# Scheme of Study - M.Tech Computer Science & Engineering

(2008-2010) Batch Onwards

## I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
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## II SEMESTER

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### III SEMESTER & IV SEMESTER

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**TOTAL CREDITS: (22+23+18) = 63**

**List of Electives:**

- E01: Operating Systems
- E02: Computer Graphics
- E03R01: Real Time Systems
- E04: Database Management Systems
- E05: Middleware Interoperability
- E06: Multicast Communication
- E07: Discrete Mathematics
- E09: Principles of Compiler Design
- E10R01: Embedded Systems
- E11R01: Mobile Computing
- E12: Image Processing Techniques
- E13: Network Security
- E14: Neural Networks and Fuzzy Logic
- **E15R01: Data Mining & Data Warehousing**
- E16: Machine Learning
- E17: Performance Evaluation of Computer Networks
- E18: Fundamentals of Theoretical Computer Science
- E24: Data Structures & Algorithm Design
- E26R01: Computer Networks
- E28: Computer Architecture
UNIT - I


UNIT - II

Complexity Search Methods: Complexity: basic complexity classes, reductions, hardness and completeness with emphasis to NP-completeness - Steepest decent method, Quasi-Newton method DFP methods of optimization - algorithms and simple examples.

UNIT - III

Space And Transforms: Inner - product space-orthogonal basis Gram - Schmidt orthogonalization process - Hilbert space - definition examples properties - orthogonal decomposition theorem - Discrete time signal processing, applications of Fourier transform in signal processing, - Wavelet series - Multiresolution analysis - scaling function - Discrete and continuous wavelets - definition examples.

UNIT - IV

Galois Field Arithmetic for Logic Devices: GF adder - multipliers - sequential logic Multipliers - cellular array multipliers - circuits for square roots division circuits over GF \((2^m)\) - arithmetic based on normal basis.

UNIT - V

Codes and Error Control: BCH-RS codes- Definition computation - scheduling - Encoding and Decoding - iterative algorithms transfer coding with Euclidean algorithm.
Text Books:


Reference Books:


UNIT - I

**Introduction:** What is Object oriented technique and its development? Object oriented themes, Advantages of OO development, Object Modeling as a design technique.
Object modeling: Objects and classes, links and associations, advanced link and association concepts, generalization and inheritance, grouping constructs, a sample object model.

UNIT - II

**Advanced object modelling:** Aggregation, Abstract Classes, Generalization as extension and restriction, multiple inheritance, metadata, candidate keys, constraints.
Dynamic Modeling: Events and states, operations, nested state diagrams, concurrency, advanced dynamic modeling concepts, a sample dynamic model, relation of object and dynamic models.

UNIT - III

**Functional modeling:** Functional models, data flow diagrams, specifying operations, constraints, sample, relation to object and dynamic models.
Methodology preview, Analysis.

UNIT - IV

**System design:** Overview, breaking a system into subsystems, identifying concurrency, allocating subsystems, management of data stores, resources handling, software control implementation choice, handling boundary conditions, trade-off priorities, common architectural frameworks, An application case study.
**Object design:** Overview, design optimization, control implementation, Inheritance adjustment, Associations design, object representation, physical packaging, documentation.

UNIT - V

**UML:** Introduction, Static and Dynamic models, Need for modeling, UML diagrams, class diagrams, use-case diagram, dynamic modeling, Model management, UML extensibility.
Object interaction, Specifying operation, Specifying Controls.
Reference Books:


UNIT - I

**Introduction** - Protocols - Techniques - Key Management Techniques - Key Length - Algorithm Types and Modes: Electronic Codebook Mode, Cipher Block Chaining Mode, Output Feedback Mode, Block Cipher Vs Stream Ciphers - Pseudorandom Bit generation - PRNG.

