J & K INSTITUTE OF MATHEMATICAL SCIENCES

IMTH-104: COMPUTER APPLICATIONS-I
Course Title: Computer Programming Using C

UNIT- I
Basic Computer Fundamentals: Introduction to computer systems; number system, integer, signed integer, fixed and floating point representations; IEEE standards, integer and floating point arithmetic; CPU organization, ALU, registers, memory, the idea of program execution at micro level. **(4L)**

C programming language: Problem Solving, Algorithms, Flowchart, Pseudocodes, Basic Structure of C programs, Character Set, Identifiers, Reserved Words, Data Types, Constants, Variables, Symbolic Constants, Casting, and Preprocessor Directives. **(4L)**

Operators (Assignment, Arithmetic, Relational, Logical, Compound Arithmetic Operators, Increment, Decrement, Bitwise Operators &Ternary Operators) **(2L)**

UNIT- II
Control Statements – Conditional, switching, looping control statements. **(3L)**
Functions: Declaring, Defining and Invoking a function, Function arguments and return types, Recursion. **(4L)**
Pointers: Concepts, Call by value and call by reference, pointer Arithmetic. Dynamic Memory Allocation. **(3L)**

UNIT- III
Arrays: Types of arrays, initialization, passing arrays to functions, dynamic arrays. Strings &String-handling functions. Pointer and Arrays **(5L)**

Structures and Unions: struct, structure members, member access operator, structures& pointers, array of structures, structures & functions. **(5L)**

UNIT- IV
File Handling in C: File Input/Output, File Operations, Opening a File, Reading from a File in C Language, Closing the File, File Opening Modes, String (line) I/O in Files **(7L)**
Command Line Parameters: in C Programming Language **(3L)**

TEXT BOOKS:

1. E.Balagurusamy - 'Object Oriented Programming in C++", Tata McGraw Hill.
2. E.Balagurusamy - ''Programming in ANSI C, Tata McGraw Hill.
3. Yashwant P. kanetkar, "Let Us C", BPB Publication

J & K INSTITUTE OF MATHEMATICAL SCIENCES

IMTH-204: COMPUTER APPLICATIONS-II
Course Title: Data Structures

Unit-I
Data Structure Basics: Basic Terminology, Built-in Data Structures in C: An overview, Data Structure and Problem Solving, Data Structure and Data Operations **(3L)**

Linear Arrays: Traversing, Inserting and Deleting values in Linear Arrays. **(2L)**
Stacks: Stacks and their representation in memory and their implementations **(2L)**
Queues: Implementations De-Queues, Priority Queues. **(3L)**

Unit II
Linked Lists: Singly and Doubly Linked List and their implementations. Concepts of Circular Linked Lists. Dynamic Memory Allocations (**4L)**
Trees: Introduction, Trees terminology Binary Tree and their representation in memory, Traversing Binary Trees. **(4L)**
Polish Notations: Evaluation of Postfix, Infix, Prefix Expressions **(2L)**

Unit-III
Graphs: array and linked representation, operations: add, delete and find vertex, add, delete edge, traverse graph (depth-first, breadth-first). Networks: minimum spanning tree, shortest path algorithm (Dijkstra's algorithm and Kruskal's algorithm). **(7L)**
Traversing a Graph: BFS, DFS Algorithms **(3L)**

Unit-IV
Searching Techniques – Linear Search, Binary Search **(2L)**
Sorting Techniques: Insertion sort, Bubble sort, Selection sort, Merge Sort, Radix Sort, Shell sort, Heap sort. **(8L)**

TEXT BOOKS:

1) "Elis Horowiz&SartajSahani, "Fundamentals of Data Structures", Galgotia Publications.
2) "Elis Horowiz&SartajSahani, "Fundamentals Computer Algorithms", Galgotia Publications

REFERENCES:

1) LIPSCHUTA, "Data Structures", Tata Mcgraw Hill

J & K INSTITUTE OF MATHEMATICAL SCIENCES

IMTH-305: COMPUTER APPLICATIONS-IV
Course Title: Numerical and Statistical Computing

UNIT I

Computer Arithmetic: Introduction, Floating Point Representation and Arithmetic, Normalized Floating Point Representation of Numbers. **(2L)**

Approximations & Errors: Types of Programming Errors, Data Errors, Computer & Arithmetic Errors, Round off and Truncation Errors. Accuracy and Precision, Measures of Accuracy, Error Propagation. **(2L)**

Iterative Methods: Non-Linear Equations, Types of Methods to find solutions to nonlinear equations, Algorithms to Compute Roots of Equation – Methods of Tabulation or Brute Force Method, Method of Bisection, Secant Method, Newton-Raphson Method, Method for False Position. **(6L)**

Derivation of mathematical formulas and implementation of these methods.

