



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA - 533 003, Andhra Pradesh, India**

**Branch: COMPUTER SCIENCE & ENGINEERING**

**M.Tech I YEAR I SEMESTER**

## **COMPUTER SCIENCE**

### **COURSE STRUCTURE**

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2	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	4	-	3
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5	OPERATING SYSTEMS	4	-	3
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7	CS LAB- I(COVERING THE EXPERIMENTS OF DATA STRUCTURES & DATABASE MANAGEMENT SYSTEMS)	-	4	2



## **M.Tech I YEAR I SEMESTER**

### **DATA STRUCTURES**

#### **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, Merge Sort.

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.

#### **TEXT BOOKS:**

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.

#### **REFERENCES BOOKS:**

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.



## **M.Tech I YEAR I SEMESTER**

### **MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

#### **UNIT I :**

Mathematical Logic: Statements and notations, Connectives, Well formed 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

#### **TEXT BOOKS:**

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

#### **REFERENCE TEXTBOOKS:**

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, 6<sup>th</sup> ed., PHI, 2009
4. Discrete Mathematics, Johnsonbaugh, 6<sup>th</sup> ed., Pearson, 2005
5. Discrete Mathematics, Malik, Sen, 6<sup>th</sup> ed., Cengage Learning, 2004
6. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005



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7. Discrete Mathematics and Combinatorics, Sengadir, Pearson, 2009
8. Discrete and Combinatorial Mathematics, Grimaldi, Ramana, 5<sup>th</sup> ed., Pearson, 2006
9. Mathematical Foundations of Computer Science, Rajendra Prasad, Rama Rao et al., USP, 2009
10. Discrete Mathematics, J K Sharma, 2<sup>nd</sup> 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, 5<sup>th</sup> 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.



## **M.Tech I YEAR I SEMESTER**

### **COMPUTER ORGANIZATION**

#### **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.

#### **TEXT BOOKS:**

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

#### **REFERENCE BOOKS:**

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.



## **M.Tech I YEAR I SEMESTER**

### **DATABASE MANAGEMENT SYSTEMS**

#### **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 database 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 Database 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



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**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, Extendible vs. Linear Hashing.

**TEXT BOOKS:**

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3<sup>rd</sup> Edition, 2003.
2. Data base 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.

**REFERENCE BOOKS:**

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<sup>nd</sup> 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.



## **M.Tech I YEAR I SEMESTER**

### **OPERATING SYSTEMS**

#### **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.

#### **TEXT BOOKS:**

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.

#### **REFERENCE BOOKS:**

1. Operating Systems, 2/e,Dhamdhre.





## **M.Tech I YEAR I SEMESTER**

### **DATA COMMUNICATIONS AND COMPUTER NETWORKS**

#### **UNIT I:**

**Network Hardware reference model:** Transmission media, Narrowband ISDN, Broad band ISDN, ATM.

**The data Link layer :** Design Issues, Error detection and correction, Elementary Data Link Protocols, Sliding window protocols : Data link layer in HDLC, Internet and ATM.

#### **UNIT II:**

**Channel allocation methods:** TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols – IEEE standard 802 for LANs – Ethernet, Token Bus, Token ring, Bridges.

**Network Layer Routing Algorithms:** Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms- General principles of congestion control, Congestion prevention policies, Choke packets and Load shedding.

#### **UNIT III:**

**Internet Working :** Tunneling, internetworking, Fragmentation, network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP. Network layer in the ATM Networks – cell formats, connection setup, routing and switching, service categories, and quality of service, ATM LANs.

#### **UNIT IV:**

**The Transport Layer:** Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, end to end protocols : UDP, reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call – RPC, NFS, XDR, DCE.

#### **UNIT V:**

**Application Layer:** Network Security, Cryptographic Algorithms: DES, RSA. Security Mechanisms : Authentication Protocols, Firewalls. Name service (DNS) Domains Hierarchy, Name servers. Traditional Applications : SMTP, MIME, World Wide Web : HTTP, Network Management : SNMP.

#### **TEXT BOOKS :**

1. Computer Networks and rew, Tanenbaum, 4/e, Pearson
2. Data and computer communications, Stallings, 8/e, PHI



**REFERENCE BOOKS**

1. Data communications and networking Forouzan, 4/e, TMH
2. Computer Networks – A System Approach , Peterson ,Bruce Davie,2/e,Harcourt Asia
3. Compute communications and networking technologies, Gallo, Hancock,Cengage
4. An Engineering approach to compute networking, Kesha ,Pearson
5. Communication networks, 2/e , Leon-Garcia, TMH
6. Computer networks , Anuranjan Misra, ACME Learning
7. Computer networks, C R Sarma, Jaico,
8. Understanding data communications, Held, 7/e , Pearson



## **M.Tech I YEAR I SEMESTER**

### **CS LAB 1**

#### **DBMS Lab**

1. Execute a single line and group functions for a table.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB.
5. Write PL/SQL procedure for an application using exception handling.
6. Write PL/SQL procedure for an application using cursors.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Write a PL/SQL block for transaction operations of a typical application using package.
10. Design and develop an application using any front end and back end tool (make use of ER diagram and DFD).
11. Create table for various relation
12. Implement the query in sql for a) insertion b) retrieval c) updation d) deletion
13. Creating Views
14. Writing Assertion
15. Writing Triggers
16. Implementing operation on relation using PL/SQL
17. Creating Forms
18. Generating Reports

#### **DATA STRUCTURES LAB**

##### **Exercise 1:**

- a) Write C program to perform Linear search for a Key value in a given list.
- b) Write C program to perform Binary search for a Key value in a given list.

##### **Exercise 2:**

- a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
- b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
- c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

##### **Exercise 3:**

- a) Write C program that implement stack (its operations) using arrays
- b) Write C program that implement stack (its operations) using Linked list

##### **Exercise 4:**

- a) Write a C program that uses Stack operations to Convert infix expression into postfix expression
- a) Write C program that implement Queue (its operations) using arrays.



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b) Write C program that implement Queue (its operations) using linked lists

**Exercise 5:**

- a) Write a C program that uses functions to create and perform various operations on a singly linked list
- b) Write a C program that uses functions to create and perform various operations on a doubly linked list
- c) Write a C program that uses functions to create and perform various operations on a circular linked list

**Exercise 10:**

- a) Write a C program to Create a Binary Tree of integers
- b) Write a recursive C program for Traversing a binary tree in preorder, in order and post order.

**Exercise 11:**

- a) Write a C program to Create and perform various operations on a BST