

Cotton College State University
Department of Computer Science and IT,
Undergraduate Syllabus (B.Sc in Computer Science)

Semester-1

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC101C | Programming Principle and Algorithm | 2+1+1 | 4 |
| CSC102C | Digital Logic | 3+1+0 | 4 |
| CSC103C | Introduction to UNIX & Shell Programming | 2+1+1 | 4 |
| CSC104E | Fundamentals of Computer | 2+1+0 | 3 |

Semester-2

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC201C | Programming in C | 2+1+1 | 4 |
| CSC202C | Computer Organization and architecture | 3+1+0 | 4 |
| CSC203C | Data Structure | 2+1+1 | 4 |
| CSC204E | Web Technology | 2+0+1 | 3 |

Semester-3

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC 301C | Object Oriented Programming using C++ | 2+1+1 | 4 |
| CSC 302C | Theoretical Foundation of Computer Science | 3+1+0 | 4 |
| CSC 303C | Database Management System | 2+1+1 | 4 |
| CSC304E | Introduction to C Programming | 2+0+1 | 3 |

Semester-4

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|---|--------------|----------------|
| CSC 401C | Java Programming | 2+1+1 | 4 |
| CSC 402C | Operating System | 3+1+0 | 4 |
| CSC 403C | Computer Networking | 3+1+0 | 4 |
| CSC404E | Introduction to Object Oriented Programming using C++ | 2+0+1 | 3 |

Semester-5

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|-------------------------|--------------|----------------|
| CSC 501C | Software Engineering | 3+1+0 | 4 |
| CSC 502C | Advanced Web Technology | 2+1+1 | 4 |
| CSC 503C | Major Project (Part- I) | 0+2+2 | 4 |
| CSC504E | Windows Programming | 2+0+1 | 3 |

Semester-6

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC601C | Data Mining | 3+1+0 | 4 |
| CSC602C | Compiler Design | 3+1+0 | 4 |
| CSC603C | Major Project-(Part-II) | 0+2+2 | 4 |
| CSC604E | Introduction to UNIX and Shell Programming | 2+0+1 | 3 |

Semester-1

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC101C | Programming Principle and Algorithm | 2+1+1 | 4 |
| CSC102C | Digital Logic | 3+1+0 | 4 |
| CSC103C | Introduction to UNIX & Shell Programming | 2+1+1 | 4 |
| CSC104E | Fundamentals of Computer | 2+1+0 | 3 |

CSC101C: Programming Principle & Algorithm

No. of Lectures-32

UNIT-I

Introduction to 'C' Language

History, Structures of C Programming, Function as building blocks.

Language Fundamentals

Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types, Comments.

UNIT-II

Operators

Types of operators, Precedence and Associativity, Expression, Statement and types of statements

Built in Operators and function

Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar();

Concept of header files, Preprocessor directives: #include, #define.

UNIT-III

Control structures

Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; Other statements: break, continue, goto, exit.

UNIT-IV

Introduction to problem solving

Concept: problem solving, Problem solving techniques (Trail & Error, Brain Storming, Divide & Conquer)

Steps in problem solving (Define Problem, Analyze Problem, Explore Solution)

Algorithms and Flowcharts (Definitions, Symbols), Characteristics of an algorithm

Conditionals in pseudo-code, Loops in pseudo code

Time complexity: Big-Oh notation, efficiency

Simple Examples: Algorithms and flowcharts (Real Life Examples)

UNIT-V

Simple Arithmetic Problems

Addition / Multiplication of integers, Determining if a number is +ve / -ve / even / odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division,

Digit reversing, Table generation for n, a, Factorial, sine series, cosine series, ${}^n C_r$, Pascal

Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers etc (Write algorithms and draw flowchart), Swapping

UNIT-VI

Functions

Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.

Referential Books :

1. Let us C-Yashwant Kanetkar.
2. Programming in C-Balguruswamy
3. The C programming Lang., Pearson Ed - Dennis Ritchie

4. Structured programming approach using C- Forouzah & Ceilber Thomson learning publication.
5. Pointers in C ó Yashwant Kanetkar
6. How to solve it by Computer ó R.G. Dromy
7. Peter Norton's Introduction to Computers ó Tata MGHill

CSC102C: Digital Logic

No. of Lectures-32

UNIT - I:

Information Representation: Number Systems, Number base conversion, Binary Arithmetic, Fixed-point and Floating-point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation ó 8421, ASCII, EBCDIC, Gray code,Unicode.

UNIT-II:

Boolean Algebra and Logic Gates : Basic Definitions of Boolean Algebra - Axiomatic Definition of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Other Logic Operations - Digital Logic Gates.

UNIT-III:

Simplification of Boolean Functions: The Map Method - Two and Three Variable Maps - Four Variable Map - Five and Six Variable Maps - Product of Sums Simplifications - NAND and NOR Implementation - Other Two Level Implementations - Don't Care Conditions.

UNIT-IV:

Combinational Logic Introduction - Adders - Subtractors - Code Conversion - Binary Adder ó Encoder - Decoders ó multiplexer and demultiplexure.

UNIT - V:

Sequential Logic: RS, JK, D, and T Flip-Flops - Edge-Triggered - Master-Slave Flip- Flops. Registers: Shift Registers - Types of Shift Registers.

