# PART – II (Ph.D Entrance Syllabus 2026)

## Unit-1: Computing Mathematics

Algebra: Fundamental operations in Algebra, Expansion, factorization, Quadratic equations, indices, logarithms, arithmetic, geometric and harmonic progressions, binomial theorem, permutations and combinations.

## Unit-2: IoT Fundamentals

IOT: Definition and basic concept of IOT, Evolution and importance of IOT in various domains (e.g., healthcare, smart cities, agriculture)

## Unit-3: Computer Fundamentals

History of Computer, Characteristics of Computer, Classification of Computer. Applications of Computer, Organization of a Computer, Hardware, Software, Firmware, Central Processing Unit (CPU), Input /Output devices, Secondary Storage devices, Memory Organization, back-up devices. Introduction to Internet and email. Functions of Operating System. Classification of Operating System. Viruses - Types and Control measures.

## Unit-4: Data Representation & Architecture

Representation of characters, integers, and fractions, binary, decimal, octal and hexadecimal representations and inter-conversions, Binary Arithmetic-Addition, subtraction, division, multiplication, One's complement arithmetic and two's complement arithmetic, floating point representation of numbers, normalized floating point representation, Boolean algebra, truth tables, Venn diagrams.

Computer Architecture: Organization of CPU, Hardwired and Micro-programmed CU, Register Organization and Instruction formats. Instruction set- register transfer, arithmetic, logic and shift operations. Addressing modes. Memory Management, Associative Memory, cache memory, virtual memory, Introduction to 8086 instruction set.

## Unit-5: Computer Programming in C

C-language fundamentals, Basic Constructs-Loops, control statements, Arrays, Functions, Structures and Unions, Pointers, Files.

## Unit-6: Computer Programming in C++

Object Oriented Paradigm (OOPs), Classes, Objects, Abstraction, Polymorphism, Inheritance, Encapsulation, Constructors, Destructors, Inline and friend function, dynamic and static binding, virtual class, Virtual functions, Operator overloading and function overloading.

## Unit-7: Database Systems

Introduction, Database Vs File Systems, DB Users, DBMS- Basic Concepts and Terminology, Models and Architecture, Relational Algebra and Relational DBMS. Normalization. Elements of Structured Query Language. Transaction Management, Concurrency control techniques, Recovery techniques, Different Types of Files like Sequential, Index based Files, etc.

## Unit-8: Data Structures

Introduction, Algorithms complexity, Stacks, Queues, linked Lists. Sorting techniques and Searching techniques: Quick Sort, Merge Sort, Heap Sort, Selection sort, Bubble Sort, Linear and binary search algorithms. Tree and Graph- terminology, representation, In memory, binary tree, traversal techniques of graphs.

## Unit-9: Operating System

Introduction, operating System Organization, process Management, Physical and virtual address memory allocation strategies, I/O Management, protection and security.

## Unit-10: Computer Networks

Introduction to Computer Networks, Data Communication Fundamentals and Techniques, Networks switching Techniques and Access Mechanisms, Data Link Layer Functions and Protocol, Multiple Access Protocol and Networks. Networks Layer functions and protocols, Transport Layer functions and Protocols, Overview of Application layer protocol.



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# PART – III (Ph.D Entrance Syllabus 2026)

## Unit-1: Probability and Statistics & Sets

Basic concepts of probability theory, Averages, Dependent and independent events, frequency distributions, and measures of dispersions, Skewness and Kurtosis, random variable and distribution functions, mathematical expectations, Binomial, Poisson, normal distributions, curve fitting, and principle of least squares, correlation and regression. Set, relations and mappings.

## Unit-2: Artificial Intelligence

Introduction to Artificial Intelligence, Background and Applications. Using AI in Problem Solving, Intelligent Agents, Problem Characteristics, Problem Solving, and Searching Techniques. Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill Climbing Search Techniques, Best First Search and its Variations, Heuristic Search Techniques: A* Algorithm, Means-Ends Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning Algorithms.

## Unit-3: Theory of Computation

Languages: Definition of Alphabet, Language and Regular languages, Context free languages, Turing-Machines and Models of Computations.

## Unit-4: Software Engineering

Concept and Nature of Software, Software Crisis, Software Engineering- Concept, Goals and Challenges, Software Engineering Approach, Software Development Process, Waterfall Model, Evolutionary and Throwaway Prototyping Model, Incremental and Iterative Models, Spiral Model, Component based and Aspect Oriented development.

