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<td>Data Structures Using C</td>
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YEAR - II, SEMESTER - IV

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### Study and Evaluation Scheme

**B.Tech. Information Technology**  
(Effective from the session 2010-11)

#### YEAR - III, SEMESTER - V

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**PRACTICALS**

|       | HCS-552     | 0   0   2   | 10 10 20 30 | 50  |
|       | HIT-512     | 0   0   3   | 10 15 25 50 | 75  |
|       | HCS-553     | 0   0   3   | 10 15 25 50 | 75  |
| 9     | HGP-501     |              | 50          | 50  |

**Total**  
1 5 5 6 - - - - 1000

#### YEAR - III, SEMESTER - VI

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**PRACTICALS**
### Study and Evaluation Scheme

**B.Tech. Information Technology**

(Effective from the session 2011-12)

**YEAR - IV, SEMESTER - VII**

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**PRACTICALS**

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**YEAR - IV, SEMESTER - VIII**

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**B. Tech. II Year**

**Computer Science and Engineering**

&

**Information Technology**

(Effective from the session 2009-10)

**HCS-301**

**DATA STRUCTURES USING C**

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Unit - I

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors.


UNIT - II

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues.

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

UNIT – III


Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

UNIT – IV

Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

UNIT - V


File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.
Text Books:


HCS-302

OBJECT ORIENTED SYSTEMS

LT P
3 1 0

UNIT – I

Object Oriented Design and Modeling: Object oriented fundamentals, Objects and Classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract Classes, Object-Oriented Design Process, importance of modeling, principles of modeling, OOAD Methods.


UNIT – II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.
UNIT- III


UNIT-IV


UNIT – V

Object-Oriented Programming Languages, Dominant features of C++, Java and C#. Object Oriented Database design, Modern Object technologies and web services.

Case Study: The Unified Library Application.

Text and Reference Books:

5. Mark Priestley: Practical Object-Oriented Design with UML, TATA Mc-GrawHill

HCS-351

DATA STRUCTURES LAB

L T P
0 0 3
Write Program in C or C++ for following.

1. Array implementation of Stack, Queue, Circular Queue, List.
2. Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
3. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
5. Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm.
Lab exercises are to be carried out using C++, Java, C# and tools like Visio, ARGOMUL etc. Design and Implementation of an Object based application using any one of the above languages/tools is desirable.

HCS-403

COMPUTER ORGANIZATION

L T P
3 1 0

Unit-I (Representation of Information and Basic Building Blocks)
Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry lookahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro-Operation. ALU-Chip, Faster Algorithm and Implementation (multiplication & Division)

Unit-II (Basic Organization)

Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers

Unit-III (Memory Organization)

Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

Unit-IV (I/O Organization)


Unit-V (Process Organization)

Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8085): Addition of two numbers, Subtraction, Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn’s and Feng’s Classification, Parallel Architectural classification. Concept of Pipelining, Multi-Core Architecture.

Text and Reference Books:

Unit- I

**Introduction:** An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and database language and interfaces, Data definitions language, DML, Overall Database Structure.

**Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Unit- II

**Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus,

**Introduction to SQL:** Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL.

Unit- III
**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

**Unit- IV**

**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

**Unit- V**

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

**Text Books**

1. Date C J. “An Introduction To Database System”, Addision Wesley
Unit -I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -II

Elementary and Structured Data Types: Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types.

Unit -III

Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co routines, Scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism.

Unit -IV

Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

Unit -V
Operating and Programming Environment: Batch Processing Environments, Embedded system requirements, Theoretical models, Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language, Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc.

Text and Reference Books:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
Unit-I: Introduction


Unit-II: Software Requirement Specifications (SRS)


Unit-III: Software Design


Unit-IV: Software Testing


Unit-V: Software Maintenance and Software Project Management

Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse

Text and Reference Books:

5. Ian Sommerville, Software Engineering, Addison Wesley.
6. Pankaj Jalote, Software Engineering, Narosa Publication

HCS-451

Database Management System LAB

L T P

0 0 3

The Queries to be implemented on DBMS using SQL.

1. Write the queries for Data Definition and Data Manipulation language.
2. Write SQL queries using Logical operators (=, <, >, etc.).
3. Write SQL queries using SQL operators (Between… AND, IN(List), Like, ISNULL and also with negating expressions ).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for Relational Algebra (UNION, INTERSECT, and MINUS, etc.).
6. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join , Outer Join)
7. Write SQL queries for sub queries, nested queries.
8. Write programs by the use of PL/SQL.
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS.
10. Create VIEWS, CURSORS, and TRIGGRS & write ASSERTIONS.
11. Create FORMS and REPORTS.