UNIT - IV:

Counters: Asynchronous Counters Ripple, Mod, Up-Down Counters- Decoding Gates - Synchronous Counters - Ring, Decade, Presetable, Shift Counters. Memory: Basic Terms & Ideas - Magnetic Memories - Memory Addressing - Types of ROMs - Types of RAMs.

Referential Books :

1. M.Moris Mano, Digital Logic and Computer Design, PHI, 2001.
2. D.P.Leach & A.P.Malvino, Digital Principles and Applications -TMH - Fifth Edition - 2002.
3. Computer Organization and Architecture; William Stallings, Pearson.
4. T. C.Bartee, Digital Computer Fundamentals, 6th Edition, Tata McGraw Hill, 1991.
5. R.J.Tocci, Digital System Principles and Applications, 8th Edition.

CSC103C: Introduction to UNIX & Shell Programming**No. of Lectures-32**

UNIT-I: UNIX/Linux Introduction to Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell. Partitioning the Hard drive for Linux, Installing the Linux system, System startup and shut-down process, init and run levels. Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories. Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, head, tail, pg, cat and disk related commands.

UNIT-II: Essential Linux commands Understanding shells, Processes in Linux-process fundamentals, connecting processes with pipes, tee, Redirecting input output, manual help, managing multiple processes, changing process priority with nice, scheduling of processes at command, cron, batch commands, kill, ps, who, sleep, Printing commands, find, sort, touch, file, file related commands-ws, sat, cut, dd, etc. Mathematical commands- bc, expr, factor, units. Creating and editing files with vi editor.

UNIT-III: System administration Common administrative tasks, identifying administrative files ó configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable userø accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages.

UNIT-IV: Shell programming Basic of shell programming, Various types of shell available in Linux, comparisons between various shells, shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automate system tasks.

UNIT-V:

Simple filter commands ó pr, head, tail, cut, paste, sort, uniq, tr. Filter using regular expressions ó grep, egrep, and sed.

Referential Books :

1. B.M.Harwani, Unix and Shell Programming, Oxford University Press
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
3. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
4. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH
5. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.

CSC104E: Fundamentals of Computer

No. of Lectures-32

UNIT-I

Introduction to Computers:

Evolution of Computers, Generation of Computers, Classification of Computers Analog Digital and Hybrid Computers, Classification of Computers according to size, Super Computers, Mainframe Computers, Personal Computers (Different Types) and Terminals (Different Types), Characteristics of Computers, Block Diagram of a Digital Computer, types of OS.

UNIT-II

Input / Output Devices:

Input Devices-Keyboard, Mouse, Output Devices ó VDU, Printers. Internet, Multimedia, Computer viruses

UNIT-III

Introduction to Programming Concepts:

Types of Programming Languages, software, Classification of software, Application software and System Software, Structured Programming, Algorithms and Flowcharts with Examples.

UNIT-IV

Memory:

Memory Heirarchy, Primary Memory-Volatile and non-valatile memory, RAM and ROM and their types, Secondary Memory-Floppy Disk and Hard Disk.

UNIT-V

Number Systems: Introduction to Binary, Octal, Hexadecimal system, Conversion, Simple Addition, Subtraction

UNIT-VI

Disk Operating System:

Introduction to DOS Commands, Types of DOS Commands Wild Card Character in DOS Directory Related Commands. File Related Commands and Utilities.

UNIT-VII

Introduction of Windows, Features, Application:

MS Windows, and its various elements of application windows title bar, menu bar, maximize and close buttons, borders and corners, scroll bars, windows icon, folder icons, dialog box and its items, starting Microsoft windows, searching the files, copying the files, disk clean up, deleting unnecessary files, Determining Free space on disk, disk defragmenter, sound recorder, using scan disk, imaging, character map, calculator notepad paint, Word Pad.

Referential Books :

1. P.K. Sinha ,Fundamentals of Computers, BPB Publications
2. V. Rajaraman, Fundamentals of Computers, 3rd Edition , PHI Publications
3. Computer Today- By Suresh Basandra

Semester-2

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC201C | Programming in C | 2+1+1 | 4 |
| CSC202C | Computer Organization and architecture | 3+1+0 | 4 |
| CSC203C | Data Structure | 2+1+1 | 4 |
| CSC204E | Web Technology | 2+0+1 | 3 |

CSC201C: Programming in C

UNIT-I

Arrays

Definition, declaration and initialization of one dimensional array; Accessing array elements; Displaying array elements; Sorting arrays; Arrays and function; Two-Dimensional array: Declaration and Initialization, Accessing and Displaying, Memory representation of array [Row Major, Column Major]; Multidimensional array

UNIT-II

Pointers

Definition and declaration, Initialization; Indirection operator, address of operator; pointer arithmetic; dynamic memory allocation; arrays and pointers; function and pointers

UNIT-III

Strings

Definition, declaration and initialization of strings; standard library function: strlen(), strcpy(), strcat(), strcmp(); Implementation without using standard library functions

UNIT-IV

Structures

Definition and declaration; Variables initialization; Accessing fields and structure operations; Nested structures; Union: Definition and declaration; Differentiate between Union and structure

UNIT-V

Introduction C Preprocessor

Definition of Preprocessor; Macro substitution directives; File inclusion directives; Conditional compilation

Bitwise Operators

Bitwise operators; Shift operators; Masks; Bit field

UNIT-VI

File handling

Definition of Files, Opening modes of files; Standard function: fopen(), fclose(), feof(), fseek(), rewind(); Using text files: fgetc(), fputc(), fscanf()

Command line arguments

Referential Books:

1. Let us C-Yashwant Kanetkar.
2. Programming in C-Balguruswamy
3. The C programming Lang., Person Ecl ó Dennis Ritchie
4. Structured programming approach using C-Forouzah & Ceilberg Thomson learning publication.

