

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

Revised MCA Course Structure-2007 (Modified)

## SEMESTER-II

### CS 7006 Object Oriented Design & Programming

#### Module I

**Computing and the Object-Oriented Design Methodology:** Basic Computing Terminology, Software Engineering Software, Object-Orientation Design.

C++- The Fundamentals: Program Organization, A First Program, A Second Program, Comments, Assigning a Value, Fundamental C++ Objects, Constants, Name Definitions, Expressions, Output Statements, Computing Average Velocity.

#### Module II

**Modifying Objects:** Assignment, Const Definitions, Input Statements, Computing the Number of Molecules in a Hydrocarbon, Compound Assignment, Increment and Decrement, Estimating Yearly Savings of Change, The String Class, Ez Windows, Moving Lawns.

**Control Constructs:** Boolean Algebra, A Boolean Type, Conditional Execution Using the If Statement, Conditional Execution Using the Switch Statement, Computing a Requested Expression, Validating a Date, Iteration, Using the while Statement, Simple String and the Lazy Hobe Riddle, Iteration Using the do Construct.

#### Module III

Functions Usage Basics and Libraries: Function Basics, The Preprocessor, Using Software Libraries, The Iostream Library, The Iomanip Library, The fstream Library, The math Library, Library ctype, The assert macros.

#### Module IV

Programmer-Defined Functions: Basics, A Tasty Problem, Some Useful Functions, Integrating a Quadratic Polynomial, The Logic Scope, Displaying a Price-Interval Chart, Recursive Functions.

Advanced Parameter Passing: Reference Parameters, Passing Objects by Reference, Validating Telephone Access Codes, Constant Parameters, Default Parameters, Casting of Function Parameters, Function Overloading, Random Numbers, A Factory Automation Trainer.

#### Module V

The Class Construct and Object-Oriented Design: Introducing a Parameter-Defined Data Type, The Rectangle Shape Class, Using the Rectangle Shape Class, Constructors, Building a Kaleidoscope, Object-Oriented Analysis and Design

### **Module VI**

Pointers and Dynamic Memory: Lvalues and Rvalues, Pointer Basics, Constant Pointers and Pointers to Constants, Arrays and Pointers, Character String Processing, Program Command-line Parameters, Pointers to Functions, Dynamic Objects, A Simple ADT for Representing Lines of Integer Values.

### **Module VII**

Inheritance: Object-Oriented Design using Inheritance, Reuse via Inheritance, A Hierarchy of Shapes, Protected Members and Inheritance, Controlling Inheritance, Multiple Inheritance, A Prettier Kaleidoscope

Templates and Polymorphism: Generic actions and Types, Function Templates, Class Templates, A Simple List Class Template, Sequential Lists, Polymorphism, Virtual Function Nuances, Abstract Base Classes, Virtual Multiple Inheritance.

Text Book:

1. J.P. Cohoon & J.W. Davidson – C++ Program Design: An Introduction to Programming and Object –Oriented Design, 2<sup>nd</sup> Edn, TMH Edn, New Delhi-2000.

Reference Book:

1. F.L. Friedman & E.B. Koffman- Problem Solving, Abstraction, and Design Using C++, 4<sup>th</sup> Edn, Pearson Education, Inc. 2004.

# **CS 7007 Computer Organization & Architecture**

## **Module I**

**Introduction:** Organization and Architecture, Structure and Function, Why Study Computer Organization and Architecture?

**Computer Evolution and Performance:** A Brief History of Computers, Designing for Performance, Pentium and Power PC Evolution.

## **Module II**

A Top-Level view of Computer Function and Interconnection: Computer Components, Computer Function, Interconnection Structures, Bus Interconnection, PCI.

## **Module III**

**Cache Memory:** Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design, Pentium 4 and Power PC Cache Organizations.

**Internal Memory:** Semiconductor Main Memory, Error Correction, Advanced DRAM Organization.

## **Module IV:**

**External Memory:** Magnetic Disk, RAID, Optical Memory, Magnetic Tape.

**Input/Output:** External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels and Processors.

## **Module V:**

**Computer Arithmetic:** The Arithmetic and Logic Unit, Integer Representation, Integer Arithmetic, Floating-Point Representation, Floating-Point Arithmetic.