UNIT II

Solution of Simultaneous Algebraic Equations: Linear Equations, Types of Methods to find solutions to linear equations. Algorithms to Solve Linear Algebraic Equations: Gauss Elimination, Gauss Jordan, Gauss Seidel, L.U. Decomposition (6L)

Interpolation: Lagrange Interpolated Polynomial, Newton's Methods of INTERPOLATION – Forward difference, Backward difference. (4L)

Derivation of mathematical formulas and implementation of these methods.

UNIT III

Least Square Approximation of Functions: Linear and Polynomial Regression. (2L)

Differentiation and Integration: Simpsons Rule, Trapezoidal Rule (2L)

Numerical solution of Differential Equations: Taylor Series Method, Euler's Method, Modified Euler's Method, Runge-Kutta Methods, Predictor Corrector Formula. (6L)

Derivation of mathematical formulas and implementation of these methods.

REFERENCE BOOKS:
1. S.C.Chapra & R.P.Canale: "Numerical methods for Engineering". Tata McGraw Hill.
2. Krishenmurty and Sen : "Numerical Algorithms"
3. V. Rajaraman "Computer oriented numerical methods." Prentice Hall of India.
4. McCalla, Thomas Richard: "Introduction to Numerical Methods and FORTRAN Programming", John Wiley & Sons, Inc.
5. Grewal, B. S.: "Higher Engineering Mathematics", Hindustan Offset Problems Series.
6. "SCHAUM'S Solved Problems Series".
7. Jain, M. K., Iyengav, S. R. K., Jain, R. K.: "Numerical Methods for Scientific and Engineering Computation"+, Wiley Eastern Ltd, New Delhi.

J & K INSTITUTE OF MATHEMATICAL SCIENCES

IMTH-405: COMPUTER APPLICATIONS-IV
Course Title: MATLAB Programming

Unit I

Introduction to Matlab: Matlab Basics, Menus and the toolbar, Computing with Matlab, Script files and the Editor Debugger, Matlab Help System, Tool Boxes Matlab Overview, features and workspace, Data types, Relational and Logical Operators. **[5L]**

Arrays: Initialization and definition, Array functions, 2D Arrays, Multidimensional Arrays, Processing Array elements, Array sorting, **[5L]**

Matrices: Introduction, Matrix Operations, Matrix Functions, Manipulating matrices, Special Matrices, Commands for getting various Rows and Columns of Matrix. **[2L]**

Unit II

Control Structures: Decision Making using If---Else and Switch, For Loops, Do While Loop, **[6L]**

Functions and Files: Function definitions, Function arguments, Function returns, Embedded Functions, Files and I/O, Reading from a file, writing to a file. **[6L]**

Unit III

Plotting: XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots **[6L]**

Linear Algebraic Equations: Elementary Solution Methods, Matrix Methods for (LE), Cramer's Method, Undetermined Systems, Order Systems **[6L]**

Unit IV

Probability and Statistics: Interpolation, Statistics, Histogram and probability, The Normal Distribution, Random number Generation, Interpolation **[6L]**

Symbolic Expressions and Algebra: Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra. **[6L]**

Reference Books:

1. Introduction to MATLAB for Engineers by William J. Palm III.
2. Essentials of MATLAB Programming by Stephen J. Chapman
3. MATLAB Guide to Finite Elements: An Iterative Approach by Peter I. Kattan.
4. An Introduction to Scientific Computing: Twelve Computational Projects Solved with MATLAB.
5. A Guide to MATLAB: For Beginners and Experienced Users by Brian R. Hunt (Editor).