

## SYLLABUS OF COMPUTER SCIENCE

### UGCS-01 (Computer Fundamental)

**HARDWARE CONCEPTS:** Introduction and Data Representation, Digital Logic Circuits, Memory Organization, Input/output Organization

**CPU ORGANIZATION:** Instruction Sets, Register Organizations and Micro-operation, ALU and Control Unit Organization, Micro-programmed Control Unit.

**MICROPROCESSOR AND ASSEMBLY LANGUAGE PROGRAMMING:** Micro-processor Architecture, Introduction to Assembly Language, Assembly Language Programming (part-1), Assembly Language Programming (part-2)

**PARALLEL ORGANIZATION AND REDUCED INSTRUCTION SET COMPUTERS:**

Introduction to Parallel Organization, Pipeline and Vector Processing, Data-flow computers and Parallel Algorithms, Reduced Instruction Set Computers Architecture-part-1, Reduced Instruction Set Computers Architecture-part-2.

### UGCS-03 (Introduction to System Software)

#### Introduction to System Software

**Programming Concepts and Software Tools:** Introduction to Programming Language Concepts: Algorithm, Flowcharting, Problem and its Algorithm, Concept of a Programming Language, Categories of Languages, Elements of a Programming language.

**Introduction to Assembler:** Advocates of a translator, types of translators, Assembler implementation, Macro processor, Loaders.

**Introduction to Compiler writing:** Compiler, Approaches to compiler development, compiler Designing Phases, Software tools.

**Graphical user interface:** Graphical user interface, Evolution of the human and Machine interaction, Common Graphical user interface terms, functionality of graphical user interfaces, A look at some graphical user interfaces.

**Introduction to a text editor and debugging system:** Introduction to a text editor, overview of the Editing process, Types of Editors and user interface, Editor structure, Interactive debugging systems, Debugging Functions and Capabilities, Relationship with other parts of the system, user interface criteria.

#### Fundamentals of operating system

**Introduction to operating system:** Operating System, Evolution of operating systems, serial processing, Batch processing, Multiprogramming, types of operating System, Batch Operating system Multiprogramming Operating system, Network operating system, Distributed Operating System, Operating System Structure, Layered Structure Approach, Kernel Approach, Virtual Machine, Client Server Model, Future Operating System trends.

**Process Management:** Process concept Processor scheduling, Types of Schedulers, Scheduling and performance Criteria, Scheduling algorithms, Interprocess Communications and synchronization, Basic concepts of concurrency, Basic Concepts of Interprocess Communication and Synchronization, Mutual Exclusion, Semaphores, Hardware support for mutual Exclusion, Mechanism for Structured form of Interprocess Communication and synchronization, Deadlocks, System model, Deadlock Characterization and Modelling.

**Memory Management:** Introduction, single process monitor, Multiprogramming with

Fixed partitions, Multiprogramming with dynamic partitions, Paging Address mapping in a paging system, Hardware Support for Paging, Address Translation by Associative Memory, Sharing and Protection in a Paging System, Segmentation, Address Mapping in a Segmented System, Implementation of segment tables, sharing and Protection in a Segmented System, Virtual memory, Advantages of virtual memory, Demand Paging Virtual memory management policies.

**File Management:** Introduction, File concept, Directories, Disk organization, Disk Space Management methods, Linked List, Bit Map, Disk Allocation Methods, Contiguous Allocation, Non Contiguous Allocation, Disk Scheduling, FCFS, Shortest seek time-first scheduling, scan scheduling, File Protection, Passwords, Access Lists, Access Groups.

## UNIX Operating System-I

**Theoretical Concepts of UNIX operating System:** Introduction, Basic features of unix operating system, UNIX system Architecture, File Structure processing Environment, CPU Scheduling, Memory Management, Swapping, Demand Paging, File System, Blocks and Fragment and Inodes, Directory Structure.

**UNIX-GETTING STARTED I:** Introduction, Getting started, user Names and Groups, Logging in, Correcting Typing Mistakes, Format of UNIX commands, changing your Password, Characters with special Meaning, UNIX documentation, Files directories, Current Directory, Locking at the Directory Contents, Absolute and Relative, Pathnames, Some UNIX Directories and Files.