UNIT - II


UNIT - III


UNIT - IV


UNIT - V

**Authentication Protocols** - Kerberos - MAC - Key establishment Protocol - Key Agreement - Key Distribution - Key Transport - Patents on Cryptography techniques - Applications of Number theory, Image Processing in cryptography.
**Reference Books:**


## MCSE 107 Computer Systems Lab

<table>
<thead>
<tr>
<th>S.NO.</th>
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<tr>
<td><strong>C PROGRAMS</strong></td>
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<tr>
<td>1.</td>
<td>SORTING USING FUNCTION WITH ARRAY</td>
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<tr>
<td>2.</td>
<td>SEARCHING TECHNIQUES - RECURSIVE BINARY SEARCH</td>
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<tr>
<td>3.</td>
<td>COUNTING THE NUMBER OF CHARACTERS, WORDS AND LINES</td>
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<tr>
<td>4.</td>
<td>ENCRYPTION AND DECRYPTION USING CEASER CIPHER</td>
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<td>FAMILY TREE USING STRUCTURES</td>
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<td><strong>C++ PROGRAMS</strong></td>
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<td>6.</td>
<td>ONLINE TRANSACTION SYSTEM</td>
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<td>7.</td>
<td>NETWORK ADMINISTRATOR SYSTEM</td>
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<td>PROJECT MANAGEMENT SYSTEM</td>
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<td>APPLICATION PROGRAM USING JAVA FRAMES</td>
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<td>13.</td>
<td>CHATTING APPLICATION USING TCP/IP</td>
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<tr>
<td>14.</td>
<td>APPLICATION DEVELOPMENT WITH DATABASE CONNECTIVITY USING SQL</td>
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UNIT - I

**Introduction, Architectures and Processes:** Definitions - Goals: Making Resources Accessible, Distribution Transparency, Openness, Scalability - Types of distributed systems: Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems

Architectures: Architectural styles, System architectures: Centralized, decentralized and Hybrid architectures, Architectures versus middleware - Self-management in distributed systems: Feedback control model - Examples

Processes: Threads - Virtualization - Clients - Servers - Code migration

UNIT - II

**Communication and Synchronization:** Fundamentals: Layered Protocols, Types of Communication - Remote Procedure Call: Basic RPC Operation, Parameter Passing, Asynchronous RPC, DCE RPC - Message-Oriented Communication, Stream oriented Communication, Multicast Communication


UNIT - III

**Consistency and Replication and Fault tolerance:** Reasons for Replication, Replication as Scaling Technique - Data -centric Consistency Models - Client-Centric Consistency Models - Replica management - Consistency protocols

UNIT - IV  


UNIT - V:


Reference Books:

UNIT- I


UNIT - II


Parallel and Distributed Databases: Multi CPU Architectures - Client-Server Architectures - CPU Cost Vs Power - Shared-Nothing Database Architecture - Two Phase Commit - Query Parallelism.

UNIT - III


UNIT- IV


UNIT - V

Objects and Database Design: Object oriented database management systems - Introduction - Standardizing and the ODMG - ODMG data model - Structural design - Behavioral design - Querying Object Oriented Databases: Queries in OQL - Programming an OODBMS: Database Programming languages.
Reference Books:


Unit - I

Testing strategies and tactics:
A strategic approach to software testing - strategic issues - Test strategies for conventional software - Test-strategies for object-oriented software - Validation testing - system testing - The art of debugging

Software testing fundamentals - White box testing: Basis path testing - Control structure testing - Black box testing - Object-oriented testing methods applicable at class level - testing methods - Inter-class test case design - testing for specialized environments, architectures and applications

Unit - II

Metrics for product, process and projects:
Software quality - framework for product metrics - metrics for analysis model - metrics for design model - metrics for source code- metrics for testing - metrics for source code

Metrics in the process and project domains - software measurement - metrics for software quality - integrating metrics within the software process - metrics for small organizations - establishing a software metrics program

Unit - III

Estimation and project scheduling:
Project planning process - software scope and feasibility - software project estimation - decomposition techniques - empirical estimation models - estimation for object-oriented projects - specialized estimation techniques - make/buy decision

Project scheduling - defining a task set for software project - defining a task network - scheduling - earned value analysis

Unit - IV

Project management and risk management
Management spectrum - people - product - process - W^5 HH principle

Unit - V

Quality and change management
Quality concepts - Software Quality Assurance - software reviews - Formal Technical Reviews - formal approaches to SQA - statistical software quality assurance - software reliability - ISO 9000 quality standards - SQA plan

Software configuration management - SCM repository - SCM process - configuration management for web engineering

Reference Books:

UNIT - I

**Algorithmic Graph Theory And Network Flows** - Circuits - cut-sets and Euler’s problem - Hamiltons circuits, parts and traveling salesman problem maximum network flow maximum cost flow flows in graphs with gain - Random graph - Basic model - asymptotic behavior

UNIT - II


UNIT - III

**Random Algorithms**: Introduction Game theoretic techniques - min max principles - randomness and non uniformity - moments and derivations- randomized selections - two point sampling - tail in equalities -rooting in a parallel computer - writing problem

UNIT - IV

**Realistic Methods** - overview - maximum satisfiability - expanding graphs-conditional probabilities - Markov chains - and random walks - Algebraic techniques

UNIT - V

**Application of Randomized Algorithms**: Hash Tables -Graph Algorithms - Approximate Counting - parallel and Distributed algorithms - Online Algorithms
Reference Books:


UNIT - I

Operating system and Processes: Operating system concepts - Operating system structure - Processes - Inter Process Communication - Process Scheduling

UNIT - II

Memory Management: Memory Management without swapping or paging - swapping - virtual memory - Page replacement Algorithms - Model Paging Algorithms - Design issues - Segmentation

UNIT - III

File Systems: Files - Directories - File system implementation - Security - Protection mechanisms

UNIT - IV

I/O and Deadlocks - Principles of I/O hardware - Principles of I/O software - Disks - clocks - Terminals - Deadlocks - Deadlocks detection and recovery - Deadlocks avoidance - Deadlocks prevention - other issues

UNIT - V

Distributed Operating system: Goals - Hardware concepts - S/w Concepts - Design issues - RPC - Deadlocks in distributed systems - Distributed file system design

Reference Books:

UNIT - I


UNIT - II

**2D transformation** - Clipping and Windowing-Line clipping algorithms (Cohen - Sutherland, Liang - Barsky, Nicholl-Lee-Nicoll) - Polygon Clipping (Sutherland-Hodgeman) - Text Clipping - Curve Clipping - Segmented display files - Display file compilation - Modeling and Modeling transformation

**3D Concepts** - Methods of 3D representation - 3D transformation - Viewing - 3D Clipping - Hidden surface and line elimination - Shading and coloring methods - Basic modeling concepts and Modeling methods

UNIT - III

**Curves & Surfaces**

**Conics:** Parametric forms for circle, ellipse, parabola - Beizar Curves: Need for cubic parametric curves, c0,c1,c2 continuity, Generation through Bernstein polynomials, condition for smooth joining of 2 segments, convex hull property - B-Spline curves: Knot vectors - uniform and open uniform curves, uniform, periodic B-Splines, Non-Uniform, rational B-Splines, Beta splines, subdividing curves, drawing curves using forward differences - Curved surfaces: Quadric surfaces, parametric bicubic surfaces.

