

22TP105**PROBLEM SOLVING THROUGH PROGRAMMING - I**

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Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Fundamentals of Problem Solving.**COURSE DESCRIPTION AND OBJECTIVES:**

This course is aimed to impart knowledge on basic concepts of C programming language and problem solving through programming. It covers basic structure of C program, data types, operators, decision making statements, loops, functions, strings, pointers, and also file manipulations. At the end of this course, students will be able to design, implement, test and debug complex problems using features of C.

MODULE-1**UNIT-1****8L+8T+8P=24 Hours****INTRODUCTION TO ALGORITHMS AND PROGRAMMING LANGUAGES**

Introduction to Algorithms: Basics of algorithms; Flow charts; Generations of programming languages. Introduction to C: Structure of a C program - pre-processor statement, inline comments, variable declaration statements, executable statements; C Tokens - C character set, identifiers and keywords, type qualifiers, type modifiers, variables, constants, punctuations and operators.

Data Types and Operators: Basic data types; Storage classes; Scope of a variable; Formatted I/O; Reading and writing characters; Operators - assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, sizeof, dot, arrow, parentheses operators; Expressions - operator precedence, associative rules.

UNIT-2**8L+8T+8P=24 Hours****CONTROL STATEMENTS**

Control Statements: Introduction to category of control statements; Conditional branching statements - if, if - else, nested-if, if - else ladder, switch case; Iterative statements - for, while, do - while, nested loops; Jump statements - break, continue, goto, and return.

PRACTICES:**QUESTIONS ON DATA HANDLING – LEVEL 1:**

- Write a program to accept a character as input from the user and print it.
- Write a program to accept a number as input from the user and print it.
- Write a program to accept a float value from the user and print it.
- Write a program to accept a message as input from the user and print it.
- Write a program to accept a message from the user as input and print it in 3 different lines.
- Write a program to accept 2 numbers from the user as input and print their sum.
- Write a program to accept 2 numbers from the user as input and print their product.
- Write a program to accept a number as input from the user which denotes the temperature in Celsius, convert it to Fahrenheit reading and print it.
- Write a program to accept a number as input from the user which denotes the radius and print the area of the circle.
- Write a program to accept a character as input from the user and print it's corresponding ASCII value.

QUESTIONS ON CONTROL STATEMENTS - LOOPING – LEVEL 1:

- Write a C program to print all the characters from a to z once.
- Write a C program to print all the characters from Z to A once.
- Write a C program to print all the characters from A to Z 3 times.
- Write a C program to print the first N natural numbers, where N is given as input by the user.
- Write a C program to print the first N natural numbers and their sum, where N is given as input by the user.
- Write a C program to print all the odd numbers between 1 and N where N is given as input by the user.
- Write a C program to print all the even numbers between 1 and N where N is given as input by the user.
- Write a C program to print the squares of the first N natural numbers between 1 and N, where N is given as input by the user.
- Write a C program to print the cubes of the first N natural numbers between 1 and N, where N is given as input by the user.
- Write a C program to print the squares of every 5th number starting from 1 to N, where N is given as input by the user.

QUESTIONS ON CONTROL STATEMENTS – DECISION MAKING – LEVEL 1:

- Write a program to accept two numbers as input check if they are equal.
- Write a program to accept two characters as input and check if they are equal.
- Write a program to accept two numbers as input and print the greater of the 2 numbers.
- Write a program to accept two numbers as input and print the lesser of the 2 numbers.
- Write a program to accept 3 numbers as input and print the maximum of the 3.
- Write a program to accept 3 numbers as input and print the minimum of the 3.
- Write a program to accept a number as input and print EVEN if it is an even number and ODD if it is an odd number.
- Write a program to accept a number as input and check if it is divisible by 3. If it is divisible by 3 print YES else print NO.
- Write a program to accept a number as input and check if it is divisible by both 3 & 5. If it is divisible print YES else print NO.
- Write a program to accept a number as input and check if it is positive, negative or zero.

QUESTIONS ON PATTERNS – LEVEL 1:

1. Write a program to accept a number N as input from the user and print the following pattern.
Sample N = 5.

2. Write a program to accept a number N as input from the user and print the following pattern.
Sample N = 5.

* *

* *

* *

3. Write a program to accept a number N as input from the user and print the following pattern.
Sample N = 5.
*

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SKILLS:

- ✓ Analysis of the problem to be solved.
- ✓ Select static or dynamic data structures for a given problem and manipulation of data items.
- ✓ Application of various file operations effectively in solving real world problems.
- ✓ Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.

4. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

*
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5. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

1
 12
 123
 1234
 12345

6. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

1
 22
 333
 4444
 55555

7. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

54321
 4321
 321
 21
 1

8. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

12345
 2345
 345
 45
 5

9. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

A
 AB
 ABC
 ABCD
 ABCDE

10. Write a program to accept a number N as input from the user and print the following pattern.
 Sample N = 5.

A
 BC

DEF
GHIJ
KLMNO

QUESTIONS ON NUMBER CRUNCHING – LEVEL 1:

- Write a program to accept a number as input and print the number of digits in the number.
- Write a program to accept a number as input print the sum of its digits.
- Write a program to accept a number as input, reverse the number and print it.
- Write a program to accept a number and digit as input and find the number of occurrences of the digit in the number.
- Write a program to accept a number as input and check if it is an Armstrong number.
- Write a program to accept a number as input and check if it is an Adam number.
- Write a program to accept a number as input and check if it is a prime number.
- Write a program to accept 2 numbers as input and check if they are amicable or not.
- Write a program to accept a number as input and check if it is a power of 2.
- Write a program to accept 2 numbers as input and find their LCM.

