SCHEME OF EXAMINATION

&

SYLLABI

for

B. TECH. COMPUTER SCIENCE & ENGINEERING
YEAR FOURTH
(Effective from the session: 2009-2010)

Uttarakhand Technical University, Dehradun

www.uktech.in
UTTRAKHAND TECHNICAL UNIVERSITY, DEHRADUN
STUDY AND EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
YEAR FOURTH, SEMESTER - VII
(Effective from the session: 2009-2010)

<table>
<thead>
<tr>
<th>S.No</th>
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<th>PERIODS</th>
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Practical/Training/Project

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Choose one Subject from each Elective

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<td>Real Time System</td>
<td>CS 023</td>
<td>System Software and Administration</td>
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<td>CS –014</td>
<td>Wireless Networks</td>
<td>CS 024</td>
<td>Soft Computing</td>
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Choose one subject from each elective

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Total 12 4 4 1000
(TCS-701) INTRODUCTION TO WEB TECHNOLOGY

UNIT I: Introduction and Web Development Strategies

UNIT II: HTML, XML and Scripting

UNIT III: Java Beans and Web Servers

UNIT IV: JSP
Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.

UNIT V: Database Connectivity

Books:
3. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly

(TCS - 702) ADVANCE COMPUTER ARCHITECTURE

Unit-I: Introduction
Introduction to parallel computing, need for parallel computing, parallel architectural classification schemes, Flynn’s , Fengs classification, performance of parallel processors, distributed processing, processor and memory hierarchy, bus, cache & shared memory, introduction to super scalar architectures, quantitative evaluation of performance gain using memory, cache miss/hits.
Unit-II: Multi-core Architectures
Introduction to multi-core architectures, issues involved into writing code for multi-core architectures, development of programs for these architectures, program optimizations techniques, building of some of these techniques in compilers, OpenMP and other message passing libraries, threads, mutex etc.

Unit-III: Multi-threaded Architectures
Parallel computers, Instruction level parallelism (ILP) vs. thread level parallelism (TLP), Performance issues: Brief introduction to cache hierarchy and communication latency, Shared memory multiprocessors, General architectures and the problem of cache coherence, Synchronization primitives: Atomic primitives; locks: TTS, ticket, array; Barriers: central and tree; performance implications in shared memory programs; Chip multiprocessors: Why CMP (Moore's law, wire delay); shared L2 vs. tiled CMP; core complexity; power/performance; Snoopy coherence: invalidate vs. update, MSI, MESI, MOESI, MOSI; performance trade-offs; pipelined snoopy bus design; Memory consistency models: SC, PC, TSO, PSO, WO/WC, RC; Chip multiprocessor case studies: Intel Montecito and dual-core, Pentium4, IBM Power4, Sun Niagara

Unit-IV: Compiler Optimization Issues
Introduction to optimization, overview of parallelization; Shared memory programming, introduction to OpenMP; Dataflow analysis, pointer analysis, alias analysis; Data dependence analysis, solving data dependence equations (integer linear programming problem); Loop optimizations; Memory hierarchy issues in code optimization.

Unit-V: Operating System Issues and Applications
Operating System issues for multiprocessing Need for pre-emptive OS; Scheduling Techniques, Usual OS scheduling techniques, Threads, Distributed scheduler, Multiprocessor scheduling, Gang scheduling; Communication between processes, Message boxes, Shared memory; Sharing issues and Synchronization, Sharing memory and other structures, Sharing I/O devices, Distributed Semaphores, monitors, spin-locks, Implementation techniques on multi-cores; OpenMP, MPI and case studies Case studies from Applications: Digital Signal Processing, Image processing, Speech processing.

Books:
UNIT-I Introduction and Fundamentals

Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-II Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

Image Restoration
A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only- Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-III Color Image Processing
Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation.

Morphological Image Processing
Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-IV Registration
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation
Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge
Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

UNIT-V
Feature Extraction
Representation, Topological Attributes, Geometric Attributes

Description
Boundary-based Description, Region-based Description, Relationship.

Object Recognition
Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching

Books:

(TCS – 012 )Network Programming & Administration

Unit – I

Unit - II
Processes and Inter-Process Communication: timers, polling vs interrupts, environment, fork, exec, wait, environment, exit and wait, pipe, fifos, message queues, semaphore

Unit - III
Network Programming: Sockets, Operation, Socket types, Domains Name Binding, Closing Sockets, I/O Multiplexing, Client/Server Models, Connection Based Services, Handling Out of Band Data, Connectionless Services, Design issues of Concurrent and iterative servers, Socket options

Unit - IV
XDR and Remote Procedure Calls, Network Programming at the level of Programming Language (can use Java or Python as case study)
Text Book:

References:
1. Internetworking with TCP/IP, Volume3, Douglas Comer, Prentice Hall, 2000
2. Internetworking with TCP/IP, Volume1, Douglas Comer, Prentice Hall, 2000

(CS - 013) REAL TIME SYSTEMS

UNIT-I: Introduction

UNIT-II: Real Time Scheduling

UNIT-III: Resources Access Control

UNIT-IV: Multiprocessor System Environment
Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

UNIT-V: Real Time Communication
Books:

(CS – 014 )WIRELESS NETWORKS

Unit – 1 Introduction
Liberalization of communications Industry, Digitalization of content, changes in spectrum management, cellular reuse, drive towards broadband, IEEE 802.11 networks

Unit – 2 Wireless Network Systems

Cellular networks
The GSM circuit switched network, GSM channel structure, Authentication and location updating, physical channels, TMN

GPRS
Introduction to GPRS, contexts, PDP context, Mobility management context, MS-SGSN physical layer, MS-SGSN protocols, GPRS operations

Unit – 3 Principles of access network planning

Circuit voice networks
Introduction to CVN, coverage, capacity. Planning for circuit multimedia services

Planning for packet multimedia services
Planning approaches, buffer-pipe model, characterization of applications, practical modeling methodologies, multiuser packet transport configurations

Unit – 4 Planning and design
RAN, GSM RAN, UMTS RAN, Cellular OFDM RAN, Mesh network

Unit – 5 Network operation and optimization
Enhanced telecom operations model (eTOM), wireless network life cycle – strategy, infrastructure and product, operations, enterprise management,

GSM network performance optimization – principles and key performance indicators, coverage optimization, GPRS RAN optimization, UMTS network performance optimization

Text Books:
2. Fundamental of Wireless Networking, Ron Price, TMH
3. 3G Wireless Networks, Clint Smity, TMH
4. Essentials of UMTS, Christopher Cox, Cambridge University Press
Unit-I
Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon’s theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

Unit-II
Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat’s and Euler’s theorem, primality testing, Euclid’s Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

Unit-III
Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).


Unit-IV
Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit-V


System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.
Books:

(CS 022) .Net Technologies & Visual Programming

UNIT 1 The Philosophy of .NET
Understanding the previous states affair, The .NET Solution, The building Block of the .NET platform (CLR,CTS,CLS), the role of the .NET base class libraries, What C# brings to the table, additional .NET – Aware programming Languages, An overview of .NET binaries (aka assemblies), The role of the common intermediate language, The role of .NET type metadata, The role of the assembly manifest, Compiling CIL to platform specific instruction, Understanding the common type system, Intrinsic CTS data types, Understanding the common languages specification, Understanding the common languages runtime, A tour of the .NET namespace, increasing your namespace nomenclature, Deploying the .NET runtime.

UNIT 2 Building C# Applications
The role of the command line compiler (CSC.exe), Building C# application using csc.exe, Working with csc.exe response file, generating bug reports, Remaining C# compiler option, The command line debugger, using the visual studio. Net IDE, Other key aspects of the VS.Net IDE, Documenting your source code via XML, C# preprocessor directives, An interesting Aside: The System. Environment class, Building .Net application with other IDEs. C# Language Fundamentals : An Anatomy of a basic C# class, Creating objects: Constructor basic, the composition of a C# application, Default Assignment and variable scope, The C# member initialization syntax, Basic input and output with the console class, Understanding value types and reference types, The master node: System. Objects, The system Data type (And C# aliases), Converting between value type and reference type: Boxing and Unboxing, Defining program constraints, C# Iterations constructs, C# control flow constructs, The complete set C# operator, Defining Custom class methods, Understanding static methods, Method parameter modifiers, Array manipulation in C#, String manipulation in C#, C# Enumerations, Defining structures in C#, Defining custom namespaces.