UNIT - IV

**Back face removal** - Floating Horizontal method for curved objects - Z-Buffer or depth buffer algorithm - Painters algorithm (Depth sorting method) - Binary space partitioning trees - Scanline algorithm - Warnock’s algorithm **Shading** Illumination model for diffused & specular reflection - Computing reflection vector - Gouraud and Phog shading - Visible surface ray tracing - Texture and bump mapping - Handling shadow - Modeling transparency - Visualization of data sets, volume rendering **Fractals** Self similar fractals - fractal dimension - Generation of Terrain - Random mid point displacement - Grammar based models - Self squaring fractals
UNIT - V

Solid modelling Generation through sweep techniques - Constructive solid geometry - B-rep representations - Octrees Animation In-betweening using rotation and translation - Procedural animation - Image transformation - Translation and rotation - Morphing - Motion control: Key framing, Spline driven animation, Arclength parameterisation Velocity curves - Euler angles and use of quaternions

Reference Books:


UNIT - I


UNIT - II


UNIT - III


UNIT - IV


UNIT - V

Programming Languages and Tools: Desired language characteristics, Data typing, control structures, Hierarchical decomposition, packages, Run-Time error handling, overloading and generics Multitasking, task scheduling Timing specification, Run-time support, Real-time Applications.
Reference Books:


UNIT - I


UNIT - II

Data models

Relational models - Order, tuple, keys, relational algebraic operations - Set operations, select, project, join, division operation. Hierarchical data models - Parent Child relationships, Occurrence trees, DDL and DML operations.

Network models

Structures, sets, constraint insertion and retention, special sets, UWA, currency indicators, DML commands.

Object-Oriented model

Object structure - class hierarchy - Multiple inheritance, Object Identity- Object Containment- Object Oriented Queries - Scheme Modification.

UNIT - III

Relational Languages: SQL - Data definition, Queries in SQL, update statements, views and indexing. Relation calculus - Tuple calculus, Well-formed formula, specification directory. aggregate operators, basic DDL and DML Features, set functions, nested sub-queries, view constructors, update statements, embedded SQL - Advanced features of SQL92:- Domains, temporary tables, constraints and privileges, assertions, catalogue, information schema - embedded SQL, dynamic SQL and cursors - The SQL call level interfaces (CLI), open SQL gateways.
UNIT - IV


Case study of a Database design.

UNIT - V

Advanced Transaction Processing: ACID properties of transaction, schedules and recoverability, serializability of schedules, levels of transaction consistency, deadlocks - TP monitors: need, features, architecture, transactional RPC’s queues and conversations transactions management standards - High performance transaction processing: Main memory databases, group commit - Limitations of flat transactions, long - duration transactions: non - serializable executions, concurrency control, nested and multi level transactions - Transactional workflows: Workflow specification, failure - atomicity requirements of workflows, workflow execution, recovery of workflows.

Reference Books:


UNIT - I


UNIT - II

RPC & message Passing middleware - Introduction to procedure calls - Principles of RPC Architecture- Structure of Communication - Java RMI

UNIT - III

Other middleware: Introduction to EJB- Introduction to JDBC &ODBC

Interface Definition Language: Introduction to specification - IDL Identifiers-Attributes-type correction -Classes- Arrays- Documentation -Any type-Modules -Interfaces- Exception handling -pre Compiler Directives -OO Design using IDL.

UNIT - IV


UNIT - V

Reference Books:

UNIT - I

**Introduction:** Types of Communication - Scalability - Applications of Group Communication - Characteristics of Groups - Special Aspects of Group Communication

Quality of Service: What is QOS? - Describing a stream - Queuing techniques - Signalling QOS requirements - Integrated Services - RSVP - ST2 - Differentiated Services - Differences and Integration Options - Multi Protocol Label Switching - Subnet Bandwidth Manager - Improving QOS in the best effort class - Issues in slow links

UNIT - II


UNIT - III

**Multicast in IP & ATM:** - The IP - Host Name Resolution - IP multicast - RTP, RTCP, RSVP, RTSP - IPv6 - IGMP (v1, v2 & v3) - IP multicast applications - IP multicast security issues - Switching technology in ATM - ATM multicast - Replication, Mirroring and Caching

UNIT - IV

**Transport Protocols:** UDP - XTP - MTP - RMP - LBRM - SRM - RMTP - PGM - MFTP Inter-domain multicast routing - Multicast caveats - multicast on non-broadcast media - flooding - address allocation - Multicast in LANs