MODULE-2

UNIT-1

8L+8T+8P=24 Hours

ARRAYS & STRINGS

Arrays: Introduction; Types of arrays; Single dimensional array - declaration, initialization, usage, reading, writing, accessing, memory representation, operations; Multidimensional arrays.

Strings: Character array, Reading string from the standard input device, Displaying strings on the standard output device, Importance of terminating a string, Standard string library functions.

UNIT- 2

8L+8T+8P=24 Hours

FUNCTIONS

Functions: User-defined functions; Function declaration-definition, header of a function, body of a function, function invocation, Call by value, Call by address, Passing arrays to functions; Recursion; Library functions.

PRACTICES:

QUESTIONS ON STRINGS – LEVEL 1:

- Write a program to accept a string as input and print it.
- Write a program to accept a string as input and count the number of vowels in it.
- Write a program to accept a string as input and count the number of consonants in it.
- Write a program to accept a string as input and print its length.
- Write a program to accept a string as input and print the reversed string.
- Write a program to accept 2 strings as input and check if they are the same.
- Write a program to accept a string as input and copy the contents into a second string and print the second string.
- Write a program to accept 2 strings as input and concatenate them into a third string and print the third string.
- Write a program to accept a string as input and check if it is a palindrome.
- Write a program to accept two strings as input and check if the second string is a substring of the first.

QUESTIONS ON STRINGS – LEVEL 2:

- Implement the string length function.

- Implement the string copy function.
- Implement the string concatenate function.
- Implement the string compare function.
- Implement the vowel count function.
- Implement the consonant count function.
- Implement the count words function.
- Implement the string reverse function.
- Implement the strstr function.
- Complete the code snippet to implement the is Palindrome function that checks if a given string is a palindrome. You will need to use the 3 functions string Copy, str Reverse and string Compare functions provided to accomplish this.

QUESTIONS ON STRINGS – LEVEL 3:

- Write a program to swap two given strings and print the swapped strings.
- Write a program to swap two given words of the given sentence and print the altered string.
- Return the maximum occurring character in the string.
- Write a program to print the character in the string with the count where count is the occurrence of the character.
- Write a program to print the duplicate characters in the given string.
- Write a program to remove the duplicate characters in the given string.
- Write a program to remove the vowels from a given string.
- Write a program to rotate a given string N number of times.
- Write a program to check if 2 strings are rotations of each other.
- Write a program to remove the characters from the first string that are present in the second string.

QUESTIONS ON 2D ARRAYS – LEVEL 1:

- Print the contents of a 2D array row-wise.
- Print the contents of a 2D array column-wise.
- Print the contents of a 2D array in a zig-zag order.
- Print the contents of a 2D array diagonal-wise.
- Print the contents of a 2D array right-diagonal order.
- Print the contents of a 2D array left-diagonal order.
- Print the contents of a 2D array in the upper triangular order – left top to right bottom.
- Print the contents of a 2D array in the lower triangular order.
- Find and print the maximum element along with its position in a matrix.
- Find and print the minimum element along with its position in a matrix.

QUESTIONS ON 2D ARRAYS – LEVEL 2:

- Find and print the maximum element of each row of a matrix.
- Find and print the minimum elements of each row of a matrix.
- Find and print the maximum element of each column of a matrix.
- Find and print the minimum element of each column of a matrix.
- Find the lowest value in the upper triangle area and the largest value in the lower triangular area of a matrix and print their product.
- Find the sum of the elements of each row and each column of a matrix and print the minimum row sum and maximum sum column.
- Write a program to find the row with the maximum number of 1's in a matrix consisting of only 0's and 1's.
- Write a program to print the quotient and remainder on dividing sum of left-top to right-bottom diagonal by sum of right-top to left-bottom diagonal.
- Write a program to print the absolute difference of the sum of major diagonal elements and the sum of minor diagonals of the given matrix.

- Write a program to search a given element in a row-wise and column-wise sorted 2D array.

QUESTIONS ON 2D ARRAYS – LEVEL 3:

- Write a program to find the Kth smallest element in the given matrix.
- Write a program to find the Kth largest element in the given matrix.
- Write a program to check whether the given two two-dimensional array of same dimensions are equal or not.
- Write a program to add the given two two-dimensional array of same dimensions.
- Write a program to subtract the given two two-dimensional array of same dimensions.
- Write a program to multiply the given two two-dimensional array of same dimensions.
- Write a program to sort each row of a matrix.
- Write a program to find the sum of the elements in 'Z' sequence of the given 2D array.
- Write a program to print the unique rows of the given two-dimensional array consisting of only 0's and 1's.
- Write a program to print the unique columns of the given two-dimensional array consisting of only 0's and 1's.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify suitable data type for operands and design of expressions having right precedence.	Apply	1,2	1
2	Apply decision making and iterative features of C Programming language effectively.	Apply	1,2	1
3	Select problem specific data structures and suitable accessing methods	Analyze	1,2	1,2
4	Design and develop non- recursive and recursive functions and their usage to build large modular programs and also able to design string manipulation functions.	Create	1,2	3
5	Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.	Evaluate	1,2	3,4

TEXT BOOKS:

1. Behrouz A. Forouzan, Richard F.Gilberg, "Programming for Problem Solving", 1st edition, Cengage publications, 2019.
2. Ajay Mittal, "Programming in C - A Practical Approach", 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Reema Thareja, "Computer Fundamentals and Programming in C", 1st edition, Oxford University Press, India, 2013.
2. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata McGraw-Hill, 2017.
3. R G Dromey and Pearson, "How to solve it by Computer", 2nd Edition, 1998.