Veer Narmad South Gujarat University, Surat

Syllabus
M.Sc. (Computer Application)-1st Year
Semester -I
Effective from June 2012

Paper No. : 101
Paper Title : Advanced Data Structures **[L:4, P:0]**

Aim: To provide a comprehensive knowledge of Data Structures concept and their implementation

Prerequisite: Preliminary knowledge of Data Structure and its classification.

1. Introduction to Data Structure
   - 1.1. Basic concepts
   - 1.2. Overview of Primitive & Non-primitive Data Structures

2. Trees
   - 2.1. Basic Concepts
   - 2.2. Binary Trees
   - 2.3. N-ary Trees
   - 2.4. Tree Traversals
     - 2.4.1. Inorder, Preorder and Postorder
     - 2.4.2. Breadth-First Traversal
     - 2.4.3. Depth-First Traversal
     - 2.4.4. Search Trees
       - 2.4.4.1. Algorithms like Binary, AVL, M-Way
       - 2.4.4.2. Average Case Analysis of algorithms of 3.4.4.1
   - 2.5. Huffman trees and Data compression including Huffman coding
   - 2.6. Recent Applications

3. Graphs
   - 3.1. Basics
   - 3.2. Traversals – Depth-First, Breadth-First,
   - 3.3. Applications
   - 3.4. Topological sort
   - 3.5. Shortest Path Algorithm
   - 3.6. Minimum Cost Spanning trees – Prim's and Kruskal's algorithm
   - 3.7. Critical Path Analysis

4. Sorting and Searching algorithms
   - 4.1. Binary search
   - 4.2. Depth-First search
   - 4.3. Breadth-First search
   - 4.4. Nearest Neighbor search
   - 4.5. Branch and Bound
   - 4.6. A* algorithm

5. Hashing
   5.1. Basic Idea – Keys and Hash Functions including Collision avoidance
   5.2. Hashing Methods
      5.2.1. Division Method
      5.2.2. Middle Square Method
      5.2.3. Multiplication Method
      5.2.4. Fibonacci Hashing
   5.3. Hash Function Implementations
      5.3.1. Integral Keys
      5.3.2. Floating Point Keys
      5.3.3. Character String Keys
      5.3.4. Hashing Containers
      5.3.5. Using Associations
   5.4. Hash Tables
      5.4.1. Abstract Hash Tables
      5.4.2. Average Case Analysis
   5.5. Scatter Tables
      5.5.1. Chained Scatter Table
      5.5.2. Scatter Table using Open Addressing

6. Heaps and Garbage Collection
   6.1. Basic Concepts Heaps
   6.2. Binary, Leftist, Binomial Queues
   6.3. Recent Applications
   6.4. Basic concepts of Garbage Collection
   6.5. Reference Counting Garbage Collections
   6.6. Mark-and-Sweep Garbage Collections
   6.7. Stop-and-Copy Garbage Collections
   6.8. Mark-and-Compact Garbage Collections

7. Algorithmic Patterns and Problem Solvers
   7.1. Brute-Force and Greedy Algorithms
   7.2. Backtracking algorithms – Depth-First, Branch-and-Bound
   7.3. Top-Down Algorithms – Divide-and-Conquer
   7.4. Bottom-Up Algorithms

References:

1. Data Structures and Algorithms, Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison-Wesley.
2. Data Structures and Algorithms with Object-Oriented Design Patterns in Java, Bruno R. Preiss, John Wiley & Sons
3. Handbook of Algorithms and Data Structures, Gaston H. Gonnet, Ricardo Baeza, Addison-Wesley Publishing Co. Inc.
4. An Introduction to Data Structures with Applications, J. Tremblay, P. Sorenson, Tata McGraw-Hill

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Paper No. : 102:
Paper Title : Advanced Relational Database Management System [L:4, P:0]

Aim: To provide a comprehensive knowledge of efficient database design approach, which includes normalization, indexing, hashing, transaction management and concurrency control.

Prerequisites: Basic concept of database management system.

1. Introduction to Relational Database Design
   - 1.1. Features of Good Relational Designs
   - 1.2. Atomic Domains and First Normal Form
   - 1.3. Decomposition Using Functional Dependencies
   - 1.4. Decomposition Using Multivalued Dependencies
   - 1.5. More Normal Forms
   - 1.6. Database-Design Process
2. Storage and File Structure
   - 2.1. Overview of Physical Storage Media
   - 2.2. File Organization
   - 2.3. Organization of Records in Files
   - 2.4. Data-Dictionary Storage
3. Indexing and Hashing
   - 3.1. Basic Concepts
   - 3.2. Ordered Indices
   - 3.3. B+-Tree Index Files
   - 3.4. B-Tree Index Files
   - 3.5. Multiple-Key Access
   - 3.6. Static Hashing
   - 3.7. Dynamic Hashing
   - 3.8. Comparison of Ordered Indexing and Hashing
   - 3.9. Bitmap Indices
4. Query Processing and Optimization
   - 4.1. SQL Overview
     - 4.1.1. Various SQL statements
     - 4.1.2. Various typed of joins, Nested Subqueries and Complex queries
     - 4.1.3. Views
     - 4.1.4. Integrity Constraints
     - 4.1.5. Authorization
     - 4.1.6. SQL Functions and Procedures

4.2. Measures of Query Cost
  4.2.1. Selection Operation
  4.2.2. Sorting
  4.2.3. Join Operation
  4.2.4. Other Operations
4.3. Evaluation of Expressions
4.4. Transformation of Relational Expressions
4.5. Estimating Statistics of Expression Results
4.6. Choice of Evaluation Plans
4.7. Materialized View

5. Transactions Management
   5.1. Transaction Concept & State
   5.2. Implementation of Atomicity and Durability
   5.3. Concurrent Executions
   5.4. Serializability
   5.5. Recoverability
   5.6. Implementation of Isolation
   5.7. Testing for Serializability

6. Concurrency Control
   6.1. Lock-Based Protocols
   6.2. Timestamp-Based Protocols
   6.3. Validation-Based Protocols
   6.4. Multiple Granularity
   6.5. Multiversion Schemes
   6.6. Deadlock Handling
   6.7. Insert and Delete Operations

7. Object-Based Databases & XML
   7.1. Introduction
   7.2. Complex Data Types
   7.3. Structured Types and Inheritance in SQL
   7.4. Table Inheritance
   7.5. Array and Multiset Types in SQL
   7.6. Object-Identity and Reference Types in SQL
   7.7. Implementing O-R Features
   7.8. Structure of XML Data
   7.9. XML Document Schema
   7.10. Querying and Transformation
   7.11. Application Program Interfaces XML
   7.12. Storage of XML Data
   7.13. XML Applications

References:

1. Database System Concepts, Silberschatz Henry F. Korth and S. Sudarshan, McGraw-Hill.
2. An Introduction to Database System, C.J. Date, Addision Wisley
3. An Introduction to Database System, Bipin C. Desai, Galgotia
4. Database Management Systems-Designing & Building Business Applications, Gerald V Post, Irwin Professional Publication
5. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw-Hill

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Paper No. : 103
Paper Title : Object Oriented System Design **[L:4, P:0]**

Aim: To provide a comprehensive knowledge of Object Oriented concepts, tools, development life cycle, problem solving, modeling, analysis and design.

Prerequisite: Programming knowledge.

1. Object Oriented Design Fundamentals
    1.1. The Object Model
    1.2. Classes and Objects
    1.3. Complexity of Software
    1.4. Classification, Notation, Process
    1.5. Pragmatics
    1.6. Binary and Entity Relationship
    1.7. Object Types
    1.8. Object State
    1.9. OOSD Life Cycle.
2. Object Oriented Methodologies and UML
    2.1. Object Oriented Methodology: Rumbaugh, Booch, Jacobson, Shaler/Mellor, Coad/Yardon
    2.2. Patterns
    2.3. Frame Works
    2.4. The Unified Approach – UML
3. Object Oriented Analysis
    3.1. Identify Use Cases
    3.2. Use Case Model
    3.3. Documentation
    3.4. Classification
    3.5. Identifying Classes
    3.6. Noun Phrases Approach
    3.7. Common Class Pattern Approach
    3.8. Use Case Driven Approach
    3.9. Identifying Object Relationship
    3.10. Attributes And Models.
4. Object Oriented Design
    4.1. Design Process
    4.2. Design Axioms
    4.3. Designing Classes
    4.4. Access Layer Design
    4.5. View Layer Design.

