

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

<b>M.Tech</b>	<b>L</b>	<b>P</b>	<b>Credits</b>
<b>I - I (CSE)</b>	<b>4</b>	<b>-</b>	<b>3</b>
<b>ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS</b>			

**UNIT-I**

Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-Algorithms. Stacks and Queues: Algorithm Implementation using Linked Lists.

**UNIT-II**

Searching-Linear and Binary Search Methods.Sorting-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, MergeSort.

Trees- Binary trees, Properties, Representation and Traversals(DFT,BFT),Expression Trees(Infix,prefix,postfix).

Graphs-Basic Concepts , Storage Structures and Traversals.

**UNIT-III**

Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing-Linear Probing, Double Hashing.

**UNIT-IV**

Priority queues- Definition, ADT, Realising a Priority Queue Using Heaps, Definition, Insertion, Deletion .

Search Trees- Binary Search Trees, Definition, ADT, Implementation,Operations-Searching, Insertion, Deletion.

**UNIT-V**

Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations,Insertion, Deletion and Searching.

Search Trees- Introduction to Red-Black and Splay Trees, B-Trees, ,Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.

**TEXTBOOKS:**

1. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg,Behrouz A. Forouzon, Cengage.
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press.

**REFERENCESBOOKS:**

1. Data Structures And Algorithm Analysis, 2/e, Mark Allen Weiss,Pearson.
2. Data Structures And Algorithms, 3/e, Adam Drozdek, Cenage.
3. C and DataStructures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad, S Chand & Co,2009.
4. Data Structures, Algorithm and OOP,Heilman, TMH.
5. Inroductions to Algorithms, 2/e, Cormen, PHI,2001.
6. Fundamentals of Computer Algorithms, 2/e, Horowitz, Sahni,Rajasekaran, University Press.
7. Design and Analysis, Dave, Pearson, 2008.
8. Design and Analysis Algorithms, Panneerselvam, PHI,2007.
9. Data Structures, Seymour Lipschutz, Schaum's Outlines, TMH.

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<b>MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE</b>			

### **UNIT-I**

Mathematical Logic: Statements and notations, Connectives, Wellformed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus, Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving

Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

### **UNIT-II**

Set theory & Relations: Introduction, Relations and ordering, Properties of binary Relations, Equivalence, Compatibility Relations, Partial ordering, Hasse diagram.

Functions: composition of functions, Inverse Function, Recursive Functions, Lattice and its Properties, Pigeon hole Principles and its application.

Algebraic structures: Algebraic systems, Examples and general properties, Semi groups and monoids, groups, sub groups, Definitions, Examples, homomorphism, Isomorphism and related problems.

### **UNIT-III**

Elementary Combinatorics: Basis of counting, Enumeration of Combinations & Permutations, Enumerating of Combinations & Permutations with repetitions and constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, principles of Inclusion –Exclusion.

### **UNIT-IV**

Recurrence Relations: Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, The method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

### **UNIT-V**

Graph Theory: Representation of Graph, Spanning Trees, BFS, DFS, Kruskals Algorithm, Binary trees, Planar Graphs, Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

### **TEXTBOOKS:**

1. Discrete Mathematical Structures with Applications to computer science J.P Tremblery, R.Manohar, TMH
2. Discrete Mathematical for computer Scientists & Mathematicians “ J.L. Molt,A.Kandel ,T.P.Baker, PHI

