Syllabus for Ph.D. Entrance Examination – 2018 Admissions

Part 'B' - Department Specific (60 Marks- 12 questions of 5 marks each)

Computer Science and Engineering

Subject	Topics	Reference Books
Theory of Computation	**Models of computation**-Finite Automata, Pushdown Automata, Nondeterministic and NFA, DPDA and PDAs and Languages accepted by these structures. Grammars, Languages, Non-computability and Examples of non-computable problems.	1. Linz P, " An introduction to formal languages and automata", 5th edition, Narosa Publishing House, 2009. 2. Michael Sipzer, " Introduction to the Theory of Computation", 3rd edition, Cengage learning, 2012.
Programming and Data Structure	**Programming in C -** Structure of C program, input and output statement, functions, control structures, recursion, files, strings, structures and unions. **Linear Data structures:** Arrays, stacks, queues, linked lists, Doubly Linked Lists, Circular Lists, and Application of Linked Lists. **Non-linear data structures:** Trees, binary search trees, binary heaps, graphs, Traversals, Shortest Path algorithms, Spanning Trees. **File structures:** Fields, Records and files. Sequential, Direct, index-sequential and relative files. Hashing, Inverted lists and multi-lists	1. Richard F Gilberg, Behrouz A Forouzan , "Data Structures – A Pseudocode approach with C", Thomson Learning, 2004 2. Adam Drozdek,"Data Structures and Algorithms in C++", 2nd Edition, PWS Publishing, 2002. 3. Mark Allen Weiss, "Data structures and Algorithm Analysis in C++", 2nd Edition, Pearson Education, 2001. 4. SartajSahni, "Data Structures, Algorithms and Applications in C", McGraw-Hill-2000.
Algorithms and Analysis	**Analysis of algorithms** - Time and space complexity, Asymptotic notations, Recursion and its systematic removal. **Sorting and searching algorithms** - Bubble sort, Selection sort, Insertion sort, Shell sort, Quick sort, Radix sort, Merge sort. Linear and Binary search. **Design of Algorithms** - Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound. **NP-hard and NP-complete problems.**	

Computer Organization and Architecture	Combinational Circuit Design, Sequential Circuit Design. Hardwired and Microprogrammed processor design, Memory organization, Interfacing. Microprocessor architecture, Instruction set and Programming	1. Patterson, David A and J L Hennessy, " Computer Organisation and Design, the Hardware, Software Interface", Morgan Kaufmann, 5th Edition 2013. 2. Hennessy and Patterson, " Computer Architecture – A quantitative approach", Elsevier, 5th Edition, 2011.
Operating Systems	**Processes and Threads**. **Process Synchronization** – Concurrent Processing : Mutual exclusion, Critical regions, Semaphores, Critical-Section problem, Peterson's Solution, Synchronization Hardware. **Scheduling:** CPU scheduling, I/O scheduling, resource scheduling. **Memory Management :** Memory allocation And Segmentation - Swapping, Contiguous memory allocation, Virtual memory, paging, fragmentation, Caching and TLBs, Caching and Demand Paging- Demand paging, copy-on-write, page replacement, Allocation of Frames, Thrashing **Deadlocks** -Model, Handling Deadlocks, Prevention, Avoidance, Detection Recovery.	1. Silberschatz, Galvin, Operating Systems concepts, John Wiley and Sons, Seventh Edition, 2002
Computer Networks	**Introduction to Computer Networks** – Types of Networks, Examples of data communication service: Sliding Window protocols-Multiple Access Protocols – Random Access Protocols – Address Resolution protocol – Reverse address resolution protocol. Flow and error control techniques, switching, routing algorithms, distance vector and link state. **Network layer** and Routing Network Service model – Routing principles. **Transport Layer Services** – Transport Layer Protocols, Congestion Control, TCP and UDP. **Application layer protocols.** **Security in Computer Networks:** Principles of Cryptography – Symmetric Key – Public key- Authentication Protocols.	1. Frorouzan B A, "Data Communication and Networking", Third Ed., Tata McGraw Hill, 2004. 2. Tanenbaum A S, "Computer Networks", Tird Edition, PHI, 2004. 3. Stallings W, "Data and Computer Communications", Seventh Edition, Pearson Ed. Asia, 2004.