

Department of Computer Science & Information Technology  
**Shepherd School of Engineering & Technology, SHIATS**  
**M. Tech. Computer Science and Engineering (Effective From 2010-2011)**

**Semester – I**

S. No.	Course Code	Course Name	Credits (L-T-P)
1.	CSE 711	Advanced Data Structures	4 (2-1-1)
2.	CSE 712	Advanced Computer Networks	4 (3-1-0)
3.	CSE 713	Computer Organization and Operating Systems	4 (4-0-0)
4.	CSE 714	Object Oriented Systems	4 (2-1-1)

**Semester -II**

S. No.	Course Code	Course Name	Credits (L-T-P)
1.	CSE 721	Software Engineering	4 (3-1-0)
2.	CSE 722	Simulation and Modeling	4 (2-1-1)
3.	CSE 821	Advanced Database Management Systems	4 (3-0-1)
4.	CSE 822	Network Security	4 (3-1-0)

**Semester – III**

S. No.	Course Code	Course Name	Credits (L-T-P)
1.	CSE 831	Advanced Computer Architecture	3 (3-0-0)
2.	CSE 832	Mobile Computing	3 (2-1-0)
3.	CSE 851-854	Elective I	4 (3-0-1)
4.	CSE 861-864	Elective II	4 (3-1-0)
5.	CSE 780	Seminar	2 (0-0-2)

**Semester – IV**

S. No.	Course Code	Course Name	Credits
1.	CSE 899	Thesis	15(0-0-15)

**Elective -I**

Course Code	Course Name
CSE 851	Data Mining and Data Warehousing
CSE 852	Advanced Data Modeling
CSE 853	Distributed Computing
CSE 854	Internet Programming and Web Engineering

**Elective -II**

Course Code	Course Name
CSE 861	Security Models and Architecture
CSE 862	Real Time Systems
CSE 863	Parallel Algorithms
CSE 864	Knowledge Based Systems

## ADVANCED DATA STRUCTURES

**Code:** CSE 711

**Credits:** 4(2-2-1)

### UNIT-I

#### **Basic Data Structures**

Review of Stacks, Queues and Linked list. Advanced concepts: Dequeue, Priority Queues and Binomial Queues. Polynomial and sparse matrix representation. Recursion.

### UNIT-II

**Trees:** Basic terminologies, Binary tree transversal, threaded binary trees and its transversal, Heaps: Binomial heaps and Fibonacci heaps. Balanced binary search tree: AVL, Introduction to Red-Black trees and Splay Trees. B-trees and B<sup>+</sup> trees. Comparison of search trees.

### UNIT-III

**Graph:** Basics of graph, Representation and Transversal of graph. Graph algorithms: Minimum Spanning Trees, Single-source shortest path. All-pairs shortest paths. Traveling salesman problem.

### UNIT-IV

**Algorithm Fundamentals:** Basic concepts. Analysis of algorithms, Growth of Functions, Recurrences: Master's Theorem and Substitution Method. Analysis of sorting algorithms: Merge Sort, Heap Sort and Quick Sort.

### UNIT-V

**Advanced Design Techniques:** Dynamic programming, Greedy algorithms, Backtracking, Branch and Bound. Case studies-Matrix Multiplication, 0/1 Knapsack problem.

#### **Text Books:**

1. A.S. Tanenbaum, "Data Structures using C & C++", PHI.
2. Coreman, Rivest, Lisserson, : "Introduction to Algorithms", PHI.

#### **Reference Books:**

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd
2. R. Kruse etal, "Data Structures and Program Design in C" Pearson Education Asia
3. K Loudon, "Mastering Algorithms With C", Shroff Publisher & Distributors Pvt. Ltd.
4. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons.

## ADVANCED COMPUTER NETWORKS

**Code:** CSE 712

**Credits:** 4(3-1-0)

### **UNIT-I**

**Overview of Wired and Wireless Data Networks:** Basic concepts of OSI and TCP/IP reference models, Physical layer: Transmission Media: Twisted pair, Coaxial Optical Fiber. Wireless LAN: IEEE 802.11, Bluetooth, Broadband Wireless LAN: 802.16, Introduction of backbone network.

### **UNIT-II**

**Data link Layer Basic Concepts:** Error detection and correction, Data Link Protocols (HDLC, PPP). MAC, IEEE standard 802.X for LAN. WAN standards – FDDI, ATM, SONET and ISDN.