*Students are advised to use Developer 2000/Oracle-9i version or other latest version for above listed experiments. However depending upon the availability of software’s, students may use Power Builder /SQL SERVER. Mini Project may also be planned & carried out through out the semester to understand the important various concepts of Database.

HCS- 452
SOFTWARE ENGINEERING LAB

L T P
0 0 3

1. Using any development tool like Rational Rose Perform SA/SD for the following types of problems.
   - Hotel Automation System
   - Book Shop Automation Software
   - Word processing Software
   - Software Component Cataloguing Software.
   - Payroll System
   - Banking System
   - Purchase Order System
   - Library Management System
   - Railway Reservation System
   - Bill Tracking System
   - College Admission System
2. Illustration of various activities of Software Project Management using MS Project 2000.

B. Tech. III Year
E-COMMERCE (HIT-501)

UNIT-I: Introduction

UNIT-II: Mobile Commerce

UNIT-III: Encryption

UNIT-IV: Electronic Payments

Overview of Electronics payments, Digital Token based Electronics payment System, Smart Cards, Credit Card / Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking.

UNIT-V: Net Commerce

EDA, EDI Application in Business, Legal requirement in E –Commerce.

Text and Reference Books:


OPERATING SYSTEMS (HCS-502)

L T P
3 1 0

Unit -I


Unit - II


Unit - III

Unit - IV

Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual' Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit - V


Text & Reference Books:

4. Tannenbaum, "Operating System Design and Implementation", PHI.
8. Crowley, "Operating System", TMH.
Unit-I


Unit-II

Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

Unit-III


Unit-IV


Unit-V

Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP).

Text and Reference Books:

5. DON Box, “Essential COM”, Addison Wesley.

DESIGN & ANALYSIS OF ALGORITHMS (HCS-503)

Unit -I

Unit -II


Unit -III


Unit -IV


Unit -V


Text & Reference Books:

1. Coreman, Rivest, Lisserson: “Algorithm”, PHI.

OPERATING SYSTEMS LAB (HCS-552)

L T P
0 0 2
Web based Address Book: This application can be used to keep track of your contacts/addresses. N Tier architecture is used to separate data layer, business layer and UI layers.

1. Simulation of the CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority Simulation of MUTEX and SEMAPHORES.
2. Simulation of Bankers Deadlock Avoidance and Prevention algorithms.
3. Implementation of Process Synchronization (Reader-Writer, Sleeping Barber and Dining Philosopher’s Problem)
4. Simulation of page Replacement Algorithms a) FIFO b) LRU c) LFU
5. Simulation of paging techniques of memory management.
6. Simulation of file allocation Strategies a) Sequential b) Indexed c) Linked
7. Simulation of file organization techniques a) Single Level Directory b) Two Level c) Hierarchical d) DAG

WEB TECHNOLOGY LAB (HIT-552)

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1. Design a HTML page to display your CV.
2. Design a HTML form to reserve a railway ticket.
3. Write a Java Script program that finds the greatest common divisor of two numbers.
4. In the form mentioned in problem 2 to reserve a railway ticket add the following validations using java Script.
   - From city and to city are two different cities.
   - Age of passengers should not be greater than 150.
   - Name of the passenger should be a string of a maximum length

5. Write a program for illustrating client/server side scripting with help of ASP.
6. Write a piece of code in XML for creating DTD, which specifies set of rules.
7. Create style sheet in CSS/XSL and display the document in Internet Explorer.
DESIGN AND ANALYSIS OF ALGORITHMS LAB (HCS-553)

Programming assignments on each of the following algorithmic strategy:

1. Divide and conquer method (quick sort, merge sort, Strassen’s matrix multiplication).
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem).
7. Selection: Minimum/ Maximum, \( k \)th smallest element.

INFORMATION SYSTEMS (HIT-601)

Unit-I

Foundation of Information Systems: Introduction to information system in business, fundamentals of information systems, solving business problems with information system, concept of balanced MIS, effectiveness & efficiency criteria.

Unit-II


Unit-III

Implementation, Operation, Evaluation and Maintenance, Structured System Methodologies, Automated systems development, Hardware/Software selection, Systems function management.
Information system for business operations, information system for managerial decision support, information system for strategic advantage.

**Unit-IV**

Managing Information Technology: Enterprise and global management, security & ethical challenges planning & implementing changes.

