



**अखिल भारतीय सूचना प्रौद्योगिकी संगठन**  
**All India Information Technology Association**  
**New Delhi**

WORK RELATED TO MINISTRY OF INFORMATION TECHNOLOGY (GOVT. OF INDIA)

## ADVANCE DIPLOMA IN SOFTWARE ENGINEERING

**Eligibility :** Graduation

**Duration :** 1 Year

**Course Code :** ADC-01

### Semester-I

#### Computer Organization

**Computer Evolution & Arithmetic** :- A Brief History of computers , Designing for Performance , Von Neumann Architecture , Hardware architecture , Computer Components , Interconnection Structures , Bus Interconnection , Scalar Data Types , Fixed and Floating point numbers , Signed numbers , Integer Arithmetic , 2's Complement method for multiplication , Booths Algorithm , Hardware Implementation , Division , Restoring and Non Restoring algorithms , Floating point representations , IEEE standards , Floating point arithmetic.

**The Central Processing Unit** :- Machine Instruction characteristics , types of operands , types of operations , Addressing modes , Instruction formats , Instruction types , Processor organization , Intel 8086 as example , Programmers model of 8086 , max/min mode , Register Organization , Instruction cycles , Read Write cycles , 8086 assembly instruction examples to explain addressing modes.

**The Control Unit** :- Single Bus Organization , Control Unit Operations : Instruction sequencing , Micro operations and Register Transfer. Hardwired Control : Design methods – State table and classical method , Design Examples - Multiplier CU. Micro-programmed Control: Basic concepts , Microinstructions and micro - program sequencing

**Memory Organization** :- Characteristics of memory systems , Internal and External Memory , Types of memories : ROM : PROM , EPROM , EEPROM , RAM : SRAM , DRAM , SDRAM , RDRAM

**High-Speed Memories** : Cache Memory , Organization and Mapping Techniques , Replacement Algorithms , Cache Coherence , MESI protocol. Virtual Memory : Main Memory allocation , Segmentation , Paging , Address Translation Virtual to Physical.

**I/O Organization** :- Input/Output Systems , Programmed I/O , Interrupt Driven I/O , 8086 Interrupt structure , Direct Memory Access (DMA) , 8237 features Buses and standard Interfaces : Synchronous , Asynchronous , Parallel I/O 8255 features , Serial I/O 8251 features , PCI , SCSI , USB Ports Working mechanisms of Peripherals : Keyboard , Mouse , Scanners , Video Displays , Touch Screen panel , Dot Matrix , Desk-jet and Laser Printers.(features and principles)



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### System Software (Windows XP / NT)

Introduction To Windows XP/NT :- Hardware and Software Required , Exploring the New Windows XP User Interface and NT user interface , The New Windows XP User Interface and NT user Interface , Logging on to Windows XP and NT , Customizing Your Desktop , Modifying Your System , Using the Control Panel , Shutting Down Windows XP , Exploring the New Windows XP Features , Windows Media Player , Windows Movie Maker , Working with Digital Photos , Exploring the New Windows XP Communication Tools , Real-Time Communication with Windows Messenger , Using Windows XP to Work Remotely , Remote Access Tools , Networking with Windows XP and NT , Exploring the New Help and Support Features , Using the Help and Support Tool , Using the Remote Assistance Tool , Exploring the New Windows XP Security Features , Internet Connection Firewall , File Systems and Recovery

### Computer Applications (Word , Excel , Power Point)

Office package :- Word processor Software , Spreadsheet software , Presentation software , Database Management software

MS Office :- Introduction to Ms Office , Introduction to Ms Word , How to Start , Components of Ms Word , File Menu , Edit Menu , View Menu , Insert Menu , Format Menu , Tools Menu , Table Menu , Window Menu , Help Menu

MS Excel :- Introduction to MsExcel , Calculations , Formula , Functions , Insert Row/Columns , Create Chart , Format Sheet

Tools Menu :- Goal Seek , Scenario , Auditing

Data Menu :- Sort , Filter , Advance Filter , Sub total , Forms , Validations , Table , Consolidate , Pivot table , Window , Help