### **UNIT-III**

**Internetworking:** Review of IP Addressing and Routing, Internet Architecture: Layer 3 Switch, Edge Router and Core Router. Overview of Control Plane, Data Plane and Management Plane. Internet Routing Protocols: OSPF, BGP, Broadcast and Multicast Routing, Mobility Issues and Mobile IP.

Ad-hoc Routing: Basic concepts, Routing Protocols: Dynamic source Routing, Destination Sequenced Distance Vector Routing, Ad-hoc On-Demand Distance Vector Routing.

### **UNIT-IV**

**Transport Layer:** Design Issues, connection management, Transport layer protocols: UDP, TCP and SCTP.

Flow Control: Flow Model, Open Loop: Rate Control, LBAP, Closed Loop: Windows Scheme, TCP and SCTP flow control. Congestion Control: Congestion Control in packet networks, ECN and RED Algorithm, TCP and SCTP congestion control.

### **UNIT-V**

**Introduction to Network Security:** Security Issues, SSL/TLS, IPsec.

**Introduction to Distributed Computer Networks.**

**Case study of Internet.**

### **Text Books:**

1. A.S. Tanenbaum, "Computer Networks", 3<sup>rd</sup> Edition, Prentice Hall India, 1997.
2. Douglas Comer, "Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture, 5<sup>th</sup> Edition, 2006", Prentice Hall.
3. W. Stallings, "Cryptography and Network Security", Pearson.

### **Reference Books:**

1. S.Keshav, "An Engineering Approach on Computer Networking", Addison Wesley, 1997.
2. W.Stallings "Data and Computer Communication", Macmillan Press,1989
3. W.Stallings, "High Speed Networks and Internets", Pearson.
4. Behrouz A. Forouzan, "Data Communication and Networking", TMH

## Computer Organization & Operating Systems

Code: CSE 713

Credits: 4(3-1-0)

### **Unit- I** Basic Organization & System Concepts:

System Buses, Internal Memory, External Memory, Input/ Output, Operating System Support. Organization fundamentals: Register Transfers, Performing of Arithmetic and Logical Operations, Memory- Read/ Write.

### **Unit- II** Micro-programmed Control & Central Processing Unit:

Hardwired Control, Micro-programmed Control: Control Memory, Address Sequencing, Design of Control Unit. Memory Hierarchy, Cache Memory. Instruction set: Characteristics and Functions, addressing modes and formats. CPU structure and function, Reduced Instruction Set Computers(RISC). Case Study: Working of a Stored Program Computer (SMAC).

### **Unit- III** Operating System Overview & Processes:

Operating system objectives and functions, Evolution of operating systems, Characteristics of Modern operating systems, Process Description and Control, Threads. Concurrency: Mutual exclusion and synchronization. Deadlocks, handling deadlocks.

### **Unit- IV** Memory Management and Scheduling:

Memory management requirements, Memory Partitioning, Paging, Segmentation. Virtual memory, operating system software. Types of Uni-processor scheduling, scheduling algorithms. Multi-processor scheduling, real time scheduling.

### **Unit- V** Input/ Output and Files:

Input/ Output Devices, Organization of the I/O Function, Operating System Design Issues, Disk Scheduling, RAID. File Management Overview, File Organization, File Directories, File Sharing, Record Blocking.

### **Text Books:**

- 1) "Computer Organization and Architecture", William Stalling, Sixth Edition, Pearson/PHI.
- 2) "Computer Organization and Architecture", John P. Hayes, Mc-Graw Hill.
- 3) "Operating System: Internals and Design Principles", William Stallings, Prentice Hall of India Pvt. Ltd., Eastern Economy Edition.

### **Reference Books:**

- 1) "Operating System Concepts", Silbershatz and Galvin, Addison Wesley.
- 2) "Digital Logic and Computer Organization", V. Rajaraman and T. Radhakrishna, PHI.
- 3) "Computer Organization", Carl Hamcher, Zvonks Vranesic, Safea Zaky, Mc-Graw Hill, Fifth Edition.
- 4) "Operating Systems", Tanenbaum, PHI.

## Object Oriented Systems

**Code:** CSE 714

**Credits:** 4(2-1-2)

### **UNIT-I**

#### **Introduction**

Overview of Object Oriented Systems Development, Object Basics: The object Model-Classes and Objects, Complexity, Notation, Process, Object types, Object state, Object Oriented Systems Development Life Cycle.

