10ABTEC22114: Problem Solving Techniques with C		
Course Frame Work:		
Credits: L-T-P: 3 - 0 - 1		Total Credits: 4
Contact Hours/Week: 5	Direct Teaching Hours: 45	Total Contact Hours: 75

Course Learning Objectives:

The course aims to get an in-depth understanding of all the fundamentals needed for C Programming and enable them to learn problem solving approaches to solve real world problems.

Course Outcomes: On completion of the course, student would be able to:

COs	Course Outcomes	RBT
CO1	Define the basic Constructs of C Language	L1
CO2	Use Decision making Statements and Loops to write Simple C Programs	L3
CO3	Explain Functions using Real world applications	L2
CO4	Develop applications using Arrays and Pointers in C	L3
CO5	Describe Strings, Structures, Union and File handling with applications in C	L2

Syllabus	Hours
Module - 1	09
Introduction to Language - Algorithm, Pseudo Code, Flow Chart, Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output, Operators(Arithmetic, Relational, Logical, Bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.	
Module - 2	09
Statements - Selection Statements (making decisions) - if and switch statements, Repetition statements (loops) - while, for, do-while statements, Loop examples, other statements related to looping - break, continue, go to, Simple C Program examples.	
Module - 3	09
Functions - Introduction to Structured Programming, Functions - basics, user defined functions, inter function communication (call by value, call by reference), Standard functions. Storage classes-auto, register, static, extern, scope rules, arrays to functions, recursive functions, example C programs	
Module - 4	09
Arrays - Basic concepts, one-dimensional arrays, two - dimensional arrays, multidimensional arrays, C programming examples. Pointers - Introduction (Basic Concepts), pointers to pointers, compatibility, Pointer Applications, Arrays and Pointers, Pointer Arithmetic, memory allocation functions, array of pointers, pointers to void, pointers to functions, command – line arguments	
Module - 5	09

Strings - Concepts, C Strings, String Input / Output functions, string manipulation functions, string /data conversion.

Structures: Defining Structure, Declaration of Structure Variable, Accessing Structure members, copying and comparing structure variable, operation on individual member, nesting of structures, Array of structures. Application of pointers and function on Structures.

Union: Defining Union Declaration of Union, Difference between Structure and Union, Introduction of Static and Dynamic memory allocation - The process of Dynamic memory allocation.

Input and Output - Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions.

Scheme of Evaluation:

A. Continuous Internal Assessment (CIA) Scheme:

Components	Presentation (GS)	Assignments	**Lab**	IAT	**Preparatory**	Total
Max. Marks	10	10	**10**	**10**	10	50

LAB (P = 1 Credit)				
Components	Problem Solving	Debugging	Quiz	Lab Total
Max. Marks	15	05	05	25

Note: A student has to obtain a minimum of 40% in theory of the subject to be eligible to appear for ESE.

B. End Semester Exam (ESE) Scheme: 50 marks

Question Paper Pattern:

a) Question paper shall have 5 main questions corresponding to 5 modules.
b) Each main question will have two full questions carrying 10 marks each.
c) A full question may have a maximum of four sub questions, covering the topics under a module.
d) The students will have to answer all 5 main questions, selecting one full question from each module.

Text Books:

1) E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 6th Edition
2) Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

Reference Books:

1) The C Programming Language. 2nd Edition Book by Brian W. Kernighan, Dennis M. Ritchie,
2) C Programming Absolute Beginner's Guide. Book by Dean Miller and Greg Perry
3) C Programming: A Modern Approach Book by K. N King
4) C programming with Solved Problems by Lal, P. Sojan, Jose, Jeeva
5) C programming for Problem Solving by Nanjesh Bennur, C K Subbaraya

e-Material:

1) https://www.programiz.com/c-programming
2) https://www.geeksforgeeks.org/c-programming-language

Activity Based Learning/Practical Based Learning:

http://nptel.ac.in

https://swayam.gov.in

PROBLEM SOLVING TECHNIQUES WITH C – LAB EXPERIMENTS

I. Experiments using C Basic Constructs

1. Write a C program to evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)).
2. Write a C program to find the sum of individual digits of a 3-digit number
3. Write a C program to read the values of x and y and print the results of the following expressions in one line: i. (x + y) / (x - y) ii. (x + y) (x - y)

II. Experiments using Control Structures

4. Write a C program to generate all the prime numbers between 1 and n.
5. Write a C program to find the roots of a quadratic equation.
6. Write a C program to check whether a given 3 digit number is Armstrong number or not.

III. Experiments using Functions & Arrays

7. Write a C program that uses functions to find the factorial of a given integer.
8. Write a C program using Arrays to find the second largest integer in a list of integers.
9. Write a C program to print the transpose of a given matrix using function.

IV. Experiments using Strings

10. Write a C program to determine if the given string is a palindrome or not.
11. Write C programs using pointers.
    a. To concatenate two strings
    b. To find the length of string
    c. To compare two strings

V. Experiments using Structures and Files

12. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the Basic pay. Gross-salary (Basic pay + DA). Print the employees name and gross salary.
13. Write C programs
    a. To display the contents of a file.
    b. To copy the contents of one file to another.
    c. To reverse the first n characters in a file, where n is given by the user.
14. Write a C program to count the no. of characters present in the file.
15. Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are put in the third file.