Ms PowerPoint :- Introduction , Insert New Slide , Format Slide , Slide Show

### Object Oriented Programming (C++)

Introduction to programming concept :- Types of programming language , Low level language , High level language , Types of language processor , Header file

Structure of programming language :- Program structure :-Comment , Define columns & Rows

Data type in C :- Introduction to data type , Variables , Input statement

Operators and expression :- Arithmetic operators , Increment and Decrement operator , Relational operator , Logical operator , And operator , Or operator , Not operator , Conditional operator

Decision control structure :- Introduction to Decision Making statement , The switch statement

loop control structure :- Introduction , For loop , While loop , Do while loop , Loop termination

Arrays :- Introduction to arrays

Function :- Introduction to function , Types of function

Structure :- What is Structures , Structure in c , The dot operator , Arrays of Structure

Introduction to C++

Overviews of C++ :- Object oriented Programming, concept , Advantage & ,usage of C++ .

Classes and objects :classes structure and classes, union and classes, Friend function ,Friend



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classes, Inline function ,Scope resolution operator, Static class members, Static data members function, passing object to function, Returning objects , Object assignment.

Constructor & Destructor :- Constructor and destructor: Introduction constructor , parameterized constructor , multiple constructor in a class , constructor with default argument , copy constructor , copy constructor , Default argument ,destructor.

Operator overloading :- function & operator overloading: function overloading , overloading constructor function finding the address of an overloading function , operator overloading: creating a member operator function , Creating prefix and postfix form of the increment & decrement operator , overloading the shorthand operation (i .e. +=,-=etc) , operator overloading restrictions , operator overloading using friend function , overloading loading Some special operators , overloading [ ],(),-,comma operator , overloading <<.

Inheritance :- Base class access control , protected member , Protected base class Inheritance , Inheritance multiple base class , constructors , destructors & Inheritance , when constructor & destructor function are expected , Passing parameter to base class constructors , grating access , Virtual functions & Polymorphism: virtual function , pure virtual function , early Vs , late binding.

The C++ input /output system basic :- C++ stream , the basic stream classes: C++ Predefined stream , formatted I/o: formatting using the ios member , setting the format flags , clearing format flags , an overloaded form of self

## Business Data Processing (Data Structure)

Introduction :- Basic Terminology , Elementary Data Organization , Data Structure operations , Algorithm Complexity and Time-Space trade-off

Arrays :- Array Definition , Representation and Analysis , Single and Multidimensional Arrays , address calculation , application of arrays , Character String in C , Character string operation , Array as Parameters , Ordered List , Sparse Matrices , and Vectors.

Stacks :- Array Representation and Implementation of stack , Operations on Stacks : Push & Pop , Array Representation of Stack , Linked Representation of Stack , Operations Associated with Stacks , Application of stack : Conversion of Infix to Prefix and Postfix Expressions , Evaluation of postfix expression using stack.

Recursion :- Recursive definition and processes , recursion in C , example of recursion , Tower of Hanoi Problem , simulating recursion.Backtracking , recursive algorithms , principles of recursion , tail recursion , removal of recursion.

Queues :- Array and linked representation and implementation of queues , Operations on Queue : Create , Add , Delete , Full and Empty.Circular queue , Deque , and Priority Queue.

Linked list:- Representation and Implementation of Singly Linked Lists , Two-way Header List , Traversing and Searching of Linked List , Overflow and Underflow , Insertion and deletion to/from Linked Lists , Insertion and deletion Algorithms , Doubly linked list , Linked List in Array , Polynomial representation and addition , Generalized linked list , Garbage Collection and Compaction.

Trees:- Basic terminology , Binary Trees , Binary tree representation , algebraic Expressions , Complete Binary Tree.Extended Binary Trees , Array and Linked Representation of Binary trees , Traversing Binary trees , Threaded Binary



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trees.Traversing Threaded Binary trees , Huffman algorithm.  
Searching and Hashing :-- Sequential search , binary search , comparison and analysis , Hash Table , Hash Functions , Collision Resolution Strategies , Hash Table Implementation.

Sorting :-- Insertion Sort , Bubble Sorting , Quick Sort , Two Way Merge Sort , Heap Sort , Sorting on Different Keys , Practical consideration for Internal Sorting.

Binary Search Trees :-- Binary Search Tree (BST) , Insertion and Deletion in BST , Complexity of Search Algorithm , Path Length , AVL Trees , B-trees.

Graphs :-- Terminology & Representations , Graphs & Multi-graphs , Directed Graphs , Sequential Representations of Graphs , Adjacency Matrices , Traversal , Connected Component and Spanning Trees , Minimum Cost Spanning Trees.

File Structures :-- Physical Storage Media File Organization , Organization of records into Blocks , Sequential Files , Indexing and Hashing , Primary indices , Secondary indices , B+ Tree index Files , B Tree index Files , Indexing and Hashing Comparisons.

### Structured System Analysis & Design

System Concept :-- Definition , characteristics , elements of System , Physical and abstract System , Open and closed system

Users requirements an analysis , fact finding process and techniques , System Performance constraints and identification of systems , Tools of structured Analysis , logical and physical model , context diagram , data dictionary data diagram , form driven methodology , pseudo codes , flow charts , system flow charts , run flow charts , input/output and form design , menu screen design , layout consideration Organization of EDP :-- introduction Job responsibility and duties of EDP

### Semester-II

### Business Computing (Oracle/ PL SQL)

Oracle Product details , Different data base model , RDBMS components –Kernel , Data dictionary , client /server computing and oracle , Overview of oracle architecture –oracle files , system and user process , Oracle memory , system data base object , protecting data.

Oracle data type , working with tables , data Constraints , column level & table level constraints , defining different constraints on the table defining integrity constraints in the ALTER TABLE command , Select Command , logical operator , Range Searching , Pattern Matching , Oracle Function , Grouping data from table in SQL , Manipulation Data in SQL Joining Multiple Tables(Equi joins) , Joining a Table to self (Self joins) , Sub queries Union , intersect & Minus clause , creating view Renaming the column of a view , granting permissions –updating , Selection , Destroying view.





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## Java Programming

Introduction of Java :-- What is Java? , How to Get Java , A First Java Program , Compiling and Interpreting Applications , The JDK Directory Structure

Data types and Variables :-- Primitive Data types ,Declarations , Variable Names , Numeric Literals , Character Literals , String , String Literals , Arrays , Non-Primitive Data types ,The Dot Operator

Operators and Expressions :-- Expressions Assignment Operator , Arithmetic Operators Relational Operators Logical Operators Increment and Decrement Operators Operate -Assign operators (+ = , etc.) The Conditional Operator Operator Precedence Implicit Type Conversions The Cast Operator

Control Flow Statements :-- Statements , Conditional (if) Statements , Data types and Variables 3 , Adding an else if , Conditional (switch) Statements , while and do-while Loops , for Loops , A for Loop Diagram , Enhanced for Loop , The continue Statement , The break Statement

Methods :-- Methods , Calling Methods , Defining Methods , Method Parameters , Scope , Method Parameters

Object-Oriented Programming :-- Introduction to Object-Oriented Programming , Classes and Objects , Fields and Methods , Encapsulation , Access Control , Inheritance , Polymorphism

Objects and Classes :-- Defining a Class , Creating an Object , Instance Data and Class Data , Methods , Constructors , Access Modifiers , Encapsulation

Using Java Objects :-- Printing to the Console , StringBuilder and StringBuffer , Methods and Messages toString , Parameter Passing , Comparing and Identifying Objects , Destroying Objects Inheritance in Java :-- Inheritance , Inheritance in Java , Casting , Method Overriding , Polymorphism , Super class

Packages :-- The import Statement , Static Imports , Casting , CLASSPATH and Import , Defining Packages , Package Scope