### **UNIT-II**

#### **Object Oriented Methodologies**

Rumbaugh Methodology, Booch methodology. Jacobson methodology. Patterns, Frameworks, Unified Approach. Unified Modeling Language – Use case, Class diagram, Interactive diagram, Package Diagram, Collaboration diagram, State diagram, Activity diagram.

### **UNIT-III**

#### **Object Oriented Analysis and Design**

Identifying use cases, Object analysis, Classification-Identifying object relationships, Attributes and Methods.

Design axioms, Designing classes, Access layer, Object storage, Object interoperability.

### **UNIT-IV**

#### **Software Quality and Usability**

Designing interface objects, Software quality assurance, System usability- metrics.

### **UNIT-V**

#### **Case Study**

Case studies on Elevator Control System and Automated Teller Machine.

#### **Text Books:**

1. Object Oriented Systems Development, Ali Bahrami, Irwin McGraw Hill,1999.
2. UML Distilled by Martin Fowler, II<sup>nd</sup> Edition, PHI/ Pearson Education, 2002.
3. Object Oriented Modeling and Design with UML, Micheal R. Blaha James,R. Rumbaugh et al Pearson Education LPE.

#### **Reference Books:**

1. Object Oriented Analysis and Design with Applications, by Grady Booch, II<sup>nd</sup> Edn, Benjamine Cummings, USA,1994.
2. Object Oriented Software Construction, by Betrond Meyor, II<sup>nd</sup> Edn, Prentice Hall PTR, New Jersey,1997
3. Introduction to Object Oriented Analysis and Design, by Stephen R Schach, Tata McGraw Hill, 2003
4. UML 2 Bible, Tom Pender, Wiley Publishing, Inc, 2005

## Software Engineering

**Code:** CSE 721

**Credits:** 4(3-1-0)

### **Unit- I**

Introduction to Software Engineering: Introduction, Process Models, Process & Project Metrics, Cost/ Effort estimation, Risk analysis, Software project scheduling, Control and Monitoring. Case Study: Project management tools.

### **Unit- II**

Software Design: Design Process, Concepts and Principles, Cohesion and Coupling, Architectural Design, User Interface Design, Component- Level Design. Software Development: Software Development Process Models, Programming principles and guidelines, Coding process, verification. Case Study: Analysis and design tools, SRS in IEEE format.

### **Unit- III**

Testing: Black- Box testing, White Box testing, Testing Process, Defect Analysis and Prevention, Software Quality, Software Reliability estimation. Software configuration management, Developing test cases for testing software.

### **Unit- IV**

Web Engineering: Attributes, Framework, Formulation and Planning, Design of web based applications, testing and management issues. Case study: Net banking software

### **Unit- V**

Advanced Software Engineering topics: Cleanroom Software Engineering, Component Based Software Engineering(CBSE), Computer Aided Software Engineering(CASE).

### **Text Book:**

- 1) Software Engineering: A Practioner's Approach, 6/e, Roger S Pressman, Mc-Graw Hill,2005, ISBN: 0072853182

### **Reference Books:**

- 1) Pankaj Jalote, "An Integrated Approach to Software Engineering", 3/e Narosa Publishing House.
- 2) Software Engineering, Ian Somerville, 8<sup>th</sup> Edition, Addison- Wesley, 2006, ISBN-10:0231313798, ISBN-13:9780321313799

## **Simulation & Modeling**

**Code:** CSE 722

**Credits:** 4(2-1-1)

### **Unit- I Introduction**

Systems, System Environment, System Modeling, Principles of Modeling. Simulation : Concept, Need, Types and Applications. Advantages, Disadvantages and Pitfalls of Simulation.

### **Unit- II Design of Simulation Experiments**

Problem formulation, Data collection and Reduction, Key variables, Length of Simulation runs, Starting Condition, Experimental layout, Interpreting Validation.

### **Unit- III Probability Distribution**

Normal, Gaussian and Poisson Distribution. Monte-Carlo method, Computation Technique for Continuous Model, Computation Technique for Discrete Model, Methods of generating Random numbers, Testing Random numbers.

### **Unit- IV Simulation Languages**

Types of Simulation Languages, Factors in selecting Simulation Languages, Simulation Software Classification, Desirable Software Features, Introduction to Simulation Languages: SIMULA, GPSS

### **Unit- V**

Study of simulation models: queuing system, Inventory Control and forecasting, PERT network.