**UNIX Getting Started II:** Introduction, Looking at file contents, your own directories, file permissions, Basic operations on files, Links between Files, Changing permission modes, standard files, Standard Output, Standard Input, Standard Error, Filters and Pipelines, Processes, Finding out about Processes, stopping Background Processes.

**TEXT Manipulation:** Introduction, Inspecting files, file statistics, Searching for Patterns, Comparing Files, Operating on files, printing files, Rearranging Files, Sorting files, Splitting files, Translating characters,

**Editors:** Introduction, General characteristics of vi, Starting up and quitting from vi, Adding

text and Navigation, changing Text, Searching for Text, Copying and Moving Text, The Features of ex, The live editors Ex and Ed. starting up and Quitting, Addressing Lines, Looking at Text, Adding Deleting and changing text, Searching for and replacing text, cut and paste operations,

files and Miscellaneous features, The Stream Editor SED, changing several files in SED, AWK.

## UNIX operating SystemI

**User to user Communication:** Introduction, Online communication. Communication, Offline

**Shell Programming:** Introduction, Programming in the Bourne and the C- shell, wild cards, simple shell programs, variables, Programming Constructs, interactive shell scripts, advanced Features.

**Programming Tools:** Introduction, The UNIX C compiler, other tools (Lint- the - Cverifier,

Program Profiles, Program listings), Cross References and Program flow, Maintaining Programs, the source code control system (Initializing a file, Examining and Altering files, Identification Keywords, Miscellaneous Commands).

**System Administration:** Introduction, System Administration – A Definition, Booting the system, Maintaining user accounts, file systems and special files, Backups and Restoration.

## UGCS-04 ('C' Programming & Data Structures)

### Introduction

**Introductory:** An overview of C, Escape sequences, Getting A "feel" for C.

**Data types in "C":** Variables of type (int, char, float, double, ...), Enumerated types, the typed of statement, Identifiers.

**Operators and Expressions In c:** Elementary Arithmetic operations and operators, Expressions, L values and P values, Promotion and Demotion of variable types: The cast operator, Print f ( ) and Scan f ( ) functions.

**Decision Structures in 'C':** Boolean operators and Expressions The goto statement, the if ( ), Statement, the if ( ) – else statement,

**Control structures – I:** The do – while( ) and while Loops, the Comma Operator, the transfer of Central from within loops, Ternary operator, The Switch case default statement.

### Programming in C

**Control Structures II:** 'The for (;) loop, one-dimensional Arrays, The sizeof operator, storage classless and scope.

**Pointers and arrays:** Pointer variables and pointer Arithmetic, Pointers, Arrays and the subscript operator, A Digression on Scan f(), Multidimensional Arrays.

**Functions:** Function Prototypes and Declarations, Functions and Scope, Pointers as Function Arguments, String Functions, Multi-Dimensional Arrays as Function Arguments.

**Functions II:** Recursive functions, Macros, Conditional Compilation, Macros with Parameters, Commandline Arguments, Variable length Argument lists, Complicated Declarations, Dynamic Memory Allocation.

**Files and Structs, Unions and Bit-Fields:** Files and File 70, Structs, the DOT Operator, Extracts and files : f seek ( ), Structs and Function and unions, The Bitwise operators.

### Data Structures:

**Introduction to Data Structures: Array:** Program Analysis, Arrays, Array Declaration, Storage of arrays in Main memory, sparse arrays.

**Lists:** Basic Terminology, Static implementation of lists, Pointer implementation of lists, Doubly linked lists, circular linked list, Storage Allocation, Storage Pools, Garbage Collection, Fragmentation, Relocation and Compaction.

**Stacks and Queues:** Defining stack and Queue, stack operations and Implementations, stack Applications, Queues: Operations and implementation, Queue Application, priority Queues.

**Graphs:** Defining graph, Basic, Terminology, Graph Representation, Graph traversal (DFS, BFS), shortest path problem, Minimum spanning tree.

### Trees and File Organization

**Trees:** Basic Terminology, Binary, trees, Traversal of a Binary tree, Binary search Trees (BST).

**AVL-Tree and B-Tree:** Height Balanced tree, Building Height Balanced tree, B-Tree, B-Tree of order 5.

**Files:** Terminology, File organization, sequential files, Direct, File organization, Indexed Sequential file organization.