**Unit-V**


**Text and Reference Books:**

1. O. Brian, "Introduction to Information System", McGraw Hill.
2. O. Brain, "Management Information System", TMH
3. Ashok Kumar Sharma, "Analysis Design & Implementation of Information Systems: A Transition to Objects".
5. Arora & Bhatia, "Information System for Managers", Excel

**COMPUTER NETWORKS (HCS-604)**

**Unit -I**


**Unit-II**

Unit - III


Unit - IV


Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.

Text and Reference Books:

1. Forouzen, "Data Communication and Networking", TMH

SOFTWARE PROJECT MANAGEMENT (HIT-602)

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UNIT-I: Introduction and Software Project Planning


UNIT-II: Project Organization and Scheduling

UNIT-III: Project Monitoring and Control


UNIT-IV: Software Quality Assurance and Testing


UNIT-V: Project Management and Project Management Tools


Text and Reference Books:


INFORMATION SYSTEMS LAB (HIT-651)

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List of Projects are as follows (Implement any one)

1. Shopping cart project using ADO.NET: This sample project has all basic features required for a shopping cart web site including Login, Registration, Add to Cart, Checkout etc. A good ASP.NET learning project using C#, ASP.NET, SQL Server.
2. Personal Assistant: This is a small project for managing personal details. Current version of this project support Address Book feature - Add, Edit and Manage contacts and addresses using VB.NET.
3. Address Book: This is a small project for managing contact details. This is a C# version of the 'Personal Assistant' project.
4. School Management System: This is a project for managing education institutes using C#.
5. Library Management System: This is an academic project for students using Java.
6. Spider Alerts & Web services: This project communicates with web services and downloads Alerts from the web server using Java & XML.
7. Patient Information System: This software can be used to keep track of the patients’ information and treatment details in a hospital or clinic. Some of the advanced features include patient consulting, lab information, billing etc using JSP, Servlet & JDBC.

COMPUTER NETWORKS LAB (HCS-654)

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1. Implementation of the Data Link Layer framing method such as character stuffing and bit stuffing in C.
2. Implementation of CRC algorithm in C.
3. Implementation of a Hamming (7, 4) code to limit the noise. We have to code the 4 bit data in to 7 bit data by adding 3 parity bits. Implementation will be in C.
4. Implementation of LZW compression algorithm in C.
5. Write a socket program in C to implement a listener and a talker.
6. Simulation of a network of 3 nodes and measure the performance on the same network.
7. Write a program in C to encrypt 64-bit text using DES algorithm.
Do the exercises based on the following aspects of SPM:

2. Preparing and Comparing Gantt Chart.
3. Drawing Pert Chart and finding critical paths.
4. Resource Management
5. Time Scheduling and Management.

# Exercises can be done on any of the following using MS Project or any other CASE Tool.

- Intranet
- Library Automation
- Academic Management
- Departmental Store Management.
- Hotel management

B. Tech. IV Year

Information Technology

(Effective from the session 2011-12)
Cryptography and Network Security (HIT-701)

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

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

Unit-V

Text and Reference Books:


ARTIFICIAL INTELLIGENCE (HIT-702)

UNIT-I: Introduction

Introduction to Artificial Intelligence, Brief history, Various approaches to AI, Areas of application, Simulation of sophisticated & Intelligent Behavior in different area, Problem solving in games, natural language processing, automated reasoning, and visual perception, Knowledge and its role in AI, Heuristic algorithm versus solution guaranteed algorithms, Introduction to soft computing.

UNIT-II: Searching in State Space


UNIT-III: Knowledge Representation and Reasoning

UNIT-IV: Understanding Natural Languages.

Various Approaches of NLP, Parsing techniques, Context free and transformational grammars, Transition nets, Augmented transition nets, Fillmore's grammars, Grammar free analyzers, Sentence generation, and translation, Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine Perception, Object Identification, Speech Recognition.

UNIT-V: Expert Systems


Text and Reference Books:

7. Lioyed, “Foundation of Logic Processing”, Springer Verlag
8. D. W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI.

DATA MINING AND DATA WAREHOUSING (HCS-703)

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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 K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods-STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier 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.

Text and Reference Books:

1. M.H.Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education
2. Jiawei Han, Micheline Kamber, “Data Mining Concepts & Techniques”, Elsevier
Unit-I: Introduction

Architecture of distributed systems: A detailed review of distributed system architecture (network operating system, distributed operating systems, etc.) will be presented leading to distributed database systems. This will then be categorized into (a) federated database systems, (b) Multi-database systems, and (c) Client/Server systems. Advanced transaction model: For managing data processing on distributed platform the conventional transaction model needs some improvements. Discussion of some advanced transaction models suitable for different types of distributed database systems.