BCA202C Computer Organization and Architecture

No. of Lectures-32

UNIT-I

DATA REPRESENTATION: Data types, fixed-point representation, floating ó point representation, other binary codes, error detection codes.

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Microoperations, Arithmetic logic shift unit.

UNIT-II

BASIC COMPUTER ORGANISATION AND DESIGN: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Register reference instructions, Input ó Output Instructions, Design of Accumulator Logic.

UNIT_III

CENTRAL PROCESSOR ORGANIZATION : Processor bus organization, arithmetic logic unit (ALU) instruction formats, addressing modes, data transfer and manipulation , program control, microprocessor organization.

UNIT_IV

INPUT-OUTPUT ORGANISATION: Peripheral devices . asynchronous data transfer , direct memory access (DMA) ,priority interrupt, input ó output processor (IOP).

UNIT_V

MEMORY ORGANIZATION : Auxiliary memory, microcomputer memory hierarchy , associative memory , virtual memory, cache memory.

Referential Books :

1. M.Moris Mano , Computer System, Architecture, 2nd Edition Prentice Hall of India.
2. Heuring and Jordan, Computer systems design and Architecture , Peason Edition
3. William Stallings , Computer Organisation and Archotecture, Peason Education
4. Floyed , Digital Fundamentals,8th Edition , Peason Education.
5. Andrew S. Temenbauam, Structured Computer Organization , 3rd Edition ; Prentice Hall of India.
6. David Patterson & Hennessy , Computer Organization & Design , Elsevier.

CSC203C Data Structure

No. of Lectures-32

UNIT – I

Introduction:

Basic Terminology, Elementary Data Organization, Structure operations, Algorithm

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.

UNIT - II

Stacks:

Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Queues:

Array and linked representation and implementation of queues, Operations on Queue and vCircular queues, Concept of D-queues and Priority Queues.

UNIT-III

Linked list: Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Circular Link List.UNIT ó IV

UNIT-IV

Trees:

Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees.

Binary Search Trees:

Binary Search Tree (BST), Insertion and Deletion in BST

UNIT – V

Searching and Hashing:

Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

UNIT – VI

Sorting:

Insertion Sort, Bubble Sorting, Selection Sorting Quick Sort, Merge Sort, Heap Sort, Radix Sort.

Referential Books :

1. Seymour Lipschutz, "Data Structures", Tata McGraw Hill
2. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
3. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
4. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
5. K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
6. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", John Wiley & Sons, Inc.
7. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt.

CSC204E: Web Technology

No. of Lectures-32

UNIT – I

History of the Internet and World Wide Web, Search Engines, News-group, E-mail and its Protocols (SMTP, POP3, IMAP) Web Portal, Browsers and their versions, Its functions, URLs, web sites, Domain names, Portals.

UNIT – II

Static Web Development: HTML - Introduction to HTML, HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and Sound, lists types of lists, tables, frames and floating frames, Developing Forms, Image maps.

UNIT – III

Introduction to Java Script: Data Types, Control Statements, operators, Built in and User Defined Functions, Objects in Java Script, Handling Events.

UNIT – IV

Cascading Style Sheet: Types of Style Sheets ó Internal, inline and External style sheets, creating styles, link tag.

Referential Books :

1. The complete reference HTML, by Thomas A powell, TMH publication.
2. Mastering HTML 4.0 by Deborah S. Ray and Erich J. Ray. BPB Publication.
3. Internet and World Wide Web Deitel HM, Deitel ,Goldberg , Third Edition
1. HTML Black Book , Stephen Holzner, Wiley Dreamtech.
2. Rajkamal, õWeb Technologyö, Tata McGraw-Hill, 2001.
3. Jeffrey C. Jackson, õWeb Technologies : A Computer Science Perspectiveö, Pearson.
4. Mastering JavaScript and Jscript by J.Jaworski ;BPB Publication

Semester-3

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC 301C | Object Oriented Programming using C++ | 2+1+1 | 4 |
| CSC 302C | Theoretical Foundation of Computer Science | 3+1+0 | 4 |
| CSC 303C | Database Management System | 2+1+1 | 4 |
| CSC304E | Introduction to C Programming. | 2+0+1 | 3 |

CSC301C Object Oriented Programming using C++**No. of Lectures-32****UNIT – I**

Different paradigms for problem solving, need for OOP, differences between OOP and procedure oriented programming, abstraction, overview of OOP principles- encapsulation, inheritance and data binding polymorphism. abstraction. C++ basics: structure of a C++ program, data types, declaration of variables, expressions, operators, type conversions, pointers and arrays, strings, structures, references, flow control statement, functions-scope of variables, parameter passing, recursive functions, default arguments, inline functions, dynamic memory allocation and deallocation operators.

UNIT II

Encapsulation, information hiding, abstract data types, Object & classes, attributes, functions, C++ class declaration, member functions, State identity and behavior of an object, static data members and member functions, friend functions, constant member functions. Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, Metaclass/abstract classes.

Operator overloading: Overload unary, binary operators, overloading binary operators using friends, manipulation of strings using operators.