### Searching and Sorting Techniques:

**Searching Techniques:** Sequential search, Binary Search,

**Sorting Techniques-I:** Internal Sort (insertion Sort, Bubble Sort, Quick Sort, way merge sort Heap sort), Sorting on Several keys.

**Sorting Techniques-II:** Data storage (Magnetic Tapes, Disks), sorting with Disks, k-way merging, Buffering, Sorting, with tapes.

## UGCS-06 (Database Management System)

### Introductory Concepts of Data Base Management Systems

**Basic Concepts:** Introduction, Traditional file Oriented approach, Motivation for database approach, database basics, three views of data, The three level Architecture of DBMS Mapping between different levels database Management System facilities, DDL, DML, Elements of a database Management System (DML Pre Compiler, DDL Compiler, File Manager, Database

Manager, query Processor, database Administrator, Data dictionary), Advantages and disadvantages of database management system.

**Data base Models and its Implementation:** Introduction, File Management System Entity, Relationship (E-R) Model, The hierarchical model, DBTG set, the network model, The Relational model, Advantages and Disadvantages of Relational Approach, Difference between Relational and other models.

**File Organization for Conventional DBMS:** Introduction, File Organization, Sequential file organization, Index-sequential file organization (Types of Indexes, Structure of Index Sequential Files, VSAM, Implementation of Indexing through Tree- Structure), Direct file organization, Multi key file Organization (Need for the multiple Access path, multicost, File organization, Inverted file organization, cellular Partitions, comparison and Tradeoff in the Design of Multikey file).

**Management Considerations:** Introduction, Organizational Resistance to DBMS Tools (Political observation, Information transparency, Fear of future potential, Reasons for Success), Conversion from An Old system to a new system, Evaluation of a DBMS, Administration of a database Management System.

**Enterprise Wide Information System of the Times of India Group (A Case Study):** Introduction, organization and the operating environment unique nature of the Business, Information System goals and how to achieve the Goal The Response System and Respnent Choices, Benefits.

### RDBMS and DBMS

**Relational Model:** Concepts, Formal Definition of a Relation, the Codd, Commandments, Relational Algebra, Relational Completeness.

**Normalization:** Functional dependency, Anomalies in a database, Properties of Normalized Relations, 1st NF, 2nd NF, 3rd NF, BCNF, Fifth Normal form examples of Database Design. **Structured Query Language:** Categories of SRL Commands Data Definition, Data Manipulation, views.

**Distributed Databases:** Structure of Distributed database Trade-OFFS in distributing the database, Design of Distributed Databases.

### Emerging Trends in DBMS

**Introduction to object oriented Database Management System:** Next Generation database System, New database applications, object oriented database Management system,

Promises and Advantages of object oriented Database Mgt. system, Difference between RDBMS and OODBMS, Alternative object oriented Database strategies.

**Introduction to client/Server Database:** Evaluation of client/Server, Emergence of client server Architecture, the client/server Computing, the critical products, Developing on Application, SQL (DDL, DML), Client/Server. Where to Next?

**Introduction to Knowledge Databases:** Definition and Importance of knowledge, Knowledge bases system, Difference between a knowledge bases system and a database system, knowledge Representation Schemes.

## UGCS-07 (Elements Of System Analysis And Design)

### System Analysis

**Overview of System Analysis and Design:** System, Systems study, Systems analysis and systems approach, characteristics of a system, Elements of systems analysis, types of systems, System Development life cycle, Software Crisis (Programmer's point of view, user's point of view), Role of a systems analyst.

**Project Selection:** System projects, sources of Project requests, Managing Project Review and selection, Preliminary investigation, Problems classifications and definitions.

**Feasibility Study:** Preliminary study, different types of feasibility (Technical, Operational, Economic, Social, Management, Legal and Time feasibility), Investigative study, cost/ Benefit analysis, Fact Findings (interviewing questionnaires, observing the current system, Determination of DFD, New System.

**System Requirement Specifications and analysis:** DFD, data dictionaries, HIPO (VTOC, IPO), decision tables and decision trees, warnier-ORR diagrams, NASSI-SHNEIDERMANN CHARTS

**Structured System Design:** System Design Considerations, Design, Methodologies, Structured Design, Modularization, Design Process, System Specifications, Prototype Design.

**Input Design and control:** Processing Transaction data, Elements of input data, Input Media and Devices, Input Media and Devices, Input Design Guidelines, Input verification and Control, Data Dictionaries, How to layout terminal screen, Major concerns Regarding CRT-Input Screen Design.

