

## **M.C.A. (Masters in Computer Applications)**

### **Revised MCA Course Structure-2007 (Modified)**

#### **SEMESTER-I**

#### **CS 7001 Introduction to Computer Science & Applications**

##### **Module I**

**Introduction To Computers:** Introduction , Characteristics of Computers, Evolution of Computers, Evolution of Computers, Generations of Computers, Classification of Computers, The Computer Systems, Application of Computers.

**Number systems And Logic Gates:** Introduction Number Systems, conversion Between Number Bases, Arithmetic systems, signed And Unsigned numbers, concept of Overflow, Binary coding, Logic Gates, Boolean Algebra, Combination of Logic Gates.

##### **Module II**

Computer Architecture: Introduction, Central Processing Unit, Memory, Communications between Various Units of a computer Systems, Processor Speed,

Multiprocessor Systems.

##### **Module III**

**Secondary Memory:** Introduction, Classification of Secondary Storage Devices, Magnetic Tape, Magnetic Disk, Optical Disk.

**Input Devices:** Introduction, Keyboard, Pointing Devices, Scanners, Optical Scanners.

**Output Devices:** Introduction, Classification of Output, Hard Copy Output Devices, Printers, Plotters, Soft Copy Output Devices, Monitors, Projectors, Terminals.

##### **Module IV**

**Computer Languages:** Introduction, Evolution of Programming Languages. Classification of Programming Languages, Generations of Programming Languages, Features of Good Programming Language, Selection of a Programming Language. **Computer Software:** Introduction, Software: Definition, Relationship Between Software And Hardware, Software Categories, System Software, Application Software, Software Terminology.

##### **Module V &VI**

**Operating System:** Introduction, Operating System, Evolution of Operating System, Types of Operating System, Functions of an Operating System, Modern Operating Systems.

**Data Communication And Computer Network:** Introduction, Data Communication, Transmission Media, Multiplexing, Switching, Computer Network, Network Topologies, Communication Protocols, Network Devices.

## **Module VII**

**Internet Basics:** Introduction, Evolution of Internet, Basic Internet Terms, Getting Connected To Internet, Internet Applications, Electronic Mail- An Introduction, How E-mail Works, Searching the Web (Search Engines), Languages of Internet, Internet and Viruses.

**Multimedia:** Introduction, Multimedia: Definition, Building Blocks Of Multimedia, Multimedia System, Multimedia Applications, Virtual Reality.

### **Text book:**

Introduction to Computer Science- ITL Education Solutions Limited, Pearson Education, 2004.

### **Reference Book:**

1. N.Nilsan & S.Schochen-The Elements of Computing Systems, PHI, New Delhi . 2005.

## **CS 7002 Problem Solving and Program Design with C**

### **Module I & II**

**Problem Solving and Programming Concepts :** Problem Solving in Everyday Life ,

Type of Problem ,Solving with Computers , Constants and Variables, Data Types, Functions , Operators , Expressions and Equations , Data Storage and Communication with Computers, Organizing the Problem , Computer Software and Software Development Method.

### **Module III**

**Overview of C:** C Language Elements , Variable Declaration , Data Types, Expressions ,Data Files .

**Top Down Design with Function :** Top Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments .

### **Module IV**

**Selection Structures :** Problem Solving with Decision, Control Structures , Conditions, All kind of if Statements, switch statement.

**Repetition and Loop Statements :** Problem Solving with loops, Repetition in program ,while Statements, for Statements, Conditional Loops, Loop Design, Nested Loops, do-while Statement and Flag Controlled Loops .

### **Module V**

**Modular Programming:** Functions with Simple Output Parameters, Multiple Calls to a Function with Input/Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

**Arrays:** Declaring and Referencing Arrays. Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Multidimensional Arrays.

### **Module VI**

**Strings:** String Basics, String Comparison, Arrays of Pointer, Character

Operations, String to-Number and Number-to-String Conversions.

**Recursion:** The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical functions, Recursive Functions with Array and String Parameters, Problem Solving with Recursion.

### **Module VII**

**Structure and Union Types:** User-Defined Structure types, Structure Type Data

as Input and Output Parameters, Functions Whose Result Values are Structured, Problem Solving with Structure Types, Union types.

