

## Post Graduate Diploma in Computer Application (PGDCA)

### Course Code and Detail

Semester	Paper No.	Course Code	Title of Course	Credits
First Semester	603	PGDCA-01	Discrete Mathematics	4
	604	PGDCA-02	Programming through C and Data Structure	4
	605	PGDCA-03	Computer Organization and Assembly Language Programming	4
	606	PGDCA-04	Lab-1 (Based on PGDCA 02)	4
	607	PGDCA-E1 OR PGDCA-E2	Computer Architecture OR Microprocessor and its Applications	4 OR 4
<b>Credits of First Semester</b>				<b>20</b>
Second Semester	608	PGDCA-05	Object oriented Programming with C++	4
	609	PGDCA-06	Database Management System	4
	610	PGDCA-07A	Computer Fundamental and Its Organization	4
	611	PGDCA-08	Lab-2 (Based on C++)	4
	612	PGDCA-E3 OR PGDCA-E4	Data Warehouse and Mining OR System Analysis and Design	4 OR 4
<b>Credits of Second Semester</b>				<b>20</b>
<b>Total credit</b>				<b>40</b>

### MCA-01(Discrete Mathematics)

#### Elementary Logic

**Propositional Calculus:** Propositions, Logical Connectives, Logical Equivalence, Logical Quantifiers.

**Methods of Proof:** What is a proof? Different Methods of proof and Direct proof, Indirect proofs), Principle of induction.

**Boolean algebra and Circuits:** Boolean Algebras, Logic circuits, Boolean Functions.

#### Basic Combinatorics

**Sets, Relations and Functions:** Introducing Sets, Operations on sets, Relations, Functions.

**Combinatorics – An Introduction:** Multiplication and addition Principles, Permutations (Permutation of objects Not Necessarily distinct, circular permutation), Combinations, Binomial Coefficients, Combinatorial probability.

**Some More Counting Principles:** Pigeonhole principle, Inclusion – Exclusion Principle, Applications of inclusion exclusion.

**Partitions and Distributions:** Integer partitions, Distributions, distinguishable objects into Distinguishable Containers, Distinguishable objects into Indistinguishable containers, Indistinguishable objects into Distinguishable Containers, Indistinguishable objects into Indistinguishable Containers.

## MCA-02 (Problem Solving and Programming through C)

### An Introduction to C

**Problem solving:** Problem solving Techniques, Design of Algorithms, Analysis of Algorithm efficiency, Analysis of Algorithm Complexity, Flowcharts.

**Basics of C:** History of C, Salient features of C, Structure of a C Program, Compiling a C Program, Link and Run the C Program, Diagrammatic Representation of Program execution process.

**Variables and Constants:** Character set, Identifiers of Keywords, Data types and storage, Data type Qualifiers, Variables, Declaring variables, Constants, Symbolic Constants.

**Expressions and Operators:** Assignment Statement, Arithmetic operators, Relational Operators, Logical operators, Comma and Conditional Operators, Type Cast operator, Size of Operator, C shorthand, priority of operators,

### Control Statements, Arrays and Functions

**Decision and Loop Control Statements:** The if statement, the switch statement, the while loop, the do... while Loop, The for loop, The Nested Loops, The goto statement, The break statement, The continue statement.

**Arrays:** Array Declaration, Initialization, Subscript, Multi- dimensional Arrays.

**Strings:** Declaration and Initialization of Strings, Display of Strings, using different formatting Techniques, Arrays of Strings, Built in String functions and Applications.

**Functions:** Definition of a function, Declaration of a function, Function prototypes, the return statement, Types of variables and storage classes, Types of function invoking, call by value, Recursion.

### Structures, Pointers and File Handling

**Structures and Unions:** Declaration of Structures, Accessing the Members of a structure, Initializing structures, Structures as function Arguments, Structures and Arrays, unions.

**Pointers:** Pointers and their characteristics, the address and Indirection operators, Pointer type, Declaration and Assignment, Pointer Arithmetic, Passing Pointers to functions, Arrays and pointers, Arrays of Pointers, Pointers and strings.

**The C Preprocessor:** #define to implement Constants #define to create, functional Macros, conditional selection of Code using # if def. Predefined Names Defined by pre-processors, Macros vs Functions.

**Files:** File Handling in C using File pointers, Input and output using file pointers, string, input/output Functions, Formatted input/output Functions, Block input/output Functions, Sequential vs. Random Access Files, Positioning the file Pointer, the buffered I/O – The UNIX like file routines.

