COURSE TITLE	**COMPUTER PROGRAMMING FOR PROBLEM SOLVING**
COURSE CODE	**01EC0114**
COURSE CREDITS	**4**

Objective:

1 To introduce students to problem-solving through C programming by building strong foundations in logic development, data structures, and modular coding—enabling them to apply programming concepts to real-world engineering problems and Electronic Applications.

Course Outcomes: After completion of this course, student will be able to:

1 Apply fundamental C programming concepts, including syntax, data types, operators, control structures, functions, arrays, strings, pointers, and structures for real-world problem solving. (Bloom's Level: Apply)

2 Analyze problems and implement efficient solutions using dynamic memory allocation and file handling. (Bloom's Level: Analyze)

3 Compare and contrast performance of given programs for a specific functionality. (Bloom's Level: Evaluate)

4 Design and implement a mini project integrating multiple C programming concepts to solve problems (Bloom's Level: Create)

Pre-requisite of course: Analytical and Logical Reasoning Skill

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Programming** Basics of Computational Thinking and Flowcharts, Algorithms and Pseudocode, History and Features of C, Structure of a Simple C Program, Compilation and Execution Process	3
2	**Data Types and Operators** C Data Types: int, float, char, double, Type Conversion and Type Casting, Constants in C Programming, Arithmetic, Relational, Logical, and Bitwise Operators, Programming Examples and Exercises	5
3	**Standard Input/Output** Reading from Keyboard and Writing to Terminal using printf and scanf, Format Specifiers in C, Programming Examples and Exercises	3