UNIT - V

**MBone** - the Multicast Backbone of the Internet - MBone Architecture - MBone Tools - Mbone Applications - Multicast routing and Mobile Systems - Multicast and DiffServ - Active Networks for Supporting Group Communication - Group Management for Large Dynamic Groups - Video conferencing - SDR: session directory - VIC & VAT - Reliable Multicast
Reference Books:


2. Kennet Miller, “Multicast Networking And Application”, Addison Wesley, 1999

UNIT - I


UNIT - II


UNIT - III

Groups: Semi groups - Monoids - Groups - Permutation group - Consets - Lagranges theorem - Group homomorphism - Kernel - Rings and Fields [Definitions and Examples only]

UNIT - IV


UNIT - V

Graphs: Introduction to graphs - Graph terminology - Representation of graphs - Graph Isomorphism - Connectivity - Euler and Hamiltonian Paths.

Reference Books:


UNIT - I

**Introduction:** Compilers and Translators - Phase of a Compiler - Types of compilers. Programming languages: Definition of Grammar and Language - Lexical and Syntactic structure of a language - Data elements - Data structures - Operators - Assignment - Statements - Program Units - Data environments - Parameter transmission.

UNIT - II

**Finite automata and Lexical Analysis:** Role of a Lexical analyser - Regular Expressions - Finite Automata - Regular Expressions to Finite Automata - Minimize the number of state of DFA - Implementation of Lexical Analysers. Context free grammars - Derivation and Parse Trees - Capabilities of context free grammars.

UNIT - III

**Parsing Techniques:** Parsers - Shift reduce parsing - Operator precedence parsing - Top down and bottom up parsing - Predictive parsers. Automatic parsing techniques: LR Parsers - Canonical LR, LALR parsing tables - Using ambiguous grammars - implementation of LR Parsing tables.

UNIT - IV

**Syntax directed translation:** Syntax directed translation Schemes - Semantic actions - Implementations - Intermediate code generation - Three address code, quadruples and triples - Parse trees and Syntax trees - Methods of Translating assignment statements. Expressions, control statements - array references - Procedure calls declarations - Case statements - Record structures. Symbol tables: Contents of a symbol tables - Data structures of a symbol tables - Representing scope information. Error detection and recovery: Errors - Lexical Phase errors - Syntactic phase errors - Semantic errors.

UNIT - V

**Code optimization:** Principles sources of optimization - Loop Optimization - DAG representations of Basic Blocks.

**Code Generation:** Object programs - Problems in code generations - Simple code generator - Code generation from DAG’s - Peephole optimisation
**Reference Books:**


UNIT - I

Introduction to Embedded systems: Embedding systems - Classification of embedded systems - Characteristics of embedded computing applications - Challenges in embedded computing system design process - Processor in embedded systems - Other hardware units - Software embedded into a system - Exemplary Embedded systems - Embedded system on-chip and VLSI circuit

UNIT - II

Embedded software development process: Software development life cycle and its models - Software analysis, design, Implementation - Testing, validating and debugging - Real time programming issues during development process - Software project management - Software maintenance - Formalisms of system design - Issues in embedded system design

UNIT - III

Embedded OS: Process - Multitasking and process management - Memory management - I/O and file system management - OS standards - OS performance guidelines - Oses and Board Support Packages (BSPs) - Operating system services - I/O subsystems - Network operating systems - OS security issues - Mobile OS

UNIT - IV

RTOS, co-design and tools: Real time Operating Systems:- Real-time and Embedded system OS - interrupt routines in RTOS environment - RTOS task scheduling models - performance metric in scheduling models - list of basic actions in a preemptive schedules and expected times taken at a processor - Fifteen point strategy for synchronization.

Co-design and tools: Embedded system design and co-design issues in system development process - Use of target system and its emulator and ICE - Use of software tools for development of an embedded systems - Use of scopes and logic analyser for system hardware tests
UNIT - V

**Distributed embedded systems and embedded programming:** Distributed embedded architectures - Networks for embedded systems - Network - Based - Design - Internet enabled systems.

