

**PhD Admission Test Syllabus**  
**Department of Computer Engineering**  
**2018-19**

**Digital Logic and Computer Architecture:**

Boolean algebra, Combinational and sequential circuits Design and synthesis, Optimization. Number representations and computer arithmetic (fixed and floating point).

Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: Cache, main memory and secondary storage, I/O interface (interrupt and DMA mode).

**Concepts of Data Structures & Algorithms, Software Engineering, and Computer Graphics:**

Programming in C: Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs. Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: Greedy, dynamic programming and divide-and-conquer. Graph Algorithms.

Software Engineering Process Models, Metrics, Quality, Estimation, Basics of Computer Graphics, Transformations, projections, shading.

**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 and Operating System:**

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

**Computer Networks:**

Concept of layering. LAN technologies. Medium Access Control (MAC) layer protocols, Flow and Error control Techniques, Switching. Routers and routing algorithms (distance vector, link state). Transport Layer TCP/UDP, Principle of Reliable data Transfer, Congestion Control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Quality of service, Mobile and wireless networks. Internet of Things (IoT).

**Data Analytics**

Information Retrieval (IR), IR Models, Text Mining, Big Data, Web Mining, Machine Learning, Classification, Clustering, Association Rule Mining, Frequent Pattern Mining, Boosting, Ensembles, Deep Learning.

**Artificial Intelligence:**

Artificial Intelligence, Informed and Uninformed Search, Knowledge Representation and Reasoning, First Order Logic, Inference in First Order Logic, Resolution, Reasoning with uncertain information, Expert System.

**Computer Security:**

Basic Cryptology: Cryptography and cryptanalysis, Application of cryptography: Network Security, system security and program security, Types of attacks. Digital signature key exchange and message authentication codes. User Authentication: Knowledge-Based Authentication, Token-Based Authentication, Biometric Authentication. Graphical Passwords.

  
25.9.18