library function.
35	Write a program to take a string from the user as an input and determine whether it is a palindrome or not without using any string library function.
36	Write a program to find number is odd or not using user defined function.
37	Write a program to check whether the number is prime or not. The function should return 1 if it is prime and return 0 otherwise.
38	Write a program to find maximum number from the array of n numbers. Using the same function, also find the maximum number from each row of 2-D array of m × n size.
39	Write a program to find out factorial of given number using function with recursion.
40	Define a structure person having three members (person's name, date of joining and salary). Using this structure, write a program to read this information for one person from the key board and print the same on the screen.
41	Make a structure point having two members (x-cord and y-cord). Using this structure, write a program to find its quadrant of the given input point using int find_quadrant(struct) function. For example, if point P having co-ordinate (1, 5) is passed to the function as find_quadrant(P) (where P is a variable of point structure), then program should give First quadrant as an output.
42	Make a structure point having two members (x-cord and y-cord). Using this structure, write a program that defines struct point mid_pt(struct, struct) function to find the mid-point of the given line by taking its two end-points as an input. For example, if point P having co-ordinate (1, 5) and point Q having co-ordinate (3, 9) is passed to the function as mid_pt(P, Q) (where P and Q are variables of point structure), then program should give mid-point (2, 7) as an output.
43	Write a program that defines the student's structure with members roll no, marks of three subjects. Using this structure, calculate and display the merit list of total n students based on the total of their marks obtained. Marks should be taken as an input in an array.
44	Write a program to print values of two different variables using pointer.
45	Write a program to exchange the values of two integer variables using function with pointer arguments.
46	Write a program that defines function add_diff() to compute the sum and difference of two given input numbers using pointers. (Note: do not return any value from the function)
47	Write a program to read an array of n integer elements and print these elements in reverse order using pointer and user defined function.

Additional Practical List

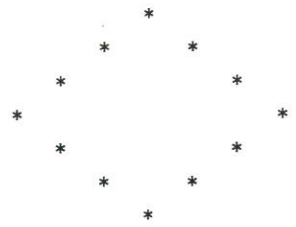
1	Write a program to print all odd numbers between given two numbers x and y including x and y, and their sum and avg.

2	Write a program to calculate the power of a number i.e. x^y without using pow() function.
3	Write a program to print all alphabet letters in upper and lower case.
4	Write a program to print 1st n prime numbers.
5	Write a program to evaluate the series $1 - x + x^2/2! - x^3/3! + x^4/4! ..... - x^n/n!$ (without using any library function).
6	Write a program to print following patterns for the input value of n (where, n represents number of lines to be printed). (Note: Following patterns are generated for the value of n = 4)

(A)



(B)



7	Write a program to insert the value at i^{th} location entered by user using 1-D array.
8	Write a program to interchange the maximum element and the minimum element of 2-D array of the size m × n.
9	Write a program to check whether the matrix (2-D array) of the size m × n is an Identity (unit) matrix or not. (Note: An identity matrix is a square matrix in which all elements of principal diagonal are one, and all other elements are zeros.)
10	Write a program to count total occurrences of upper case letters, lowercase letters, numbers, spaces, tab spaces and special characters from a string taken as an input.
11	Write a program to delete every occurrences of one character from string without using any string library function.
12	Write a calculator program to perform operations (add, subtract, multiply, divide). Prepare user defined function for each functionality.
13	Write a program to enter n elements. Pass these elements to a function int search(int a[], int size, int x). This function will search location of x and will return index value of the number if the number is found. It will return -1, if the number is not found.
14	Write a program that illustrates the use of nested structure.
15	Write a program to reverse the given input string using pointer and user defined function without using any string library function(s).

Recommended Reference Books

1. Balagarusamy E, Programming in ANSI C, Tata McGraw-Hill Publishing Company Limited, Eighth edition, 2019
2. Kanetkar Y. P., Let us C, BPB Publication , Fifteenth edition, 2016

3	B. Gottfried , Programming in C, Tata Mc-Graw Hill Publishers, Fourth edition, 2018
4	Kernighan B W and Ritchie D M, C Programming language, Prentice Hall , Second edition, 2015
5	Reema Thareja, Programming in C, Oxford University Press, Second Edition, 2012
6	K R Venugopal and Sudeep R Prasad, Mastering in C, Tata McGraw Hill, Second Edition, 2006
7	Samuel P. Harbison and Guy L. Steele, C: A Reference Manual, Pearson, Fifth Edition, 2002

CO-PO-Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO – 1	2	1	3	1	2	1	-	1	1	1	-	2
CO – 2	2	-	3	1	1	-	-	1	1	1	-	2
CO – 3	2	2	3	1	2	-	-	1	1	1	-	2
CO – 4	2	2	2	1	2	-	-	1	1	1	-	2
CO – 5	2	1	2	1	2	-	-	1	1	1	-	2

List of Open Source/learning website:

1. http://ps-iiith.vlabs.ac.in/
2. https://nptel.ac.in/courses/106104128
3. https://www.youtube.com/@problemsolvingthroughprogr8170

List of Open Source Software:

1. geany editor
2. codeblocks editor
3. gcc compiler
4. Dev C++
5. Eclipse CDT
6. Clang