## Unit-5: Cyber Security

Introduction to Cybersecurity: Defining Cybersecurity and its importance. The CIA triad: Confidentiality, Integrity, and Availability. Types of cyber threats and vulnerabilities. Cybercrime and its Types. Understanding cybercrime and its motivations. Types of Cyber Attackers: White, grey and black hat. Common types of cybercrime: hacking, phishing, malware, ransomware. Methods of Intrusion: Social Engineering, Denial-of-Service, distributed DoS. Impact of cybercrime on individuals, organizations, and society. Security Vulnerability & Exploits: Hardware vulnerability, software vulnerability. Remedial and Mitigation Measures: Implementing security controls to prevent cyberattacks, Network security: firewalls, intrusion detection systems, access control, Endpoint security: antivirus, antimalware, software updates, User awareness and training: educating users about cybersecurity threats and best practices.

## Unit-6: Cryptography & Network Security

History of cryptography, Basics of cryptography, Types of cryptographic algorithms, Security implications of cryptography. Classical Ciphers: Caesar Cipher, Mono-alphabetic cipher, Hill cipher, Poly-alphabetic cipher (Vegenere Cipher), One-time pad, Transposition Cipher (Rail-fence Cipher). Introduction to Number Theory: Prime Number Generation and Testing for Primality, Fermat's and Euler's Theorems. Symmetric Key Cryptography: Principles of symmetric key cryptography, Encryption and decryption algorithms, Claude Shannon's Theory of Diffusion and Confusion, Avalanche Effect, Feistel Cipher, Common symmetric key algorithms (e.g., DES, Triple DES, AES)

## Unit-7: Design & Analysis of Algorithms

Introduction to Algorithms, Analysis of Algorithms, Growth of functions, Asymptotic Notations (Big-O, Big-Omega, Big-Theta), Complexity Analysis Techniques (Substitution method, Recursion Tree), Masters Theorem, Tower of Hanoi problem and its complexity. Search Algorithms (Linear Search, Binary Search), Sorting Algorithms (Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort). Time complexity analysis of searching and Sorting algorithms, Introduction to Divide and Conquer strategy, Greedy method, Knapsack problem.



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## Unit -8: Blockchain Technologies

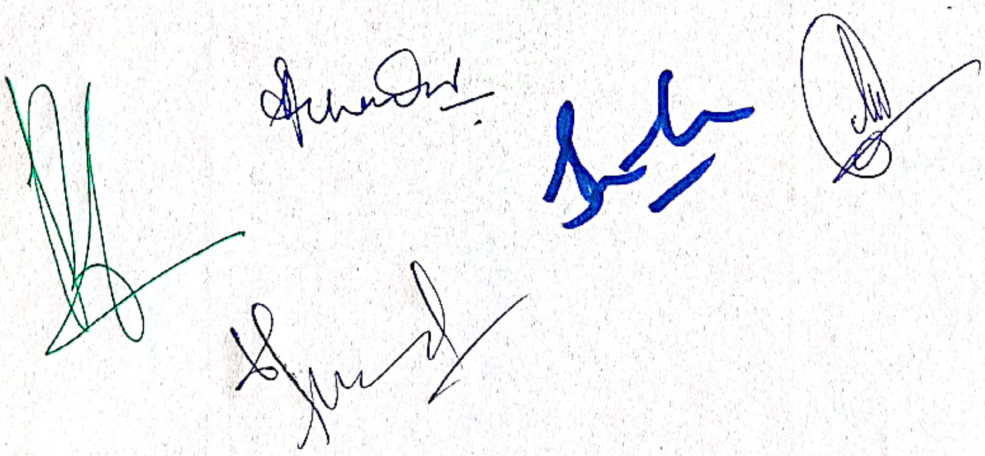
Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

## Unit – 9: Big Data

Definition and Explanation. Characteristics of Big Data (Basic, 3V and 5V). Why Big Data is important? Types of Big Data: Structured, Semi-structured, and unstructured. Big Data Technology Foundation: Physical Infrastructure (Generation, Computation, Communication, and Storage), Security Infrastructure. Current trends and Challenges.

## Unit – 10: Cloud Computing

Overview, Evolution and Characteristics. How Cloud Computing works? Pros and Cons of Cloud Computing. Challenges of Cloud Computing. Comparison with traditional computing architecture (Client/Server). Comparison with other recent computing trends (Grid, Cluster and Distributed Computing). Virtualization: Introduction to virtualization, types and implementation levels. Cloud Computing Architecture: Cloud computing stack, Introduction to Cloud Service Models - Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Introduction to Cloud Deployment Models – Public Cloud, Private Cloud, Hybrid Cloud, and Community Cloud. Services provided at various levels.



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