SVKM NMIMS Global University, Dhule

School of Technology, Management & Engineering

Ph.D. Entrance Exam Syllabus –2025

Computer Engineering: PAPER-II

Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Monoids, Groups. Graphs: connectivity, matching, colouring. Combinatorics: counting, recurrence relations, generating functions.

Computer Organization and Architecture: Machine instructions and addressing modes. ALU, data-path and control unit. Memory hierarchy: cache, main memory and secondary storage

Programming and Data Structures: Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Algorithms: Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph traversals, minimum spanning trees, shortest paths.

Theory of Computation: Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.

Compiler Design: Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation

Operating System: System calls, processes, threads, inter-process communication, concurrency and synchronization, Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.

Databases: ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms

Computer Networks: Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, UDP, TCP, sockets; Application layer protocols: DNS, SMTP, HTTP, FTP, Email.

Machine Learning: Machine Learning, types of learning, hypothesis space and inductive bias, evaluation, cross-validation, regression, Decision trees, over fitting, Instance based learning, Feature reduction, Collaborative filtering based recommendation

REFERENCE BOOKs:

1. JP Trembly and Manohar, Discrete Mathematical Structures.
2. Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4th Edition,2013
3. William Stalling, Computer Organization and Architecture: Designing for Performance, Prentice Hall Publication, 8th Edition, 2009.
4. E. Balagurusamy, Object Oriented Programming with C++, McGraw-Hill Publication, 6th Edition, 2013.
5. T. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
6. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.
7. Henry Korth, Abraham Silberschatz & S. Sudarshan, Database System Concepts, McGraw- Hill Publication, 6th Edition, 2011**.**
8. Hopcroft, Ullman, Motwani, *Introduction to Automata Theory*, *Languages, and Computation*, Addison Wesley Publication, 2nd Edition, 2001.
9. Tanenbaum, Computer Networks, PHI Publication, 5th Edition, 2011.
10. Tom Mitchell, Machine Learning, First Edition, McGraw Hill, 1997.