5. Object Oriented Development
    5.1. Managing Analysis and Design
    5.2. Evaluation Testing
    5.3. Coding
    5.4. Maintenance
    5.5. Metrics
    5.6. Case Study: Foundation Class Library – Client/Server Computing.

References:

1. Ali Bahrami, Object Oriented System Development, Mc Graw Hill.
2. Larman, Applying UML & Patterns: An Introduction to Object Oriented Analysis and Design, Pearson Education
3. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Patterns and Java, Pearson Education.
4. J. Rambaugh, M. Blaha et al, Object Oriented Modeling and Design, PHI
5. Ivar Jacobson, Object Oriented Software Engineering

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Paper No. : 104
Paper Title : Enterprise Data Management and ERP **[L:4, P:0]**

Aim: To provide a comprehensive knowledge of the concepts related to Information Systems and modeling of data in these systems.

Prerequisites: Nil

1. Data Management
   1.1. Hierarchy of Data
   1.2. Data Modeling
   1.3. Data Integrity
   1.4. Data Quality
   1.5. Metadata
   1.6. Legacy Systems and Data Migration

2. Information System
   2.1. Overview of Information System
   2.2. Overview of different types of Information Systems: MIS, DSS, GDSS, ESS, GIS, KBS etc.
   2.3. Impact of Information System on an organization
   2.4. An Introduction to Electronic Commerce
   2.5. An Introduction to Mobile Commerce
   2.6. Threats and security to e-commerce and m-commerce

3. Introduction To ERP
   3.1 Evolution of ERP and Reasons for the growth of ERP
   3.2 Scenario and Justification of ERP in India
   3.3 Various Modules Of ERP,
   3.4 Advantage of ERP.
   3.5 ERP for Small Business
   3.6 ERP for make to order companies
   3.7 Business Process Mapping for ERP Module Design
   3.8 Hardware Environment and its Selection for ERP Implementation.

4. ERP Modules
   4.1 Introduction to ERP modules
   4.2 Finance module
   4.3. Plant Maintainance module
   4.4 Quality Management module
   4.5 Materials Management

5. Overview of ERP Products
   5.1 Introduction to SAP, People Soft, BaaN, Oracle, Microsoft Dynamics ERP solutions
   5.2 Comparative Assessment and Selection of ERP Packages and Modules.

6. ERP implementation lifecycle
   - 6.1 Issues in implementing ERP packages
   - 6.2 Pre-evaluation screening
   - 6.3 Package evaluation
   - 6.4 Project planning phase, gap analysis, reengineering,
   - 6.5 Configuration, implementation, team training, testing, going live
   - 6.6 End-user training, post implementation (Maintainance mode).
   - 6.7 Vendors, Consultants and users, In-House Implementation - pors and cons, consultants, end user.

7. Business Intelligence
   - 7.1. Introduction
   - 7.2. Types of Business Rule
   - 7.3. Implementing Business Rule
   - 7.4. Business Re-engineering
   - 7.5. Overview of Data Warehousing and Data Mining
   - 7.6. Business Intelligence using Data Warehousing and Data Mining
   - 7.7. Business Intelligence Applications: Customer Relationship Management, Supply Chain Management.

References:

1. Principles on Information Systems: A Managerial Approach, Ralph Stair and Gearge Reynolds, Thomson Course Technology.
2. Management Information System: Managing the Digital Firm, Kenneth Laudon and Jane Laudon, Prentice Hall of India.
3. Content Management Bible, Bob Boiko, Wiley Publishing Inc.
4. Management Information System: Text & Applications , C.S. V. Murthy,Himalaya Publishing House
5. Management Information System , W.S. Jawadekar, Tata McGraw Hill.
6. Information System for Modern Management, Murdick Ross and Claget, Prentice Hall.
7. Maximizing your ERP System: A practical guide for Managers By Scott Hamilton McGrow Hill Company ISBN : 007-140611-5
8. ERP : Making It Happen By Thomas F. Wallace, Michale H. Kremzar. Wiley Publication
9. ERP: Tools, Techniques, and Applications for Integrating the Supply Chain, Second Edition By Carol A. Ptak, Eli Schragenheim.Wiley Publication.
10. Enterprise Sales and Operations Planning By George E. Palmatier, Colleen Crum, J.Ross publishing
11. SAP MM Questions and Answers By Kogent Learning Solutions Publicattion:Jones & Bartlett Learning ,
12. ERP 100 Success Secrets By Godfrey Glenn
13. Management Information Systems By Gordon B davis and Margethe H Olson. TMGH, New Delhi
14. Management Information Systems By Sadagopan Prentice hall of India.

