Semester I

DMCA101 ENGLISH
MODULE - I

Speech Sounds: Phonemic symbols - Vowels - Consonants - Syllables - Word stress - Stress in polysyllabic words - Stress in words used as different parts of speech - Sentence stress - Weak forms and strong forms - Intonation - Awareness of different accents: American, British and Indian - Influence of the mother tongue

MODULE - II

Listening: Active listening - Barriers to listening - Listening and note taking- Listening to announcements - Listening to news on the radio and television

MODULE- III

Speaking: Word stress and rhythm - Pauses and sense groups - Falling and rising tones - Fluency and pace of delivery - Art of small talk - Participating in conversations - Making a short formal speech - Describing people, place, events and things - Group discussion skills and telephone skills

MODULE - IV

Reading: Reading: theory and Practice - Scanning - Surveying a textbook using an index - reading with a purpose - making predictions - Understanding text structure - Locating main points - Making inferences - Reading graphics - reading critically - Reading for research

TEXT BOOKS
V.Sasikumar, P Kiranmai Dutt and Geetha Rajeevan,
Communication Skills in English. Cambridge University Press and Mahatma Gandhi University.
Sasikumar V, Kiranmai Dutt and Geetha Rajeevan, Acourse in listening and speaking I & II
Tony Lynch, study Listening: A course in Listening to lectures and note-taking
Anderson Kenneth, Joan Maclean, Study speaking: A Course in Spoken

English for Academic Purposes
Glendinning, Eric and Beverly Holmstrom, Study Reading: A Course in Reading Skills for Academic Purposes, New Delhi, CUP, 2008
Sky Massan, Communication Studies, Palgrave Macmillan
Joan Van Emden and Lucinda Becker, effective Communication for Arts and Humanities Students, Palgrave Macmillan

DMCA102 - Mathematical Foundations of Computer Science

Module 1:- Sets: Basic Concepts. **Relations:** Binary relations, Equivalence relations and partition. **Functions:** Different types of functions, Composition and Inverse.

Module 2:- Partial Ordering Relations

Partially ordered set: Representation of Poset - Hasse Diagram, LUB, GLB, well ordered set, meet and join of elements. Mathematical Induction.

Module 3:- Logic

Mathematical logic, Logical operators – Conjunction, Disjunction, Negation, Conditional and biconditional. Truth tables. Equivalence formula, Tautology, methods of proof-direct, indirect, contradiction, equivalence and induction. Inference Theory, Validity by truth table, Rules of Inference.

Module 4:- Graph Theory

Basic terminology: Different types of graphs – Directed and undirected, Simple, Pseudo, Complete, Regular, Bipartite. Incidence and degree, Pendant and Isolated vertex and Null graph. Isomorphism, Sub graphs.

Module 5:- Euler & Hamiltonian Graphs

Walk, Path and Circuit, Connected and disconnected graphs and components, operations on graphs. Euler Graphs, Fleury's Algorithm, Hamiltonian circuits and paths. Traveling salesman problem. Matrix representation of graphs – Incidence and Adjacency matrices.

References

Discrete Mathematical Structures with Applications to Computer Science

by J. P. Tremblay and R Manohar, Tata McGraw-Hill Publications, 1997.

Graph Theory by Narsingh Deo, Prentice-Hall of India publications, 2004. Malik, Thomson Learning , I Edn.

Discrete Mathematics for Computer Science, Haggard, Thomson Learning , I Edn.

Discrete Mathematics and Its Applications by Kenneth H Rosen. Tata McGraw-Hill Publications.

Mathematical foundation of Computer Science by Y. N Sings. New Age international Publishers.

Bernard Kolman, Robert.C.Busby & sharon Ross, "Discrete Mathematical structures" Prentice Hall of India,2001.

