Semester* : II
Course Type : SEC
Course Code** : MAT-SEC-151
Name of the Course : Mathematical Programming in C
Learning level*** : 200
Credits : 3
Contact Hours : 45
Total Marks : 100
End Semester Marks : 80 (Theory - 50, Practical - 30)
Internal Marks : 20
Course Objective

The main objective of this course is to introduce the fundamentals of the C programming language and its application in mathematical programming and to develop problem-solving skills by implementing mathematical algorithms.

THEORY

Unit – I

Introduction to C language, C characters, constants and variables. Arithmetic expression and statement. Input-output statements, assignment statement, printf and scanf statements, declaration statement.

Unit – II

Simple computer programs. Logical expression and statements, logical and relational operators.

Unit – III

Decision control structures and loops: if statement, if-else statement, for loop, while loop, do-while loop, switch statement, break statement, continue statement, go to statement.

Unit – IV

Functions: Defining a function, function prototypes, passing arguments to a function.

Unit – V

Return statement, arrays, defining one and multi-dimensional arrays.

Textbook:

1. E. Balagurusamy, Programming in ANSI C, 8th ed., McGraw Hill Education (India), 2019.

Reference books:

1. T. Jeyapoovan, A First Course in Programming with C, 1st ed., Vikas

Publishing House, 2004. 2. Y. Kanetkar, Let Us C, 15th ed., BPB Publications, 2016.
3. B.W. Kernighan, D.M. Ritchie, The C Programming Language, 2nd ed., Pearson Education India, 2015.

PRACTICAL

1. Write a program to find the area of a
    a. circle
    b. rectangle
    c. triangle
2. Write a program to determine whether a given year is a leap year or not
3. Write a program to check whether a given character is a vowel or a consonant
4. Write a program to check whether a given positive integer is prime
5. Write a program to find the factorial of a positive integer using a
    a. loop b. recursive function
6. Write a program to find the sum of the following series for a given positive integer n:
$$1! + 2! + \cdots + n!$$
7. Write a program to find the biggest element in an array of integers
8. Write a program to sort a given array of integers in
    a. ascending order b. descending order
9. Write a program to find
    a. the sum of two matrices b. the product of two matrices
10. Write a program to find the determinant of a
    a. 2×2 matrix b. 3×3 matrix
11. Write a program to find the inverse of a
    a. 2×2 matrix b. 3×3 matrix

Course Outcome

On successful completion of the course, learners will be able to
1. Demonstrate a comprehensive understanding of the syntax, variables, and data types used in the C programming language,
2. Apply C programming concepts effectively to solve mathematical problems, including calculating areas, determining leap years, and checking for prime numbers,
3. Develop efficient C programs to compute factorials, sum of series, and manipulate arrays for mathematical computation,
4. Utilize decision control structures (if-else, switch) and loops (for, while, do-while) proficiently in mathematical programming scenarios,
5. Design and implement modular programs by defining functions, passing arguments, and using return statements to solve mathematical problems.