Software programming in ALP and C - C program elements - Macros and functions - data types, data structures, modifiers, statements, loops and pointers, Queues, stacks, lists and ordered lists - Embedded programming in C++ - Embedded programming in Java - C program compiler and cross-compiler - source code engineering tools for embedded C/C++

**Reference Books:**


UNIT - I


UNIT - II


UNIT - III

**Mobile IP**: Goals, Assumptions and requirements - IP packet Delivery - Tunneling - Ad Hoc Network - Mobile Ad Hoc Routing: Unicast, Broadcast and Multicast protocols for MANET - AODV- ODMRP- Mobile Transport Layer: Traditional TCP - Indirect TCP, Snooping TCP, Mobile TCP.

UNIT - IV


UNIT - V

**Reference Books:**


UNIT - I


UNIT - II

Image Analysis: 2D - sampling - spectrum of a samples image; image reconstruction Aliasing - practical image sampling and reconstruction systems- their imperfection - image quantization - uniform and non-uniform quantization - Max Lloyd quantizer.

UNIT - III

Image enhancement: image enhancement and restoration- enhancement- contrast enhancement - histogram modification - noise cleaning - edge crisping.

Digital image restoration: sources of degradation. basic principles of inverse filtering - super solution - system identification - noise modelling - implementation.

UNIT - IV


Pattern recognition: Image segmentation process - edge detection and linking - region growing binary image processing - segmental image structure.

UNIT - V

Dynamic image analysis: Region analysis and scene analysis - statistical and syntactic models for picture classification image understanding systems - image processing case histories automatic visual application - process control - robotic guidance and control diagnostic medical imaging - military guidance and reconnaissance remote sensing.- image processing for remote sensed data.
Reference Books:


E13: NETWORK SECURITY

UNIT - I

Network Security Fundamentals: Network security issues - Basic Network security objective & Threats - Security services the trusted N/W interpretation - TNI Security service AIS interconnection issues - Distributed systems security.

UNIT - II


UNIT - III


UNIT - IV

Network Security: e-mail security - pretty good privacy - S/MIME - IP security - overview and architecture - authentication header - encapsulating security payload - combing security associations - web security requirements SSL - TLS - secure electronic transactions - intruders- higher wall design principles - trusted systems.

UNIT - V


Legal and Ethical Issues: Computer Crime, Ethical Issues in Computer Security, Case studies of Ethics, Codes of Ethics.
Reference Books:


UNIT - I

**Fundamental concepts of ANNs:** Basic Models and Learning rules of ANNs - Distributed representation. Single-layer perceptron Networks, Multilayer Feedforward Networks, Hopfield Networks- Associated Memories- Optimization problems.

UNIT - II


UNIT - III

**Fuzzy sets and operation Fuzzy sets:** Extension principles and its applications - Basic Fuzzy relations-Operation on Fuzzy relation-Types of Binary Fuzzy relations -Fuzzy relation equation .Fuzzy Measures-Fuzzy Integrals-Measure of Fuzziness - Basics of possibility theory-Fuzzy arithmetic.

UNIT - IV

Fuzzy Logic - Linguistic variables - Approximate reasoning - Basic concepts of integrating Fuzzy System and Neural Networks - Equivalence of Fuzzy Interference Systems and Neural Networks.

Neural Realization of Basic Fuzzy Logic Operations - Neural Networks-based Fuzzy Modelling.

UNIT - V

**Neural Networks in Sensor Processing:** Fuzzy Pattern Recognition - Neural Fuzzy controller with hybrid structure - Parameter learning - Parameter learning for Neuro-Fuzzy controllers - Structure learning for Neural Fuzzy controllers.
**Reference Books:**


UNIT - I

Data Mining:
Introduction - Potential applications - Data mining issues-Knowledge discovery in Databases – Association rules and apriori algorithm - Data Preprocessing - Outlier discovery - Data Cleaning - Data Integration and Transformation - Data Reduction - A Multi Dimensional Data Model - Measures - Concept Hierarchy - Data Warehouse Architecture & Design - OLAP operations - ROLAP, HOLAP and MOLAP Servers - Enterprise Warehouse & Data Mart - Virtual Warehouse.

Unit - II

Classification:

Unit - III

Cluster Analysis:
Introduction - Data types - Applications of clustering - Clustering Methods - Quality of Clustering - Partitioning Algorithms - k means method - k nearest neighbour algorithm - PAM (k-medoids) algorithm, Hierarchical algorithms - Divisive, Density based, Grid based methods-STING and model based methods - COBWEB- Clustering large databases - BIRCH - Clustering with categorical databases.

Unit - IV

Web and Spatial Mining:
Web content mining - Web crawlers - Web structure mining - Web usage mining - preprocessing for web mining - pattern discovery - Spatial mining Overview - Primitives - Generalization and Specifications - Spatial Rules - Spatial queries - Spatial data structures-kD tree - Thematic maps and Image databases - Spatial Classification algorithm - STING - Spatial clustering algorithms.- BIRCH - CLARANS
Unit - V

**Temporal and Multimedia database mining:**

**Reference books:**


UNIT - I

**Introduction:** An illustrative task, and a few approaches to it. What is known from algorithms, theory, and experiment. **Concept Learning:** learning as search, version spaces, choosing examples, inductive bias.

UNIT - II

**The PAC model:** Consistency and PAC learning. Example algorithms and proofs, general relations, decision lists, Occam’s razor. **Decision Tree Learning:** information gain, post-pruning, extracting rules. **Evaluating Hypotheses:** sampling errors, confidence intervals, probabilistic inequalities, cross validation.

UNIT - III

**On-Line Learning:** The mistake-bound model, Winnow and Weighted-Majority algorithms, applications to game playing. **Neural Network Learning:** Perceptrons, gradient descent, Multilayer nets, backpropagation. **Overfitting and Bias II:** uniform convergence, VC-dimension.

UNIT - IV

**Bayesian Approaches:** Bayes theorem, Maximum likelihood, Minimum description length principle, Naïve Bayes. **Instance-based techniques:** Nearest neighbour methods.

**Genetic Algorithms:** Evolutionary computation, genetic programming **Explanation-Based Learning:** Using prior knowledge to reduce sample complexity.
UNIT - V

**Combined inductive/analytical learning:** Symbolic methods, Neural network methods. Bayesian networks **Hidden Markov Models:** Expectation maximization. **Learning Agents:** Reinforcement learning, Agent architectures for learning(e.g., Soar), Learning finite state environments and feature invention.

**Reference books:**

UNIT - I


UNIT - II


UNIT - III

Congestion and Traffic Management:

UNIT - IV

Internet Routing:

**UNIT - V**

**Quality of Service In IP Networks:**

**Reference books:**


UNIT - I

Basic Mathematical Notation and Technique - Mathematical Induction and recursive definitions - Chomsky hierarchy of languages - Recognizers - Introduction.

UNIT - II

Finite automata and regular languages: Regular expressions and regular languages - Memory required to recognize a language - Non-determination and Kleenes theorem - Pumping lemma - Decision problems.

UNIT - III

Push down Automata and context free languages: Context free grammars - Definition - Examples - Operations - Derivation trees - Ambiguity - PDA&CFG - Context free and non context free languages.

UNIT - IV

Turing Machines: Cheuch turing hypothesis - TM as acceptors - Partial function - Non-deterministic TM - Universal Turing Machines - Application.

UNIT - V

Unsolvable problems and computable functions: Rice Theorem - Halting Problem - Post’s correspondence Problem - Primitive recursive functions - Godel Numbering - Recursive and recursively enumerable languages.

Reference books:


UNIT - I

Introduction to data structures: Elementary data structures - STACKS & QUEUES fundamentals, evaluation of expressions. LINKED LISTS: Singly linked lists, the storage pool, polynomial additions, more on linked lists, doubly linked lists and dynamic storage management, generalized list, Garbage collection and compactions. - Arrays - Axiomatization, ordered lists, sparse matrices, Representation of arrays Implementing pointers and objects

UNIT - II


UNIT - III

Basic Graph Algorithms

Depth first search on graphs - Computation of bi-connected components and strongly-connected components using the depth first search paradigm - Topological sorting of nodes of an acyclic graph

Shortest path algorithms on Graphs - Relationship between shortest and longest path problems on graphs - Bellman-ford equations for modelling the single source shortest path problem, Dijkstra’s algorithm for solving the equations Analysis of Dijkstra’s algorithm using Fibonacci heaps

UNIT - IV

Minimum Weight Spanning Tree Algorithms and the Greedy Paradigm: The basic greedy strategy for computing minimum spanning trees - Algorithms of Kruskal and Prim - Use of Union Find algorithm in Implementation of Kruskal’s Algorithm - The Relationship in Dijkstra’s and Prim’s Algorithms - Use of greedy strategy in algorithms for the knapsack problem and Huffman trees.
**Divide and Conquer Paradigm:** Divide and conquer recurrence equations and their solutions - Review of various sorting techniques from the perspective of their fitting into the divide and conquer paradigm - Linear time selection algorithm - The basic divide and conquer algorithm for matrix multiplication.

**UNIT - V**

**Dynamic Programming Paradigm**
The basic dynamic programming paradigm - Viewing shortest path algorithms from that perspective - Dynamic Programming solution to the optimal matrix chain multiplication and the longest common subsequence problems - Top down recursive algorithms using tables of solutions of sub problems as an alternative to bottom up general dynamic programming.

**String Matching Algorithms:** Modelling the general string matching problem as a finite automata - Motivation of the failure function in the Knuth Morris and Pratt paradigm - Linear time analysis of the KMP algorithm - The Boyer-Moore refinement at the KMP Algorithm, Computation of the failure functions for the Boyer-Moore algorithm, NP - Complete Problems

**Reference Books:**


UNIT - I


UNIT - II

**Data Link Layer:** Design issues - Error Detection and Correction - Elementary data link protocol - Sliding window protocol.

**Medium Access Control:** Channel Allocation Problem - Multiple Access protocol - Ethernet - Wireless LANs - Broadband wireless - Blue tooth - Data Link Layer Switching.

UNIT - III


UNIT - IV


UNIT - V

Reference Books:


UNIT - I


UNIT - II

Control unit organization: Control design - Hardwired control - Micro programmed control - Multiplier control unit - CPU control unit - Pipelined control unit - Super scalar processing I/O Organization I/O interfacing with CPU: Addressing Data Transfer Techniques, Asynchronous data transfer - Programmed I/O - interrupts - initiated I/O - DMA - I/O processors.

UNIT - III

Memory Organization: Memory technology - Device characteristics - Random access memories - Serial access memories - Interfacing with CPU: Main memory, Auxiliary memory - Cache memories, Associative memory and Virtual Memory - Memory systems - Multilevel memories - Virtual memory- Caches - Associative memories- Parallelizing disk access RAID Technology- improving Reliability, Performance with RAID- RAID organizations and levels.

UNIT - IV

Advanced computer architecture: Advanced computer architecture - RISC machine design principle - RISC verses CISC - Example of RISC architecture - SPARC - Dataflow architecture - Fault tolerant computers.

UNIT - V

Introduction to Parallel Processing, Architectural Classification Schemes - Different types of Parallel Architectures and their Applications Principles of Pipeline and Vector Processing Arithmetic Pipelines - Pipelined Instruction Processing - Principles of Designing Pipeline Processors - Pipeline Scheduling Processors.
Reference Books:


