

641. Information Technology

Mathematics

Mathematical Logic:

Propositional Logic; First Order Logic.

Probability:

Conditional Probability; Mean, Median, Mode and Standard Deviation; Random Variables; Distributions; uniform, normal, exponential, Poisson, Binomial.

Set Theory & Algebra:

Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean Algebra.

Combinatorics:

Permutations; Combinations; Counting; Summation; generating functions; recurrence relations; asymptotics.

Graph Theory:

Connectivity; Spanning trees; Cut vertices & edges; covering; matching; independent sets; Colouring; Planarity; Isomorphism.

Linear Algebra:

Algebra of matrices, determinates, systems of linear equations Eigen values and Eigen vectors.

INFORMATION TECHNOLOGY

Computer Organization and Architecture:

Machine instructions and addressing modes, ALU and Data-Path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

Programming and Data Structures:

Programming in C and C++; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

Algorithms:

Analysis, Asymptotic notation, Notions of space and time complexity, worst and average case analysis; Design, Greedy approach, Dynamic programming, Divide and conquer; Tree and graph Traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes P, NP, NP-hard, NP-complete.

Operating System:

Processes, Threads, Inter-process communication, concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, file systems, I/O systems, Protection and security.

Databases:

ER-model, Relational Model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Information Systems and Software Engineering:

Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance. OOAD using UML.

Computer Networks:

ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion Control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security basic concepts of public key and private key, cryptography, digital signature, firewalls.

Web technologies:

HTML, XML, basic concepts of client-server computing.