Unit-II: Workflow

It is a unit of business processing. From conventional viewpoint it is a set of tightly linked atomic processing units which requires special concurrency control and commit protocols. Discussion of existing ways of handling workflows.

Unit-III: Query processing and Optimization: On distributed systems a query may be fragmented for processing on multiple nodes. This give rise to the problem of query fragmentation and distribution which must be addressed for improving performance.

Unit-IV: Application distribution: To support parallel and concurrent processing of transactions processing application have to be distributed. This gives rise to application recovery problem. This course will explore new ways of managing application recovery which is more complex than database recovery.

Unit-V: Transaction management, commit protocol and database recovery: These are system related issues. We will discuss commonly used schemes and advanced protocols for managing these activities.

Buffer management: Database maintains their own buffer for processing transactions. We will discuss the buffer architecture and buffer management schemes (replacement, allocation, etc.)

Text and Reference Books:

1. Distributed Systems: Concept and Design. Coulouris, Dollimore, and Kindberg., AW.

SERVICE ORIENTED ARCHITECTURE (HCS-705)

UNIT-I: SOA Fundamentals
Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment

UNIT-II: SOA Planning and Analysis
Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA).

UNIT-III: SOA Design
Service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing.

UNIT-IV: SOA Implementation
Implementing SOA, security implementation, implementation of integration patterns, services enablement, Quality assurance, A brief overview of tools available for SOA Implementation.

UNIT-V: Managing SOA Environment
Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrics), QoS compliance in SOA governance, role of ESB in SOA governance, impact
of changes to services in the SOA lifecycle.

Text and Reference Books:


DOT NET & C# (HIT-702)

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Unit-I


Unit-II

C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.

Unit-III

Unit-IV
Advanced Features Using C#: Web Services, Windows services, messaging, Reflection, COM and C#, Localization.

Unit-V
Advanced Features Using C#: Distributed Application in C#, XML and C#, Unsafe Mode,
Graphical Device Interface with C#, Case Study (Messenger Application)

Text and Reference Books:
2. Shildt, “C#: The Complete Reference”, TMH
6. Balagurusamy, “Programming with C#”, TMH

ERP SYSTEMS (HIT-703)
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Unit-I
Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

Unit-II
Unit- III
Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective.

Unit- IV
Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

Unit- V
Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

Text and Reference Books:

BIOINFORMATICS (HCS-708)

Unit-I: Introduction
Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools, Metadata: Summary & reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, Overview of the bioinformatics applications.
Unit-II: The Information Molecules and Information Flow

Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, Transcription, Translation, Genes- the functional elements in DNA, Analyzing DNA, DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit-III: Perl

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, Understanding and Using Biological Databases, Java clients, CORBA, Introduction to biostatics.

Unit-IV: Nucleotide

sequence data Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit-V: Biological data types and their special requirements: sequences, macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: alignments, regular expressions, hierarchies and graphical models.

Text and Reference Books:

1. O’Reilly, “Developing Bioinformatics computer skills”, Indian Edition’s publication
2. Rastogi, Mendiratta, Rastogi, “Bioinformatics concepts, skills & Applications”, CBS Publishers
4. “Bioinformatics”, Addison Wesley

CRYPTOGRAPHY & NETWORK SECURITY LAB (HIT-751)

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The following programs should be implemented preferably on ‘UNIX’ platform using ‘C’ language (for 1-5) and other standard utilities available with ‘UNIX’ systems (for 6-8):

1. Implement the encryption and decryption of 8-bit data using 'Simplified DES Algorithm(created by Prof. Edward Schaefer) in ‘C’.
2. Implement ‘Linear Congruential Algorithm’ to generate 5 pseudo-random numbers in ‘C’.
4. Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in ‘C’.
5. Implement RSA algorithm for encryption and decryption in ‘C’.
6. Configure a mail agent to support Digital Certificates, send a mail and verify the correctness of this system using the configured parameters.
7. Configure SSH (Secure Shell) and send/receive a file on this connection to verify the correctness of this system using the configured parameters.
8. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:
   a. Two neighborhood IP addresses on your LAN
   b. All ICMP requests
   c. TCP SYN Packets

**DISTRIBUTED SYSTEMS (HCS-801)**

**Unit–I**

**Characterization of Distributed Systems**: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges.

**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 deadlock detection, Distributed deadlock 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.