UNIT 3 Object Oriented Programming with C#
Formal definition of the C# class, Definition the “Default public interface” of a type, Recapping the pillars of OOP, The first pillar: C# Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: C#’s Inheritance supports keeping family secrets: The “Protected” keyword, The Nested type definitions, The third pillar: C#’s Polymorphic support casting between types, Generating class definitions using Visual Studio. Net. Exceptions and Objects Life Time Ode to errors, Bugs and exceptions, The role of .NET exceptions handling, The system. Exception base class throwing a generic exception catching exception, CLR system level exception (System. system exception),Custom application level exception (System. application exception), Handling multiple exception, The finally block, The last chance exception, dynamically identify application and system level exception,
Debugging system exception using VS.Net, Understanding Object life time, The CIT of new, The basic of garbage collection, Finalizing a type, Finalization process, building and Ad hoc destruction method, garbage collection optimization, The system .GC type.

UNIT 4 Interfaces and Collections
Defining interfaces using C#, Invoking interface member at the object level, Exercising the shape hierarchy, Understanding explicit interface implementation, Interfaces as Polymorphic agents, Building interface hierarchies, Implementing interface using VS.Net, Understanding the Iconvertible interface, Building a custom enumerator (I Enumerable and Ienumerator), Building cloneable objects (Icloneable), Building comparable objects (I Comparable), Exploring the system the collection namespace, Building a custom container (Retrofitting the cars type).

UNIT 5

Text Book:

(CS 023 ) System Software and Administration

Unit-I
Assemblers: General design procedures, Design of two pass assemblers, Cross Assemblers, Macro Processors – Features of a macro facility,(macro instruction arguments, conditional macro expansion, macro calls within macros), Implementation of a restricted facility : A two pass algorithm; Macro Assemblers.

Loader schemes: Compile and go loaders, absolute loaders, relocating loader, Linking, Reallocation- static & dynamic linking, Direct linking loaders, Binders, Overlays, dynamic binders; Working principle of Editors, Debuggers.

System Administration
Unit - II

Introduction: Duties of the Administrator, Administration tools, Overview of permissions.

Processes: Process status, Killing processes, process priority. Starting up and Shut down:

Peripherals, Kernel loading, Console, The scheduler, init and the inittab file, Run-levels, Run level scripts.

Managing User Accounts: Principles, password file, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users.

Unit - III

Managing Unix File Systems: Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making filesystems, Superblock, I-nodes, Filesystem checker, Mounting filesystems, Logical Volumes, Network Filesystems, Boot disks

Configuring the TCP/IP Networking: Kernel Configuration; Mounting the /proc Filesystem, Installing the Binaries, Setting the Hostname, Assigning IP Addresses, Creating Subnets, Writing hosts and networks Files, Interface Configuration for IP, ifconfig, netstat command, Checking the ARP Tables; Name service and resolver configuration.

Unit- IV

TCP/IP Firewall: Methods of Attack, What Is a Firewall? What Is IP Filtering? Setting Up Linux for Firewalling Testing a Firewall Configuration; A Sample Firewall Configuration: IP Accounting, Configuring the Kernel for IP Accounting, Configuring IP Accounting, Using IP Accounting Results

IP Masquerade and Network Address Translation: Side Effects and Fringe Benefits, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade.

Unit-V


System Backup & Recovery: Log files for system and applications; Backup schedules and methods (manual and automated).

Text Books:
4. Maxwell – “Unix system administration” - TMH
5. Limoncelli – “The Practice of System & Network Administration” – Pearson
6. Wells, LINUX Installation & Administration, Vikas

**Reference Books:**


### (CS024) Soft Computing

**Unit –I**
Introduction to soft computing. Applications of Artificial Neural Networks, fuzzy logic, genetic algorithms and other soft-computing techniques. Their strengths and weaknesses. Synergy of soft computing techniques.

**Unit-II**
Introduction to artificial neural network
Neural Networks: Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Competitive learning networks, Kohonen self organizing networks, Hebbian learning; Hopfield Networks,

**Unit-III**

**Unit - IV**
Genetic algorithms(Gas), Evolution strategies(Ess), Evolutionary programming(EP), Genetic Programming(GP), Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models.

**Unit - V**
Other Soft computing approaches Simulated Annealing, Tabu Search, Ant colony based optimisation, etc.
Text:
1. “Neuro-Fuzzy and Soft computing”, Jang, Sun, Mizutani, Pearson
3. “Genetic Algorithms”, Goldberg, Pearson

Reference:
(TCS-801) DISTRIBUTED SYSTEMS

Unit–I

System Models: Architectural models, Fundamental Models

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport’s & vectors logical clocks, Causal ordering of messages, global state, termination detection.

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Unit–II
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.


Unit–III
Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.


Unit–IV
Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.
Unit –V

**Distributed Algorithms:** Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm.

**CORBA Case Study:** CORBA RMI, CORBA services.

**Books:**

**(TCS-802) MOBILE COMPUTING**

**Unit – I**
Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

**Unit - II**

**Unit – III**
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

**Unit - IV**
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.

**Books:**
1. J. Schiller, Mobile Communications, Addison Wesley.
2. A. Mehrotra, GSM System Engineering.
(CS – 031) EMBEDDED SYSTEMS

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing. Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance
Formal Verification.

Books:

(CS - 032) PARALLEL COMPUTING

UNIT-1

UNIT-2
Basic Communication Operation: One-to-all broadcast; All-to-all broadcast; Reduction and prefix sums; One-to-all personalized communication; All-to-all personalized communication;

UNIT-3
Performance and Scalability of Parallel Systems: Performance matrices for Parallel systems? Run time, Speed up, Efficiency and Cost; The effect of granularity on performance
UNIT-4

Sorting: Sorting networks; Bubble sort and its variants; Quick sort and other sorting algorithms

UNIT-5

Dynamic Programming: Overview of dynamic programming, Serial monadic DP Formulations: The shortest path Problem, the 0/1 Knapsack Problem, Serial Polyadic DP Formulation: all pair shortest paths algorithms.

References:

2. George Coulouris, Jean Dollimore and Tim Kindberg; Distributed Systems Concepts and Design, Addison-Wesley, Massachusetts
5. J Jaja; An Introduction to Parallel Algorithms, Addison Wesley, Massachusetts.

(CS – 033) MULTIMEDIA COMMUNICATION & SYSTEM DESIGN

Unit-I: Introduction
Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects
Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks
Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.
Unit-III: Data Compression

Unit-IV: Speech Compression & Synthesis
Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images
Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images, Video: Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

Books:
4. Mark Nelson “Data Compression Book” BPB.
5. David Hillman “Multimedia technology and Applications” Galgotia Publications.

(CS – 034) PATTERN RECOGNITION

Unit – 1 Introduction
Pattern recognition, classification and description, patterns and features extraction, training and learning in PR systems, pattern recognition approaches

Unit – 2 Pattern Discrimination
Decision regions and functions, feature Space Metrics, The Covariance Matrix, Principal components, feature assessment, dimensionality ratio problem

Data Clustering
Unsupervised classification, Standardization issues, tree clustering, dimensional reduction, K-means clustering, cluster validation
Unit – 3  Statistical Classifications
Linear Discriminants, Bayesian classification, Model free techniques, feature selection, classifier evaluation, tree classifier

Unit – 4  Syntactic pattern recognition
Introduction, quantifying structure in pattern description, grammar based approach and applications, elements of formal grammars, recognition of syntactic descriptions, parsing, CYK parsing algorithm

Unit – 5  Structural pattern recognition
Primitives, structural representations, syntactic analysis, structural matching

Text Books:

(CS-035) NATURAL LANGUAGE PROCESSING

Unit-I

Unit-II
Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III
Unit-IV

Unit-V

Books:
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

(CS – 041) ADVANCED DATABASE SYSTEMS

UNIT-1
Distributed DBMS Concepts and design: Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in a DDBMS, Twelve rules for a DDBMS. Advanced concepts: Distributed transaction management, distributed concurrency control, distributed deadlock management, distributed database recovery, X/open distributed Transaction processing model, Replication servers, Distributed query optimization, Mobile databases.

UNIT-2
Object-Oriented DBMS Introduction, advanced database applications, weakness of RDBMS, storing objects in a relational database, next-generation database systems. Concepts and design: OODBMS perspectives, persistence, issues in OODBMS, advantages and disadvantages of OODBMS, Object-oriented database design.

UNIT-3
Standards and systems: object management group, object database standard ODMG 3.0 1999, Object store. Object relational DBMS: Introduction, third generation database manifestos, SQL8, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.

UNIT-4
Web technology and DBMS Web as a database Application Platform: Requirements for web-DBMS integration, web-DBMS architecture, advantages and disadvantages of web-DBMS approach, approaches to integrating the web and DBMS, Oracle Internet Application Server (IAS).
UNIT-5
Data Warehousing Concepts, OLAP and Data mining Evolution of data warehousing, data warehousing concepts, benefits and problems of data warehousing, comparison of OLTP systems and data warehousing, On-Line Processing, Introduction to data mining.

