

# Syllabus for Computer Science

## PAPER-I

### UNIT-1 :Mathematics and Graph Theory

Set theory – Notations, set operations, power set, set identities, Relations and ordering – Relations, Properties of Binary relation, Matrix representation of relations, Closures of relations, Equivalence relations, Partial order relation.

Functions – Introduction, Composition of Functions, Inverse Functions

Mathematical Logics - Connectives, Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables, Conditional and Bi-conditional.

Tautologies- Equivalence of Formulas, Tautological Implications, Theory of Inference and deduction, Predicate Calculus, Mathematical Induction.

Graph Theory- Paths and Cycles, Hamiltonian Cycles and the Traveling Salesperson problem, a shortest-path algorithm, representations of graphs, isomorphism of graphs, planar graphs.

Semi Groups and Groups-Semi groups-products and quotients of semi groups, groups, products and quotients of groups, Groups and coding.

### UNIT-2: Digital Electronics and Computer Design

Number System – Different types of number systems, Conversion from one system to another, signed numbers representation, complements, BCD codes,Alphanumeric codes, Logic gates Boolean algebra laws, Demorgan's theorem, SOP and POS, K- map.

Combinational and sequential logic circuits- Adders, Subtractors, parallel adders, Multiplexer and De-multiplexers, Encoder&Decoder, Latches,Different types of FLIP-FLOPs with their design, Synchronous and Asynchronous counters, Up and down synchronous counters, cascaded counters, Shift registers.

Computer architecture concepts-operand addressing, addressing modes, instruction set architectures, data transfer instructions, data manipulation instructions, floating-point computations, program control instructions, program interrupts.

Central Processing Unit designs- The complex instruction set computer, the reduced instruction set computer, Input-Output and Communication, memory systems hierarchy.

### UNIT 3: Algorithms and C- Programming

The problem solving aspect- top-down design, characteristics of algorithms, implementation of algorithms, program verification, efficiency of algorithms, analysis of algorithms.

C Language-Features, Data types, Operators in C, Expressions, Input/output in C, Decision making and looping statements, functions, Arrays, Structure and union, string handling functions.

Pointers and Files– Pointer declaration, pointer arithmetic, functions using pointers, array of pointer and pointer to an array, Pre-processor and Files, file handling functions.

#### **Unit 4: Object oriented programming**

Object oriented programming - Object oriented concepts, C++ as an Object oriented programming, function overloading, inline functions, friend functions, constructors and destructors, Operator overloading and Inheritance.

Pointers – Pointer to objects, this pointer, and virtual functions, virtual base class , type conversion, stream classes, formatted and unformatted i/o functions, Stream classes, unformatted i/o operations, formatting of output-ios class functions and flags, manipulators, Files and Templates.

Java – Features, applications, Java API, SDK, Java class and objects, Interface and Packages, Multithreading, Error handling.

Java Applets –Life cycle and applet methods, graphics and networking applications

Web Technology - HTTP & FTP Protocols, Tier architecture, Style sheets, JDBC-ODBC connectivity, Web Server Concept.

#### **UNIT 5: Data structures**

Data Types- Primitive and Non Primitive, abstract data type, a model for an abstract data, algorithm efficiency, Algorithm notation and complexity.

Stacks-Basic stack operations, design using linked list, stack applications, ADT— linkedlist implementation, array and structure implementation of stacks, ADT— array implementation.

Queues- Queue operations, design using linked list, queueapplications.

Recursion: How –recursion works, designing recursive algorithms.

Linear List- Concept and algorithms-single, double, circular, double ended and applications.

Trees – Tree definition, terminology, Tree traversal, B tree, B+ tree, Binary search tree.

Graph – Graph terminologies, Graph representation, Graph Traversal-DFS and BFS, Wars hall’s algorithm.

Searching and Sorting –Binary and linear search, Bubble sort, insertion sort, selection sort, quick sort, shell sort, merge sort with their time complexity, hashing techniques.