## **Module VI:**

**Instruction Sets – Characteristics and Functions:** Machine Instruction Characteristics, Types of Operands, Pentium and Power PC Data Types, Types of Operations, Pentium and Power PC Operations Types.

**Instruction Sets – Addressing Modes and Formats:** Addressing, Pentium and Power PC Addressing Modes, Instruction Formats, Pentium and Power PC Instruction Formats.

## **Module VII:**

**Processor Structure and Function:** Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining, The Pentium Processor, The PowerPC Processor.

**Reduced Instruction Set Computers:** Instruction Execution Characteristics, The use of Large Register File, Compiler-Based Register Optimization, Reduced Instruction Set Architecture, RISC Pipelining, MIPS R4000, SPARC, RISC versus CISC Controversy.

**Text Book:**

1. W. Stallings – Computer Organization & Architecture : Designing for Performance, 7<sup>th</sup> Edn, Pearson Education, New Delhi-2006.

**Reference Books:**

1. C.Hamcher – Computer Organizations, 5<sup>th</sup> Edn, McGraw Hill, International Education, New Delhi – 2002.
2. M.M.Mano – Computer System Architecture, 3<sup>rd</sup> Edn, PHI/Pearson Education, New Delhi-2006.
3. J.P.Hyes – Computer Architecture and Organization, 3<sup>rd</sup> Edn, McGraw Hill, Internal Edn, New Delhi-2998.

# **CS 7008 Fundamentals of Computer Algorithms**

## **Module I**

**Elementary Algorithmic:** Introduction, Problems and Instances, The efficiency of algorithms, Average and worst-case analysis, What is an elementary operation, why look for efficiency

**Asymptotic Notation:** Introduction, A notation for “the order of”, Other asymptotic notation, Conditional asymptotic notation, Asymptotic notation with several parameters, Operations and asymptotic notation

## **Module II**

Analysis of Algorithm: Introduction, Analyzing control structures, Using a barometer, Supplementary examples, Average-case analysis, Amortized analysis, Solving recurrences

## **Module III**

Greedy Algorithms: General characteristics of greedy algorithms, Graphs: Minimum spanning trees, Shortest paths, The knapsack problem, scheduling

## **Module IV**

Divide-and-conquer: Introduction: Multiplying large integers, The general template, Binary search, Sorting, Finding the median, Matrix Multiplication, Exponentiation

## **Module V**

Dynamic Programming: Calculation of binomial coefficient, The World Series, Making change, The principle of optimality, The knapsack problem, Shortest paths, Changed matrix multiplication

## **Module VI**

Exploring Graphs: Graphs and games: An introduction, Traversing trees, Depth-first search: Unidirected graphs, Depth-first search: directed graphs, Breadth-first search, Backtracking, Branch-and-bound, the minimax principle.

## **Module VII**

Probabilistic Algorithms: Introduction, Probabilistic doesn't imply uncertain, Expected versus average time, Pseudorandom generation, Numerical probabilistic algorithms, Monte Carlo algorithms, Las Vegas algorithms

## **Text Book:**

1. G Brassard & P Bratley – Fundamentals of Algorithmics. PHI, New Delhi , 2005.

**Reference Books:**

1. E.Horowitz. et.al.- Fundamentals of Computer Algorithms, Galgotia Publication Pvt. Ltd., New Delhi , 2004.
2. J.Kleinberg & E.Tardos – Algorithm Design, Pearson Education, New Delhi , 2006.
3. T.H.Cormen et. Al. – Introduction to Algorithms – PHI, New Delhi , 2005.
4. S.Dasgupta et.al.- Algorith, TMH, New Delhi , 2007.
5. S.Sahani – Data Structures, Algorithms and Applications in C++ 2<sup>nd</sup> Edition, Universities Press ( India ) Pvt. Ltd., 2005.