## MCA-03 (Computer Organization and Assembly Language Programming)

### Introduction to Digital Circuits

**The Basic Computer:** The Von Neumann Architecture, Instruction Execution, Instruction Cycle, Computers: Then and Now. Data Representation Number Systems, Decimal Representation in Computers, Alphanumeric Representation, Data Representation for Computation. Principles of Logic Circuits I Logic Gates, Logic Circuits, Combinational circuit (Address, Decoders, Encoders, ROM) Principles of Logic Circuits – II Sequential Circuits (Definition) Flip Flops(BasicFlip-Flops,ExcitationTables,MasterslaveFlip-Flop,Edge-

Triggered Flip-Flops), Sequential circuit Design (Registers, Counters Asynchronous Counters, synchronous counters, RAM) Design of a sample counter.

### **Basic Computer Organization**

**The Memory System:** The Memory Hierarchy RAM, ROM, DRAM, FLASH Memory Secondary Memory and characteristics, Raid and its Levels, The concepts of High speed Memories, virtual memory, SIMM, DIMM. The input /Output System Input/output Devices, The input/output Interface, The Device Controllers and its structure, Device Drivers, Input – Output Techniques, Input Output Processors,

### **External Communication Interfaces**

**Secondary Storage Techniques:** Secondary Storage Systems, Hard Drives, Removable Storage options. The I/O Technology: Keyboard, Mouse, Video Cards, Monitors (Cathode Ray Tubes, DPI, Interlacing, Bandwidth, Liquid Crystal Displays, Digital Camera, Sound Cards, Printers, Modems, Scanners, Power Supply. The Central Processing Unit, Instruction Set Architecture, Instruction set characteristics, Instruction set Design Considerations, Addressing Scheme (Immediate Addressing, Direct Addressing, Indirect Addressing, Register Addressing, Register Indirect Addressing, Indexed Addressing Scheme, Base Register Addressing, Relative Addressing Scheme, Stack Addressing), Instruction set and Format Design issues (MIPS 2000, Instruction Format), Registers Micro-Operations and Instruction Execution, Basic CPU Structure, Register Organization, General Registers in a processor, Micro-operation Concepts.

### **Instruction Executions, Instruction Pipelining**

**ALU Organization:** ALU Organization, Arithmetic Processors

**The Control Unit:** The Control unit, the Hardwired Control, Wilkes Control, The Micro-programmed Control, The Micro instructions, The Execution of Micro Program Reduced Instruction set Computer Architecture Instruction to RISC, RISC Architecture, The use of Large register file, Comments on RISC, RISC pipelining.

### **Assembly Language Programming**

**Microprocessor Architecture:** Microcomputer Architectures, Structure of 8086 CPU, Register set of 8086, Instruction set of 8086, Addressing modes.

**Introduction to Assembly Language Programming:** The Need and use of the Assembly language, Assembly program, Execution, An Assembly program and its components, Input/output in Assembly program, The types of Assembly programs.

**Assembly language programming (Part-I):** Simple Assembly programs, Programming with Loops and Comparisons, programming for Arithmetic and String operations.

**Assembly language programming (Part-II):** Use of Arrays in Assembly, Modular Programming, Interfacing, Assembly language Routines to High level language programs, Interrupts, Device Drivers in Assembly.

## **MCA-E1 (Computer Architecture)**

- Introduction to parallel processing
- Memory and input-output subsystems
- Principles of pipelining and vector processing
- Pipeline computers and vectorization methods
- Structures and algorithms for array processors
- SIMD computers and performance enhancement
- Multiprocessor architecture and programming
- Multiprocessing control and algorithms
- Example multiprocessor systems

- Data flow computers and VLSI computations.

Reference Book: Computer Architecture and Parallel Processing.

By Kai Hwang (McGraw-Hill Education)

## MCA-E2 (Microprocessor and its Applications)

- Architecture and Pin Details of the 8085 Microprocessor
- Programming the Microprocessor-I
- Programming the Microprocessor-II
- Programming Exercises
- Interfacing Input and Output Devices
- Interrupts
- Memory in a Microprocessor Based System
- Programmable Peripheral Interface-8255
- Keyboard and Display Interface-8279
- Serial Communication Interface-8251
- Priority Interrupt Controller-8259
- Direct Memory Access-8257.
- Microprocessor Based Applications
- Other 8 Bit Microprocessors
- 16 Bit Microprocessors

Reference Book: Microprocessor and its Applications

By R. Theagarajan (New Age International Publication)

## MCA-05 (Object Oriented Programming with C++)

### An Introduction to Object Oriented Programming

**Object Oriented Programming:** OOP Paradigm, the soul of OOP, OOP characteristics, Advantages of OOP, Applications of object Oriented Programming (System software, DBMS, Applications of OODBMS, Advantages and Disadvantages of OODBMS), The Object Orientation, OO Languages, Advantages of C++.