#### **Unit 6: System Software and Operating System**

System software – Functions of various system software, Assembler design, Different loading schemes with their advantages and disadvantages, Subroutine

Linkage. Macroprocessor – Macro instruction, macro with arguments, conditional macro expansion, and macro calls within macro, Specification of databases and formats, algorithm for macro definition processing.

Compiler – Compiler Phases, code optimization techniques – Machine independent and dependent code optimization techniques, Parsing Techniques – Top down parse – LL, Recursive descent, Operator precedence, LR parsers.

Operating system – Functions and Services, Types of Operating system – batch, multiprogramming, time sharing, Process – Process state, Scheduling criteria, Scheduling policies, Threading concepts and Multithreading.

Memory management – Non-virtual memory management techniques – Contiguous, partitioned, paging techniques, virtual memory management techniques, page replacement algorithms – FIFO, LRU, tuple coupling, overlays.

Process Synchronization-Critical section problem, Bakery Algorithm, Semaphores, Synchronization problems- Bounded Buffer Problem, Readers-Writers problem and Dining Philosophers problem.

Deadlocks- Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and recovery, Banker algorithms, Disk scheduling – disk scheduling algorithms, file management – file concept, file allocation and access, directory structures.

UNIX –Features of UNIX, Architecture, Different types of shell, File and directory related command, file system, filters in UNIX, UNIX editor, shell programming, administrative commands.

## **PAPER-II**

### **UNIT-7: Design and Analysis of Algorithms**

Performance analysis, asymptotic notation, analysis of recursive and iterative algorithm.

Divide and Conquer– Binary search, Quick sort, merge sort, Finding maximum and minimum.

Greedy method-Knapsack Problem, Prim's algorithm, Dijkstra's algorithm, Huffman trees.

Dynamic programming and traversal techniques - 0/1 Knapsack, travelling salesman, all pair shortest path, Breadth first search and Depth first search techniques.

Branch and bound and backtracking – 0/1 knapsack, travelling salesman, 8 queens problem, graph coloring, Decision trees, P, NP, and NP-complete problems.

## **UNIT 8: Relational Data Base Management and Data Mining**

Database Architecture, Data Models, Abstractions, ER Model, Relational Data Model – Relational algebra and Relational calculus, Relational model Constraints, Primary key, secondary key, Candidate key, Foreign key.

SQL –data types, DDL, DML and TCL and DCL commands, Set Operations, Aggregate functions, Views, Joins, index, sequences, synonyms, data dictionary, Normalization- 1NF, 2NF, Functional Dependencies, Transitive and Multivalued dependency- 3NF, BCNF, Advantages of RDBMS- Codd's Rules.

Transaction processing- desirable properties of transaction, schedules and recoverability, serializability of schedules concurrency control, locking techniques, time stamp ordering multi version concurrency control, granularity of data items.

Database recovery techniques- based on deferred up data and immediate updating, shadowpages, ARIES recovery algorithm, database security and authorization, security issue access control based on granting/revoking of privileges, introduction of statistical database security.

Data mining-concepts related to data mining and data warehousing, data mining stages, preprocessing, Association and Correlation, Classification and Clustering.

## **UNIT 9: Computer Networks and Mobile Communication**

Data communication – Components of communication systems, Topologies, Transmission modes.

Signal transmission – Analog and Digital transmission, Encoding techniques, Guided and unguided communication media.

OSI model – Services of various layers, Internetworking devices, Protocols –TCP, UDP, IP, IPV4, IPV6, TCP/IP Suite, SMTP, Datagram and virtual circuits.

Switching networks – Circuit, Packet and message switching, ALOHA, Routing algorithm – Shortest path, congestion control, 802 LAN standards, Multiplexing and Demultiplexing, RPC, TCP, UDP.

Mobile Communication- wireless communication, a simplified reference model, frequencies for radio transmission, spread spectrum, cellular systems.

