

Course Name : Advanced Algorithms

INTRODUCTION:

(02)

Algorithm concepts, Analyzing and design, Pseudocode conventions, asymptotic efficiency of algorithms, asymptotic notations and their properties.

RECURSION:

(02)

Recurrence equations and method of solving recurrences, substitution method, recursion tree method and master method.

PROBABILISTIC ANALYSIS AND RANDOMIZED ALGORITHMS:

(04)

Probabilistic analysis concepts, hiring problem and its probabilistic analysis.

SORTING

(04)

Heap sort and heaps as priority queues, quick sort, randomized quick sort, sorting in linear time.

SELECTION

PROBLEM

(03)

Medians and order statistics.

SEARCHING

(05)

Searching using hash tables, collision resolution, hash functions, open addressing using linear probing, quadratic probing and double hashing.

DYNAMIC

PROGRAMMING

(06)

Deterministic & probabilistic, greedy algorithms, amortized analysis.

ADVANCED

DATA

STRUCTURES

(06)

B trees, B+ trees, data structures for disjoint sets.

GRAPH

ALGORITHMS

(06)

Breadth First and Depth First Search, minimum spanning trees, shortest path algorithms: single source and all pair, max flow problem and its solutions.

LINEAR

PROGRAMMING

(03)

Algorithms for linear programming, DFT and FFT.

STRING

MATCHING

(04)

Rabin Karp algorithm, Knuth-Morris-Pratt algorithm.

NP-COMPLETENESS

CONCEPTS

(05)

Polynomial time verification, NP-completeness and reducibility, showing problems to be NP-complete like Clique problem, vertex cover problem etc. Approximation algorithms of these problems.

Books:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms", Prentice Hall of India.
2. Brassard, Bratley, "Fundamentals of algorithms", Prentice Hall of India.
3. Knuth, "The Art of Computer Programming", Vol I-III, Pearson Education.

Course Name : Advanced Database Systems

DATA STORAGE & QUERYING:
(10)

File Structures: Heap files, Sorted files, Hashing, RAID.

Indexing files: Single level, Multiple level, B-Trees

Query Processing & Optimization: Translating SQL queries in relational algebra, External sorting, Various operations like SELECT, JOIN etc, Combining operations using pipelining, Query optimization using heuristics, Selectivity & Cost estimation.

Database Tuning: Physical Database Design, Tuning in Relational Systems.

TRANSACTION MANAGEMENT:
(10)

Transaction processing concepts: Properties, Schedules, Serializability, Transaction support in SQL.

Concurrency control techniques: Two phase locking, Timestamp ordering, Multiversion.

Database recovery techniques: Recovery concepts, Deferred update, Immediate update, Shadow paging.

DATABASE SECURITY:
(08)

Database security issues, Discretionary access control, Mandatory & role based access control, Database audit.

DISTRIBUTED DATABASES:
(10)

Distributed database concepts, System architecture; Distributed database design, Fragmentation, Replication, Allocation; Types of distributed databases; Query processing in distributed databases.

EMERGING TECHNOLOGIES:
(07)

Data mining: Data mining concepts, Association rules, Classification, Clustering, Application of data mining.

Data warehousing: Characteristics of Data warehouses, Data modelling of data warehouses, Typical functionality of data warehouses.

XML & Internet databases, Object relational databases.

CASE STUDIES OF LEADING DATABASE SYSTEMS.
(05)

Books:

1. Elmasri R. & Navathe S. B. , Fundamentals of Database Systems, Pearson Education.
2. Silberschatz A., Korth H. F. & Sudarshan S., Database System Concepts, McGraw Hill.

Course name : NETWORK SYSTEM SECURITY

ENCRYPTION AND DECRYPTION:

(04)

Attackers and Types of Threats, challenges for information security, Encryption Techniques, Classical Cryptographic Algorithms: Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher, Stream and Block Ciphers.

NUMBER THEORY AND BASIC ALGEBRA:

(03)

Prime Numbers, Greatest Common Divisor, Euclidean algorithm, Modular Arithmetic, Properties of Modular Arithmetic, Computing the inverse, Fermat's Theorem, algorithm for computing inverses, Random number generation.

SYMMETRIC KEY SYSTEMS:

(03)

The Data encryption Standard (DES), Analyzing and Strengthening of DES, TDES, Advance Encryption Standard (AES)

KEY MANAGEMENT PROTOCOLS:

(03)

Solving Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Cryptography.

PUBLIC KEY ENCRYPTION SYSTEMS:

(05)

Concept and Characteristics of Public Key Encryption system, Introduction to Merkle-Hellman Knapsacks, Rivets – Shamir-Adlman (RSA) Encryption, introduction to Digital Signature Algorithms, The Digital Signature Standard (DSA)

HASH ALGORITHMS:

(05)

Hash concept, description of Hash Algorithms, Message Digest Algorithms such as MD4 and MD5, Secure Hash Algorithms such as SHA1 and SHA2.

NETWORK SECURITY:

(06)

Network Security Issues such as Impersonation, Message Confidentiality, Message Integrity, Code Integrity, Denial of Service Attacks, Securing Switches and Routers, Firewalls, DMZs, Virtual Private Networks, Network Monitoring and Diagnostic Devices, Virtual LANs, IPSec Secure Communication Mechanism, PKI based authentication and Kerberos.

WEB SECURITY:

(03)

Secure socket Layer Protocol, Pretty Good Privacy, Public Key Cryptography Standards.