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Contents : Unit	Topics	Contact Hours
4	**Control Structures** Branching Structures: if, if…else, if…elseif, Ternary Operator, Switch Statement and Its Applications, Looping Structures: while, do…while, for, Special Features: break, goto, continue; Programming Examples and Exercises	4
5	**Functions and Recursion** Function Declaration, Definition, and Calling, Scope of Variables, Lifetime of Variables, Recursion: Examples (Factorial, Fibonacci); Programming Examples and Exercises	4
6	**Arrays and Strings** 1D Arrays: Declaration, Initialization, and Access, 2D Arrays and Their Applications, String Handling Functions in C, Array Operations: Sum, Search, Sort, Programming Examples and Exercises	5
7	**Pointers** Basics of Pointers, Pointer Arithmetic, Pointers and Arrays, Pointers to Functions, Programming Examples and Exercises	4
8	**Structures and Unions** Defining and Using Structures, Nested Structures and typedef, Enums, Unions, and Memory Sharing, Programming Examples and Exercises	4
9	**File Handling and Dynamic Memory Allocation** File Handling Functions: fopen, fclose, File Input/Output: fscanf, fprintf, Reading and Writing Files: Practical Usage, File Modes and Error Handling Techniques, Dynamic Memory Allocation: malloc, calloc, Reallocation and Deallocation: realloc, free, Using Dynamic Memory with Arrays and Structures; Memory Leaks and Best Practices; Programming Examples and Exercises	7
10	**Preprocessors & Data Structures** Introduction to Preprocessors and Compiler Control Directives, Introduction to Data Structures: Primitive and Non-Primitive Data Types, Abstract Data Types, Data Structures Overview: Stacks, Queues, Linked Lists, Trees	3
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment-1** Write a program to print student detail., Write a program to calculate simple interest., Write a program that accepts centigrade and convert it into Fahrenheit., Write a program that accepts two numbers in A and B interchange value of A and B variable., Write a program to demonstrate the use of the basic data types int, char and float.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
2	**Experiment-2** Write a program to demonstrate the use of Arithmetic operators by getting two numbers from the user, Write a program that accepts a number from keyboard and find weather the number is ODD or EVEN using Conditional operators., Write a program to demonstrate the use of increment and decrement operator., Write a program to demonstrate the use of shorthand operators, Write a program to demonstrate the use of sizeof() of operator., Write a program to demonstrate the use of bitwise operators.	2
3	**Experiment-3** Write a program that accepts three numbers from the user and print maximum of them., Demonstrate the use of GOTO statement., Write a program to input the Name and the Salary of an Employee. Calculate and print the Name, Salary and Bonus of the Employee, where bonus= 5.3% if salary is at least Rs. 10,000 and 6.5% otherwise., Admission to professional course is subject to the following conditions. Marks in Mathematics>=60, Marks in Physics>=50 Marks in Chemistry>=40, Total in all three subjects>=200 or total in mathematics and physics>=150, Given the marks in the three subjects, write a program to process the application to list the eligible candidates.	2
4	**Experiment-4** Write a program that accepts two numbers and one code (1,2,3,4) from the user. According to the code, the operations to be performed, using switch case statements as follows: (Code: 1? Addition, 2? Subtraction, 3? Multiplication, 4? Division)., Write a program that reads the marks for five subjects of a student. Calculate and print the grade for the student [i.e. Grade A, B, C, D and F] using Else-If ladder., Write a program that do sum=1+3+5+ ……. N terms Print value of Sum., Write a program to print the Fibonacci Series [i.e. 1,1,2,3,5,8,13…N terms]., Write a program to accept one number from the user., Display reverse of that number., Find if it is Armstrong or not.	2
5	**Experiment-5** Write a program that accepts a number from the user and print prime numbers from 0 to that number., Write a C program to display various Patterns., Write a program to accept 5 numbers in an array and display it., Write a program to accept 9 numbers in form of matrix and display in matrix form., Write a program to accept 5 numbers in array and find maximum and minimum value of it.	2
6	**Experiment-6** Write a program to accept 5 numbers in array and find maximum and minimum value of it., Write a program to sort all elements of 1-D array in ascending and descending order., Write a program to calculate and display addition of two matrix., Write a program to count number of vowels in a given string., Write a program to check whether entered string is palindrome or not.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
7	**Experiment-7** Write a program for string concatenation without using library function., Write a program to demonstrate the Library function for string., Write a function which receives number as argument and return sum of digit., Write a program for calculating Fibonacci series using UDF and call by value, Write a program to calculate Factorial using recursion in UDF.	2
8	**Experiment-8** Write a program to find Average, maximum and minimum of Array elements using UDF., Write a program to calculate total number of positive, negative and zero value in array using UDF.	2
9	**Experiment-9** Write a program to swap two numbers using UDF and pointer.	2
10	**Experiment-10** Write a program using pointer to read in an array of integers and print its elements in reverse order.	2
11	**Experiment-11** Write a C program to create a structure of employees with Full Name, Last Name, City and Salary. Display it for n employees., Write a program to demonstrate nested structure. (make structures for circle and rectangle)	2
12	**Experiment-12** Write a program to create array of structure. Make a structure for student having student_no, student_name, student_marks., Write a program to create union cricketer having player_name, batting_avg, player_age.P for swapping of two values with help of UDF and call by reference., Write a program to Display contents of a file on screen. Use functions (fopen,fclose, getc,putchar,eof), Write a program to count number of characters in a file.	2
13	**Course Project** Based on the topics above students can be asked to develop a software-based project. Suggested Course Projects are - Resistor color code calculator, Temperature logger with threshold alert, Waveform sample visualizer, Simple signal generator simulation, Basic calculator for EC formulas (dB, attenuation, etc.)	4
Total Hours		**28**

Textbook :

1 Programming in ANSI C, E. Balagurusamy, Tata Mcgraw-Hill Publishing Com, 2014

References:

1 Programming in C, Programming in C, Pradip Dey & Manas Ghosh, Oxford Publication , 2011

2 C - How to Program, C - How to Program, Paul Deitel, Harvey Deitel, Pearson, 2015

References:

3 C: Programming Language, C: Programming Language, Ritchie Dennis M, Kernighan Brain W, Prentice Hall Of India Private limited, 1988

4 Let Us C, Let Us C, Yashavant Kanetkar, BPB Publications, 2023

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	15.00	30.00	15.00	15.00	15.00

Instructional Method:

1 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

2 Practical examination will be conducted at the end of the semester for evaluation of performance of students in laboratory.

3 Students may use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory, etc.

4 The course delivery method will depend upon the requirement of content and need of the students. The teacher in addition to conventional teaching method (Chalk and Talk) may use any of the tools such as demonstration, role play, Quiz, brainstorming, Flipped class, Project based learning, Collaborative learning, MOOCs etc. for effective teaching.

Supplementary Resources:

1 http://nptel.ac.in/courses/106105085/4

2 http://nptel.ac.in/courses/106104128

3 https://www.udemy.com/course/c-programming-for-beginners/