### **REFERENCETEXTBOOKS:**

1. Elements of Discrete Mathematics, C L Liu, D P Mohanpatra, TMH
2. Discrete Mathematics, Schaum’s Outlines, Lipschutz, Lipson TMH.
3. Discrete Mathematical Structures, Kolman, Busby, Ross, 6th ed., PHI, 2009
4. Discrete Mathematics, Johnsonbaugh, 6th ed., Pearson, 2005
5. Discrete Mathematics, Malik, Sen, 6th ed., Cengage Learning, 2004
6. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005
7. Discrete Mathematics and Combinatorics, Sengadir, Pearson, 2009
8. Discrete and Combinatorial Mathematics, Grimaldi, Ramana, 5th ed., Pearson. 2006
9. Mathematical Foundations of Computer Science, Rajendra Prasad, Rama Rao et al., USP, 2009
10. Discrete Mathematics, J K Sharma, 2nd ed., Macmillan, 2005
11. Discrete Mathematics with Combinatorics and Graph Theory, Santha, Cengage Learning, 2009
12. Applied Discrete Structures For Computer Science, Alan Doerr, Levassure, GP, 2005
13. Discrete Mathematics with Applications, Koshy, Elsevier, 2006.
14. Discrete Mathematics and its Applications, Rosen, 5th ed, T M Graw-Hill ed, 2006.
15. Discrete Mathematics for Computer Science, Gary Haggard, John Schlipf, Sue Whitesides, Cengage., 2006.
16. Discrete Mathematical, Kevin Ferland, Cengage, 2008.
17. Discrete Mathematical Structures, Jayant Ganguly, Sanguine, 2007.

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<b>COMPUTER ORGANIZATION AND ARCHITECTURE</b>			

## **UNIT-I**

### **Number Systems And Computer Arithmetic**

Signed And Unsigned Numbers, Addition and Subtraction, Multiplication, Division, Floating Point Representation Logical Operation, Gray Code, BCD Code, Error Detecting Codes. Boolean Algebra, Simplification of Boolean Expressions- Maps.

## **UNIT-II**

### **Combinational and Sequential Circuits**

Decoders, Encoders, MultiPlexers, Half and Full Adders, Shift Registers, Flip-Flops, Binary Counters, Memory Unit.

## **UNIT-III**

### **Memory Organisation**

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory Concept.

## **UNIT-IV**

### **ALU Design**

Addition and Subtraction, Sign and Unsigned Numbers, Multiplication and Division Algorithms, BCD Adders.

## **UNIT- V**

### **Input –Output Organisation**

Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, DMA, Input Output Processor, Serial Communication.

## **TEXTBOOKS:**

1. Computer System Architecture, 3/e, Moris Mano, Pearson/PHI.
2. Micro Processor and Interfacing, 2/e, Douglas V.Hall, TMH.

**REFERENCEBOOKS:**

1. Digital Logic and Computer Organisation, Rajaraman, Radha Krishnan, PHI.
2. Micro Computer Systems : 8086/8088 family, 2/e, Liu, Gibson, PHI.
3. Computer Organisation and Architecture, 7/e, Stallings, Pearson.
4. Computer Organisation, 5/e, Hamacher, vranesic, TMH.
5. Computer Systems Organisation and Architecture, Carpinelli, Pearson.
6. Computer Organisation and Design, PalChowdary, PHI.
7. Computer Systems Organisation, jotwani, TMH.

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<b>DATABASE MANAGEMENT SYSTEMS</b>			

### UNIT-I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, History of Database Systems. Introduction to Database design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

**Relational Model:** Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views – Destroying/altering Tables and Views.

### UNIT-II

**Relational Algebra and Calculus:** Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus. Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set – Comparison Operators, Aggregate Operators, NULL values – Comparison using Null values – Logical connectives – AND, OR and NOT – Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

### UNIT-III

**Introduction to Schema Refinement** – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms – BCNF – Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

## UNIT-IV

**Overview of Transaction Management:** The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions –Lock Based Concurrency Control, Deadlocks – Performance of Locking– Transaction Support in SQL.

**Concurrency Control:** Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

**Crash recovery:** Introduction to Crash recovery, Introduction to ARIES, the Log, Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

## UNIT-V

**Overview of Storage and Indexing:** Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.

Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear

Hashing, Extendable vs. Linear Hashing.

## TEXTBOOKS:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Database System Concepts, A. Silberschatz, H.F. Korth, S. Sudarshan, McGraw Hill, VI edition, 2006.
3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant B. Navathe, Pearson Education, 2008.