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Paper No. : 105
Paper Title : Web Programming using JAVA **[L:4, P:0]**

1. Java Database Connectivity
   1.1. JDBC API
   1.2. JDBC Drivers and Components
   1.3. Basic Steps to JDBC
      1.3.1. Using Joins, Transactions, Stored Procedures
   1.4. Executing SQL Queries
      1.4.1. Handling null fields
      1.4.2. The ResultSet Object
   1.5. Handle Exception
      1.5.1. BatchUpdateException, DataTruncation
      1.5.2. SQLException, SQLWarning
   1.6. Writing a Complete Application

2. Servlet
   2.1. Servlet in the Middle Tier
   2.2. The Servlet Life Cycle
   2.3. Java Servlet Development Kit
      2.3.1. The javax.servlet Package
      2.3.2. The Javax.servlet.http Package
   2.4. Handling HTTP Get/Post Request
   2.5. Using Cookies
   2.6. Session Tracking
   2.7. Sharing Connection Pools
   2.8. Writing a Complete Application

3. Introduction to JSP
   3.1. JSP tags
   3.2. JSP directives
   3.3. Scripting elements
   3.4. Flow of control
   3.5. Conditionalization
   3.6. Actions and implicit objects
   3.7. JSP components
   3.8. JSP bean tags
   3.9. Working with databases
   3.10. Writing a Complete Application

4. MVC Architecture & Struts
   4.1. MVC Architecture
   4.2. Struts Architecture
   4.3. How Struts Works?
   4.4. Introduction to the Struts Controller
   4.5. Introduction to the Struts classes - ActionForward, ActionForm, ActionServlet, Action classes
   4.6. Understanding struts-config.xml
   4.7. Understanding Action Mappings
   4.8. Using Struts HTML Tags
   4.9. Introduction to Struts Validator Framework
   4.10. Client Side Address Validation in Struts
   4.11. Custom Validators Example
   4.12. Developing Application with Struts Tiles
   4.13. Internationalizing Struts Application

5. Introduction to Beans and EJB 3.0 Architecture
   5.1. Session Bean
   5.2. Entity Bean
   5.3. Statefull and Stateless Entity Beans with Examples
   5.4. Various Application Servers (WebLogic, Jrun, Tomcat, WebSphere)
   5.5. Bean Deployment

6. J2ME Architecture
   6.1. Downloading and Installing J2ME Toolkit
   6.2. Building Application for MIDP
   6.3. Developing Simple J2ME Applications
   6.4. Working with Ktoolbar

References:

[1] Web Development with Java Server Pages, D. K. Fields, M. A. Kolb, S. Bayern, Manning Pub.
[2] Java Cook Book, Ian Darwin, O'relley
[3] Advanced Java, Jambu Krishnamurthi, Comp-U Learn Inc,
[4] Beginning J2ME: From Novice to Professional, S. LI and J. Knudsen, Apress
[5] Mastering Enterprise Java Beans 3.0, Rima Patel, Wiely Publication

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Paper No : 106
Paper Title : Practical 1 **[L:0, P:4]**

Practical shall be based Paper No. : 105 Paper Title : Web Programming using JAVA.

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Paper No : 107
Paper Title : Practical 2 **[L:0, P:3]**

Practical shall be based Paper No. : 101 Paper Title : Advanced Data Structures.

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Paper No : 108
Paper Title : Practical 3 **[L:0, P:3]**

Practical shall be based Paper No. : 102 Paper Title : Advanced RDBMS.