# **CS 7009 Database Management System**

## **Module I**

**Introduction :** Purpose of database Systems, Data Models, Schemas and Instances, three- Schema Architecture and Data Independence, Database languages, database Architecture, classification of DBMS, relational database, Database users and Administrators, Advantages of DBMS.

## **Module II**

**E-R- Model:** Entities and Entity Sets, Relationships and Relationship sets, Keys, Mapping, Constraints, ER diagram, Reducing ER Diagram to Tables, Generalization and Specialization, Aggregation.

## **Module III**

**Relational Model:** Concepts, Constraints and Relational database Schemas, Relational Algebra, Relational Calculus, QUEL, QBE, SQL ..

## **Module IV**

Database Design: Pitfalls in relational database design, Normalization using functional, Multivalued and join dependencies, DKNF, Atomic values, alternative approaches to database design.

## **Module V**

Security & Integrity :Security & Integrity violations, authorization and views, integrity constants, encryption, Statistical databases.

## **Module VI**

Transaction Processing and Concurrency Control : Transaction Processing, Schedules and Recovery, Locking and Timestamp Ordering for concurrency control.

## **Module: VII**

Distributed Databases : Concepts and Types of Distributed databases, data fragmentation Replication and Allocation.

### **Text Book:**

Fundamentals of Database Systems “Ramez Elmasri”. Pearson Education

### **Reference Book:**

Database Systems Concepts “A. Silberschatz,Korth”, Mc Graw Hill

# **CS 7010 Operating Systems**

## **Module I**

**Overview of Operating systems :** OS and the Computer Systems, Efficiency, system Performance and User Convenience, classes of Operating Systems, Batch Processing Systems, Multiprogramming Systems, Time sharing Systems, Real Time Operating Systems, Distributes Operating Systems, Modern Operating Systems.

## **Module II**

**Processes and Threads:** Processes and Programs, Programmer view of Processes, OS view of Processes, Threads, Case studies of Processes and Threads,

## **Module III**

**Scheduling:** Preliminaries, Non-preemptive Scheduling Policies, Preemptive Scheduling Policies, Scheduling in Practice, Real Time Scheduling, Scheduling in Unix, Scheduling in Linux, Scheduling in Windows, Performance Analysis of Scheduling Policies.

## **Module IV**

**Memory Management:** Managing the Memory Hierarchy, Static and Dynamic Memory Allocation, Memory Allocation to a Process, Reuse of Memory, Contiguous Memory Allocation, Noncontiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Kernel Memory Allocation, A Review of Relocation, Linking and Program Forms.

## **Module V**

**Virtual Memory:** Virtual Memory Basics, Demand Paging, Page Replacement Policies, Memory Allocation to a Process, Shared Pages, Memory Mapped Files, Unix Virtual Memory, Linux Virtual Memory, Virtual Memory using Segmentation.

## **Module VI**

**File Systems:** File System and IOCS, Files and File Operations, Fundamental File Organizations, Directory Structures, File Protection, Interface between File System and IOCS, Allocation of Disk Space, Implementing File Access, File Sharing Semantics, File System Reliability, Virtual File System, Unix File System, Linux File System, Windows File System, Performance of File Systems.

## **Module VII**

**Security and Protection:** Overview of Security and Protection, Goals of Security and Protection, Security Attacks, Formal and Practical aspects of Security, Encryption, Authentication and Password Security, Access Descriptors and the Access Control Matrix, Protection Structures, Capabilities, Unix Security, Linux Security, Windows Security.

**Text Book:**

1.D.M.Dhamdhare- Operating Systems: A Concept-Based Approach, 2<sup>nd</sup> Edn, TMH, New Delhi-2006.

**Reference Books:**

1. A. Silberschatz et.al-Operating System Concepts, 6<sup>th</sup> Edn, John Wiley, Indian Reprint, 2003
2. C.Cronsley-Operating Systems: A Design-Oriented Approach, TMH, New Delhi , 2002.
3. H.M.Deitel-Operating Systems, 2<sup>nd</sup> Edn, Pearson Education, 2003.
4. A.S.Tanenbaum-Operating System:Design and Implementation, PHI, New Delhi , 2002.