Department of Computer Science and Engineering

Faculty Recruitment

Written Exam Syllabus

Data Structures and Algorithms

Asymptotic notations, Big O, Theta, Omega. Notion of Time and Space complexity. Recurrence Equations – Solving using substitution method, Master's theorem. Data Structures – Stacks, Queues, Linked list, Binary Trees, Binary search trees, balanced binary search tree, AVL Tree, Heaps, Priority Queues. Hashing – Storage, Collision detection

Sorting – Bubble Sort Quicksort, Heapsort, Counting Sort – Searching – Linear Search, Binary Search, Graph – Representation, BFS, DFS, Shortest path problems. Algorithm Design Paradigms – Divide and conquer, Greedy, Dynamic Programming and Backtracking.

Operating Systems

Abstract View of OS – System Structures – System Calls – Virtual Machines – Process Concepts – Threads – Multithreading – Process Scheduling – Process Coordination – Synchronization – Semaphores – Monitors ko– Hardware Synchronization – Deadlocks – Methods for Handling Deadlocks – Memory management strategies – Contiguous and non-contiguous allocation – virtual memory management – Demand Paging – Page Replacement and policies. File system – Basic concepts – Design and Implementation – Case Studies – Linux and Windows

Computer Organization and Architecture

Memory Technologies - Basics of Caches - Measuring and Improving Cache Performance - dependable memory hierarchy - Virtual Machines - Virtual Memory - - Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks

Instruction-Level Parallelism: Concepts and Challenges - Basic Compiler Techniques for Exposing ILP - Reducing Branch Costs with Prediction - Overcoming Data Hazards with Dynamic Scheduling - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP Using Multiple Issue and Static Scheduling - Exploiting ILP - Advanced Techniques for Instruction Delivery and Speculation - Studies of the Limitations of ILP.

Vector Architecture - SIMD Instruction Set Extensions for Multimedia - Graphics Processing Units - Detecting and Enhancing Loop-Level Parallelism - Centralized Shared-Memory Architectures - Performance of Shared-Memory Multiprocessors - Distributed Shared Memory - Models of Memory Consistency - Multicore Processors and their Performance.

Computer Networks

Introduction to networks – applications – Topology – IEEE802.3, 802.4, 802.5. Network layer – issues – routing, congestion control – internetworking – issues, Network protocol – IP datagram, hop by hop routing, ARP, RARP, DHCP, Sub-net addressing, address masking, ICMP, RIP, RIPV2, OSPF, DNS, Multicasting. Transport layer – design issues, connection management, Transmission control protocol – user datagram protocol.

Data Base Management Systems

Views of data – data models, database management system, three-schema architecture of DBMS, E/R Model - Conceptual data modeling - E/R diagram notation

Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors.

Database Design - Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF