

**Semester - I**  
**P.1. Mathematical Foundations of Computer Science**  
**(Hrs of Instruction Per Week: 4)**

- Unit 1: Matrices** (8 Hrs)  
Types of Matrices - Matrix operations- Inverse of matrix – properties of Determinants – Eigen values- Cayley – Hamilton theorem.
- Unit 2: Set Theory** (8 Hrs)  
Basic set operations – Relations and functions – Relation matrices – Principles of mathematical Induction.
- Unit 3: Introduction to Probability** (8 Hrs)  
Sample space and Events – Axioms of Probability – Conditional Probability – Independence of Events – Baye’s Theorem.
- Unit 4: Regression and correlation** (8 Hrs)  
Linear Regression – Method of Least Squares – Correlation Coefficient – Rank Correlation Coefficient.
- Unit 5: Grammars and Languages** (8 Hrs)  
Context Free Grammars – Introduction – Context Free Grammars – Derivation Trees.
- Unit 6: Finite Automata** (8 Hrs)  
Finite State Systems – Basic Definitions – Non Deterministic finite Automata.
- Unit 7: Mathematical logic: Statements and Notations** (8 Hrs)  
Connectives – Normal Forms - Equivalence of Formulas.
- Unit 8: Automatic Theorem Proving & Rules for Conditional Proofs** (8 Hrs)  
Variables-Connectives-String of Formulas-Sequents-Axiom Schema-Theorem-Rules-Indirect method –Direct method of proving.
- Unit 9: Numerical methods** (8 Hrs)  
Finding Rules: Bisection Method - Regula - Falsi Method – Newton –Raphson Method.
- Unit 10: Solution of Simultaneous Linear Equations** (8 Hrs)  
Gauss-Elimination Method –Gauss – Seidal Method Numerical Integration: Trapezoidal Rule – Simpson’s  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  Rules .

**Reference Books**

1. M.K.Venkatraman, “Engineering Mathematics”, Volume II, National Publishing Company, 2000.
2. Trembly and Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill, 2002.
3. Radha Muthu, T.Santha, 'Discrete Mathematics for Computer Science and Applications', Kalaikathir Achchagam, Coimbatore, 2003.
4. Goel and Mittal, 'Numerical Analysis in Engineering', Pragati Prakashan, Merut 2003.
5. S.P.Gupta, "Statistical Method", Sultan Chand & Sons, New Delhi, Reprint 2006.

**P.2 Computer Organization And Architecture**

**(Hrs of Instruction Per Week: 4)**

**Unit 1:** **(8 Hours)**

Number system– Conversion from one to another – Complements – Binary Codes. Basic logic Gates – Basic Theorems and Properties of Boolean Algebra – NAND, NOR implementation – Sum of Product – Product of Sums – Karnaugh Map – Tabulation – Don't Care Conditions.

**Unit 2:** **( 8 Hours)**

**Combinational Logic Circuit Design:** Multiplexers – Demultiplexers – Decoders – Encoders - Half Adder – Full Adder - Subtractor – Parallel Adder. Flip-flops: RS, D, JK Flip-flop – Registers – Shift Registers – Ripple Counters - Synchronous Counters.

**Unit 3:** **(8 Hours)**

Data representation – Data types – Complements, fixed point and floating point representation other binary codes – Micro operations: Register transfer languages, Register transfer, Bus and Memory transfer, Arithmetic, logic, and shift micro operations, Arithmetic logic shift unit

**Unit 4:** **(8 Hours)**

Micro programmed control – Control memory – Address sequencing – Micro program example – Design of control unit.

**Unit 5:** **(8 Hours)**

**Central processing unit:** General register Organization - Stack organization- Instruction formats – Addressing modes - Data transfer Instructions and Data Manipulation Instruction – Program control Instructions – Reduced Instruction Set Computers (RISC)

**Unit 6:** **(8 Hours)**

**Computer Arithmetic:** Introduction – Addition and Subtraction Algorithms - Multiplication Algorithm – Booth Multiplication – Array Multipliers – Division Algorithm – Floating point Arithmetic Operations – Decimal Arithmetic operations.

**Unit 7:** **(8 Hours)**

Input – Output organization – Peripheral devices - Input-output Interface- Asynchronous Data transfer - Modes of transfer - Priority interrupt - Direct memory Access - I/O processor - serial communications.

**Unit 8:** **( 8 Hours)**

Memory organizations – Memory hierarchy – Main memory – Auxiliary memory – Associative memory - Cache memory - Virtual memory - Cache coherence- Memory management hardware.

**Unit 9:****(8 Hours)**

Pipeline and vector Processing – Parallel Processing – Pipelining – Arithmetic Pipeline - Instruction Pipeline Processors –RISC Pipeline – Vector processing – Array Processors

**Unit 10:****(8 Hours)**

Multiprocessors and Multicomputers: Multiprocessor System Interconnects-Cache Coherence and Synchronization Mechanisms – SIMD Computers: SIMD Computer Organization – Implementation

**REFERENCE BOOKS:**

1. Morris Mano, “Digital Logic and Computer Design”, PHI/Pearson Education, 2001
2. Morris Mano, “Computer System Architecture”, Third Edition, PHI/ Pearson Education, 2001
3. Kai Hwang, “Advanced Computer Architecture”, Tata-McGraw Hill Edition, 2001
4. William Stallings, “Computer Organization & Architecture – Designing for Performance”, Pearson Education, Sixth Edition, 2002.
5. Hennessey&D.A.Patterson, ”Computer Architecture: A Quantitative approach” International Student Edition, Third Edition, 2002, Morgan Kaufmann publisher.

**P.3 Advanced Operating Systems**

**(Hrs of Instruction Per Week: 4)**

- Unit 1: Introduction to Operating system** (8 hrs)  
Process concept - Process state transition - process control block - operation on processes - suspend and resume - interrupt processing - nucleus of the operating system.
- Unit 2: Parallel Processing** (8 hrs)  
Asynchronous concurrent processes - parallel processing control structures for indicating parallelism - mutual exclusion - critical sections - mutual exclusion primitives – semaphores. Deadlock: Deadlock Definition - examples - deadlock prevention, avoidance, detection and recovery.
- Unit 3: Storage management** (8hrs)  
Real storage - storage organisation - management hierarchy - storage management strategies - contiguous and non contiguous storage allocation - fixed and variable partition, multi-programming - storage swapping. Virtual storage organisation: Concepts - paging - segmentation – paging / segmentation systems - virtual storage management - strategies - page replacement.
- Unit 4: Process management** (8 hrs)  
Job processor scheduling - objectives - preemptive vs non preemptive scheduling - priorities - scheduling techniques - multi processing - hardware organisation. Multiprocessor operating system organisation – Processor Interconnection.
- Unit 5:File System and Case Studies** (8hrs)  
File System, Case Studies: UNIX Operating systems, Windows operating systems
- Unit 6: Distributed Operating Systems** (8 hrs)  
Distributed Systems – Goals,hardware concepts,Software Concepts,Design Issues.
- Unit 7: Communication in Distributed Systems** (8 hrs)  
Layered Protocols,The Client-Server Model, Remote Procedure Call.
- Unit 8: Processes and Processors in Distributed Systems** (8 hrs)  
Threads, System Models, Processor Allocation, Scheduling in Distributed Systems.
- Unit 9: Real Time Operating Systems** (8 hrs)  
Real Time operating Systems: Introduction-Performance measures for Real Time Systems –Estimating program Run Times.Task Assignment and Scheduling:Introduction-Classical uniprocessor – RM Scheduling Algorithm[only description]-Preemptive EDF Algorithm[only description]-Task Assignment-Mode changes-Fault Tolerant Scheduling.
- Unit 10:** (8 hrs)  
Real time databases Real Time Vs General purpose Database-Main memory databases - Transaction priorities - Transaction aborts - Concurrency control issues-Databases for hard real time systems-Real time communications.

**Reference Books:**

1. Harvey M.Deital, “An Introduction to Operating Systems”, Addison Wesley, Publishing Company, 2000.
2. Andrew S.Tanenbaum ‘Modern Operating Systems’,Prentice Hall of India,5<sup>th</sup> Edition 2006.
3. C.M.Krishna and Kang G.Shin, ‘Real-Time Systems’,McGraw Hill,2000.

**P.4 DATABASE MANAGEMENT SYSTEMS**

**(Hrs of Instruction Per Week: 4)**

- Unit 1: Overview of Database Management (8 hours)**  
 Introduction to Database Systems - Overview - File system versus DBMS - Advantages of DBMS - Describing and storing data in a DBMS - Data models - Database languages - Database system structure- History of Database Systems- Applications.
- Unit 2: Introduction to Relational model (8 hours)**  
 Relational model – integrity constraints over relations- enforcing integrity constraints – Querying relational data – logical database design – Functional dependency – lossless join and dependency.
- Unit 3: Relational Model (8 hours)**  
 SQL – Basic structure – set operations – complex queries – joined queries – DDL – Embedded SQL – Dynamic SQL – other SQL functions – Query by example – Integrity and security of searching-relational database design.
- Unit 4: Normalization (8 hours)**  
 Preventing decomposition-third normal form-Boyce codd normal form-multivalued dependency-fourth normal form-join dependency-project join normal form-domain key normal form.
- Unit 5: Entity Relation Model and Data protection (8 hours)**  
 Overview of E/R model-E/R diagrams-Database design with E/R model-Concurrency-privacy-security-integrity.
- Unit 6: Data storage and indexing (8 hours)**  
 Storage & File structure- Disks-RAID-File Organization-Indexing & Hashing-B+TREE-B Tree-Static Hashing-Dynamic hashing-Multiple Key Access.
- Unit 7: Query Evaluation & Optimization (8 hours)**  
 Query Processing-Selection Operation-Sorting-Join Operation-Evaluation of Expressions-Query Optimization
- Unit 8: Transaction Management (8 hours)**  
 Transaction Concept-Static Implementation-Concurrency Control-Protocols-Deadlock Handling-Recovery Systems-Recovery with Concurrent Transactions-Shadow Paging-Buffer Management-Case Studies-Oracle-Microsoft SQL Server
- Unit 9: Distributed Databases (8 hours)**  
 Introduction-Networks-Data Distribution-Object Naming-Consistency-Concurrency Control-Distributed Commitment and Recovery-Deadlocks in Distributed Systems-Homogeneous and Heterogeneous Systems. Introduction to OODBMS:Object Approach. Knowledge Based Systems.
- Unit 10: Object Oriented Databases (8 hours)**  
 Object-Oriented Concepts - Characteristics of an Object-Oriented Data Model – OODM and Previous Data Models: Similarities and Differences – Object-Oriented Database Management Systems – How Object Orientation Affects Database Design – OODBMS: Advantages and Disadvantages – OO Concepts in Relational Model – The Next Generation of Database Management Systems. Advanced Data Types and New Applications: Motivation – Time in Databases – Spatial and Geographic data – Multimedia Databases – Mobility and Personal Databases.

## REFERENCES

1. Ramez Elmasri and Shamkant B.Navathe,"Fundamental Database Systems", Third Edition, Pearson Education, 2003.
2. Raghu Ramakrishnan,"Database Management System", Tata McGraw-Hill Publishing Company, 2003.

3. Peter Rob and Corlos Coronel-“Database System, Design, Implementation and Management”, Thompson Learning Course Technology-Fifth Edition, 2003.
4. C.J.Date,”An Introduction to database systems”, Addison Wesley, Third Edition, 2006.
5. Abraham Silberschatz, Henry F.Korth and S.Sudarshan-“Database System Concepts”, Fourth Edition, McGraw-Hill, 2002.

**P.5 Computing Lab – I**  
**(Data Structures & Object Oriented Programming)**  
**Hrs of instruction per week: 2+4**

**Unit 1:Introduction** (4 hrs)  
Introduction – Data Types – Control Structures – Operators.

- Unit 2: Functions** (4 hrs)  
 Standard Library Functions – User Defined Functions – Declaration And Definitions – Parameter Passing – Inline Functions – Overloading – Strings – String I/O.
- Unit 3: Arrays** (4 hrs)  
 Arrays – Passing Arrays to Functions – Search Algorithms – Sorting Algorithms.
- Unit 4: Pointers** (4 hrs)  
 Pointers And References – Objects – New Operator – Delete Operator, Pointers to Pointers – Pointers to Arrays – Arrays of Pointers – String Handling.
- Unit 5: Classes** (4 hrs)  
 Classes – Constructors – Destructors – Overloading Operators – Inheritance.
- Unit 6: Virtual Functions** (4 hrs)  
 Virtual Functions – Friend Functions - Polymorphism.
- Unit 7: Templates** (4 hrs)  
 Templates And Iterators – Container Classes – Iterator Classes.
- Unit 8:** (4 hrs)  
 UML Specifications – Abstract Data Types – Linked Structures – Operations – Stacks, Queues.
- Unit 9: Binary Trees** (4 hrs)  
 Binary Trees – Traversal Algorithms – Search Trees – AVL Trees – BTrees.
- Unit 10: Graphs** (4 hrs)  
 Graphs – Depth First and Breadth first Search – Minimal spanning tree- Shortest Path – Dijkstra's Algorithm.

**Reference Books:**

1. John Hubbard, Programming with C++, Schaum's Outline Series, Mcgraw Hill, 2002.
2. Tremblay and Sorenson, Introduction to Data Structures with Applications, Mcgraw Hill, 2002.

**List of Programs****Hours of Instruction per week:2+4**

- Program for illustrating Parameter passing.
- Programs for String Functions
- Program for extracting a substring from a given string and to replace portion of a string.
- Program to perform string reversal and palindrome checking.
- Program to perform linear search on an array of numbers.
- Program to perform binary search on an array of numbers.
- Program to perform insertion sort and selection sort.
- Program to implement heap sort.
- Program to Implement Stack Operations.
- Program Using Stacks and an appropriate interface to convert an expression from infix to Postfix Form.
- Program using stacks to implement recursion.
- Program for Linked List Operations.
- Programs to Implement Binary Trees and Traversal Algorithms.
- Programs to Implement – BTrees.Perform insertion and deletion operations
- Programs to Implement – B<sup>+</sup>Trees.Perform insertion and deletion operations
- Program to implement a dictionary and its operations using Trie.
- Programs for Implementing Depth First and Breadth First Search in graphs.
- Program for Constructing minimal spanning trees.
- Program for Finding Shortest Path using Dijkstra's Algorithms.
- Program to implement queues, priority queues

## P.6 Computing Lab II (VB.NET with Oracle)

**Hrs of instruction per week: 2+4**

- Unit 1:** (4 Hrs)  
Introduction to DBMS, File Systems vs. Database Systems, Data Dictionary, Database Languages, Overall DBMS structure, Advantages and Disadvantages of DBMS, Concept of Data Models.
- Unit 2:** (4 Hrs)  
Relational Model: Overview, Structure of Relational Databases, Integrity Constraints.  
SQL: Introduction to Oracle, SQL Features, Types of SQL, Data types in SQL, CREATE TABLE command, INSERT statement.
- Unit 3:** (4 Hrs)  
Basic SELECT statements, IN and BETWEEN operator, LIKE, IS, NULL, Aggregate functions, GROUP BY and HAVING clause, Set operators, Join and Sub query.
- Unit 4:** (4 Hrs)  
Other DML commands: DELETE, UPDATE commands; Other DDL commands: ALTER, TABLE, DROP TABLE; Other SQL Functions: Character Functions, Numeric Functions, Date Functions, Conversion Functions, Date Arithmetic.
- Unit 5:** (4 Hrs)  
Database Authorization: User management, Role, Privileges; Data Control Language: GRANT, REVOKE; Transaction Control Language (TCL): COMMIT, ROLLBACK, SAVEPOINT etc. View in SQL, Indexes, Sequence, Dynamic SQL, Database Triggers.
- Unit 6:** (4 Hrs)  
Overview of PL/SQL: Basic Structure, Constructs, and Cursors, Exception handling- Named Oracle Exception handlers, User defined exception handling, Function, Procedure, Overview of Packages- Package Spec, Package Body, Package Uses.
- Unit 7:** (4 Hrs)  
Introduction- The .NET framework & Common Language Runtime- Getting Started with VB .NET- Concept of event handling- Data Types, Basic Constructs & Program Flow, Procedures/Functions, Introduction to IDE, Tools, SDI/MDI applications, Namespaces.
- Unit 8:** (4 Hrs)  
Windows Forms – Form designer, anchoring & docking, Menus, Multiple Forms, working with Basic Form Controls, controls collection-Advanced Form Controls, Dialog Boxes, Using Dialog Controls, Custom Dialog Controls, File Handling. Visual Basic Language – Operators & Conditionals & Loops- Procedures & Functions- Understanding Scope- Exception handling.
- Unit 9:** (4 Hrs)  
Web Application in VB. NET- Working with web forms and web form controls – Buttons, Textboxes, Labels, Literals & Place Holders- Using other controls in Web form - HTML Client controls & server controls.
- Unit 10:** (4 Hrs)  
Database Access with ADO .NET- Accessing data with Server Explorer-Accessing data with Data Adaptors & Datasets- Working with ADO .NET- Database Access in Web Application- Simple & complex data binding- Binding data grids and standard web server controls- Navigating in Datasets.

### Reference Books

1. George Koch, Keon Loney, "Oracle 8, The Complete Reference".Tata McGraw Hill.2000.
2. Ivan Bayross , "SQL/PLSQL",p BPB Publications,2003
3. Richard Blair et al "Beginning VB.Net(2<sup>nd</sup> Edition)" Wrox Press, 2003
4. Steven Holzner : Visual Basic .NET Programming Black Book DeramTech Press.
5. Jeffrey Kent : Visual Basic .NET A Beginner's Guide Tata McGraw-Hill Pub. Co. Ltd.

**List of Problems****Hours of instructions per week: 2+4**

- Design an Oracle application using SQL statements.
- Design an Oracle application using Built-in functions.
- Design an Oracle application using PL/SQL Block.
- Design an Oracle application using Cursors.
- Design an Oracle application using Procedures, Functions and Packages.
- Design an Oracle application using Triggers.
- Design an Oracle application using User defined and built-in Exception Handling.
- Design a VB.NET application using basic form controls.
- Design a VB.NET application using I/O and Control statements.
- Design a VB.NET application using Built-in Functions.
- Design a VB.NET application using Procedures and Functions in a module.
- Design a VB.NET application using structures and arrays.
- Design a VB.NET application using MDI and Menus.
- Design a VB.NET application to implement structured Exception handling.
- Design a VB.NET application using advanced Form controls.
- Design a VB.NET application using File Handling.
- Design a VB.NET application using client and server controls.
- Create a data access application using Data Form Wizard using ADO.NET Objects.
- Design a VB.NET application to access data with ADO.NET using data grids.
- Deploying a Windows-based Application using the Setup Wizard.

**Semester II**

## P.7 ADVANCED DATA STRUCTURES AND ALGORITHMS

**Hours of Instruction per week: 4**

**Unit 1: Advanced Data Structures**

(8 hrs)

Red black trees-AVL trees- B-trees-Heaps-Data structures for disjoint sets.

**Unit 2: Graph Theory, Shortest path**

(8 hrs)

Elementary Graph algorithms: Representation of graphs-BFS-DFS-Topological sort-Strongly connected components- Single source shortest paths: Shortest paths and relaxation-Dijkstra's algorithm-Bellman -Ford algorithm-Single source shortest paths in directed acyclic graphs-difference constraints and shortest paths.

**Unit 3: Dynamic Programming, Greedy algorithm, Amortized analysis**

(12 hrs)

Matrix-chain multiplication-Elements of dynamic programming-Longest common subsequence-Optimal polygon triangulation.Greedy algorithm: An activity selection problem-Elements of greedy strategy-Huffman codes-Theoretical foundations for greedy methods-task scheduling problem. Amortized analysis: Aggregate method-accounting method-potential method-Dynamic tables.

**Unit 4: Polynomial Representation and FFT**

(6 hrs)

Representing Polynomials-DFT & Fft-Operations-FFT implementations.

**Unit 5: Integer and Polynomial Arithmetic**

(8 hrs)

Similarity between integers and polynomials-Integer multiplication and division-Polynomial multiplication and division-Elementary number theoretic notions-Greatest Common Divisor-Modular Arithmetic-Solving modular linear equations-Chinese Remainder Theorem-powers of an Element-RSA Public Key Crptosystem-Primality Testing-Integer Factorization.

**Unit 6: NP Completeness**

(8 hrs)

Polynomial time-polynomial time verification-NP-completeness and reducibility-NP-completeness proofs-NP-complete problems.

**Unit 7: Matrix Operations**

(8 hrs)

Properties of matrices-strassen's algorithm for matrix multiplication-Algebraic number systems and Boolean matrix multiplication-Solving systems of linear equations-Inverting matrices-Symmetric positive definite matrices and least squares approximation.

**Unit 8 :Algorithm for Parallel Computers**

(8 hrs)

Pointer jumping-CRCW Algorithms Vs EREW Algorithms-Brent's theorem and work Efficiency-Work Efficient Parallel Prefix Computation-deterministic Symmetry breaking.

**Unit 9: String Matching Algorithms**

(8 hrs)

The Naïve string matching algorithm-Rabin-Karp algorithm-string matching with finite automata-Knuth Morris pratt algorithm-Boyer-Moree algorithm.

**Unit 10 : Advanced Algorithms**

(6 hrs)

Computational Geometry: Line segment properties-Determining whether any pair of segments intersects-Finding the convex hull-Finding the closest pair of points. Approximation Algorithms : Vertex cover problem-set covering problem-subset problem.

**Reference Books:**

1. Thomas H. coromen, Charles E. Leiserson,Ronald L. Riverst,"Introduction to algorithms", Prentice-hall 2007.
2. Aho, Hopcraft, Ullman,"The Design and analysis of computer Algorithms", Wesley 2006.

## P.8 Systems Software and Compiler Design

Hours of Instruction per week : 4

- Unit 1:** (4 Hrs)  
Evaluation of Components of a Programming System: Assemblers, loaders, Macros, Compilers, Formal Systems.
- Unit 2:** (4 Hrs)  
General Machine Structure, Machine Language, Assembly Languages.
- Unit 3:** (8 Hrs)  
Macros- Features, Implementation, Loaders – Schemas – Compile and Go – Absolute Loaders, Relocating Loaders, Direct Linking Loaders.
- Unit 4:** (8 Hrs)  
Compilers – Phases – Lexical and Syntactic Analysis – Intermediate Code Generation- Syntax Directed Transaction.
- Unit 5:** (10Hrs)  
Parsing - Operator Precedence, Predictive, LR Parsers.
- Unit 6:** (10Hrs)  
Intermediate Code Generation – Types of Intermediate Code – Code Generator- Problems in Code Generation – Machine Model.
- Unit 7:** (10Hrs)  
Basic Blocks and Flow Graphs – Next use Information – Register Allocation and Assignment.
- Unit 8:** (10Hrs)  
Run time storage Administration – Heaps – Stacks - Static and Dynamic Allocation Schemes.
- Unit 9:** (10 Hrs)  
Symbol Table Organization – Data structures for Implementing symbol Tables.
- Unit 10:** (6 hrs)  
Code Optimization –Sources of Optimization – peephole Optimization.

### References:

1. John J.Donovan, “System Programming “, McGraw Hill, 2003.
2. “Principles of Compiler Design”, Alfred V.Aho and Jeffrey D.Ullman. Addison Wesley Publishers 2000.

## P.10 Computing Lab-III (Java)

**Hrs of instruction per week: 2+4**

**Unit 1: (4 hrs)**

Java Programming: Constants, Variables and Data Types – Operators and Expressions – Decision Making and Branching – Decision Making and Looping

**Unit 2: (4 hrs)**

Variables –Array –Strings –Classes and Objects –creating objects-Access control-Public – Private ,Protected –Static methods.

**Unit 3: (4 hrs)**

THIS keyword –retrieving objects - passing objects as parameters –Overloading, interface , basic concepts-use of super keyword – method overriding –final keyword –abstract classes.

**Unit 4: (4 hrs)**

Packages and interfaces – access protection – implementing interfaces –dynamic interface usages- extended interfaces –Package hierarchy – hiding the class –importing packages – access modifier

**Unit 5: (4 hrs)**

**String** constructors – String methods: length, charAt, getChars, miscellaneous string methods – sub strings and concatenating strings – stringBuffer class - character extraction – string comparison –modifying a string.

**Unit 6: (4 hrs)**

Files and streams – Creating, reading and updating a sequential access file – Creating, writing and reading a random access file.

**Unit 7: (4 hrs)**

Exceptional handling – Managing Errors and Exceptions – Types of errors – User defined exceptions –Multiple Catch statements

**Unit 8: (4 hrs)**

Multithreaded programming: Creating Threads, Extending the Thread class – Stopping and Blocking a Thread – Life cycle of a thread – Using Thread Methods – Thread Priority.

**Unit –9: (4 hrs)**

Web page design using applets – Applet Programming: Building Applet code – Applet Life cycle – Creating applet – Running the applet – Passing parameters to applets –

**Unit - 10: (4 hrs)**

Graphics programming: Graphics class – Methods in Graphics class -Lines and Rectangles – Circles and Ellipses – Drawing Arcs and Polygons

**Reference books :**

1. E.Balagursamy, “ Programming with Java – A Primer”, Tata McGraw-Hill Publishing Company Limited, Third Edition, 2007
2. C. Xavier, “Programming with Java2”, Scitech Pub.(India) Pvt. Ltd.

3. Cays S. Horstmann, Gary Cornell, "Core Java2 Volume I–Fundamentals", Pearson Edi., 2001.
4. Cays S. Horstmann, Gary Cornell, "Core Java2 Volume II–Fundamentals", Pearson Edi., 2003.

### **List of Programs**

1. Programs using constructors
2. Programs using Method overloading
3. Programs using Packages
4. Programs using Interfaces
5. Programs using String functions
6. Programs using File streams
7. Programs using Exceptional handling mechanisms
8. Programs using User defined exceptions
9. Programs using multithreading
10. Programs using Applets

Hrs of instruction per week: 2+4

- Unit 1:** (4 hrs)  
Introduction to Internet, Exploiting the World Wide Web, HTML: HTML Overview, Designing web Page with HTML, document structure, Image, Internal and External linking between WebPages, forms, tables and frames
- Unit 2:** (4 hrs)  
VB Script basics - Variables, Subtypes, and Constants – Arrays -VBScript Operators - VBScript Procedures - Program Control and Structure-Strings and Numbers-Message and Input Boxes
- Unit 3 :** (4 hrs)  
Introduction to JavaScript-JavaScript Variables and Data Types-Statements and Operators-Control Structures-Functions-Message box in Javascript
- Unit 4: ASP.NET** (4 hrs)  
Overview of ASP.NET framework- Building forms with web controls – Introducing ASP.NET web forms - Creating web forms Application- Projects using web controls and working with events
- Unit 5:** (4 hrs)  
Using rich web controls – Creating and using custom controls, Validating user Input – Understanding validation controls, Using required field validator control, compare validator control, Range validator control, Regular Expression validator control, Custom validator control, Validation summary control, Debugging ASP.NET pages.
- Unit 6:** (4 hrs)  
Introducing ADO.NET – ADO.NET basics, ADO.NET object model, changes from ADO, communicating with OLEDB data sources using ADO.NET
- Unit 7:** (4 hrs)  
Data base Accessing on web Applications - understanding data binding, working with data grids, using templates and using SQL server with ASP.NET
- Unit 8:** (4 hrs)  
Introduction to XML – Overview of XML and Data structures – XML elements-Data structures and organization- organizing XML Data-Creating well formed XML
- Unit 9:** (4 hrs)  
XML Name spaces – Validating XML Document-Defining DTD(Document Type Definition) Entities, Adding processing Instructions
- Unit 10:** (4 hrs)  
XML Schema, CSS and XSTL- Introduction-Schema Vs DTD, CSS, Extensible Style Sheet

### Reference Books

1. Mridula Parihar et al, “ASP.NET Bible”, Published by arrangement with the John wiley & Sons Ltd., USA, 2005.
2. Dr.Kamlesh N.Agarwala, Dr.Om Prakash Vyas, Prateek A. Agarwala, “An Introduction to HTML”, Published by Kitab Mahal, 22-A, Sarojini Naidu Marg, Allahabad, 2004.
3. Heather Williamson, “The complete reference XML”, Tata Mcgraw Hill edition 2001.
4. Editorial Panel, “Step by step learning XML”, MBD International, 2003.
5. Paul Lomax,Matt Childs,Ron Petrusa,” VBScript in a Nutshell,”O’Reilly,First Edition,May 2000.

List of Programs

Hrs. of instruction per week:2+4

- Designing Web page using HTML Sections and Substructures
- Designing Web page using HTML elements, DHTML
- Designing Web page using list, tables and text formatting elements
- Designing Web page using Frames
- Designing Web page using Forms
- Designing Web page using XML name space and database.
- Designing Web page using XML links and Pointers
- Designing Web page using XSL
- Designing Web page using VB Script
- Designing an application using basic ASP techniques
- Designing Web page using The ASP request and response objects
- Designing Web page using ASP Application, Session and Cookies objects
- Designing Web page using ASP and Data Store
- Designing Web page using JSP and JavaScript
- Designing Web page using JSP, Java beans and JDBC,ODBC
- Program using Vector class
- Program using inheritance and method overloading
- Program using Multiple implementation of interfaces
- Program to throw user defined exceptions
- Program using event handling

## **P.12 Data Communication and Networks**

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|--|--------------------------------------|
|  | <b>Hrs of Instruction per week:4</b> |
| <b>Unit 1:</b>   | (8 hrs)                              |
| Overview of Data communications and networking - Network Model, Layered Tasks, Internet Model, OSI model |                                      |
| <b>Unit 2:</b>   | (8 hrs)                              |
| Physical layer-Signals – Digital Transmission, Multiplexing, Transmission media.                         |                                      |

**Unit 3: Circuit switching and telephone network:** (8 hrs)

Circuit switching: Space Division switch, Time Division switch, TDM bus, space and Time division switch combinations.

Telephone network: Major components, Making a connection, Analog services, Digital services. High-speed digital access: DSL, cable modems and SONET.

**Unit 4: Data Link Layer** (8 hrs)

Error Detection and Correction – Types of Errors, Detection, Error correction, Data Link Control and Protocols – flow and Error Control, Stop and Wait ARQ, Go-Back – NARQ, Selective Repeat ARQ, HDLC, PPP, Multiple Access – Random Access, Controlled Access, Channelization.

**Unit 5: LAN** (8 hrs)

Traditional Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LANs – IEEE 802.11 – Bluetooth connecting LANs, Backbone Networks and Virtual LANs – connecting Devices Backbone Networks, Virtual LANs.

**Unit 6: Cellular Telephone and Satellite Networks** (8 hrs)

Frequency Reuse principle - Transmitting – Receiving – Hand Off – Foamy – First Generation – Second Generation – Third Generation. - Orbits – Foot Print – 3 Categories of Satellite – GeoSatellites – MEO Satellites – LEO Satellites  
Virtual Ckt Switching, Frame Relay and ATM.

**Unit 7: Network Layer** (8 hrs)

Host-to-Host Delivery : Addressing and Routing – Internet Address – Classful Address – Subnetting – Supernetting – Classless Addressing – Dynamic Address Configuration – Network Address Translation (NAT). Internetworking - Need For Network Layer, Internet as a Packet Switched Network Internet as a Connectionless Network.

Network Layer Protocols: ARP, IPV4, V6, ICMP, ICMV6 - Unicast and Multicast Routing : RIP, OSPF, BGP, IGMP Multicast Tree, Mbone DVMRP, MOSPF, CBT, PIM

**Unit 8: Transport Layer:** (8 hrs)

UDP, TCP, Congestion Control and Quality of Service

**Unit 9: Application Layer** (8 hrs)

Client – Server Model, Socket Interface, DNS, Email (SMTP) FTP, HTTP and WWW

**Unit 10: Security** (8 hrs)

Cryptography – Message Security, Digital Signature-User Authentication and Key Management, Kerberos Security Protocols: IP Level Security, IPSEC, Transport Layer Security, Application Security, Firewalls, VPN.

**Reference Books:**

1. Behrouz A. Forouzan Sophia Chung Fegan, “Data Communication And Networking”, 4<sup>th</sup> Edition, Tata McGraw-Hill Publishing Company Limited New Delhi.– 6<sup>th</sup> reprint 2007.

2. Andrew S. Tannenbaum, “Computer Networks”, 3<sup>rd</sup> Edition, Pearson Education, New Delhi - 2003

**P.13 Software Project Management**

**Hrs of Instructions per week: 4**

**Unit 1: Introduction to Software project management:** (8hrs)

What is project?- Software project versus other types of project – Activities covered by software project management – some ways of categorizing software projects – the project as a system – what is Management? – Problems with software projects – management control.

Stakeholders – Requirement specification – information and control in organizations – measurements.

**Unit 2: Step Wise an overview of Project planning** (8hrs)

Step 0 : select project – identify project scope and objectives – 2: identify project infrastructure – 3: Analyse project characteristics – 4: Identify project products and activities – 5: Estimate effort for each activity – 6: Identify activity risks – 7: Allocate resources – 8: Review/ Publicize plan – 9and10: Execute plan/ lower levels of planning.

**Unit 3: Project Evaluation:** (8 hrs)

Strategic assessment – technical assessment – cost – benefit analysis – cash flow forecasting – cost – benefit evaluation techniques – risk evaluation.

**Unit 4: Project analysis and technical planning:** (8 hrs)

Choosing technologies – Technical plan contents list – choice of process models – structured methods – the waterfall model – the V-process model – The spiral model – Software prototyping – other ways of categorizing prototypes – tools – a prototyping example – Incremental delivery – An incremental example.

**Unit 5: Software estimation:** (8hrs)

Where are estimated done? – Problems with over and under estimates – the basis for software estimating – COCOMO: a parametric model – Expert judgement –price to Win and Design to cost – Estimating by analogy – Ablrecht function point analysis – Function points markII – A systems analysis – oriented approach – A program – oriented approach.

**Unit 6: Activity Planning:** (8 hrs)

The objectives of activity planning – when to plan – project schedules – project and activities – sequencing and scheduling activities – network planning models – sing dummy activities – Representing lagged activities – Adding the time dimension – The forward pass-backward pass- identifying the critical path – Activity float – shortening project durations – identifying critical activities – precedence networks.

**Unit 7: Risk Management** (8 hrs)

The nature of risk – managing risk – evaluating risks to the schedule – The nature of resources – identifying resource requirements- creating critical paths – counting the cost – being specific – publishing the resource schedule – cost schedules – scheduling sequence.

**Unit 8: Monitoring and control** (8 hrs)

Monitoring and control – responsibility- assessing progress – setting checkpoints – taking snap-shots – collecting the data – visualizing progress – cost monitoring – prioritizing monitoring – getting the project back to target – change of control.

**Unit 9:Managing people and organizing teams** (8 hrs)

Understanding behaviour – organizational behaviour: a background – selecting the right person for the job – instruction in the best methods – motivation – the Oldham – Hackman job characteristics model – working in groups – becoming a team – decision making – leadership – organizational structures.

**Unit 10:Software Quality**

(8hrs)

The place of software quality in project planning – importance of software quality – defining software quality – practical software quality measures – project versus process quality management – external standards – techniques to help enhance software quality.

|        |
|--------|
| 80 hrs |
|--------|

**Reference Books:**

1. Mike Cotterell and Bob Hughes,“Software Project Management”, An International Thomson publishing Company, 2000.
2. Royce, Walker ,“Software Project Management”, Addison Wesley, 2000.
- 3 Roger S. Pressman, “Software engineering a practitioners approach”, Fifth edition, Mcgrawhill intention , 2001.

**P.14 Data Mining and Warehousing****Hrs of Instructions per week: 4****Unit 1:**

(8 hrs)

Introduction and Functionalities , Data mining concepts – kinds of data – practical applications – setting up a KDD environment

**Unit 2:** (8 hrs)

- Concept/class description – association analysis – classification and prediction – cluster analysis – outlier analysis.

**Unit 3:** (8 hrs)

Data Warehousing and architecture , Basic concepts – OLAP technology – schemas for multidimensional databases

**Unit 4:** (8 hrs)

Design and construction – 3-tier architecture – implementation.

**Unit 5:** (8 hrs)

Preprocessing and Data Mining Primitives, Data cleaning – integration and transformation

**Unit 6:** (8 hrs)

Data reduction – discretization - Primitives – tasks – Query languages.

**Unit 7:** (8 hrs)

Association Rules, Classification and Prediction Association rule mining – single dimensional boolean association rules – multi level association rules

**Unit 8:** (8 hrs)

Classification methods–Predictive models – Clustering methods – Partitioning – Hierarchical method

**Unit 9:** (8 hrs)

Advances in data mining, Mining complex data types

**Unit 10:** (8 hrs)

Applications and trends in data mining.

**Reference Books:**

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann Publishers, 2002.
2. Peter Adrians and Dolf Zantinge, “Data Mining”, Addison Wesley, 2000.
3. Tom Soukup and Ian Davidson, “Visual Data Mining”, Wiley Publishing Inc., 2002.

## **P.15 Computing Lab –V (Advanced Java)**

**Hrs of Instructions per week: 2+4**

- Unit 1:** (4 hrs)  
Introduction to Java , data types, variables, arrays and operator, control statements, Looping statements – break and continue statements.
- Unit 2:** (4 hrs)  
Exception handling –fundamentals ,exception types ,try and catch ,multiple catch clause ,nested try statement ,throw , throws and finally – User defined Exceptions
- Unit 3:** (4 hrs)  
Multithreaded programming – Creating and Extending thread class – Life cycle of thread – Using thread methods – Thread priority – synchronization
- Unit 4:** (4 hrs)  
AWT classes – Windows fundamentals – working with frame window – Working with graphics, colors and forms – using AWT controls – Buttons, Checkboxes , List, Scrollbars, Text Fields, TextArea – Layout Managers.
- Unit 5:** (4 hrs)  
Applet basics – Architecture – Simple Applet – The HTML Applet tag – formatting tags, List – ordered list – Tables – Forms.
- Unit 6:** (4 hrs)  
Event handling: Event Handling Mechanism – Event classes – sources of events – Event Listener interfaces
- Unit 7:** (4 hrs)  
Network basics – Socket Programming – Proxy server – TCP/IP socket – Client socket – Server socket – Inet address – URL – Datagrams – sending and receiving the datagram packet
- Unit 8:** (4 hrs)  
Introduction to Database – Client/Server methodology – Databasearchitecture – JDBC drivers – Using JDBC – simple sql commands.
- Unit 9:** (4 hrs)  
An overview of Servlet – Life cycle of servlet – Servlet packages – Servlet API – HTTPServlet class – HttpServletRequest interface – HttpServletResponse Interface – Handling HTTPGetRequest – Handling HTTP post request – Session Tracking
- Unit 10:** (4 hrs)  
Java Bean – advantages – using JDK – JAR files – Introspection – create a bean – Using Bean Builder – Applications.

### **Reference Books:**

1. H.M. Deitel, P.J Deitel, “Java How to program”, Prentice Hall of India, New Delhi, 2003.
2. Herbert Schildt, “ The Complete reference Java 2” Tata McGraw Hill, New Delhi, 7<sup>th</sup> Edition, 2006.
3. P.Naughton and H.Schildt, “Java 2 – The Complete Reference ”,5<sup>th</sup> Edition, 2002.
4. Karl Moss,” Java Servlets Developers Guide”, Tata McGraw Hill, New Delhi, 1<sup>st</sup> Edition, 2002.

**List of Programs****Hrs of Instruction per week:2+4**

- Programs using Predefined Exception.

- Program to throw user defined exceptions.
- Programs to create a using Threads using Runnable Interface.
- Program using event handling, Java utilities.
- Programs using Graphics class to draw the pictures.
- Programs using Socket Programming, Server Client sockets, Datagrams.
- Programs using AWT classes.
- Programs using Layout managers and Menus.
- Programs using Servlets.
- Programs using Java Web Server and Servlet chaining, session, session tracking.
- Programs using JDBC.
- Programs using JavaBeans.

**Minimum of 20 programs is expected out of the listed concept.**

### **P.16 Computing Lab –VI (Network Administration)**

**Hrs of Instructions per week: 2+4**

**Unit 1:** (4 hrs)

An Overview of Fedora and Red Hat Enterprise Linux- Linux's Roots in UNIX, Common Linux Features, New features - Linux Networking.

**Unit 2:** (4 hrs)

Configure NIC'S IP Address, Configure two gateway, Configuring IP forwarding, Configure NIC for DSL and cable modem Internet Connections.

**Unit 3:** (4hrs)

The Linux Boot Process- Boot sequence- Determining the default boot run level- changing run levels-Switching run levels- System shutdown and Rebooting-starting and stopping Daemons.

**Unit 4** (4 hrs)

Understanding system administration - Using the root user account, configuration files and log files, Administering Linux system- Creating user accounts- Modifying , Deleting, Checking disk QUOTAS- Sending mail to all users.

**Unit 5:** (4 hrs)

Introduction to network services- setting up boot servers: DHCP and NIS - Configuration of NFS.

**Unit 6:**

Configuring SAMBA- SAMBA Security. Setting up a File Server- Goals- Setting up a Print Server-Using Print commands-Configuring Print Server.

**Unit 7:** (4 hrs)

Setting up FTP server- Understanding FTP servers- Secure FTP- anonymous FTP- Issues- TFTP- XINETD. Configuring DNS- BIND- DNS caching – name server- regular DNS server,

**Unit 8:** (4 hrs)

Web Hosting with the Apache Web Server- Configuring the Apache server- starting and stopping the server. Monitoring server activities.

**Unit 9:** (4 hrs)

Setting up a mail server- SMTP- Configuring send mail – Stopping SPAM - Configuring POP mail server, Authentication servers- PAM operations- Security limits.

**Unit 10:** (4 hrs)

Monitoring server performance- SNMP, MRTG, WEBALIZER, Controlling web usage with SQUID and Firewalls – SQUID disk usage ,Basics of my SQL Configuration.

**Reference Books:**

1. Christopher Negus,“Red Hat Fedora 5 and Enterprise Linux 4 BIBLE ”,edition, Willey INDIA Edition,2006.
2. Bill Ball and Hoyt Duff, “Red Hat Linux and FEDORA Unleashed “,edition, Pearson,2004.
3. Richard Peterson,“The Complete Reference –LINUX”,3<sup>rd</sup> edition .McGRAW Hill,1999.

**List of Programs**

**Hrs of Instruction per week: 2+4**

- Managing startup.
- Kernel Initialization.
- Working with Virtual Consoles.

- User Administration.
- Group Administration.
- Creating quotas.
- Joining NIS.
- Configuring Network Device.
- DNS Client Configuration.
- Configuring DHCP server.
- Configuring DNS server.
- Configuring NFS services.
- Configuring Samba server.
- Configuring FTP services.
- The Apache HTTP Server.
- Electronic Mail Services.
- Authentication Services.
- System Monitoring.
- Squid Server.
- Security Audits.

**Minimum of 20 programs is expected out of the listed concept.**

## **Elective List**

### **1. Soft Computing**

**Hrs of Instructions per week: 4**

**Unit 1:** (8 hrs)  
Introduction to Artificial Intelligence systems – Neural Networks, Fuzzy Logic , Genetic Algorithm - Fundamentals of Neural Networks – Basic concepts

**Unit 2:** (8 hrs)  
Model of an Artificial Neuron – Neural Network Architecture – Characteristic of Neural Network – Learning methods – History of Neural Network PERCEPTION.

**Unit 3:** (8 hrs)  
Back propagation Networks – Architecture – BPN learning – BPN algorithm – Illustration – Selection of various parameters in BPN – Augmented BPN – Variations of BPN algorithm –

**Unit 4:** (8 hrs)  
Adaptive Resonance Theory – ART 1 architecture algorithm, ART 2 architecture algorithm – Special features – Applications.

**Unit 5:** (8 hrs)  
Fuzzy Logic – Fuzzy set theory versus Crisp – Fuzzy sets – Membership function – Fuzzy set Operations - Fuzzy systems – Crisp Logic – Predicate Logic

**Unit 6:** (8 hrs)  
Fuzzy Logic – Fuzzy rule based system – Defuzzification methods – Applications – Air conditioner controller.

**Unit 7:** (8 hrs)  
Fundamentals of genetic algorithm – Basic concepts – Biological background – Creation of offsprings – Encoding – Binary Encoding – Fitness function

**Unit 8:** (8 hrs)  
Reproduction Roulette – Wheel selection - Genetic modeling – Inheritance operators – Cross over, Inversion and Deletion – Mutation operator – Bit-wise operators used in GA.

**Unit 9:** (8 hrs)  
Convergence of GA – Applications – Constrained optimization – Multilevel optimization – GA and other traditional methods – Advances in GA

**Unit 10:** (8 hrs)  
Hybrid systems – Integration of Neural Networks, tools – Fuzzy Logic as a soft computing tool – Genetic Algorithm as a soft computing tool – Applications.

#### **Reference Books:**

1. David E .Gold berg, “Genetic Algorithms in search, optimization and Machine learning”, Addison Wesley , 2000.
2. S.Rajasekaran , G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy logic and Genetic Algorithms – Synthesis and Applications“, Prentice Hall of India Pvt Ltd, New Delhi, Reprint 2006.
3. Madan M. Gupta, Liang Jin and Noriyasu Homma, “Static and Dynamic Neural Networks”, John Wiley and Sons, Inc., Huboken, New Jersey, 2003.

## 2. Pattern Recognition and Image Processing

Hrs of Instruction per week :4  
(8hrs)

### Unit 1 :Introduction

Introduction - Applications of Pattern Recognition-Statistical decision theory – Image processing and analysis

### Unit 2: Probability theory (8hrs)

Probabilities of Events-Random Variables-Joint Distributions and Densities – Moments of Random Variables – Estimation of Parameters from samples – Minimum Risk Estimators

### Unit 3: Statistical decision making (8hrs)

Introduction – Baye’s theorem – Multiple features – Decision Boundaries – Unequal Cost of Errors –Estimation of Error Rates- Characteristic Curves

### Unit 4 : Nonparametric decision making (8hrs)

Introduction – Histograms –Kernel and Window Estimators – Nearest Neighbor Classification techniques – Adaptive Decision Boundaries – Adaptive Discriminant Functions – Minimum Squared Error Discriminant Functions – Choosing a decision making technique

### Unit 5: Clustering (8hrs)

Introduction - Hierarchical Clustering – Partitional clustering

### Unit 6: Artificial Neural Networks (8hrs)

Introduction - Nets without hidden layers – Nets with hidden layers – Back propagation algorithm

### Unit 7: Processing of waveforms and images (8hrs)

Gray level scaling Transformations – Equalization – Edge detection – Laplacian and Sharpening operators – Line Detection and Template Matching – Gray level scaling

### Unit 8: Image Analysis (8hrs)

Introduction – Representing Boundaries – Projections – Hough Transforms –Eigen values and Eigen Vectors

**Unit 9: Techniques****(8hrs)**

Morphological operations- Texture - Fourier transforms – System design - Image Compression

**Unit 10: Image Segmentation****(8hrs)**

Introduction – Detection of Discontinuities – Edge linking and Boundary Detection – Thresholding – Region based Segmentation

**Reference Books:**

1. Earl Gose Richard, Johnsonbaugh and Steve Jost, "Pattern Recognition and Image Analysis" Prentice Hall of India Private Ltd, New Delhi, 2003.
2. Rafael C.Gonzalez, Richard E.Woods "Digital image processing" second edition Pearson, 2006.
3. S.Annadurai, R.Shanmugalakshmi, "Fundamentals of Digital Image Processing" Pearson Education, 2007.
4. B.Chande, D.Duttamajumder "Digital Image processing and Analysis" Tata McGraw Hill 2002.

### 3.Unix Architecture and Programming

**Hrs of Instructions per week: 4**

**Unit 1:**

(8 hrs)

**UNIX System Overview**

Introduction-UNIX Architecture- Logging In- Files and Directories-Input and Output- Programs and Processes- Error Handling- User Identification - Signals- Time Values- System Calls and Library Functions-UNIX Standardization and Implementations- UNIX Standardization- UNIX System Implementations- Relationship of Standards and Implementations- Limits- Options- Feature Test Macros-Primitive System Data Types-Conflicts Between Standards

**Unit 2:**

(8 hrs)

**File I/O -**

Intoduction-FileDescriptors-Functions- open,creat,close,lseek,read,write,dup,sync fsync,fdatasync,fcntl,iocntl, /dev/fd-Files and Directories- stat,fstat,lstat functions- stat, fstat, and lstat Functions- File Types- Set-User-ID and Set-Group-ID- File Access Permissions- Ownership of New Files and Directories- access Function- umask Function- chmod and fchmod Functions- Sticky Bit- chown, fchown, and lchown Functions- File Size- File Truncation- File Systems- l ink, unlink, remove, and rename Functions- Symbolic Links - File Times- utime Function-mkdir and rmdir Functions- Reading Directories-chdir, fchdir, and getcwd Functions- Device Special Files- Summary of File Access Permission Bits

**Unit 3:**

(8 hrs)

**Standard I/O Library**

Introduction- Streams and FILE Objects- Standard Input, Standard Output, and Standard Error- Buffering-Opening a Stream-Reading and Writing a StreamLine I/O- Standard I/O Efficiency-Binary I/O- Positioning a Stream- Formatted I/O- Implementation Details-Temporary Files-Alternatives to Standard I/O

**Unit 4:**

(8 hrs)

System Data Files and Information Introduction- Password File- Shadow Passwords- Group File- Supplementary Group IDs- Implementation Differences- Other Data Files- Login Accounting- System Identification- Time and Date Routines

**Unit 5:**

(8 hrs)

Process Environment ,Process control and Process Relationships-Introduction- main Function-Process Termination-Command-Line Arguments- Environment List- Memory Layout of a C Program-Shared Libraries-Memory Allocation- Environment Variables-setjmp and longjmp Functions- getrlimit and setrlimit Functions- Process Identifiers- fork Function- vfork Function- exit Functions- wait and waitpid Functions- waitid Function- wait3 and wait4 Functions- Race Conditions- exec Functions- Changing User IDs and Group IDs- Interpreter Files- system Function- Process Accounting-User Identification-. Process Times- Terminal Logins- Network Logins- Process Groups- Sessions- Controlling Terminal-. tcgetpgrp, tcsetpgrp, and tcgetsid Functions

**Unit 6:**

(8 hrs)

Signals- Introduction- Signal Concepts- signal Function- Unreliable Signals- Interrupted System Calls- Reentrant Functions- SIGCLD Semantics- Reliable-Signal -Terminology and Semantics- kill and raise Functions- alarm and pause Functions- Signal Sets- sigprocmask Function- sigpending Function- sigaction Function-

sigsetjmp and siglongjmp Functions- sigsuspend Function- abort Function- system Function- sleep Function-Job-Control Signals

**Unit 7.** (8 hrs)

Threads -Introduction- Thread Concepts- Thread Identification- Thread Creation- Thread Termination-Thread Synchronization - Thread Limits- Thread Attributes- Reentrancy- Thread-Specific Data- Cancel Options-Threads and Signals- Threads and fork- Threads and I/O

**Unit 8.** (8 hrs)

Daemon Processes and Advanced I/O-Introduction- Daemon Characteristics- Coding Rules- Error Logging- Single-Instance Daemons- Daemon Conventions- Client-Server Model-Nonblocking I/O- Record Locking-STREAMS- I/O Multiplexing- Asynchronous I/O- readv and writev Functions- readn and writen Functions- Memory-Mapped I/O

**Unit 9:** (8 hrs)

Interprocess Communication - Introduction-Pipes-popen and pclose Functions- Coprocesses- FIFOs- XSI IPC- Message Queues- Semaphores - Shared Memory- Client-Server Properties-Network IPC: Sockets-- Socket Descriptors- Addressing- Connection Establishment- Data Transfer- Socket Options- Out-of-Band Data- Nonblocking and Asynchronous I/O-Advanced IPC- STREAMS-Based Pipes- UNIX Domain Sockets-. Passing File Descriptors- An Open Server, Version 1- An Open Server, Version 2

**Unit 10:** (8 hrs)

Terminal I/O- Introduction- Overview-Special Input Characters- stty Command- Baud Rate Functions-. Line Control Functions-Terminal Identification- Canonical Mode- Noncanonical Mode-Terminal Window Size- termcap, terminfo, and curses

**Reference books:**

1)Advanced Programming in the UNIX Environment by W. Richard Stevens; Stephen A. Rago,Addison Wesley Professional Publication -2006

2)Unix The Complete Book-A guide for the Professional User by Jason J.Manger-Galgotia Publications-2002

3) A User guide to the Unix System by Dr.Rebecca Thomas ,Jean Yates Tata McGraw Hill Publication-2002.

#### 4. Network Security and Cryptography

Hrs of Instruction per week: 4

**Unit 1: Introduction to Security and Cryptographic Techniques:** (8 hrs)

Introduction-The Need for Security-Security Approaches-Principles of Security-Types of Attacks. Cryptographic Techniques: Introduction-Plain Text and Cipher Text-Substitution Techniques-Transposition Techniques

**Unit 2:** (8 hrs)

Encryption and Decryption-Symmetric and Asymmetric Key Cryptography-Steganography-Key Range and Key Size -Possible Types of Attacks.

**Unit 3: Symmetric and Asymmetric Key Cryptographic Algorithms:** (8 hrs)

Algorithm Types and Modes-An Overview of Symmetric Key Cryptography-Data Encryption Standard (DES)-International Data Encryption Algorithm (IDEA)-RC5-Blowfish-Advanced Encryption Standard (AES)-Differential and Linear Cryptanalysis

**Unit 4:** (8 hrs)

Asymmetric Key Cryptographic Algorithms: Brief History of Asymmetric Key Cryptography-An Overview of Asymmetric Key Cryptography-RSA Algorithm-Symmetric and Asymmetric Key Cryptography Together-Digital Signatures-Knapsack Algorithm- Other Algorithms.

**Unit 5: Public Key Infrastructure (PKI) and Internet Security Protocols** (16 hrs)

Digital Certificates-Private Key Management-The PKIX Model-Public Key Cryptography Standards (PKCS)-XML, PKI and Security-Basic Concepts of Internet Security Protocols-Secure Socket Layer (SSL)

**Unit 6:** (8 hrs)

Secure Hyper Text Transfer Protocol (SHTTP)-Time Stamping Protocol (TSP)-Secure Electronic Transaction (SET)-SSL Versus SET-3-D Secure Protocol-Electronic Money-Email Security-Security in GSM.

**Unit 7: User Authentication Mechanisms and Practical Implementations of Security**

(8 hrs)

Authentication Basics-Passwords-Authentication Tokens - Certificate-based Authentication-Biometric Authentication-Kerberos –Single Sign On (SSO) Approaches -

**Unit 8:** (8 hrs)

Cryptographic Solutions Using JAVA- Cryptographic Solutions Using Microsoft-Cryptographic Toolkits-Security and Operating Systems.

**Unit 9: Network Security and Case Studies** (8 hrs)

Brief Introduction to TCP/IP-Firewalls-IP Security Virtual Private Networks (VPN)-Cryptographic Solutions-Single Sign On (SSO)-Secure Inter –branch Payment Transactions-Denial of Service (DOS) Attacks

**Unit 10:** (8 hrs)

IP Spoofing Attacks-Cross Site Scripting Vulnerability (CSSV)-Contract Signing-Secret Splitting-Virtual Elections Secure Multiparty Calculation.

**Reference Books:**

1. Atul Kahate “Cryptography and Network Security”, Tata McGraw-Hill, 2003.
2. William Stallings “Cryptography and Network Security Principles and Practice”, 2<sup>nd</sup> Edition, Prentice Hall, Pearson Education,2000.
3. Bruce Schneier, “Applied Cryptography”, 2<sup>nd</sup> Edition, John Wiley and Sons,2002.
4. Kaufman “Network Security: Private Communication in a Public world”, 2<sup>nd</sup> Edition Prentice Hall Of India,2002.

## 5 Cyber crime and Cyber laws

**Hrs of Instruction per week: 4**

### **Unit 1:**

**(8 Hrs)**

Understanding cybercrime, Cybercrime investigation, Computer forensics, Recovering encrypted digital evidence, Incident reporting.

### **Unit 2:**

**(8 Hrs)**

Cybercrime policy issues, Collective digital crime, Intrusion and detection, Distributed digital crime, Information Technology, Act, 2000.

### **Unit 3:**

**(8 Hrs)**

Criminal activities in cyber world, Emergence of cyber crime : latest scenario of crime & law, Increasing focus : increasing threats : internet & networks abuse, Hiding crimes in cyberspace : encryption—a double edged knife, Rising challenges : need for continuous regulatory updates, Cyber gambling : uncontrollable and proliferating, Responding to new economy & controls : new technology used to commit old crimes.

### **Unit 4:**

**(8 Hrs)**

Facing challenges in law enforcement : limitation & capabilities of tools, Locating, identifying, stopping the criminals, India awakens : developing teeth to stop crimes & abuse, Hackers & the hacking : the first & foremost of the cyber crimes, Hackers: the people, the believers : sneaking into their world & community.

### **Unit 5:**

**(8 Hrs)**

Spam attacks, cyber stalking and abuse ,Spam attacks and spammers : the potential irritants & time-wasters, Identify culprits and stop them : the spamming cometh, The insider threat to information systems : the psychology of the dangerous insider.

### **Unit 6:**

**(8 Hrs)**

Cyber stalking and harassment : fighting the virtual hell & real life nightmares, Rules of the road for the information superhighway.

### **Unit 7:**

**(8 Hrs)**

Cyber terrorism, hoaxes, & law enforcement, Cyber terrorism : the internet opens new arena for outlaws, Countering the cyber terrorism : gathering intelligence, tools & techniques, Cyber hoaxes : not so funny, incur heavy losses sometimes, Child pornography on the internet : the book "Lolita" and its horrible aftermath, Rise & development of porn industry : the secret history of civilisation.

### **Unit 8:**

**(8 Hrs)**

Computer viruses on the internet : their history, evolution and reality, Searching & seizing computers under law : the US procedure could well suit us too, Electronic surveillance of networks : rising question of privacy infringement, The crime combat : FBI develops sniffer : the carnivore project under controversy, Random reports of net crimes : writing on the wall.

### **Unit 9:**

**(8 Hrs)**

Frauds & financial crimes in cyberspace, Criminals hot on cyberspace money trail : catch them if you can, Cyberlaundering : anonymous digital cash and money laundering, Long distance scams & frauds, Investment scams and stock frauds : demographics, expectations & the frauds, Business opportunities : fraudulent business opportunity scams.

### **Unit 10:**

**(8 Hrs)**

Women empowering women : another pyramid of deception, Talent scout & travel scams, Money problem scams, Major thefts of online credit card info, Bank and banking related fraud, Placement techniques of money laundering, Avoiding internet investment scams.

**Reference books:**

1. Y.K. Singh, Cyber Crime and Law, Shree publications, New Delhi, 2005.
2. Yogesh Barua and Denzyl P. Dayal, Cyber Crimes : Notorious Aspects of the Humans and the Net, Dominant publications, 2001.

## 6. Real Time and Embedded Systems

Hrs of Instruction per week: 4

### Unit 1: Introduction and reference Model

(8 hrs)

Introduction- Typical Real time applications: Digital control-High Level controls-Signal Processing- Hard versus soft real time systems- Jobs and Processors-Release times, Deadlines and timing constraints-Hard and soft timing constraints-Hard Real-Time systems, Soft Real-Time systems

### Unit 2:

(8 hrs)

Reference model of Real-Time systems: Processors and Resources-Temporal parameters of Real-Time workload-Periodic task model-Precedence constraints and data dependency-Functional parameters-Resource Parameters of jobs and parameters of resources-Scheduling hierarchy.

### Unit 3: Real time Scheduling

(8 hrs)

Commonly used Approaches to real time scheduling: Clock-driven approach-weighted round-robin approach-Priority driven approach-Dynamic versus static systems-Effective Release times and dead lines-optimality of the EDF and LST algorithms- non-optimality of the EDF and LST algorithms- Challenges in validating timing constraints in priority driven systems-Off-line versus On-line scheduling.

### Unit 4:

(8 hrs)

Scheduling Flexible Computations and tasks with temporal distance constraints- Flexible applications-Tasks with temporal Distance constraints-Clock –Driven Scheduling: Notations and Assumptions-Static, Timer-Driven Scheduler-General Structure of Cyclic Schedules-Cyclic Executives-Improving the Average Response Time of Periodic Jobs-Scheduling Sporadic Jobs-Practical Considerations and Generalizations-Algorithm for Constructing Static Schedules-Pros and Cons of Clock-Driven Scheduling.

### Unit 5:Scheduling of Periodic and a Periodic tasks

(8 hrs)

Priority-Driven Scheduling of Periodic Tasks: Static Assumption-Fixed-Priority versus Dynamic-Priority Algorithms-Maximum Schedulable Utilization-Optimality of the RM and DM algorithms-A Schedulability Test for Fixed-Priority Tasks with Short Response Times-Schedulability Test for Fixed-Priority Tasks with Arbitrary Response Times-Sufficient Schedulability Conditions for the RM and DM Algorithms Practical Factors

### Unit 6:

(8 hrs)

Scheduling a periodic and sporadic jobs in Priority-Driven systems: Assumptions and approaches-Deferrable servers-Sporadic servers-constant utilization, total bandwidth and weighted fair queue servers-Slack stealing in deadline driven system- Slack stealing in fixed Priority systems-Scheduling in Sporadic jobs-Real time performance for jobs with soft timing constraints- A Two – level scheme for integrated scheduling.

### Unit 7: Resource Access Control

(8 hrs)

Resources and Resource Access control: Assumptions on resources and their usage-effects of resource contention and resource access control-Non-Preemptive critical sections-Basic Priority-Ceiling protocol-Stack based Priority-Ceiling protocol- Use of Priority-Ceiling protocol in dynamic priority system-Preemption Ceiling Protocol-Controlling accesses to multiple-unit resources-controlling-concurrent accesses to data objects

### Unit 8:

(8 hrs)

Multiprocessor scheduling, Resource access control and synchronization: Model of multiprocessor and distributed systems-Task assignment-Multiprocessor priority ceiling protocol-Elements of scheduling algorithms for end-to-end periodic tasks-End-to-end tasks in heterogeneous systems-Predictability and validation of dynamic multiprocessor systems.

**Unit 9: Real Time Communication and RTOS** (8 hrs)

Real Time communication- Model of Real time communication-Priority based service disciplines in switched networks-weighted round-robin service disciplines-Medium access control protocols of broadcast networks-Internet and resource reservation protocols-Communication in multi computer systems

**Unit 10:** (8 hrs)

Operating systems: Overview-Time services and scheduling mechanisms-Basic operating system functions-Processor reserves and Resource Kernel-Open system architecture-Capabilities of Real time operating systems-Predictability of general purpose operating systems

**Reference Books:**

1. Jane W.S. Liu, “ Real Time Systems”, Pearson Education, 2001.
2. C.M. Krishna, Kang G. Shin ,“ Real Time Systems”, McGraw-Hill Series in Computer Science,2000.