BOOK:

1. Principles of Cryptography, William Stallings, Pearson Education.

REFERENCES:

1. "Security in Computing (Second Edition)", Charles P.Pfleeger, 1996, Prentice Hall International, Inc.
2. Cryptography & Network Security, Atul Kahate, TMH
3. Applied Cryptography: Protocols, Algorithms, and Source Code in C, Bruce Schneier, John Willey and Sons.
4. Firewalls and Internet Security, Bill Cheswick and Steve Bellovin, Addison-Wesley
5. "Security Technologies for the world wide web", Rolf Oppliger, Artech House, Inc.
6. "Digital Certificates Applied Internet Security", Jalal Feghhi and Peter Williams, Addison Wesley Longman, Inc.

Course Name : Artificial Intelligence

INTRODUCTION

(08)

Artificial Intelligence, Intelligent Systems

PROBLEM SOLVING

(09)

Search in state spaces, Uniformed search, Heuristic search.

KNOWLEDGE REPRESENTATION & REASONING

(18)

Logical agents, First order logic, Knowledge bases, representing commonsense knowledge, reasoning with uncertain information, Fuzzy logic, Neuro-Fuzzy techniques.

NEURAL NETWORKS

(07)

Introduction, Characteristics of Neural Network, perception, MLNN

NATURAL LANGUAGE PROCESSING

(05)

BOOKS:

- 1) Artificial Intelligence: By Stuart J Russell

REFERENCES:

- 1) Artificial Intelligence: A new system by Nih J Nilson
- 2) Artificial Intelligence: by Rich and Knight
- 3) Neural Networks in Computer Intelligence by FU

Course Name : Advanced Computer Networks

INTRODUCTION (4)

Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc.

MEDIUM ACCESS (8)

MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless ethernet, etc.)

INTERNETWORKING AND ROUTING (8)

Packet Switching, The Internetworking Problem, The IP/TCP split connections, Scaling IP, Routers: Forwarding and Routing, The IP forwarding path, Unicast Internet routing: Intra and Inter domain routing, Internet Routing-in-the-wild, Router Design and Implementation, Security problems with Internet Architecture, IPV6.

RESOURCE MANAGEMENT (8)

End-to-End Congestion Control, Router-Assisted Congestion Control: Active Queue Management, Fair Queuing and Variants, Modeling and Measurement: Packet Trains, TCP Congestion Control Impediments, Adaptive Network Applications, QoS: Why QoS; Basic Models and Architecture, Mechanisms and Properties, Modeling and Measurement: Traffic Self-Similarity; Virus Propagation.

GROUP COMMUNICATION (5)

Multicast Routing and Transport, IP Multicasting: Multicast routing protocols, address assignments, session discovery, etc., Multicasting in mobile networks.

TRANSPORT LAYER PROTOCOL (6)

TCP protocol dynamics, TCP extensions for high-speed networks, transaction-oriented applications. Other new options in TCP.

WIRELESS NETWORKS (6)

Wireless LAN architecture, Mobile IP, Broadcast file system, Agent technology, Satellite technology

SECURITY (5)

Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, digital certificates.

BOOKS and REFERENCES:

1. Andrew Tenenbaum. Computer Networks, PHI
2. W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
3. G. R. Wright. TCP/IP Illustrated, Volume 2: The Implementation, Addison Wesley, 1995.
4. W. R. Stevens. TCP/IP Illustrated, Volume 3: TCP for Transactions,

- HTTP, NNTP, and the Unix Domain Protocols, Addison Wesley, 1996.
5. R. Handel, M. N. Huber, and S. Schroeder. ATM Networks: Concepts, Protocols, Applications, Addison Wesley, 1998.
 6. W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, Prentice Hall, 1998.
 7. C. E. Perkins, B. Woolf, and S. R. Alpert. Mobile IP: Design Principles and Practices, Addison Wesley, 1997.
 8. Articles in various journals and conference proceedings.

Course Name : Internet & Web Based Technologies

INTRODUCTION

(10)

Introduction to Java, Difference between C/C++ and Java, Applets and Applications, Java Development Kit, Advantages of Java, (Data types, modifiers, expressions, operators in Java), Control Statements in Java, Classes statements in Java, Classes, Inheritance (single, multilevel, hierarchical), Multiple Inheritance using Interfaces, Arrays, Strings and Vectors, Java packages, Exception handling, Multithreading, Applets, Graphics and AWT.

MULTITHREADING

(05)

Java Thread Model, Thread Priorities, Creating Multiple Threads, Synchronization, Inter thread communication.

APPLETS

(04)

Applet Basic, Applet Architecture, Display Methods, HTML APPLET tag.

EVENT HANDLING

(05)

Event Handling Modles, Event classes, Event Listener Interfaces, Adapter Classes.

AWT CLASSES

(06)

Window fundamentals, working with frames windows, Panels, working with color, fonts, AWT Controls, layout Manager & Menus.

SWING

(04)

Swing components classes and their brief description such as buttons, boxes, panes, tables, fields and trees.

JDBC

(05)

Java as a database front end, Database Client/Server methodology, Two-and three-tier database design, The JDBC API, A JDBC database example.

JAVA BEANS

(05)

The Java Bean component model, The Java “Bean”, Bean introspection and customization, Simple Bean applications.

SERVLETS

(06)

Servlet engines, Life cycle of servlets, Run-time environment, Servlet exceptions.

BOOKS:

1. The Complete Reference, Java™ 2, 3rd Edition, Patrick Naughton, Herbert Schildt, Tata McGraw Hill.

REFERENCES:

1. Programming with JAVA, John R. Hubbard, Schaum's Outline Series, McGraw Hill, New York.
2. Java Script, Don Gosselin, Thomson Learning, Cambridge, 2000.
3. Programming with Java, E Balagurusamy, Tata McGraw Hill, New Delhi, 2002.