#### **Text Books:**

1. Geoffrey Gordon, "System Simulation", 2<sup>nd</sup> Edition, PHI
2. Averill M. Law, "Simulation Modeling and Analysis", 4<sup>th</sup> Edition, TMH

#### **Reference Books:**

1. Narsingh Deo, "System Simulation with Digital Computer", PHI

## Advanced Database Management Systems

Code: CSE 821

Credits: 4(3-0-1)

### Unit- I

**Introduction:** An overview of database management system, database system Vs file system, Database system concepts and architecture, data models, schema and instances, data independence and database languages, Data definition language, DML, overall database structure, E-R model concepts, notation for E-R diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, normalization.

### Unit- II

**Relational Data Model and Languages:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, types of SQL commands, SQL operators and their procedure, Tables, views and indices, queries and sub queries, Aggregate functions, Insert, update and delete operations, Set operations: Union, Intersection, Minus, Join Operations, Cursors.

### Unit-III

**Object Oriented Database:** Concept of the object, Names and Identity, Implementation of object identifiers, object class and instantiation, inheritance, object database.

### Unit- IV

**Distributed DBMS-advanced Concepts:** Distributed Transaction Management, Distributed Concurrency Control, Distributed Deadlock Management, Distributed Database Recovery, Replication Servers, Distributed Query Optimization, Mobile Database.

### Unit- V

**Case Study:** Design the database of banking system.

### Text Books:

1. Korth, Silbertz, Sudarshan, “ Database Concepts”, Mc-Graw Hill.
2. Elmasri, Navathe, “Fundamentals of Database Systems”, Addison Wesley

### Reference Books:

1. Date C J, “An Introduction to Database Concepts”, Addison Wesley
2. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication
3. Majumdar & Bhattacharya, “Database Management System”, TMH
4. Ramakrishnan, Gehrke, “ Database Management System”, McGraw Hill

### Practical list

#### Oracle/ Ms-SQL

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using Logical Operators(=,<,>,etc.)
3. Write SQL queries using SQL operators(Between.... AND, IN( LIST), LIKE, ISNULL and also with negating expressions).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for relational algebra(UNION, INTERSECT and MINUS etc.)
6. Write SQL queries for extracting data from more than one table(Equi-Join, Non Equi-Join, Outer Join)



## Network Security

Code: CSE 822

Credits: 4(3-1-0)

### Unit- I: Introduction

**Cryptographic Tools:** Network Security Overview: Attacks, Services and Mechanism. A Model for internetwork Security. Cryptographic tools: principles of Cipher, Symmetric Key Cipher, Public Key Cipher, Message Authentication and Hash Functions.

**Authentication Mechanisms:** Overview of Authentication protocols. Digital Signature : need, process, services, schemes and applications. Authentication services: Kerberos and X.509.

### Unit- II: Electronic mail and IP security

E-mail Security overview. E-mail security protocols: Pretty Good Privacy (PGP) and Secure Multipurpose Internet Mail Extensions (S/MIME). IP Security: Overview, Architecture, Authentication Header. Encapsulating Security Payload. Combining Security Associations.

### Unit- III: Web and Network Management Security

Web Security Considerations. Secure Socket Layer(SSL) and Transport Layer Security(TLS). Secure Electronic Transactions(SET).

### Unit- IV: System Security

Intruders. Intrusion detection techniques. Password Management. Firewall Design Principles: Characteristics, types of Firewalls, Firewall Configurations. Data Access Control. Concept of Trusted Systems.

### Unit- V: Security in Wireless Networks

Introduction. Security and Privacy needs of Wireless Systems. Wireless LAN security, Bluetooth Security, Cellular Network Security.

Case Study: Security implementation in Banking Systems.

### **Text Books:**

1. William Stallings, "Network Security", Pearson Education.
2. Behrouz A. Frouzan, "Cryptography and Network Security", Tata Mc-Graw Hill.

### **Reference Books:**

1. William Stallings, "Cryptography and Network Security: Principles and Practise", Pearson Education.
2. Bernard Menezes, "Network Security and Cryptography", Tata Mc-Graw Hill.
3. Atul Kahate, "Cryptography and Network Security", Tata Mc-Graw Hill.
4. Bruce Schiener, "Applied Cryptography", John Wiley & Sons.