Books:

(CS – 042) DATA MINING AND WAREHOUSING

Unit-I
Overview, Motivation(for Data Mining), Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:- Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Unit-II
Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases.

Unit-III
Classification and Predictions:
What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods Knearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:
Unit-IV
**Data Warehousing:** Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V
Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

**Books:**
1. M.H.Dunham,”Data Mining: Introductory and Advanced Topics” Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier

**(CS – 043) COMPUTATIONAL GEOMETRY**

**UNIT-I**
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs;

**UNIT-II**
Voronoi diagrams: construction and applications, variants; Delauney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, minmax angle properties;

**UNIT-III**
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems;

**UNIT-IV**
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

**UNIT-V**
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing; Applications of computational geometry;
Books:
3. *Algorithmische Geometrie* (auf deutsch) by Rolf Klein; Addison-Wesley, 1996.

**CS – 044** GRANULAR COMPUTING

Unit – 1 Methodology and mathematical framework
Information Granules, Formal models of information granules, conceptual aspects, granular world, granular computing: pyramid, communication between granular worlds.

Unit – 2 Sets and Intervals
Formalism of sets, set enclosure, Interval analysis, Interval Vectors, Interval Matrices, enclosure of functions.

Fuzzy Sets
Concept and formalism, geometry of fuzzy sets, main classes, operations on fuzzy sets, relationships, transformation, fuzzy arithmetic.

Rough sets
Concept, set approximation, characterization, rough functions.

Unit – 3
Algorithm of Information Granulation
Principle of granular clustering, computational aspects of granular computing, granular analysis.

Recursive information granulation
Introduction, design and characterization of information granules, assessment and Interpretation, Granular time series.
Unit – 4  Granular Systems Application

Temporal granulation and signal analysis, Granulation of signals in spatial domain, Granular models of signals, rough sets in signal granulation.

Unit – 5  Granular Data Compression

Fuzzy relational equations, relational calculus in image compression, experiments.

Text Books:


(CS-045) STORAGE NETWORKS

Unit – 1  Introduction to Storage Technology

Introduction to storage network, Five pillars of IT, parameters related with storage, data proliferation, problem caused by data proliferation, Hierarchical storage management, Information life cycle management (ILM), Role of ILM, Information value vs. time mapping, Evolution of storage, Storage infrastructure component, basic storage management skills and activities, Introduction to Datacenters, Technical & Physical components for building datacenters

Unit – 2  Technologies for Storage network

Server centric IT architecture & its limitations, Storage centric IT architecture & advantages, replacing a server with storage networks, Disk subsystems, Architecture of disk subsystem, Hard disks and Internal I/O channel, JBOD, RAID& RAID levels, RAID parity, comparison of RAID levels, Hot sparing, Hot swapping, Caching : acceleration of hard disk access, Intelligent Disk subsystem architecture,

Tape drives

Introduction to tape drives, Tape media, caring for Tape& Tape heads, Tape drive performance, Linear tape technology, Helical scan tape technology
Unit- 3   I/O techniques
I/O path from CPU to storage systems, SCSI technology – basics & protocol, SCSI and storage networks, Limitations of SCSI,

Fibre channel
Fibre channel, characteristic of fibre channel, serial data transfer vs. parallel data transfer, Fibre channel protocol stack, Links, ports & topologies, Data transport in fibre channel, Addressing in fibre channel, Designing of FC-SAN, components, Interoperability of FC-SAN, FC products,

IP Storage
IP storage standards (iSCSI, iFCP, FCIP, iSNS), IPSAN products, Security in IP SAN, introduction to infiniband, Architecture of Infiniband

NAS – Evolution, elements & connectivity, NAS architecture,

Unit – 4   Storage Virtualization
Introduction to storage virtualization, products, definition, core concepts, virtualization on various levels of storage network, advantages and disadvantages, Symmetric and asymmetric virtualization, performance of San virtualization, Scaling storage with virtualization

Unit – 5   Management of storage Networks
Management of storage network, SNMP protocol, requirements of management systems, Management interfaces, Standardized and proprietary mechanism, In-band& Out-band management,

Text Book:
3.  "Designing Storage Area Networks: A Practical Reference for Implementing Fibre Channel and IP SANs, Second Edition", Tom Clark Addison Wesley