Graham Everest, Thomas Ward: An Introduction to Number Theory, , Springer

Fernando Rodriguez Villegas: Experimental Number Theory, Oxford University Press

DMCA 103- Statistics I

Module I:- Scope and Limitations of Statistics

Introduction, Limitations of Statistics, Misuse of Statistics, Collection of data- primary and secondary data, collection of primary data, Classification and tabulation-methods of classification and tabulation

Module II:-Diagrams and Graphs

Pictorial representation of data, Representation of categorical data, Graphs of frequency distribution, ogives and uses of ogives

Module III:-Measures of central tendency and Dispersion

Definition of central tendency, Measures- Mean, Median, Mode, Geometric Mean , Harmonic Mean. Dispersion –Introduction, Absolute and relative measures of

dispersion-Range, Inter- quartile range, quartile deviation, mean deviation and standard deviation

Module IV:- Skewness, Moments and Kurtosis

Definition and types of Skewness, Measures of Skewness-Karl pearson's coefficient of skewness, Bowley's coefficient of skewness, Kelly's measure of skewness. Moments- raw and central moments. Kurtosis

Module V:- Correlation and Regression

Correlation- Meaning and definition, types of correlation, Karl Pearson's coefficient of correlation, Rank correlation. Regression- Meaning and definition, types of regression, lines of regression.

References

Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications.

Introduction to Probability and Statistics, Medenhall, Thomson Learning , 12 Edn.\

B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.

Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta

DMCA 104- Introduction to Computers and PC hardware

Module I
Basic Components of a Computer, History, Types of computers. I/O devices: Input and Output devices, Printers-Different types of Printers, Display Devices, Scanners.

Module II

CPU & Memory – CPU, ALU, Control Unit & Registers, RAM, Variants of RAM, ROM, Variants of ROM, Physical Memory organization: DIP, SIMM, DIMM, SIPP.

Module III
Introduction, Getting started withPC hardware support, Operating systems, CPUs and motherboards, Basic Input/Output System, Memory systems, Bus structures, Expansion cards, Ports, connectors, and cables, Data storage devices, Video and multimedia input/output devices,

Module IV
Hard Disk**: Hard** disk drive components, disk platter, read/ write head, head arm/ head slider, spindle motor, logic board, air filter, head actuator mechanism. Disk Geometry: Sides or heads, track, cylinder, sector, Disk Recording: Data recording method, writing on reading from a magnetic disk, interleave, skew. Hard Disk Interfacing: Concepts of Interfacing Formatting: Low level and high level.

Module V
Mother Board: CPU socket, Memory and secondary Cache sockets or chips, ROMBIOS and BIOS CMOS, Universal serial bus. Secondary Storage Devices: Floppy disk, CD Family, DVD, ZIP Drive**.** Trouble shooting and PCMaintanance.

References
The Complete Reference – PC Hardware – Craig Zacker & John rourke, Edition 2001 Tata McGraw Hill

All About Hard Disk, Manohar Lotia

All About Motherboard, Manohar Lotia

DMCA 105 Programming methodology & C Programming

Module I
Introduction to algorithm, flowchart, structured programming concept, programs – Compiler, Interpreter. Introduction to C Language: The C character set, identifiers and keywords, data types, how floats and doubles are stored, constants, variables and arrays, declarations, expressions, statements,

Lvalues and Rvalues , type conversion, symbolic constants.

Module II
Operators and expressions: Arithmetic operators, unary operator, relational and logical operator, assignment operators, the conditional operator, type conversion, Library function, Data input and output: Single character input, single character output, scanf, printf, puts gets functions, interactive programming. Control statement: Branching: if else statement, Looping, nested control structure, switch statement, break statement, continue statement, comma operator, goto statement.

Module III
Functions: Overview, function prototypes, passing arguments to a function, recursion. Program structure: Storage classes, automatic variables, external variables, static variables, multifile program. Arrays: Defining an array, passing array to functions, multidimensional arrays, strings: one dimensional character array, array of strings.

Module IV
Pointers: Fundamentals, void pointer, null pointer, passing pointers to a function, pointers and one dimensional arrays, dynamic memory allocation, operation on pointers, pointers and multidimensional arrays, array of pointers, pointer to an array, pointers and strings, structure pointer, pointers to function, pointers and variable length arguments list, passing functions to other functions. Structures and unions: Defining a structure, processing a structure, user defined data types, structure and pointers, passing structure to function, self-referential structures, and union.

Module V
Data files: Why files, opening and closing a data file, reading and writing a data file, processing a data file, unformatted data file, concept of binary file. Low level programming: Register variable, bitwise operations, bit fields. Additional features of C: Enumeration, Command line parameters, Macros, C Preprocessor.