**Object Oriented Programming System:** What is OOPS?, Class, Inheritance, Abstraction (Procedural language, Object-oriented language), Mechanisms of Abstraction, Encapsulation and information hiding, Polymorphism, overloading,

**Advanced concepts:** Dynamism (Dynamic Typing, Dynamic Binding, Late Binding, Dynamic Loading, Structuring programs, Reusability, Organizing Object-oriented Projects (Large scale designing, Separate Interface and Implementation, Modularizing, Simple Interface, Dynamic decisions, Inheritance of Generic Code, Reuse of tested code.

**Introduction to Object Oriented Languages:** Objective-C, Features of Objective-C, Python, Features of Python, C # (C SHAR), Features of C#, Eiffel, Modula-3, Features of Modula-3, Small talk, object REXX, Java, Features of Java (Object Oriented, Distributed, Interpreted, Robust, Secure, Architecturally neutral, Portable High performance, Dynamic), Beta various object oriented programming languages Comparative chart.

**An Introduction to Unified Modelling Language (UML):** UML (Goals, History, use), Definition, UML Diagrams (Use case, class, interaction diagrams), State diagrams, Activity Diagrams, Physical diagrams.

**C++ — An Introduction**

**Overview of C++:** Programming Paradigms (Procedural Programming, Modular Programming, Data Abstraction, Object Oriented Programming), Concepts of C++ functions and files.

**Classes and Objects:** Definition and Declaration of a class, Scope Resolution Operation, Private and Public member functions, Creating Objects, Accessing class data members and member functions, Arrays of objects, Objects as Function Arguments.

**Operator overloading:** Operator Functions, large objects, Assignment and initialization, Function Call, Increment, Decrement Operator, Friends.

**Inheritance-Extending classes:** Concept of inheritance, Base class and Derived class, visibility Modes, Single inheritance Multiple Inheritance, Nested classes, virtual functions.

**Streams and Templates:** Output, Input, Files Exception, handling and streams, Templates.

## **MCA-06 (Database Management System)**

### **The Database Management System Concepts**

**Basic Concepts:** Need for a database Management System, The logical DBMS Architecture, Physical DBMS Architecture, Commercial Database Architecture, Data Models.

**Relational AND E-R Models:** The Relational Model, Relational Constraints, Relational Algebra, Entity Relationship (ER) Model, E-R diagram, Conversion of ER diagram to Relational database.

**Database integrity and Normalization:** Relational Database integrity, Redundancy and Associated problems, Single – valued dependencies, single valued Normalization, desirable properties of decomposition, Rules of Data Normalization.

**File organization in DBMS:** Physical Database Design issues, storage of database on Hard disks, file organization and its types, types of indexes, Index and tree structure, Multi-key file organization, Importance of file organization on database.

### **Structured Query language and transaction Mgt**

#### **The Structured Query language:**

SQL Data Definition language, DML, Data control, Database objects: Views sequences, Indexes and synonyms, table Handling, Nested Queries.

**Transactions and Concurrency Management:** The transactions, the concurrent transactions, the locking protocol, Deadlock and its prevention, optimistic concurrency control.

**Database Recovery and Security:** Recovery, Recovery Techniques, Security and Integrity, Authorization.

**Distributed and Client Server Databases:** Need for Distribution Database Systems, Structure of distributed Database, Advantages and Disadvantages of DDBMS, Design of Distributed database, client server Database.

**Application Development:** Development of A Hospital Management System, Needs to Develop HMS, Creating a database for HMS, Developing Front and forms, Reports, using Queries and Record set.

### **Study Centre Management System: A Case Study**

**A Introduction:** Introduction to Software, Software Development process: Analysis, System Designing, Software Development, Testing and Maintenance.

### **MCA-07A (Computer Fundamentals and its Organization)**

**Computer Basics:** Algorithms. A Simple Model of a Computer, Characteristics of Computers. Problem-solving Using Computers.