**File Processing and Programming in the Large:** Input and Output Files, Binary Files, Using Abstraction to Manage Complexity, Header Files, Implementation Files, Storage Classes, Macros.

**Text Books:**

1. M.Sprankle- Problem Solving and Programming Concepts, 7<sup>th</sup> Edn, Pearson Education, New Delhi.2006
2. JR.Hanly & E.B. Koffman- Problem Solving and Program Design in C, 4<sup>th</sup> Edn, Pearson Education, New Delhi.2004.

**Reference Books:**

1. E.Balagurusamy- Programs in ANSI C, 3<sup>rd</sup> Edn, TMH, New Delhi-2004
2. B.A.Forouzan & R.F. Gilberg- Computer Science: A structured Programming Approach Using C, 2<sup>nd</sup> Edn, Brooks/Cole- Thomson Learning, Indian Reprint, 2003.

## **CS 7003 DATA STRUCTURES**

### **Module I**

**Introduction:** Pseudocode, The Abstract Data Type, A Model for an Abstract Data, Algorithm Efficiency.

**Searching:** List Searches, Hashed List Searches, Collision Resolution.

### **Module II**

**Linked Lists:** Linear List Concepts, Linked List Concepts, Linked List Algorithms, Processing a Linked List, List Applications, Complex Linked List Structures, List Abstract Data Type- Linked List Implementation.

### **Module III**

**Stacks:** Basic Stack Operations, Stack Linked List Implementation, Stack Applications, Stack Abstract Data Type Implementation, Stack ADT – Array Implementation.

**Queues:** Queue Operations, Queue Linked List Design, Queuing Theory, Queue Applications, Queue ADT List implementation, Queue ADT-Array Implementation.

### **Module IV & V**

**Recursion:** Factorial – A Case Study, How Recursion works, Designing Recursive Algorithms, Another Case Study – Fibonacci Numbers, The Towers of Hanoi.

**Introduction to Trees:** Basic Tree Concepts, Binary Trees, Binary Tree Traversals, Expression Trees, General Trees, Huffman Code.

**Search Trees:** Binary Search Trees, AVL Trees, AVL Tree Implementation, AVL Abstract Data Type.

### **Module VI**

**Heaps:** Heap Definition, Heap Structure, Basic Heap Algorithms, Heap Data Structure, Heap Algorithms, heap Applications.

**Multiway Trees:** m-Way Search Trees, B-Trees, Simplified B-Trees.

### **Module VII**

**Advanced Sorting Concepts:** General Sort Concepts, Insertion Sorts, Selection Sorts, Exchange Sorts, External Sorts

**Text Book:**

1. R.F.Gilberg & B.A. Forouzan-Data Structures: A Pseudocode Approach with C++, 2<sup>nd</sup> Edn, Brooks/Cole – Thomson Learning, Indian Reprint, 2005.

**Reference Books:**

1. E.Horowitz et.al – Fundamentals of Data Structures in C++, Galgotia Publication, New Delhi , 2006.
2. A.M. Berman – Data Structures via C++, Oxford Univ. Press, Inc. Indian Reprint, 2002.
3. M.T.Goodrich et.al – Data Structures and Algorithms in C++, John Wiley, Inc. Indian Reprint, 2004.

## **CS 7004 Discrete Mathematics**

### **Module 1**

**Fundamentals:** Sets and I Subsets, Operations on Sets~ Properties of Integers, Mathematical Structures.

### **Module II**

Logic: Propositions and Logical Operations, Conditional Statements, Methods of Proof, Mathematical Induction.

### **Module II**

Counting: Permutation, Combination, Pigeonhole Principle. Elements of Probability.

### **Module IV**

Relations and Digraphs; Product Sets and Partitions, Relations and Digraphs, Paths in a Digraph. Properties of Relations, Equivalence Relations, Computer Representation of Relations and Digraphs, Operations on Relations, Transitive Closure and Warshall's Algorithm

### **Module V**

Functions: Functions, Functions for Computer Science, Growth of Functions, Permutation Functions

Order Relations & Structures: Partial Ordered Sets, External Elements of Partially Ordered Sets, Lattices, Finite Boolean Algebra, Circuit Design

### **Module VI**

Tress: Trees, Labelled Trees, Tree Searching, Undirected Trees, Minimum Spanning

Trees.

