

UNIT I: COMPUTER SCIENCE (100 MARKS)

SUBJECT / UNIT NAME	DETAILED TOPIC-WISE SYLLABUS
Unit 1: Digital Logic	• Data & Number Systems: Binary, Octal, and Hexadecimal representations & conversions. • Codes: BCD, ASCII, EBCDIC, Gray codes and their conversions. • Binary Arithmetic: Signed binary number representation with 1's and 2's complement methods. • Boolean Algebra & Logic Gates: Venn diagrams, Truth tables, Circuits, SOP and POS forms, Minimization by algebraic & K-Map methods. • Combinational Circuits: Adder, Subtractor, Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer, Parity Generator. • Memory Systems: RAM, ROM, EPROM, EEPROM, Design of combinational circuits using ROM, PLAs, and PLDs. • Sequential Circuits: S-R, J-K, D, T Flip-Flops, Registers, Counters, Irregular counters, State tables, Transition diagrams. • Logic Families & Converters: A/D and D/A conversion techniques, TTL, ECL, MOS, CMOS operations.
Unit 2: Computer Organization & Architecture	• Data Representation & Arithmetic: Addition/Subtraction (using 1's and 2's complement), Multiplication, Division. • Error Detection & Correction: Parity Bit, Checksum, Hamming Code. Alphanumeric Codes (Excess-3, Gray to Binary conversions). • Microcomputer Architecture: CPU, Address Bus, Data Bus, Control Bus. Memory hierarchy (RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM). • Microprocessor & Digital Electronics: History of Microprocessors, Microcontrollers, Addressing techniques, De Morgan's Theorems, Universal Gates, K-Map Simplification (up to 4 variables, Don't Care conditions). • Arithmetic Logic Unit (ALU): Half Adder, Full Adder, Binary Adder, 2's Complement Adder/Subtractor.
Unit 3: Programming & Data Structures	• Fundamentals: Data vs Information, Built-in & Abstract Data Types (ADT), Linear vs Non-Linear Data Structures. • Algorithm Analysis: Performance Analysis, Asymptotic Notations, Order of Growth. • Arrays & Recursion: 1-D, 2-D Arrays (Row/Column Major Order index derivation), Sparse Matrices. Tower of Hanoi, Backtracking. • Linked Lists: Singly, Doubly, Circular Linked Lists (Insertion, Deletion, Traversal, Polynomial Addition/Subtraction/Multiplication). • Stacks & Queues: Push/Pop, Prefix/Postfix expressions evaluation, Iteration vs Recursion. Circular queues, Deque, Priority Queues. • Searching & Hashing: Linear Search, Binary Search, Index Sequential Search. Hashing & Collision resolution techniques. • Sorting Algorithms: Insertion, Selection, Bubble, Heap, Counting, Bucket Sort. • Graphs & Trees: Adjacency Matrix/List, BFS, DFS. BST Traversals (Inorder, Preorder, Postorder), Threaded Trees, Huffman Coding, AVL & B-Trees.

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Unit 4: Algorithms	• Algorithm Analysis: Time-Space Trade-off, Asymptotic & Conditional Asymptotic Notations, Recurrence equations. • Divide & Conquer: Binary Search, Max/Min finding, Merge Sort. • Dynamic Programming & Greedy: Multistage Graphs, All-Pair Shortest Paths, Optimal BST. • Backtracking & NP Topics: 8-Queens Problem, Hamiltonian Problem, Spanning Trees, NP-Hard and NP-Completeness.
Unit 5: Operating System	• OS Structure: Functional behavior, System structure, Layered organization, Interrupt structure. • Process Management: Process states, Context switching, CPU Scheduling (FCFS, SJF, Round Robin). • Synchronization & Deadlocks: Semaphores, Monitors, Inter-process communication (IPC), Deadlock prevention, avoidance & detection. • Memory Management: Fixed/Variable partitions, Paging, Segmentation, Virtual Memory, Page replacement algorithms, Thrashing. • File Systems & Security: Directory management, File descriptors, DMA, Protection models, Access matrix.
Unit 6: Database Management System	• DBMS Architecture: 3-Level Architecture, File System vs DBMS. • Relational & ER Model: Primary, Foreign, Candidate Keys. Entities, Attributes, Relationships, ER to Relational Table Conversion. • Normalization: Codd's Rules, Database Anomalies, 1NF, 2NF, 3NF, BCNF. • Transactions & Concurrency: ACID Properties, Locking Protocols, 2-Phase Commit, Timestamp Ordering.
Unit 7: Computer Networks	• Network Basics: Topologies, OSI & TCP/IP Models, Transmission Media, Encoding schemes. • Data Link Layer: Framing, Flow Control, Error Control, MAC sublayer protocols. • Network Layer: Routing, Congestion Control, IPv4/IPv6, Subnetting, ARP, Classless IP Addressing. • Transport & Application Layer: Sockets, UDP, TCP, HTTP, FTP, Telnet, SMTP, SNMP.
Unit 8: Software Engineering	• Process Models: Waterfall, Prototype, Spiral Models comparison. • Project Management & SRS: LOC & FP Metrics, COCOMO model, SRS documents. • Design & Testing: DFDs, Object-Oriented Design, Black Box, White Box, Unit, Integration & System Testing. • Quality & Maintenance: ISO 9000, SEI CMM, Software maintenance cost estimation.
Unit 9: Object Oriented Programming	• Core Concepts: Classes, Objects, Data Abstraction, Encapsulation, Information Hiding. • Methods & Polymorphism: Constructors, Destructors, Method Overloading & Overriding. • Advanced OOP: Inheritance, Abstract Classes, Abstract Methods, Namespaces, Exception Handling.
Unit 10: Web Application Development	• Frontend Stack: HTML, CSS, jQuery, JavaScript, DOM Manipulation, HTTP Sessions. • Technologies & Formats: XML, DTD, Node.js, Git basics. • Backend Scripting: PHP Syntax, MySQL Integration, Forms & Database interactions.