UNIT – III

Inheritance: defining a class hierarchy, different forms of inheritance, defining the base and derived classes, access to the base class members, base and derived class construction, destructors, virtual base class. Polymorphism: static and dynamic bindings, base and derived class virtual functions, dynamic binding through virtual functions, virtual function call mechanism, pure virtual functions, abstract classes, implications of polymorphic use of classes, virtual destructors.

UNIT-IV

Exception handling: benefits of exception handling, throwing an exception, the try block, catching an exception, exception objects, exception specifications, rethrowing an exception, catching all exceptions. File handling : stream classes hierarchy, stream I/O, file streams, opening and closing data file, creating a data file, read and write functions, error handling during file operations, formatted I/O, sequential and random file processing.

Referential Books :

1. Herbert Schild, ÷ The complete reference to C++ö, Osborn McGraw Hill
2. R. Lafore, ÷Object Oriented Programming using C++ö, Galgotia Publications
3. Ian Graham, ÷Object Oriented Methodsö, Addison Wesley..
4. E. Balaguruswamy, ÷Object Oriented Programming with C++ö, Tata McGraw Hill

CSC302C Theoretical Foundation of Computer Science

No. of Lectures-32

UNIT- I

Finite Automata :

DFA, NFA, NFA with ϵ -moves. Equivalence of DFA and NFA. Reduction of the number of states in a finite automata.

UNIT-II

Regular Languages and Regular Grammar:

Concept of languages and grammar. Regular expressions. Connection between regular expressions and regular languages. Regular grammars, Right and Left-Linear Grammars. Equivalence between Regular languages and Regular grammars.

UNIT-III

Properties of Regular Languages:

Closure under simple set operations- union, intersection, concatenation, complementation and star-closure. Decision algorithms for emptiness, finiteness and infiniteness, equality. Proof of non-regularity using Pigeonhole principle and using pumping lemma for regular languages.

UNIT-IV

Context free languages :

Context-free grammars, leftmost and rightmost derivations, derivation trees. Parsing and Ambiguity in grammars and languages. Simplification of Context free Grammars- removing useless productions, empty-productions and unit-productions. Normal forms- Chomsky and Greibach normal forms.

UNIT-V

Pushdown Automata:

Definition and language accepted (acceptance by empty stack and final state and their equivalence). Pushdown Automata and Context free languages. Deterministic PDA and Deterministic Context free Languages.

UNIT-VI

Properties of Context free Languages:

Pumping Lemma for CFL. Using Pumping Lemma to show certain languages not to be Context free. Closure properties of CFL ϕ closure under union, concatenation and star-closure. and showing that CFLs are not closed under intersection and complementation. Decision algorithms for emptiness, finiteness and infiniteness.

Referential Books :

1. An introduction to Formal Languages and Automata, Peter Linz, Narosa.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft and Ullman, Addison Wesley.
3. K. L. P. Mishra, N. Chandrasekaran; Theory of Computer Science (Automata, Languages and Computation), P. H. I.
4. T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Tata-Mcgraw Hill Publishers.

CSC303C: Database Management System

No. of Lectures-32

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

UNIT- III

Data Base Design & Normalization:

DFD, Functional dependencies, Full functional dependency, Partial dependency, Transitive dependency, normal forms, first, second, third normal forms, BCNF.

UNIT- IV

File structure:

Record storage and primary file organization: memory hierarchies and storage devices, Storage of DataBases, Placing file records on disks: Records and its Types, Files, Fixed length records and variable length records, Record Blocking, allocating file blocks on disks, operation on files. Issues in Physical Design: Concept of indexes

Referential Books :

1. Date C J, "An Introduction To Database System", Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley
4. Leon & Leon, "Database Management System", Vikas Publishing House.
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
6. Majumdar & Bhattacharya, "Database Management System", TMH
7. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill

CSC304E: Introduction to C Programming.

No. of Lectures-32

UNIT-I

Algorithm and algorithm development:

Definition and properties of algorithm, flow chart symbols, conversion of flow chart to language, example of simple algorithms, Introduction to program design, errors ó syntax error, runtime error, logic error.

UNIT-II

Basics of C – Language:

History, Constants ó Integer, Real, Character; Variables and Keywords; Data types and size, constants, arrays, pointers, Operators ó arithmetic, relational, logical, increment and decrement, bitwise and assignment, Hierarchy of Operators and Operations, Associativity of Operators, creation and evaluation of expressions

UNIT-III

Control Structure:

Decision Structure: - Simple if, if ó else, if ó else ó if, nested if, switch case; Loop Control Structure:- while , do while and for; Use of break, goto and continue;

UNIT-IV

Arrays and pointers:

Storage classes : Automatic, External, Static, Register. Scope and lifetime of variables. Arrays and pointers and corresponding operators. Pointer arithmetic. Programs using arrays and pointers like sum, average, minimum, maximum of an array of numbers. Add and delete an element of an array. Merge two sorted arrays. String manipulation programs like addition, subtraction, multiplication and their combinations. Sum of rows, columns, and diagonal elements of a matrix. Transpose of a matrix. Linear search, binary search. Selection sort and bubble sort.

UNIT-V

Functions:

Function definition, declaration and prototypes, Call by Value and Call by Reference, Scope Rule of Functions.