Exception Handling :-- Exceptions Overview , Catching Exceptions , The finally Block , Exception Methods , Declaring Exceptions , Defining and Throwing Exceptions , Errors and RuntimeExceptions

Input/Output Streams :-- Overview of Streams , Bytes vs. Characters , Converting Byte Streams to Character Streams , File Object , Binary Input and Output , PrintWriter Class , Reading and Writing Objects , Basic and Filtered Streams

Collection Framework :-- The Collections Framework , The Set Interface , Set Implementation Classes , The List Interface , List Implementation Classes , The Map Interface , Map Implementation Classes

Inner Classes :-- Inner Classes , Member Classes , Local Classes , Anonymous Classes , Instance Initializers , Static Nested Classes

Introduction to Threads :-- Non-Threaded Applications , Threaded Applications , Creating Threads , Thread States , Runnable Threads , Coordinating Threads , Interrupting Threads , Runnable Interface , ThreadGroups

Interfaces and Abstract Classes :-- Separating Interface and Implementation , UML Interfaces and Realization , Defining Interfaces , Implementing and Extending Interfaces , Runnable Threads , Abstract Classes

Serialization :-- Object Serialization , Serializable Interface , Serialization API , ObjectOutputStream and ObjectOutputStream , The Serialization Engine , readObject and writeObject , Externalizable Interface



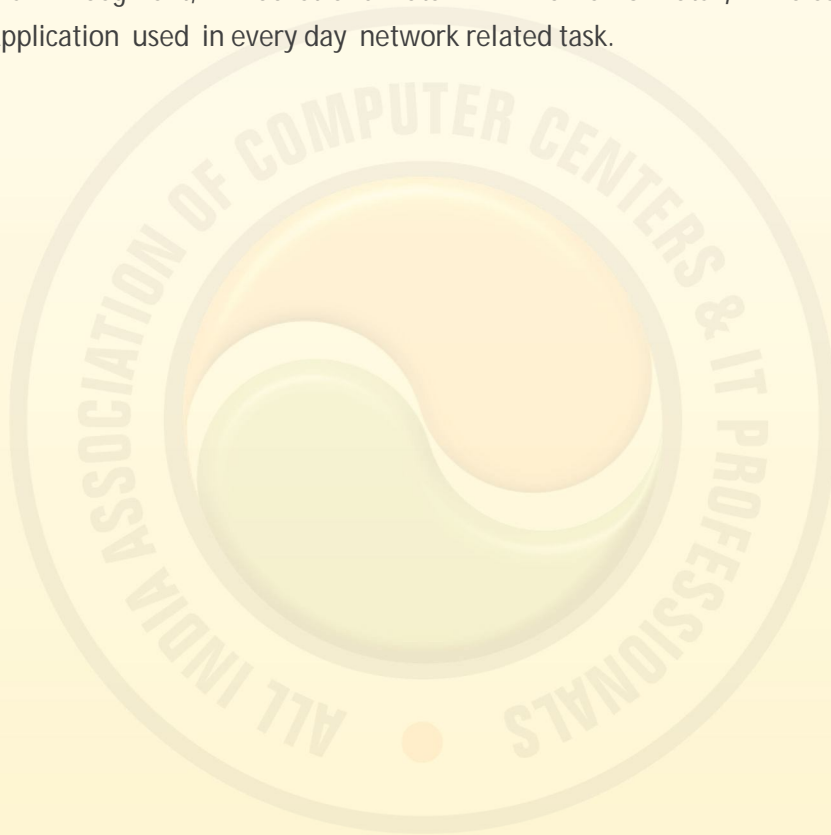
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Visual Computing :-- Basic Concept of Visual Computing , Digital Image Processing , Digital image generation , Learning Methods of vision

## Data Communication & Networking

Overview of computer networks and Internet, the OSI model TCP/IP , Ethernet Token Ring and Wireless and the methods they use of connecting , Data Link Layer Responsibilities , Internet Protocols , TCP IP Segment, IP Packet and Data Link Frame Formats , Wireless and Mobile networks , Application used in every day network related task.



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