**Data Representation:** Representation of Characters in computers, Representation of Integers, Representation of Fractions. Hexadecimal Representation of Numbers, Decimal to Binary Conversion, Error-detecting codes. Input & Output Devices. Description of Computer Input Units, Other Input methods. Computer Output Units Printers. Plotters)

**Computer Memory:** Memory Cell. Memory Organization, Read Only Memory, Serial Access Memory. Physical Devices Used to Construct Memories. Magnetic Hard Disk, floppy Disk Drives. Compact Disk Read Only Memory, Magnetic Tape Drives.

**Processor:** Structure of Instructions, Description of a Processor. Machine Language and Instruction set Processors used in desktops and lap tops. Specification of a desktop and Lap top computer currently available in the market (Specifications of Processor. motherboard & chipset, memory. interface & capacity of hard disk & DVD drives, I/O ports).

**Computer Architecture:** Interconnection of Units. Processor to Memory communication. LO to Processor Communication. Interrupt Structures, Multiprogramming. Processor Features, Reduced Instruction Set Computers (RISC), Virtual memory.

**Software Concepts:** Types of Software. Programming Languages. Software (Its Nature & Qualities). Programming Languages. Operating Systems: History and Evolution. Main functions of OS Multitasking. Multiprocessing. Time Sharing. Real Time Operating System with Examples

### **MCA-E3 (Data Warehouse and Mining)**

- Introduction
- Data Preprocessing
- Data Warehouse and OLAP Technology: An Overview
- Data Cube Computation and Data Generalization
- Mining Frequent Patterns, Associations, and Correlations
- Classification and Prediction
- Cluster Analysis
  
- Mining Stream, Time-Series, and Sequence Data
- Graph Mining, Social Network Analysis, and Multirelational Data Mining
- Mining Object, Spatial, Multimedia, Text, and Web Data
- Applications and Trends in Data Mining

Reference Book: Data mining: concepts and techniques

By Han, Jiawei, Micheline Kamber, and Jian Pei. (Morgan Kaufman Publication)

## **MCA-E4 (Systems Analysis and Design)**

### **Introduction to Systems Development**

**Introduction to SAD:** Fundamentals of Systems, Real Time Systems, Distributed Systems, Development of a successful System, various Approaches for Development of information systems (Model Driven, Accelerated approach, Joint Application Development).

**System Analyst – A profession:** Needs Systems Analysts, users, Analysts in various functional Areas (Systems Analyst in Traditional Business, Systems Analyst in Modern Business), Role of a Systems Analyst, Duties of a Systems Analysts, Qualification of a Systems Analyst.

**Process of System Development:** Systems Development Life Cycle, Phases of SDLC, Products of SDLC Phases, Approaches to Development (Prototyping, Joint Application Design, Participatory Design ), Case Study (College Library).

**Introduction to documentation of Systems:** Concepts and process of Documentation, Types of Documentation, Different Standards for Documentation, Documentation and Quality of Software.

### **Planning and Designing Systems**

**Process of Systems Planning:** Fact Finding Techniques, Need for fact finding, Issues involved in Feasibility Study, Cost Benefit Analysis, Preparing Schedule, Gathering Requirements of System.

**Modular and Structured Design:** Design principles (Top Down Design, Bottom up Design), Structure Charts, Modularity (Goals of Design, Coupling, Cohesion).

**System Design and Modeling:** Logical and Physical Design, Process Modelling, Data Modeling (ER Diagram), Process specification Tools (Decision Tables, Decision Trees, Structured English Notation), Data Dictionary.

### **More Design Issues and Case Tools**

**Forms and Reports Design:** Forms, Reports, Differences between forms and Reports, Process of Designing Forms and Reports, Deliverables and outcomes, Design specifications, Types of Information, General formatting Guidelines, Guidelines for Displaying Contents, Criteria for form Design, Criteria for Report Design.

**Physical file Design and Database Design:** Introduction to Database Design, Design of Database fields, Design of Physical Records, Design of Physical Files, Design of Database, Case Study (Employee database).

**Case Tools for Systems Development:** Use of Case Tools by Organizations, Advantages and Disadvantages of CASE Tools, Components of CASE, Types of CASE tools, classification of CASE Tools, Reverse and Forward Engineering, Visual and Emerging Case tools.

### **Implementation and Security of Systems & MIS**

**Implementation and Maintenance of Systems:** Implementation of Systems, Maintenance of Systems.

**Audit and Security of Computer Systems:** Definition of Audit, Audit of Transactions on computer, Computer Assisted Audit Techniques, Computer System and Security Issues, Concurrent Audit Techniques.

**Management Information Systems:** Role of MIS in an organization, Different kinds of information systems, Expert Systems.