Referential Books :

1. Byron Gottfried, Programming with C, Tata McGraw Hill.

2. Dennis.Ritchie , *ANSI-C-Programming*.
3. Yashavant Kanetkar, *Let us C*
4. Balaguruswamy, *Programming in C*

Semester-4

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC 401C | Java Programming | 2+1+1 | 4 |
| CSC 402C | Operating System | 3+1+0 | 4 |
| CSC 403C | Computer Networking | 3+1+0 | 4 |
| CSC404E | Introduction to Object Oriented Programming using C++ | 2+0+1 | 3 |

CSC401C: Java Programming

No. of Lectures-32

UNIT-I

Introduction to Java:

Byte code, features of Java, data types, variables and arrays, operators, control statements.

Objects & Classes:

Object Oriented Programming, defining classes, static fields and methods, object construction

UNIT-II

Inheritance:

Basics, using super, method overriding, using abstract classes, using final with inheritance.

Packages and Interfaces:

Defining a package, importing package, defining an interface, implementing and applying interfaces.

UNIT-III

Exception Handling:

Fundamentals, exception types, using try and catch.

Multithreaded Programming:

Creating a single and multiple threads, thread priorities, synchronization.

UNIT-IV

Applets:

Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets.

Graphic Programming: Basics, Introduction to swings.

Event Handling: Event classes and event listener interfaces.

UNIT – V

Networking :

Socket overview -- datagram socket and TCP/IP based server socket, Internet Addressing --- DNS, URL.

UNIT – VI

Java Database Connectivity:

Establishing a connection(JDBC, ODBC connectivity) , transactions with database.

Recommended Books :

1. P. Naughton and H. Schildt: The complete reference to Java, Tata Mc-Graw Hill.
2. Deitel and Dietel: How to program in Java
3. E. Balaguruswamy : Programming in Java, Tata McGraw Hill.

CSC402C Operating System

No. of Lectures-32

Introduction:

Operating systems overview: Operating systems as an extended machine & resource manager, operating systems classification; Operating systems and system calls; Operating systems architecture.

UNIT-II

Processes:

Process Concept, Thread, design issues of thread, user space thread and kernel space thread.

Usage of thread. Process states, Operation on Processes:- creation and termination.

Implementation of process:- process table.

UNIT-III

Process Synchronization:

Race condition, Critical-Section, mutual exclusion. Solution to race condition and synchronization: - disabling interrupt, test-and-set-lock, Peterson's solution, semaphore, mutex, monitor, message passing. Classical problems:- The Dining philosopher, sleeping barber and readers-and-writers (bounded buffer) problems and their solution.

UNIT-IV

Scheduling:

Basic Concepts, preemptive and non preemptive scheduling. Scheduling Algorithms. Types of scheduling: - batch, interactive and real-time. Goals of scheduling algorithms. FCFS, SJF, RR, priority, multiple queues, three-level scheduling.

UNIT-V

Deadlocks:

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Banker's algorithm.

UNIT-VI

Memory management:

Multiprogramming. Address binding (relocation), and protection. Swapping. Virtual memory: - logical versus physical address space, paging, page fault, page table and its entries, demand paging, multi level page table, TLB, its entries and working. Page replacement algorithms: - LRU, optimal, NRU, FIFO, second chance, clock, NFU. Working set. What is segmentation, what are its benefits and drawbacks.

UNIT-VII

File system:

What is file, file naming, file types(directory, regular, device), sequential access and random access files, file attributes, operations on file, hierarchical directory structure, path name(relative and absolute), operation on directories, disk layout, disk partition, file system layout, disk block allocation:-contiguous allocation linked list allocation, FAT, i-nodes, directories in UNIX, file system security

UNIT-VIII

I/O management:

Basic principles and overall structure of I/O management subsystem, Device controllers, layers of the I/O subsystem:- interrupt handlers device driver, device independent I/O software and user space I/O software.

Referential Books :

1. Modern Operating System, Tanenbaum, PHI Publication.
2. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne.
3. G. Nutt Operating Systems: A Modern Perspective, Pearson Education.
4. W. Stallings Operating Systems, Prentice Hall of India.

CSC403C: Computer Network

No. of Lectures-32

UNIT 1

Introduction:

Usage of Computer Network, study of topology, concept of protocol, Connection less and connection Oriented Service, Layered architecture, study of OSI and TCP model.

UNIT-II

Physical layer:

Introduction to Guided and Unguided media, physical description of twisted pair, coaxial cable, and fiber optic cable, Maximum data rate of a channel (Nyquist and shannons law), Basic concepts of Modulation and demodulation, Data encoding techniques (Manchester and Differential Mancestar encoding) Network connecting devices hub, repeater, bridge, switch, router, and gateway

UNIT-III

Data Link Layer:

Functions and services of DLL, Framing and Framing Methods, Concept of Error Control, Error Correcting code(Hamming code), Error detecting code(CRC), Concept of Flow Control, Piggybacking, Stop-and-Wait sliding window protocol, Pipelining techniques(Go backN, Selective Repeat).

UNIT-IV

Medium Access Control:

What is MAC? Static Channel Allocation, Dynamic Channel Allocation, Pure ALOHA, Slotted ALOHA, Carrier Sense Protocol, 1-persistent CSMA, Non-Persistent CSMA, CSMA/CD, Ethernet(IEEE 802.3) and Ethernet Frame Format, Basic concept of Wireless LAN(IEEE 802.11), Binary Exponential Backoff Algorithm.

UNIT-V

Network Layer:

Services and Functions of Network Layer, Virtual Circuit and Datagram Subnet, Routing, Distance Vector Routing, the Count-to-Infinity problem, Link State Routing, Congestion (definition and factors of congestion only), Definition of Quality of Service, Traffic shaping, Leaky Bucket and token Bucket Algorithm, Concept of IP Address.