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Unit 11: Theory of Computation	• Automata: DFA, NFA, NFA-epsilon, Minimization, Moore & Mealy Machines. • Grammars & Languages: Regular Expressions, Arden's Theorem, Pumping Lemma, CFG, CFL, CNF/GNF forms. • Pushdown & Turing Machines: PDA, Turing Machine variants, Church's Thesis, Halting Problem, Undecidability, PCP.
Unit 12: Internet of Things (IoT)	• Architecture & Protocols: Web 3.0 View, M2M, WSN, SCADA, RFID, Zigbee, BACNet, Modbus. • Cloud & Web of Things: WoT Platform Middleware, Cloud of Things Architecture. • Industrial IoT (IIoT): Industrie 4.0, Security & Safety Systems, Smart Grid Applications.
Unit 13: Artificial Intelligence	• Search Strategies: DFS, BFS, Hill Climbing, Heuristic Functions, Constraint Satisfaction. • Knowledge & Inference: Predicate Logic, Resolution, Frames, Forward/Backward Chaining, Bayesian Networks. • Planning & Expert Systems: Machine Learning basics, MYCIN, DART, Expert System Shells.
Unit 14: Fundamentals of E-Commerce	• Framework & Infrastructure: E-Commerce anatomy, I-Way infrastructure, Client-Server security, Firewalls. • Payments & EDI: Smart Cards, Digital Tokens, Credit Systems, Electronic Data Interchange (EDI). • Digital Libraries: Document infrastructure & Corporate Data Warehouses.
Unit 15: Multimedia Systems	• Audio & Text: Sound cards, MP3, MIDI, Coloring, Digital imaging formats. • Animation & Video: Kinematics, Morphing, Authoring tools, Broadcast video standards. • Project Management: Multimedia team roles, Interactive TV, Digital Broadcasting.

UNIT II: ART OF TEACHING & OTHER SKILLS (50 MARKS)

SECTION & MARKS	DETAILED TOPIC-WISE SYLLABUS
(A) Art of Teaching (30 Marks)	• Teaching & Learning: Meaning, Process, Characteristics & Factors affecting Learning. • Instructional Objectives: Meaning, Types, and Bloom's Taxonomy. • Teaching Methods: Types, Characteristics, Merits, and Demerits. • Lesson Plan & Microteaching: Formats, Models, and Instructional Analysis. • Classroom Ecosystem: Discipline, Effective Environment, Teacher Qualities. • Teaching Resources: Textbooks, Library, Teaching Aids & Hands-on Learning. • Evaluation & Curriculum: Assessment for Learning, Continuous Evaluation, Curriculum Design.
(B) Other Skills (20 Marks)	• General Knowledge: Bihar State Special Awareness & Recent National Events. • Environmental Science: Ecological Balance, Pollution, Climate Change & Conservation. • Mathematical Aptitude: Basic Arithmetic, Percentages, Averages, Ratios. • Logical Reasoning: Series, Analogies, Coding-Decoding, Blood Relations.

Official Preparation Material provided by JobBodh.com.