Medium access control-SDMA, FDMA, TDMA, CDMA Telecommunications and satellite systems: GSM, DELT, TETRA, UMTS, and IMT-2000, basics of satellite systems, routing, localization, handover.

Wireless LAN- infrared vs radio transmission, infrastructure and adhoc network, IEEE 802.11 HIPER LAN, BlueTooth.

Mobile Network Layer and Transport Layer- Mobile IP, dynamic host configuration protocol, mobile adhoc networks, TCP over 2.5/3G wireless networks, WAP 2.0.

## **Unit 10: Software Engineering**

Different software development process model with their merits and demerits, Characteristics of software process, Software Metrics, Software planning :Estimation of efforts, cost estimation model, project scheduling and staffing, risk assessment and management, project monitoring and planning.

Problem analysis- SRS, Components and characteristics, Specification language, validation, design principles and methodology – Modular, Top down and bottom up, Object oriented, DFD.

Coding and Testing – Programming guidelines and characteristics, Structured programming, information hiding, Testing – Levels of testing, Block box and white box testing, verification and validation.

Software quality assurance, Software Maintenance – Need for maintenance, maintenance activities, Different types of maintenance

Overview of object-oriented systems- Object oriented analysis and design concepts, modelling concepts.

Introduction to UML- Basic expression of classes, attributes and operations, Class diagrams, generalization and association constructs composition and aggregation, Use case diagrams, Object interaction diagrams, collaboration diagrams, sequence diagrams, asynchronous messages and concurrent execution, State diagrams. Activity diagrams, Architecture diagrams, Encapsulation structure, Inheritance, polymorphism.

## **UNIT- 11: Computer Graphics and Digital Image Processing**

Computer Graphics – Applications, Graphical input and output devices, Scan conversions method, Line and Circle drawing algorithm – DDA, Brenham's and Mid- point method.

2D and 3D geometrical transformations – Basic and Composite 2D transformation, transformations in homogeneous notation, Basic 3D transformation, Projection –parallel projection, orthographic projection, oblique projection, perspective projection, clipping algorithms.

Digital Image Processing- Fundamentals Steps in Image Processing, Image Sampling and Quantization, Image Enhancement in the Spatial Domain, Image Enhancement in the Frequency Domain, Image Restoration.

Image Segmentation- Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation, Representation and Description.

Introduction to Morphology- Morphological Algorithms, Object Recognition- Patterns and Pattern Classes, Decision-Theoretic Methods, Structural Methods.

## **UNIT- 12: Internet Programming and E-Commerce**

World Wide Web-Concepts, Web pages-Static, Dynamic, Active, Scripting languages-Server side, Client Side, Web site development phases, Web Designing, Development and Publishing, HTTP, URL registration, Web server, Proxy servers.

HTML & XHTML- Basic layout of HTML, Head Section: title, base, link, meta. Body Section: Text formatting and alignment, fonts, colors, ordered and unordered lists, links, images, sounds, video, background, tables, forms, frames. Introduction to XHTML and DHTML, Issues in Web site creations & Maintenance, Web Hosting and publishing Concepts .

ASP.NET- Controls, Applications, Buttons, Text Box , Labels, Checkbox, Radio Buttons, List Box. Adding controls at runtime. Running a web Application, creating a multiform web project.

Form Validation- Client side validation, server Side validation, Validation Controls, Internet Explorer Control.

Overview of ADO.NET- architecture, Accessing Data using Data Adapters and Datasets, using Command & Data Reader, binding data to data bind Controls, displaying data in data grid, VB and .NET, VB .NET features.

E-Commerce - Shopping cart technology, E-commerce solutions using IIS architecture - Domain model - Site server application - Intelligent agents - Internet marketing. Electronic Payment System: Real World Payment System, Electronic funds transfer, Digital payment, Electronic data interchange(EDI).

Security-Threats to Network security, Public key cryptography, Secured sockets layer, Secure electronic transactions, Network security solutions, Firewalls.