UNIT-VI

Transport Layer:

Functionality of transport Layer, Establishment and release of connection, TCP and UDP(Overview), Introduction to Sockets, port numbers.

UNIT VII

Application Layer:

Concept of E-mail, Telnet, WWW, DNS, HTTP, FTP, URL, SMTP, MIME.

Referential Books :

1. Computer Networks, Andrew S. Tanenbum, PHI Publication
2. Data and Computer Communication, 8th edition, William Stallings, Pearson Publication.
3. Computer Networkö , by S.S. Shinde, NAI Publisher.

CSC404E: Introduction to Object Oriented Programming using C++

No. of Lectures-32

UNIT – I

Different paradigms for problem solving, need for OOP, differences between OOP and procedure oriented programming, abstraction, overview of OOP principles- encapsulation, inheritance and data binding polymorphism. abstraction. C++ basics: structure of a C++ program, data types, declaration of variables, expressions, operators, type conversions, pointers and arrays, strings, structures, references, flow control statement, functions-scope of variables, parameter passing, recursive functions, default arguments, inline functions, dynamic memory allocation and deallocation operators.

UNIT- II

Encapsulation, information hiding, abstract data types, Object & classes, attributes, functions, C++ class declaration, member functions, State identity and behavior of an object, static data 4members and member functions, friend functions, constant member functions. Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, Metaclass/abstract classes.

Operator overloading: Overload unary, binary operators, overloading binary operators using friends, manipulation of strings using operators.

UNIT – III

Inheritance: defining a class hierarchy, different forms of inheritance, defining the base and derived classes, access to the base class members, base and derived class construction, destructors, virtual base class. Polymorphism: static and dynamic bindings, base and derived class virtual functions, dynamic binding through virtual functions, virtual function call mechanism, pure virtual functions, abstract classes, implications of polymorphic use of classes, virtual destructors.

UNIT-IV

Exception handling: benefits of exception handling, throwing an exception, the try block, catching an exception, exception objects, exception specifications, rethrowing an exception, catching all exceptions.

File handling : stream classes hierarchy, stream I/O, file streams, opening and closing data file, creating a data file, read and write functions, error handling during file operations, formatted I/O, sequential and random file processing.

Recommended Books

1. Herbert Schild, ò The complete reference to C++ö, Osborn McGraw Hill
2. R. Lafore, òObject Oriented Programming using C++ö, Galgotia Publications
3. Ian Graham, òObject Oriented Methodsö, Addison Wesley..
4. E. Balaguruswamy, òObject Oriented Programming with C++ö, Tata McGraw Hill

Semester-5

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|-------------------------|--------------|----------------|
| CSC 501C | Software Engineering | 3+1+0 | 4 |
| CSC 502C | Advanced Web Technology | 2+1+1 | 4 |
| CSC 503C | Major Project (Part- I) | 0+2+2 | 4 |
| CSC504E | Windows Programming | 2+0+1 | 3 |

CSC 501C: Software Engineering

No. of Lectures-32

UNIT-I

Software Engineering Fundamentals:

Definition of Software, Software characteristics, Software Applications.

Software Process:

Software Process Models - Waterfall model, prototyping model, spiral model, incremental model, concurrent development model.

Project management Concepts:

The Management Spectrum - The People , The Product , The Process , The Project.

UNIT-II

Software Process and Project Metrics:

Measures , Metrics and Indicators , Software measurement : Size - Oriented Metrics , Function - Oriented Metrics , Extended Function point metrics

Software Project Planning:

Project Planning Objectives, Software Project Estimation , Decomposition Techniques - Problem Based Estimation , Process Based Estimation , Empirical Estimation Models- The COCOMO Model

Risk Analysis and Management:

Software risks, Risk identification, Risk Projection, Risk Refinement, Risk Mitigation , Monitoring and Management.

UNIT-III

Software Quality Assurance:

Basic concepts- Quality, Quality Control, Quality Assurance, Cost of Quality , Software Quality Assurance (SQA) , Formal Technical Review

Software Configuration Management:

Baselines, Software Configuration Items, The SCM Process, Version Control, Change Control, Configuration Audit, Status Reporting.

Analysis Concepts and Principles:

Requirements Elicitation for Software , Analysis Principles - The Information Domain, Modeling, Partitioning, Essential and Implementation Views, Specification: Specification Principles, Representation, The Software Requirement Specification (SRS)

UNIT-IV

Design Concepts and Principles:

Design Principles , Design Concepts ó Abstraction, Refinement, Modularity, Software Architecture, Control Hierarchy, Structural Partitioning, Data Structure, Software Procedure, Information Hiding , Effective Modular Design- Cohesion , Coupling

Software Testing:

Testing Objectives & principles, Unit Testing, Integration Testing (Top Down Integration , Bottom Up Integration , Regression Testing, Smoke Testing), Validation Testing (Alpha and Beta Testing), System Testing (Recovery Testing, Security Testing, Stress Testing, Performance Testing).

UNIT-V

Reengineering:

Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

CASE Tools:

What is CASE, Building Blocks of CASE, A Taxonomy of CASE Tools, Integrated CASE Environments, The Integration Architecture, The CASE Repository.