## Advanced Computer Architecture

**Code:** CSE 831

**Credits:** 3(3-0-0)

**Unit I** Introduction to Computer Systems: CPU: Register and bus organized computers, stacks, ALU, instruction execution, control unit organization. Hardwired and Micro-programmed control. Parallelism: Horizontal Vs Vertical.

**Unit II** Memory Organization: Types of memories: Random access, serial access and semi random access. Core semiconductor and bubble memories, Multi-level memory systems, address translation and memory allocation: non-preemptive allocation, pre-emptive allocation, replacement policies, Caches: organization, address mapping, levels, structure vs performance: cache types, performance and design process.

**Unit III** Parallel Processing: types of parallelism, performance considerations. Multi-function and array pipelines, Pipeline processor design principles: pre-fetch and branch handling, data buffering, busing structure, Vector Processing: requirements, characteristics. Multiprocessors: types, MINs: Fault tolerance, reliability, performance.

**Unit IV** Instruction level parallelism (ILP): high performance instruction delivery ILP, software approach- compiler techniques - hardware based speculation- limitation of ILP, register tagging, hazard detection, job sequencing and collision prevention.

**Unit V** Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.- static branch protection- VLIW approach- H.W support for more ILP at compile time- H.W versus S.W solutions, Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks.

### **Text Books:**

1. John P. Hayes: “Computer Architecture and Organization”, Third Edition, McGraw-Hill International Edition.
2. Kai Hwang and F.A. Briggs: “Computer Architecture and Parallel Processing”, McGraw Hill International Edition.

### **References books:**

- 1 P. Pal. Chaudhuri : “Computer Organization and Design”, PHI.
- 2 Stallings: “Computer Organization and Architecture”, Pearson Education, Asia.
- 3 A.S. Tanenbaum : “Structured Computer Organization”, PHI.
- 4 Jyotsna Sengupta, "Interconnection Networks for Parallel Processing", Deep & Deep Publications, 2005.

## Mobile Computing

**Code:** CSE-832

**Credits:** 3(2-1-0)

### **Unit – I**

Basic concepts, principles of cellular communication, overview of 2G,3G and 4G technologies, GSM, CDMA architecture. Issues in mobile computing, location management: home location register, visiting location register, handoffs.

### **Unit - II**

Wireless networking, wireless LAN overview: MAC issues, IEEE 802.11, wireless multiple access protocols. TCP over wireless, wireless applications, data broadcasting, mobile IP, WAP: architecture, protocol stack, applications.

### **Unit – III**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, coda file system, disconnected operations in coda file system, weak connectivity for mobile file access. Weakly connected replicated storages system.

### **Unit - IV**

Process and Task Migration issues, Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

### **Unit – V**

Ad-hoc networks, localization, MAC issues, routing protocols, global state routing (GSR), destination sequenced distance vector routing (DSDV), dynamic source routing (DSR), Ad-hoc on demand distance vector routing (AODV), temporary ordered routing algorithm (TORA), QoS in Ad -hoc networks, applications.

### **Text books:**

1. Mobile Communications by J. Schiller, Addison Wesley.
2. Mobile Computing by Asoke k Talukder, Hasan Ahmed, and Roopa R Yavagal, Second edition, Mc Graw Hill.

### **Reference books:**

1. Mobile IP by Charles Perkins, Addison Wesley.
2. Ad hoc Networks by Charles Perkins, Addison Wesley.
3. Mobile Computing”, Upadhyaya, Springer

## Elective-II

### Data Mining and Data Warehousing

Course Code: CSE 851

Credits: 4 (3 -0- 1)

#### Unit - 1

**Introduction:** Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema. Data Marts: Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

#### Unit - 2

**Online Analytical Processing:** OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Micro strategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema; OLAP tools.

#### Unit - 3

**Developing a Data Warehouse:** Building of a Data Warehousing, Architectural strategies & organizational issues, Design considerations, Data content, Distribution of data, Tools for Data Warehousing.

#### Unit - 4

**Data Mining:** Definitions; KDD (Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in Government Organizations.

**Association Rules:** A priori algorithm, Partition algorithm, Dynamic inset counting algorithm, FP – tree growth algorithm; generalized association rule.

**Clustering Techniques:** Clustering paradigm, Partition algorithms, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; Categorical clustering, STIRR, ROCK, CACTUS.

**Decision Trees:** Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

#### Unit – 5

##### Advanced Concepts

**Web Mining:** Web content Mining, Web structure Mining, Web usage Mining, Text Mining.

**Temporal and Spatial Data Mining:** Basic concepts of temporal data Mining, GSP algorithm, SPADE, SPIRIT, WUM.

##### Textbooks:

1. Data Mining, Han & Kamber, Morgan Kaufman

##### References:

1. Data Warehousing –Concepts, Techniques, products, application; Prabhu; PHI.
2. Data Mining Techniques; A. K. Pujari; Universities Press.
3. Data Warehousing, Data Mining and OLAP; Alex Berson and Stephen J Smith; TMH.
4. Data Warehousing in the real world; Anahory; Pearson Education.
5. Data Mining Introductory & Advanced Topic; Dunham; Pearson Education.

## Advanced Data Modeling

Course Code: CSE 852

Credits: 4 (3 -0- 1)

### Unit -1

**Extended Entity Relationship Model and Object Model:** The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Superclasses, Inheritance, Specialization and generalization, Relationship types of degree higher than two

### Unit -2

**Object–Oriented Databases:** Overview of object–oriented concepts, Object identity, Object structure and type constructors, Encapsulation of operations, Methods and persistence, Type hierarchies and inheritance, Type extents and persistent programming languages, OODBMS architecture and storage issues, Transactions and concurrency control, Examples of ODBMS

**Object Relational and Extended Relational Databases:** Database design for an ORDBMS, Nested relations and collections, Storage and access methods, Query processing and optimization, An overview of SQL3, Implementation issues for extended type, Systems comparison of RDBMS, OODBMS, ORDBMS

### Unit – 3

**Parallel and Distributed Databases and Client–Server Architecture:** Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations, Sorting Joins, Distributed database concepts, Data fragmentation, Replication and allocation techniques for distributed database design, Query processing in distributed databases, Concurrency control and recovery in distributed databases, An overview of client–server architecture

### Unit - 4

**Databases on the Web and Semi–Structured Data:** Web interfaces to the web, Overview of XML, Structure of XML data, Document Schema, Querying XML data, Storage of XML data, XML applications, Semi–structured data model, Implementation issues, Indexes for text data

### Unit – 5

**Enhanced Data Models for Advanced Applications:** Active database concepts, Temporal database concepts, Spatial databases: concept and architecture, Deductive databases and query processing, Mobile databases, Geographic information systems

### Textbooks:

1. Elmsari and Navathe, Fundamentals of Database Systems
2. Ramakrishnan and Gehrke, Database Management Systems

### References:

1. Korth, Silberschatz, Sudarshan, Database System Concepts
2. Rob and Coronel, Database Systems: Design, Implementation and Management
3. Date and Longman, Introduction to Database Systems

## Distributed Computing

**Course Code: CSE 853**

**Credits: 4 (3 -0- 1)**

### **Unit-I: Introduction and Architectures**

Goals, types of distributed systems, centralized architectures, decentralized architectures, hybrid architectures, architectures versus middleware, interceptors, self- management in distributed systems, The feedback control model.

### **Unit-II: Communication**

Fundamentals of layered protocols, Types of communication, remote procedure call- Basic RPC operation, parameter passing, asynchronous RPC, Message-oriented transient communication, message-oriented persistent communication, streams and Quality of Service.

### **Unit-III: Synchronization**

Clock Synchronization- Physical Clocks. Global positioning systems, clock synchronization algorithms: lamport's logical clocks, Vector clocks, Mutual exclusion, Centralized, Distributed Algorithm.

### **Unit-IV: Fault tolerance and security**

Introduction to fault tolerance- basic concepts, failure models, failure masking by redundancy, design issues, failure masking and replication, agreement in faulty systems, failure detection, reliable client-server communication, reliable group communication, Introduction to security- security threats, policies and mechanisms, design issues, firewalls, secure mobile code, denial of service.

### **Unit-V: Distributed Object based and Distributed Co-ordination based Systems**

Distributed objects, binding a client to an object, static versus dynamic remote method invocations, Parameter passing, Example: Java RMI, Object based messaging, Client side caching, server side replication, mobility and coordination, Content based Routing, describing composite events, consistency and replication.

### **Text books:**

1. Distributed systems concept and design. G Couloris, Jean Dollimore, T Kindberg, Pearson Education
2. Distributed Systems- Principles and Paradigm, A S Tanenbaum, M V Steen, Pearson Education

### **References:**

1. Data and computer Communications- William Stallings, PHI
2. Hand book of computer communications standards, Volume-I- William Stallings, PHI
3. An Engineering Approach to Computer Networks- Keshav, Addison Wesley.

## Internet Programming and Web Engineering

Course Code: CSE 854

Credits: 4 (3 -0- 1)

### Unit- I

**Markup Language(HTML)** Forms, Tables, Frames and executable content.

**DHTML:** Cascading style sheet(CSS), adding multimedia, working with data and dialog boxes, working with browser object models.

### Unit-II

**Client side programming:** Introduction to VB Script, embedding Active-X controls in web document.

**Server Side Programming:** Introduction to ASP, Session Tracking, Database Connectivity.

### Unit-III

**XML:** Anatomy of an XML document, mark up elements and attributes, creating valid documents, developing advanced Document Type Definition(DTD) based XML objects, checking validity, creating XML links, advanced addressing, viewing XML in browsers, processing, event-driven programming, programming with DOM, metadata, styling XML with CSS.

### Unit-IV

**Web Engineering(WE):** Introduction and Components, **Process:** Framework, Tasks and Umbrella Activities, **Planning:** Understanding the Scope, Refining Framework Activities, Managing Risk and developing a schedule. **Web Application Design:** Types, Goals, Design Process, Aesthetic Design.

### Unit-V

**Testing Web Applications:** Testing Concepts, Content testing, user interface testing, usability testing, compatibility testing, component level testing, navigation testing, configuration testing, security and performance testing.

**Case Study:** Web based applications

### Text Books:

1. Web Programming: Building Internet Applications, 3<sup>rd</sup> edition by Chris Bates, Publisher: Wiley India Pvt Ltd(June 2007)
2. Web Engineering: A practitioner's Approach (SIE) by Pressman R S, Publisher: Tata Mc Graw Hill (2011)

### Reference Books:

1. Programming Internet E-mail by David Wood, Publisher Shroff/ O' Reilly(1999)
2. Web Technologies: TCP/IP, Architecture, and Java Programming by Achyut Godbole, Atul Kahate, Publisher: Tata Mc-Graw Hill
3. Web Engineering by Gerti Kappel, Brigit Proll, Siegfried Reich, Werner Rerchitzegger, Publisher: Wiley India Pvt Ltd( Aug 2009)
4. Ontological Engineering: with examples from the areas of knowledge management, e-commerce and semantic web by Gomez- perez, Publisher: Elsevier(2011)

## Elective-II

### **SECURITY MODELS AND ARCHITECTURE**

**Code:** CSE-861

**Credits:** 4(3-1-0)

**Introduction to Computer Architecture:** Introduction to Security. Central processing unit. Memory. Memory mapping. CPU Modes and protection rings. Process and its states. I/O Device Management. System architecture. Trusted Computing Base.

**Computer Security:** Attacks & attackers, Security Management, Data Vs Information, Principles of Security. Identification and Authentication: Password management, Spoofing attacks, Single Sign-on. Access Control: Authentication & Authorization, Access operations, Ownership, access control structures. Security kernel. Principles of Cryptography.

**Security Models:** Domains, Resource Isolation, Security Policy. Layering, data hiding & Abstraction. State Machine Models. Bell-LaPadula Model. Biba Model. The Chinese Wall Model. Clark-Wilson Model. Information Flow Model. Brewer and Nash Model. Graham-Denning and Harrison-Ruzzo-Ullman Models.

**Security Evaluation:** Introduction. System evaluation methods: The Orange Book, Rainbow series, The Red Book. TNI – The Trusted Network Interpretation. Information Technology Security Evaluation Criteria(ITSEC). The Common Criteria. Quality Standards.

**Network Security:** Distributed Systems Security: Authentication, Security API, CORBA Security. World Wide Web Security: Web Browsers, CGI Scripts, Cookies, The Sandbox. Network Security: TCP/IP Security, Network Boundaries, Firewalls.

#### **References Books:**

1. “Computer Security”, Dieter Gollman, Wiley India Publication.
2. “Security in Computing”, Charles P. Pfleeger & Shari Lawrence Pfleeger, Prantice Hall.
3. “Certified Information Systems Security Professional”, Roberta bragg, Que Publishing.
4. “Computer Architecture”, Moris M. Mano, EEE Publication.



# **Real Time Systems**

**Code:** CSE-862

**Credits:** 4(3-1-0)

## **UNIT-I:** Introduction

Concept of Real Time System, Issues in Real Time computing, Typical real time applications. Basic terminologies: Release Times, Deadlines and Timing constraints, hard real time systems and soft real time systems. Model of Real Time System: Processor, resources, temporal parameter, Periodic Task Model, Sporadic Task Model, Precedence Constraints and Data Dependencies.

## **UNIT-II:** Approaches to Real Time Scheduling

Clock driven approach, weighted, round robin approach, priority driven approach, dynamic versus static systems, optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) algorithms, rate monotonic algorithm, offline versus online scheduling, scheduling Aperiodic and Sporadic jobs in priority driven and clock driven systems.

## **UNIT-III:** Resources and Resource Access Control

Assumptions on resources and their usage, resource contention, resource access control (Priority Ceiling Protocol, Priority Inheritance protocol, Slack Based Priority Ceiling Protocol, Preemption Ceiling Protocol).

## **UNIT-IV:** Real Time Communication

Basic concepts in real time communication, soft and hard real time communication systems, Model of real time communication, priority-based service and weighted round-robin service disciplines for switched networks, medium access control protocols for broadcast networks, Internet and resource reservation protocols.

## **UNIT-V:** Real Time Operating Systems

Features of RTOS, time services, characteristic of temporal data, temporal consistency, concurrency control.

### **Text books:**

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.

### **Reference books:**

1. Real-Time Systems: Scheduling, Analysis, and Verification by Albert M. K. Cheng Wiley.

2. Real Time Systems by Mall Rajib, Pearson Education Publication.

## **Parallel Algorithms**

**Code :** CSE 863

**Credits :** 4(3-1-0)

### **Unit-I**

Sequential model, need of alternative model, parallel computational models: SIMD versus MIMD Architectures, Global versus Distributed Memory, The PRAM Shared-Memory Model, PRAM submodels and basic algorithms. Interconnection networks: Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, and Tree model.

### **Unit-II**

Parallel algorithm techniques: Divide and Conquer, Randomization and Parallel pointer technique. Performance measures of parallel algorithms, speed-up and efficiency of PA, Cost-optimality, Cost- optimal algorithms- such as summation, Min/Max on various models.

### **Unit-III**

Parallel sorting networks, Parallel merging algorithms on CREW and EREW, Parallel sorting algorithms on CREW and EREW, Linear array.

### **Unit-IV**

Parallel searching algorithms, Parallel matrix transposition and multiplication algorithms on PRAM and MCC. Vector-Matrix multiplication algorithms, Solution of linear equation, Root finding.

### **Unit-V**

Graph Algorithms - Connected Graphs, Search and traversal, Combinatorial Algorithms- Permutation, Combinations.

### **Text Book:**

S.G. Akl, "Design and Analysis of Parallel Algorithms"

### **References:**

1. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer", McGrawHill.
2. S.G. Akl, "Parallel Sorting Algorithm" by Academic Press
3. Behrooz Parhami, "Introduction to Parallel Processing: Algorithms and Architecture, Kluwer Academic Publishers

## Knowledge Based Systems

CSE-864

4(3+1+0)

**Unit 1 Introduction to knowledge Base**

DIKW chain, types of knowledge, KBS structure, KBS development process, KBS tools, KBS applications, Advantages and Limitations

**Unit 2 Knowledge Representation:**

Ontology and knowledge representation, properties of knowledge representation, challenges of knowledge representation

Rule based representation, Structure based representation, reasoning under uncertainty, statistical reasoning

**Unit 3 Knowledge Acquisition and Validation**

Acquisition techniques(1:1, collaborative acquisition), Methodology, difficulties in knowledge acquisition, Performance measures

Learning: definition, formal learning theory, types: induction based, explanation based, validation techniques

**Unit 4 Search and Control Strategies:**

Examples of search problems, heuristic search techniques, types of search, Uninformed search: Informed search: best-first search, constraint satisfaction, means- ends analysis, branch and bound, A\* AO\*

**Unit 5 Expert System**

Expert system shell, rule based system architecture, non-production system Architecture, case study of any expert system

**Text Books:**

1. Knowledge- based systems , Priti Sajja and Rajendra Akerkar, Jones and Barlett
2. Artificial intelligence, Elaine Rich and Knight, TMH

**Reference books:**

1. Artificial intelligence and Expert System, Dan W. Patterson, PHI