

Branch Name:	BCA (Bachelor of Computer Applications)
Program Code:	CS101
Course Title:	Problem Solving Techniques-II
Course Code:	22-SEC102-1C
Pre-requisite Course:	Basic Knowledge of C language.

Course Objective: (CO)

1. This course is intended to develop problem solving skills in students with advance programming skills.
2. To strengthen the understanding of functions and pointers for effective program modularity and dynamic data handling.
3. To develop the ability to implement structures and unions for efficient management of complex data types in C.
4. To enable students to perform file handling operations for persistent data storage and retrieval in applications.
5. To introduce preprocessor directives and macros to enhance code reusability and program efficiency.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								Total
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory				Practical				
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min. Marks	Min. Marks	Min. Marks	Min. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	
4	-	4	6	18	50	18	50	09	25	09	25	150

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	User-Defined Functions & Structures: User-Defined Functions: Introduction, Need for user-defined functions, Arguments and return types, Classifications of functions using arguments and return types, Nesting of functions, Recursion, Functions with arrays, Scope and lifetime of variables in functions. Structures and Unions: Introduction, Structure definition, Initialization, Arrays within structures, Structures and functions, Unions, Bit fields.	15	25
2	Pointers: Pointers: Introduction, understanding pointers, accessing variable addresses, Declaring and initializing pointers, accessing variables through pointers, Pointer expressions, Pointer increments and scale factor, Pointers with arrays, character strings, functions, and structures.	15	25
3	File Handling & Dynamic Memory Allocation: File Management in C: Defining, creating, opening, and closing files, I/O operations, Error handling, Random access files, Command line arguments. Dynamic Memory Allocation: Introduction, Memory allocation functions (malloc, calloc, etc.), Basic linked list operations.	15	25
4	Preprocessors & Macros: Preprocessors: Introduction, Types of preprocessor directives. Macros: Introduction, Format of Macro, Simple Macro substitution, Argument macro substitution, Nested macro substitution, File inclusion, Compiler control directives.	15	25

Course Learning Outcomes (CLO):

At the end of this course, the student would be able

1. **CLO1:** To understand the concept of software modules (using function).
2. **CLO2:** To use by structure, unions and pointers in designing application in C.
3. **CLO3:** To apply the knowledge of the advance concepts in using dynamic memory allocation.
4. **CLO4:** To understand store/retrieve data to/from files on auxiliary memory.
5. **CLO5:** Use preprocess or directives and macros effectively to simplify code, manage file inclusion.

List of Textbook:

1. Programming in ANSI C, By E Balaguruswami, Tata McGraw-Hill Publishing Company Limited.
2. Programming with C, By Bayron Gottfried, Tata McGraw-Hill Edition.
3. Let Us C, By Yashavant Kanetkar, BP BPublications.

List of Text Reference book:

1. Working with C, By Yashavant Kanetkar, BPB Publications.
2. C in Depth, By Suresh K. Srivastava, BPB Publications.
3. Programming in C, by Reema Thareja Publisher –Oxford.

E-Resources/ WebLinks:

1. <https://www.tutorialspoint.com/cprogramming/index.htm>
2. <https://www.w3schools.com/c/>
3. <https://www.javatpoint.com/c-programming-language-tutorial>
4. <https://www.guru99.com/c-programming-tutorial.html>
5. <https://www.cprogramming.com/tutorial/c-tutorial.html>

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

No.	Program Description
1	Write a program to check if a given number is palindrome using User Defined Function (UDF).
2	Write a program to find factorial of a given number using UDF.
3	Write a program to find factorial of a given number using recursion.
4	Write a program to display first 25 terms of Fibonacci series using recursion.
5	Write a program using a recursive function to find the GCD of two positive integers.
6	Write a program to convert all lowercase characters of a string to uppercase using UDF.
7	Write a program to sort an array of integers using UDF.
8	Write a program to search a number within an array using UDF.
9	Write a function <code>power</code> that computes x raised to the power y and returns a double value.
10	Define a structure <code>struct personal</code> containing name, date of joining, salary; read and display the information.
11	Define a structure <code>student_records</code> (Roll_no, Name, City, Percentage); read and display data for 5 students.
12	Write a program using structure within structure.
13	Write a program using structure within function.
14	Write a program to print the value and address of array elements.
15	Write a program to use pointers in arithmetic operations.

16	Write a program to accept 10 numbers and display their sum using pointer.
17	Write a program to accept 10 numbers and sort them using pointer.
18	Write a program to swap two values using pointers and UDF.
19	Write a program with structure and pointer.
20	Write a program to determine length of a string using pointer.
21	Write a program to read an array of integers and print its elements in reverse order using pointers.
22	Write a program using UDF and pointers to add two matrices and return the resultant matrix.
23	Create a text file, store information into it, and print the information on terminal.
24	Read integers from file DATA, write odd numbers to ODD file, even numbers to EVEN file, display both files.
25	Read data from keyboard, write to INPUT file, and display data from INPUT file.
26	Write a program that counts the number of characters and lines in a file.
27	Read student marks file and generate annual examination results table (Roll no, Name, Sub1, Sub2, Sub3, Total, Percentage, Class).
28	Read empinfo data file (empno, empname, basic) and create empout data file in tabular format.
29	Write a program using fseek and ftell functions.
30	Merge two sorted files DATA1 and DATA2 into DATA using command line arguments.
31	Write a program to work as DOS 'copy con' command using command line arguments.
32	Write a program to work as DOS 'type' command using command line arguments.
33	Write a program to work as DOS 'copy' command using command line arguments.
34	Write programs explaining use of memory allocation functions.
35	Write a program explaining use of macros.

Mapping of CLO, PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1		M		H	H	M	M	L	L	M	M	M	M	M	M
CLO2	L	H	M	H	M	M	H	M			H				L
CLO3	L	M		H	H		H	H	M	M	H	L	M	L	
CLO4	L	M	M	H	M	M	H	H	M		M		H	L	L
CLO5	M	M	L	M	M	H	M	M	M	H	M	L	L	M	L

H: High, M: Medium, L: Low