Referential Books :

1. R. Pressman: Software Engineering, McGraw-Hill.
2. K.K. Agrawal and Y. Sing: Software Engineering, New Age International.
3. P. Jalote: Software Project Management in Practice, Pearson.
4. R. Mall: Fundamentals of Software Engineering, PHI.
5. R.K. Malu: Software Engineering, Scitech Publications.

CSC 502C: Advanced Web Technology

No. of Lectures: 32

UNIT I

Internet Basics:

Basic concepts, Communication on the Internet, Internet Domains, WWW, MIME, TCP/IP and Internet, UDP, Idea of Web Server, Web browser, Idea on protocols like HTTP, SMTP, TELNET, FTP. Introduction to HTML, Basic tags and attributes, Tags used for text formatting, image, creating hyperlink, List, Ordered List and Unordered List, Table, Clickable Map, Frame, Designing Forms & Controls ,DHTML.

UNIT-II

Introduction to VBScript:

Adding VBScript Code to an HTML Page - VB Script Basics - VBScript Data Types - VBScript Variables - VBScript Constants - VBScript Operators ó mathematical- comparison- logical - Using Conditional Statements - Looping Through Code - VBScript Procedures ó type casting variables - math functions ó date functions ó string functions ó other functions .

UNIT-III

Introduction to Javascript:

Advantages of Javascript ó Javascript syntax - Data type ó Variable - Array ó Operator & Expression ó Looping ó control structures - Constructor Function ó user defined function Dialog Box .

UNIT-IV

Javascript document object model ó Introduction ó Object in HTML ó Event Handling ó Window object ó Document object ó Browser object ó Form object ó Navigator object ó Screen object ó Build in object ó User defined object ó Cookies.

UNIT-IV

ASP.NET Language Structure ó Page Structure ó Page event , Properties & Compiler Directives HTML server controls ó Anchor, Tables, Forms, Files . Basic Web server Controls ó Label, Text box, Button, Image Links, Check & radio Button, Hyperlink, Data List Web Server Controls ó Check box list. Radio button list, Drop down list, List box, Data grid, Repeater.

Referential Books :

1. Deitel & Deitel, Goldberg, "Internet and World Wide Web- How to Program", Pearson Education Asia, 2001.
2. The Internet óComplete M.L Young; Tata McGraw Hill Using CGI by J.Dwight , M.Erwin, R. Niles: Prentice Hill.
3. Mastering JavaScript and Jscript by J.Jaworski; BPB Publication.
4. Dynamic HTML óthe definitive references by D.Godman: Shroff Publishers.
5. Understanding XHTML by D.P Nagpal: Wheeler Publishing.
6. Rebecca M. Riordan, "Head First Ajax", SPD, O'REILLY.
7. Kongent S., "Java Server Programming (JEE 6) Black Book, Platinum Edition", 2008, Dreamtech Wiley India Pvt. Ltd.
8. I.Bayross, 2000, Web Enable Commercial Application Development Using HTML, DHTML, Javascript, Perl CGI, BPB Publications.
9. A.Russell Jones, Mastering Active Server Pages 3, BPB Publications.

CSC 503C Major Project (Part- I)**CSC 504E: Windows Programming****UNIT-I**

Introduction ó Concepts of Windows Programming ó Event Driven Programming ó Languages that support Windows Programming ó Visual Basic ó Java ó Visual C++
Visual Basic Programming: Basic Language features ó Variables, data types, constants, control statements ó Forms ó Creating and Using basic Controls ó text boxes, labels, buttons ó Event handling procedures ó Properties Window ó Common properties for Controls. Message boxes.

UNIT-II

Visual Basic Programming (Contd) Standard Controls ó List boxes, Comboboxes, Image box, picture box, Shape controls, Timer, Scrollbars, Frames, Checkboxes, Option Boxes ó Frames ó File, Drive and Directory List boxes.- MDI and SDI interfaces ó Menus.

UNIT-III

ActiveX controls ó RichTextBox, Tree View Control, List view Control, Progressbar, Flexgrid Control, Common dialog Controls ó Font, File, Print Dialogs ó Creating Custom activex controls ó Creating Events and properties for ActiveX controls.

UNIT-IV

Graphics and Multimedia ó Drawing Graphics in Windows ó setting colors ó Drawing text, lines, ellipses, arcs, circles ó plotting points ó Filling figures with colors and patterns ó Using clipboards to transfer images between applications Printing graphics and text ó Creating

animations with Picture clip control ó applying image effects ó stretching, flipping, embossing, engraving, blurring, sweeping ó Using the Multimedia Control ó Handling multimedia Errors.

UNIT-V

Database Access ó Using DAO, RDO and ADO for accessing databases ó Creating tables, inserting, deleting and updating records ó Using the Data Control ó Using the ADO Data Control Using Windows API: Using DLL Procedures in Visual Basic ó Declare statement ó Handling C++ and Windows Data types ó Playing sound with API funtions ó Capturing Images from the screen ó Handling mouse outside Applications window ó Making an always on top window.