**Security**: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent.


**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.

**Text and Reference Books:**

**MOBILE COMPUTING (HIT-801)**

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.

**Text and Reference Books:**

1. J. Schiller, Mobile Communications, Addison Wesley.
2. A. Mehrotra, GSM System Engineering.
MULTI CORE ARCHITECTURE (HCS-803)

Unit-I: Multi-core Architectures

Introduction to multi-core architectures, issues involved into writing code for multi-core architectures, Virtual Memory, VM addressing, VA to PA translation, Page fault, TLB- Parallel computers, Instruction level parallelism (ILP) vs. thread level parallelism (TLP), Performance issues, OpenMP and other message passing libraries, threads, mutex etc.

Unit-II: Multi-threaded Architectures

Brief introduction to cache hierarchy - Caches: Addressing a Cache, Cache Hierarchy, States of Cache line, Inclusion policy, TLB access, Memory Op latency, MLP, Memory Wall, 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-III: Compiler Optimization Issues


Unit-IV: Control Flow analysis

**Unit-V: Data-Flow Analysis**

Data Flow analysis, Interval Analysis, Backward Analysis, Available Expression, Live variable Analysis, Very busy Expression, pointer analysis, alias analysis; Data Dependence Analysis: data Dependence, solving data dependence equations (integer linear programming problem); Data Dependency graph, Basic Block dependence, Data Dependence in loops, iteration space, iteration Vector, Data dependency in parallel loops, Loop optimizations.

**Text and Reference Books:**

2. Shameem Akhter and Jason Roberts, Multi-Core Programming, Intel Press, 2006

**EMBEDDED SYSTEMS (HCS-804)**

**UNIT-I: Introduction to Embedded Systems**

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

**UNIT-II: Devices and Buses for Devices Network**
UNIT-III: Programming Concepts and Embedded Programming in C

Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions - Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of ‘C’ Program compilers – Cross compiler – Optimization of memory codes.

UNIT-IV: Real Time Operating Systems

Timing and clocks in embedded system, Task modeling and management: RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics – Co-operative Round Robin Scheduling – Cyclic Scheduling with Time Slicing (Rate Monotonics Co-operative Scheduling) – Preemptive Scheduling Model strategy by a Scheduler – Critical Section Service by a Preemptive Scheduler – Fixed (Static) Real time scheduling of tasks

UNIT-V: Embedded Control

Embedded control and control hierarchy, communication strategies for embedded system: encoding and flow chart. Fault tolerance and formal verification.

Text and Reference Books:

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc.,
Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems,
Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time
Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin
Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-
First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling
Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Access Control

Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections,
Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of
Priority-Ceiling Protocol in Dynamic nPriority Systems, Preemption Ceiling Protocol, Access Control in
Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

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

Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service
Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet
and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An
Overview of Real Time Operating Systems.

Text and Reference Books:


SOFT COMPUTING (HIT-802)

Unit-I: Artificial Neural Networks

Unit-II: Fuzzy Systems
Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III: Neuro-Fuzzy Modelling

Unit-IV: Genetic Algorithms
Survival of the Fittest - Fitness Computations - Crossover - Mutation - Reproduction - Rank method - Rank space method.

Unit-V: Soft Computing and Conventional AI

Text and Reference Books:
UNIT-I: Introduction


UNIT-II: Software Quality Metrics


UNIT-III: Software Quality Management and Models


UNIT-IV: Software Quality Assurance


UNIT-V: Software Verification, Validation & Testing:

Text and Reference Books:


SOFTWARE TESTING (HCS-808)

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Unit-I: Introduction

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing

White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

**Unit-V: Test Management and Automation**


**Text and Reference Books:**


**MOBILE COMPUTING LAB (HIT-851)**

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Experiments/Exercises based on simulation, working and performance analysis of various mobile systems are to be done on tools like NS2, NetSIM, GlomoSIM, and MATLAB.

**DISTRIBUTED SYSTEMS LAB (HCS-851)**
The following programs should be developed preferably on ‘**UNIX**’ platform:-

1. Simulate the functioning of Lamport’s Logical Clock in ‘C’.
2. Simulate the Distributed Mutual Exclusion in ‘C’.
3. Implement a Distributed Chat Server using TCP Sockets in ‘C’.
4. Implement RPC mechanism for a file transfer across a network in ‘C’.
5. Implement ‘Java RMI’ mechanism for accessing methods of remote systems.
7. Implement CORBA mechanism by using ‘C++’ program at one end and ‘Java’ program on the other.