## REFERENCEBOOKS:

1. Database Management System Oracle SQL and PL/SQL,P.K.Das Gupta,PHI.
2. Database System Concepts,Peter Rob & Carlos Coronel,Cengage Learning,2008.
3. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.
4. Database-Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2 nd ed.,ELSEVIER
5. Fundamentals of Relational Database Management Systems,S.Sumathi,S.Esakkirajan, Springer.
6. Introduction to Database Management, M.L.Gillenson and others, Wiley Student Edition.
7. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
8. Introduction to Database Systems,C.J.Date,Pearson Education.

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<b>OPERATING SYSTEMS</b>			

## **UNIT-I**

### **Overview of Operating System**

Introduction, Computer System Organization, Computer System Architecture, Operating Systems Services, Systems Calls and Types, Evolution of Operating Systems.

## **UNIT-II**

### **Process Management**

Process, Process States , Process Control Block ,Process Scheduling, Operations On Processes, Threads Concepts, Process Scheduling Concepts, CPU Scheduling Algorithms, Multiple Processor Scheduling.

## **UNIT-III**

### **Synchronization**

Importance of Synchronization, The Critical-Section Problem, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples

**Principles Of Deadlock** – Deadlock System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Deadlock Detection And Avoidance, Recovery Form Deadlock.

## **UNIT-IV**

### **Memory Management Strategies & Virtual Memory Management Concepts**

Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

**Secondary-Storage Structures & I/O Systems** Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, Disk Management, RAID Structure, I/O Hardware, Application Interface, Kernel I/O Subsystem.

## UNIT-V

### **File System Interface And Implementation**

The Concept of a File, Access Methods, Directory Structure, File System Structure, File System Implementation, File Sharing, Protection, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

**Protection And Security:** Principles of Protection, Security Problem, System and Network Threats, Denial Lock Service, Importance of Cryptography.

### **TEXTBOOKS:**

1. Operating System Principles, 7/E, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, WILEY INDIA publications.
2. Operating Systems, 6/e, William Stallings, PHI/Pearson.

### **REFERENCEBOOKS:**

1. Operating Systems, 2/e, Dhamdhre.

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<b>SOFTWARE ENGINEERING</b>			

## UNIT-I

### **Introduction to Software Engineering:**

The evolving role of software, Changing Nature of Software, Software myths. (Text Book 3)

**The software problem:** Cost, schedule and quality, Scale and change.

## UNIT-II

### **Software Process:**

Process and project, component software process, Software development process models : Waterfall model, prototyping, iterative development, relational unified process, time boxing model, Extreme programming and agile process, using process models in a project. Project management process.

## UNIT-III

**Software requirement analysis and specification:** Value of good SRS, requirement process, requirement specification, functional specifications with use-cases, other approaches for analysis, validation.

**Planning a software project:** Effort estimation, project schedule and staffing, quality planning, risk management planning, project monitoring plan, detailed scheduling.

## UNIT-IV

**Software Architecture:** Role of software architecture, architecture views, components and connector view, architecture styles for C & C view, documenting architecture design, evaluating architectures.

**Design:** Design concepts, function-oriented design, object oriented design, detailed design, verification, metrics

## UNIT-V

**Coding and Unit testing:** Programming principles and guidelines, incrementally developing code, managing evolving code, unit testing, code inspection, metrics.

**Testing:** Testing concepts, testing process, black-box testing, white-box testing, metrics.

**TEXTBOOKS:**

1. A Concise introduction to software engineering (undergraduate topics in computer science), Pankaj Jalote, Springer International Edition.
2. Software Engineering, A Precise approach, Pankaj Jalote, Wiley
3. Software Engineering, 3/e ,& 7e Roger S.Pressman , TMH

**REFERENCEBOOKS:**

1. Software Engineering, 8/e, Sommerville, Pearson.
2. Software Engineering principles and practice, W S Jawadekar, TMH
3. Software Engineering concepts, R Fairley, TMH

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**CSE LAB-1**

Covering Experiments from ADS, DBMS and OS

PACE