Recommended Books

1. Visual Basic 6 Programming Black Book ó Steven Holzner (Dreamtech Press)
2. Programming Windows fifth Edition ó Charles Petzlod (Microsoft Press) 3.
3. Visual Basic ó Ivan Petrosaus (BPB)
4. Visual Basic ó Garry Cornell (BPB)
5. Using Visual Basic ó Resselman (PHI)

Semester-6

| Paper Code | Paper Title | L-T-P | Credits |
|-------------------|--|--------------|----------------|
| CSC601C | Data Mining | 3+1+0 | 4 |
| CSC602C | Compiler Design | 3+1+0 | 4 |
| CSC603C | Major Project-(Part-II) | 0+2+2 | 4 |
| CSC604E | Introduction to UNIX and Shell Programming | 2+0+1 | 3 |

CSC601C: Data Mining

No. of Lectures-32

UNIT-I

Data Warehousing

Overview and concepts:

Need for Data Warehousing, Basic elements of Data Warehousing, differences between Database Systems and Data Warehouse.

Planning and Requirements: Project planning and management, collecting the requirements.

Architecture and Infrastructure: Data Warehouse Architecture and its components, Infrastructure and metadata. Data Design and Data Representation: Principles of dimensional modeling, advanced topics- data extraction, transformation and loading, data quality.

Information Access and Delivery: Matching information to classes of users, OLAP in Data Warehouse, Data warehousing and the web. Implementation and Maintenance: Physical design process, Data Warehouse deployment, growth and maintenance.

UNIT-II

Data Mining

Introduction :

Basics of data mining, Different definitions of Data Mining and related concepts, Data mining process- Data preparation, data cleaning and data visualization. KDD process. Data mining techniques: Clustering, Association rules and Decision trees.

UNIT-III

Clustering:

Partitional versus Hierarchical Clustering, types of data in clustering. Partitional clustering methods ó k-means, k-medoids, PAM, CLARA, CLARANS. Hierarchical clustering methods ó BIRCH, CURE. Density based clustering methods- DBSCAN. Categorical clustering ó DBSCAN.

UNIT-IV

Rule Mining:

What is an association rule? Mining association rules, frequent sets and border sets, algorithms for mining association rules ó Apriori algorithm, Pincer-Search algorithm, Border algorithm. Generalized association rule, quantitative association rule, association rule with item constraint.

UNIT-V

Decision Trees:

Introduction, tree construction principle, decision tree generation algorithms ó CART, ID3.

UNIT-VI

Applications:

Application and trends in Data Mining: Data Mining Application, Data Mining system products and research prototypes, additional themes on data mining and social impacts of Data Mining.

Recommended Books

1. A.K. Puzari, Data Mining Techniques, University Press.
2. J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufman. 2001.
3. P. Tan, M. Steinbach and V. Kumar; Introduction to Data Mining; Pearson Education (LPE); 2009.

CSC602C: Compiler Design

No. of Lectures-32

UNIT -I

Overview of Compilation:

Phases of Compilation ó Lexical Analysis, pass and Phases of translation, interpretation, bootstrapping, data structures in compilation ó LEX lexical analyzer generator.

UNIT II:

Finite Automata

DFA, NFA, NFA with ϵ -moves. Equivalence of DFA and NFA.

Regular Languages and Regular Grammar

Concept of languages and grammar. Regular expressions. Connection between regular expressions and regular languages. Regular grammars, Right and Left-Linear Grammars. Equivalence between Regular languages and Regular grammars.

UNIT III

Top down Parsing:

Context free grammars, Top down parsing ó Backtracking, LL (1), recursive descent parsing, Predictive parsing, Preprocessing steps required for predictive parsing.

UNIT IV

Bottom up parsing

Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing , handling ambiguous grammar, YACC ó automatic parser generator.

UNIT V

Code generation:

Symbol table contents, implementation. Type checking. Syntax directed translation. Forms of intermediate codes. Abstract Syntax Trees, Directed Acyclic Graph, Three address code. Intermediate code generation for different language constructs , boolean expressions, if, if-else, while, case or switch, function calls. Target code generation issues, register allocation, Runtime storage management.

UNIT VI

Code optimization :

Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, folding, DAG representation. Flow graph, data flow equation, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation.

Recommended Books

1. Principles of compiler design -A.V. Aho . J.D.Ullman; Pearson Education.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

CSC603C Major Project (Part-II)

CSC604E : Introduction to UNIX and Shell Programming

No. of Lectures-32

UNIT-I: UNIX/Linux Introduction to Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell. Partitioning the Hard drive for Linux, Installing the Linux system, System startup and shut-down process, init and run levels. Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories. Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, pwd, file, more, less, head, tail, pg, cat and disk related commands.

UNIT-II: Essential Linux commands Understanding shells, Processes in Linux-process fundamentals, connecting processes with pipes, tee, Redirecting input output, manual help, managing multiple processes, changing process priority with nice, scheduling of processes at command, cron, batch commands, kill, ps, who, sleep, Printing commands, find, sort, touch, file,

file related commands-`ws`, `sat`, `cut`, `dd`, etc. Mathematical commands- `bc`, `expr`, `factor`, `units`. Creating and editing files with vi editor.

UNIT–III: System administration Common administrative tasks, identifying administrative files ó configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable userø accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using `su`. Getting system information with `uname`, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with `kudzu`, installing and removing packages.

UNIT–IV: Shell programming Basic of shell programming, Various types of shell available in Linux, comparisons between various shells, shell programming in `bash`, `read` command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automate system tasks.

UNIT-V:

Simple filter commands ó `pr`, `head`, `tail`, `cut`, `paste`, `sort`, `uniq`, `tr`. Filter using regular expressions ó `grep`, `egrep`, and `sed`.

Referential Books :

1. B.M.Harwani, Unix and Shell Programming, Oxford University Press
2. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
3. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
4. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH
5. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.