or more variables, Extreme values, Lagrange's method of undetermined multipliers, Differentiation under the integral sign.

Multiple Integrals: Evaluation of double integral (in Cartesian and polar co-ordinates) change of order of integration, integration by change of variables and its applications in area, mass, and volume. Triple integral (in Cartesian, cylindrical and spherical co-ordinates) and its application in volume.

SUGGESTED READINGS

1. G. B. Thomas and R. L. Finney,"Calculus and Analytic Geometry," Pearson Education.
2 R. K. Jain and S. R. K. Iyenger, "Advanced Engineering Mathematics," Narosa.
3 Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley.
4 Michael Greenberg, "Advanced Engineering Mathematics", Pearson Education.

Course Code	Type	Subject	L	T	P	Credits	CA	MS	ES	CA	ES	Pre-Requisites
FC002	FC	Computer Programming	3	0	2	4	15	15	40	15	15	None

COURSE OUTCOMES

1. To understand the basic terminology and program structures used in computer programming to solve real world problems.
2. To learn the process of representing problems and writing, compiling and debugging programs.
3. To develop programming skills in using different types of data, decision structures, loops functions, pointers, data files and dynamic memory allocation/de-allocation.
4. To understand the need for continuing to learn new languages to solve complex problems in different domains.

COURSE CONTENT

C Programming Language

Thinking like a programmer: problem solving. Components of a problem, algorithm, checking for errors and inconsistencies, writing a pseudocode.

Boolean Logic: Binary Number systems and codes and operations.

Introduction to programming& Basics of C: Concepts of Algorithm and Flowcharts, Process of compilation, Basic features of C Language like Identifier, Keywords, Variable, data types, Operators and Expression, basic screen and keyboard I/O, Control Statements, iteration, nested loops, Enumerated data types, bitwise operators, C Preprocessor statements.

Arrays and Pointers: One and multidimensional dimensional arrays, strings arrays, operations on strings, Array and Pointers, Pointers and strings, Pointer to Pointer, other aspect of pointers,User Defined Data Types: Structures, Unions, bit fields.

Functions: Concept of modular programming, Using functions, Scope of data, Recursive functions, Pointers and functions, Command line arguments.

Linked List: Dynamic memory allocation, singly link list, traversing, searching, insertion, deletion.

Files: Types of files, working with files, usage of file management functions.

C++ Programming Language

Moving from C to C++: Concepts of Object Orientation, Objects, classes, encapsulation, data abstraction, inheritance, delegation, software reuse. Inheritance visibility rules using public, private, protected, member functions: Constructors / destructors, operator (::),accessing member functions within a class, new, delete.

Friend functions and classes, static data and functions, function templates, pointers within a class, passing / returning objects as arguments.

Functions Polymorphism – virtual functions, function overloading, variable definition at the point of use, reference variables, strict type checking, default arguments, type conversion.

Exception handling, streams based I/O.

Emerging Trends: Kinds of programming languages.

Guidelines for practical work:

Programs for temperature conversion, area of triangle, counting frequencies of letters,

words to understand the basic data types, input-output, control flags.
Programs for decision making using selection, looping, processing of arrays for sorting, searching , string manipulations, matrix operations.
Programs for parameter passing to functions, returning values, interactions among functions, pointer with arrays, strings, call by reference.
Programs using structure , pointers and files for linked lists , inventory management etc.
Program using bit wise operators to simulate the combinational circuits.
Program showing the concept of objects, access specifiers and inheritance.

SUGGESTED READINGS

1. B. W. Kernighan and D.M. Ritchie, "The C programming language", Prentice Hall.
2. Herbert Schildt and Tata McGraw Hill ,"The Complete Reference",.
3. Yashwant Kanitkar, "Let us C", BPB Publication
4. Byron Gottfried, Schaum Series, Tata McGraw Hill,"Schaum's Outline of Programming with C",
5. Addison Wesley, "Object Oriented Programming", Budd.
6. D Samantha, "Object oriented Programming in C++ and Java ", PHI. Stroustrup,"Programming in C++", Special Edition, Addison Wesley.