**Output System Design:** Types of output, output Devices, output Design Consideration, Design of output Reports Designing Screen output, Menu design, Form Design and Control, Computer Graphics.

**File and Data Base Design:** Selecting data storage Media Types of File (Master, Transaction, Table, Report Backup, Archival, Dump, Library), File organization, File Design, Data base Design, Types of database coding system, Types of Code (Classification, Function, Card, Sequence, Significant digit, Subset code, Mnemonic code, Acronym).

### System Development and Implementation

**System Development:** Task of System Development, Prototype installation Hardware and Software selection and performance, Benchmark Testing, Preparing software development cycle, software specification language selection criteria.

**System Control and Quality Assurance:** Quality Assurance in Software life, cycle, Levels of Quality Assurance, Design objectives, Reliability and maintenance, Maintenance issues, Maintainable Designs, Testing practice and plans, Levels of tests, special tests, Designing test data, system control, Audit Trial.

**Documentation:** Characteristics of a good documentation, types Software Design and documentation tools, need for documentation, Format for preparing documentation Package.

**System Implementation:** Training of Personnel involved with system, Training Methods, Conversion Methods, Review plan, System Maintenance, Hardware, Acquisitions, criteria for vendor's selection, service Bureaux.

### Management Information System

**Introduction to MIS:** Definition, Historic Development, Typical Systems,

**The Technology Component:** Overview of computing Technology, Overview of Communication Technology, Database Technology, Decision Support Systems, knowledge Based systems.

**The Organizational Impact of MIS:** Information as a Resource, Information for Competitive Advantage, Organization, Information and Decision, MIS as a profession.

**Building Management Information Systems:** System Analysis, Techniques of Systems Analysis.

**Case Studies:** Case (A) Information System Planning, Case (B) Preparing for systems analysis, Case (C) Systems Analysis Completion, Case (D) System Design Proposal, Case (E) Evaluation and selection of Systems Case (F) Implementation plan and Activities.

## Emerging Trends

**The Analyst As A Professional:** Attributes of a good analyst, Organizational issues, The Systems Analyst and law.

**Human Computer Interaction:** The What, Why, When and where of Human Computer Interaction, Communicating with Computers, Ergonomics, Human problems in the Automated Office, Designing Human Machine Systems.

**Introduction to Multimedia:** Multimedia – The Concept, Design, Production and Distribution, Components of Multimedia, Software and Hardware for Multimedia.

## UGCS-08 (Discrete Mathematics)

**ELEMENTARY LOGIC:** Propositional Calculus, Methods of Proof, Boolean algebra and Circuits

**BASIC COMBINATORICS:** Combinatory- An Introduction, Partitions and Distribution, More about Counting

**RECURRENCE:** Recurrence Relation, Generating Function, Solving Recurrence

**GRAPH THEORY:** Basic properties of graph, Special graph, Euler and Hamiltonian Graph, Graph Coloring and Planar Graphs

## UGCS-09 (Computer Networks)

### An Introduction to Computer Networks

**Network, Classification and Reference Models:** Introduction, Network, Network Goals/ Motivation, Applications of Networks, Types of network, Reference Model (OSI, TCP) IEEE standards for LAN.

**Data transmission and Multiplexing:** Introduction, Transmission, Terminology, Time-domain Concepts, Frequency domain Concepts, Relationship between Data Rate and Bandwidth, Analog and digital data transmission, transmission media, Multiplexing.

**Medium Access Control and D.L.L.:** Introduction, D.L.L., Medium Access Control Sub-layer (Contention based media access protocols, polling based MAC protocols, IEEE standard

802.3 and Ethernets, IEEE standard 802.4 Token bus, IEEE standard 802.5 Token Ring.

**Network, Transport (TCP/IP) And Application layer:** Introduction, Network layer

(Routing Algorithms, Shortest path routing, Flooding), Congestion Control Algorithms, Comparison of virtual circuit and datagram subnets, Internetworking (Repeaters, Bridges, Routers),

Transport layer (Transport service and Mechanism, Types of Service/Quality of Service), Transport Control Mechanism (Addressing, Flow Control and buffering, Multiplexing, Connection establishment and Management, Crash Recovery), TCP/UDP, Application layer (The domain names system (DNS), TCP/IP Internet Domain Name, Electronic Mail, www, Mail-based Applications), Remote procedure Call (RPC), File transfer protocol (FTP), Telnet.

