

**Syllabus for Ph. D. Entrance Exam**

**Computer Organization and Architecture:**

Logic functions, minimization, design and synthesis of combinatorial and sequential circuits, number representation and computer arithmetic. Machine instructions and addressing modes, ALU and data path, hardwired and micro programmed control, memory interface, I/O interface, serial communication interface, instruction pipelining, cache, main and secondary storage.

**Computer Networks:**

ISO/OSI stack, transmission media, data encoding, multiplexing, flow and error control, LAN technologies (Ethernet, token ring), network devices - switches, gateways, routers, ICMP, application layer protocols - SMTP, POP3, HTTP, DNS, FTP, Telnet, network security - basic concepts of public key and private key cryptography, digital signature, firewalls

**Theory of Computation:**

Regular languages and finite automata, Context free languages and push down automata, recursively enumerable sets and Turing machines, Undesirability.

**Compiler Design:**

Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.

**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:**

OS Structure, services and components, multitasking, multiprogramming, time sharing, multithreading, Process Management, CPU scheduling, Deadlocks. Inter-process Communication, Concurrent Processing and concurrency control, Memory management, Virtual memory, Demand Paging and Page Replacement Algorithms. I/O and Device management, buffering and spooling file management, file storage, Access methods and free space management.

**Databases:**

ER - model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures, Transactions and concurrency control.