### **Module VII**

Semigroups and Groups: Binary Operations, Semigroups, Products and Quotients of Sernigroups, Groups, Products and Quotients of Groups.

### **TextBook:**

1. Discrete Mathematical Structures, Kolman, Busby, Ross, 5<sup>th</sup> Edition, Pearson Education.

### **Reference Books:**

1. R.Johnsonbargh- Discrete Mathematics, 6<sup>th</sup> Edn, Pearson Education, New Delhi- 2007.
2. K.H.Rosen- Discrete Mathematics and Its Applications, 4<sup>th</sup> Edn, TMH, New Delhi- 2001.

## **CS 7005 Numerical & Statistical Methods**

### **Numerical Methods**

#### **Module I**

Errors in Numerical Calculations Errors & their computations-absolute, relative & percentage.

Solution of algebraic and transcendental equations: Introduction, Dissection Method, Iterative Method, False Position Method, Newton's Raphson Method, Lin Bairstows Method, Error Analysis & Convergence Study.

#### **Module II**

Interpolation with equal & unequal intervals: Introduction, finite differences- forwards, backward and central, difference tables, difference of polynomials, Newton's formula for interpolation, Gauss's central difference Interpolation formula, Divided difference & their properties – Newton's divided differences formula, Langrange's Interpolation formula, Inverse Interpolation

#### **Module III & IV**

Numerical differential & Integration: Introduction, derivatives using forward & backward difference formula, Numerical Integration – Trapezoidal rule, Simpson's 1/3 & 3/8 rules Weddle's rule.

Numerical solution of linear system of equations: Direct method-Gauss elimination, Gauss-Jordan, LU decomposition methods. Iterative methods-Gauss-Jacobi & Gauss Seidel methods.

Numerical solution ordinary differential equations: Taylor Seriesmethod, Euler's method, Modified Euler's method, Runga-Kutta methods of 2<sup>nd</sup> & 4<sup>th</sup> order, Predictor-Corrector methods (Milne's method and Adam's methods).

### **Statistical Methods**

#### **Module V**

Concepts of Probability: Experiment and Sample Space, Events and Operations with Events, Probability of an Event, Basic Probability Rules, Applications of Probability Rules, Conditional Probability.

Random Variables: How Random Variable Arise, Probability Distribution of a Random Variable, Mean or Expected Value of a Random Variable, Probability Histogram Value of a Random Variable, Variance and Standard Deviation of a Random Variable.

#### **Module VI**

Bionomial Experiments: Structure of a Bionomial Experiment, Bionomial Probability Distribution, Use of Bionomial Probability Table.

Normal Curve and Normal Distribution: Approximating a Bionomial Probability, The Normal Theorem and the Central Limit Theorem.

## **Module VII**

**Estimation of Population Parameters:** Parameters and Statistic, Point and Interval Estimation, Interval Estimation of Three Common Parameters.

**Hypothesis Testing for a Single Population:** Concept of a Hypothesis, Tests involving a Population Mean, Tests involving a Population Proportion, Tests involving a Population Standard Deviation.

**Hypothesis Testing to compare Two Populations:** Comparison of two populations, Tests for Two Population Means, Tests for Two Population Means, Tests for Two Population Proportions, Tests for Two Population Variance.

**Bivariate Quantitative Data-Correlation and Regression:** Concepts of a Bivariate Data Set, Correlation Coefficient, Inferences on a Population, Correlation Coefficient, Data Set, Correlation Coefficient, Inferences on a Population Correlation Coefficient, The Regression line, Inferences on the Population Regression Line.

Text Books:

1. S.S. Sastry – Introductory Methods of Numerical Analysis- PHI, Pvt. Ltd., New Delhi
2. N.Pal & S.Sarkar- Statistics: Concepts and Applications, PHI, New Delhi-2005.

Reference Books:

1. R.V.Hogg et.al- Probabilty and Statistical Inpane, 7<sup>th</sup> Edn. Pearson Education, New Delhi – 2006.
2. R.L.Burden & J.D.Faires- Numerical Analysis, Thomson Learning- Brooks/Cole, Indian Reprint, 2005.