**Network Devices and Technology Network Devices –I:** Introduction, Network devices (Repeaters, Bridges, Switches, Hubs).

**Network Devices-II:** Introduction, Network devices (Routers, Comparison of Bridges and Routers, Gateways, Modem).

**Integrated Services Digital Network (ISDN):** Introduction, Baseband and Broadband Communication, ISDN Services, Advantages of ISDN, ISDN applications (Internet Access, Telephony, Telecommunicating, Video conferencing, Education, Large-Scale file transfers).

**Asynchronous Transfer Mode (ATM):** Introduction, Switching Techniques (Circuit switching, Packet Switching, Multirate Circuit Switching, Frame Relay, Cell Relay), How compatible

is ATM as Technology?, ATM layered Architecture in Comparison with OSI Model, How ATM protocol works?, The ATM Network, The ATM CELL, ATM classes of services (ATM Service classes, ATM Technical Parameters), ATM, Traffic Control (Network Resource Management, Connection Admission Control, (Network Resource Management, Connection Admission Control, Usage Parameter Control and Network Parameter Control, Priority Control, Congestion Control), Benefits of ATM, ATM Applications (ATM Services, ATM workgroup and Campus networks, ATM enterprise network consolidation, multimedia virtual private networks and managed services, frame relay backbones, Internet backbones, Residential broadband networks, Carrier infrastructures for the telephone and private line networks).

## **UGCS-11 (C++ And Object Oriented Programming)**

### **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, ActivityDiagrams, Physicaldiagrams.

## 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,

PrivateandPublicmemberfunctions,CreatingObjects,Accessingclassdatamembersandmember functions, Arrays of objects, Objects as FunctionArguments.

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

**Inheritance-Extendingclasses:**Conceptofinheritance,BaseclassandDerivedclass,visibility Modes, Single inheritance Multiple Inheritance, Nested classes, virtualfunctions.

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

## UGCS-17 (Operation Research)

### Formulation of Linear Programming Problems

**Introduction to Operation Research:** Introduction, Phases of OR Problem, Operation ResearchModelingApproach,DefiningtheProblem&GatheringData, FormulatingaMathematicalModels,DerivingSolutionfromtheModelIntroductiontoLinearProgramming,Formulation of a Linear Programming Problem withexamples.

**Graphical Method to Solve LPP:** Introduction, Graphical Solution to LinearProgramming Problem.

### Simplex Method of Solving LPP

**Simplex Method:** Introduction, Principle of Simplex Method, Simplex Method with Several DecisionVariables,TwoPhase&M-Method,Multiple,UnboundedSolution&InfeasibleProblems, SensitivityAnalysis.

**Duality Problem in LPP:** Introduction, Dual Linear Programming Problem, Formulation of a 12Dual Problem withexample.

### Transportation Problem&Assignment Problem

**Representation of Transportation Problem (Non-Generated & Balanced Cases only) & Assignment Problem as Linear Programming Problem:** Introduction of T.P. &A.P., Transportation Problem as LPP, Non- Degenerate Transportation Problem, Balanced Transportation Problem, Assignment Problem &LPP, Balanced AssignmentProblem.

**Different Methods of Finding Initial Feasible Solution of a Transportation Problem (T.P., MODI Method of Finding Optimal Solution of a T.P.) :** Introduction, Basic



Feasible Solution of a Transportation Problem, Modified Distribution Method (MODI), Vogel's Approximation Method (VAM), Maximization in a Transportation Problem.

**Solution of Assignment Problem With using Hungarian Method:** Introduction, Solution of an Assignment Problem, Hungarian Method, Maximization in an Assignment Problem.

### **Theory of Games**

**Basic Concepts of Game Theory:** Introduction, A Game, Pure & Mixed Strategies, Two-Person Zero-Sum Game, Pay-Off Matrix, Games without Saddle Point and Mixed Strategies, Methods of Solving Game Problems.

**Dominance Rule, Equivalence of Rectangular Games with Linear Programming:** Introduction, Rectangular Games without Saddle Point, Dominance Property of reducing the Size of the Game, Solution Methods of Games without Saddle Point, Equivalence of Rectangular Games with Linear Programming.