References
The c programming language – Brian W Kernighan & Dennis Ritchie IInd edition Eastern Economy Edition, Prentice Hall 2001
Programming with C – Byron S Gottfried– Schaum"s outlines 2nd Edition,2010
Computer Science: A Structured Programming Approach Using C,

Forouzan, 3rd Cengage Learning 2007

C – How to Program, Deitel & Deitel, Pearson Education Asia, 6th Edition,2009

Programming in C –Pradip Dey, Manas Ghosh – Oxford Higher Education ,2007

Ansi C programming Bronson, Cengage learning, C2009

Understanding pointers in C- Yashavant Kanetkar – BPB publication , 2009

Let us C - Yashavant Kanetkar – BPB publication C. 1997

C by discovery – l s Foster – Pearson C 2005

Working with C - Yashavant Kanetkar – BPB publication,2008

Instant C program – Ivor Horton – Wrox, 1995

The art of programming computer science with „C‟ – Steven c Lawlor – Wess , Cengage C2006

DMCA 106 – Software Lab I (PC HARDWARE LAB)

1. Identification of PC Components and Assembling the PC
2. Understanding BIOS set up-
3. Installation of Operating Systems-
4. Installation of Software Packages
5. Replacing and fitting of Hard Disk and Removable Disk Drives on PC
6. Identification of different cards in the PC
7. Disc Managers and it's use
8. Virus removal and disc scan
9. Backup and Restoration utility
10. Connecting input/output devices and installation of their driver softwares.
11. Configuration of Audio and Video
12. Trouble shooting of the PC
13. Ms office –Word, Excel, Powerpoint and Access

References

The Complete Reference – PC Hardware – Craig Zacker & John rourke, Edition 2001 Tata McGraw Hill

DMCA 107 Software Lab II (C Programming Lab)

Section A

- Implementation of the various Data Types in C.
- Demonstration of Data type conversion (Hint: Usage of type casting).
- Implementation of various Storage Types.
- Demonstration of for loop.
- Demonstration of do...while loop.
- Demonstration of while loop.
- Demonstration of nested if (Hint: Use logical operators).
- Demonstration of switch... case structure.
- Implementation of arrays.
- Implementation of multidimensional arrays (Hint: implement matrix operation).
- Implementation of functions (Hint: Demonstrate call by value, call by schemes, passing of arrays).
- Demonstration of various string operations (Hint: Usage of user defined functions only allowed).
- Demonstration of pointer operations.
- Demonstration of recursion (Hint: GCD, factorial, Fibonacci series).
- Demonstration of Debugging a C program.

Section B

- Implementation of structures (Hint: simple structure operations, array of structures).
- Implementation of Union.
- Implementation of pointers to structures and unions.
- Demonstration of dynamic allocation of memory (Hint: malloc, calloc, realloc, free).
- Demonstration of sorting techniques (Hint: selection sort, bubble sort).
- Demonstration of searching techniques (Hint: linear search, binary search).
- Demonstration of bitwise operations.
- Demonstration of macro processing.
- Demonstration of various file operations. (Hint: Text file)
- Implementation of character counting, line counting and word counting for a file.
- Program to find the lengthiest line in a text file.

Semester II

DMCA 201 Technical Communication

Module I
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); **Speaking -** Speaking about one‟s place, important festivals etc. – Introducing oneself, one‟s family / friend; **Reading -** Skimming a reading passage – Scanning for specific information - Note-making; **Writing -** Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one‟s leisure time activities, hometown, etc.); **Grammar -** Prepositions - Reference words - Wh-questions - Tenses (Simple); **Vocabulary -** Word formation - Word expansion (root words / etymology); **E-materials -** Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

Module II
Listening - Listening and responding to video lectures / talks**; Speaking -** Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; **Reading –** Critical reading - Finding key information in a given text - Sifting facts from opinions**; Writing -** Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; **Grammar -** Use of imperatives - Subject-verb agreement**; Vocabulary -** Compound words - Word Association**; E-materials -** Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

Module III
Listening - Listening to specific task - focused audio tracks; **Speaking -** Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); **Reading -** Reading and interpreting visual material**; Writing -** Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing**; Grammar -** Tenses (Past) - Use of sequence words - Adjectives**; Vocabulary -** Different forms and uses of words, Cause and effect words**; E-materials -** Interactive exercises for Grammar and Vocabulary - Excerpts from films related to

the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

Module IV
Listening - Watching videos / documentaries and responding to questions based on them**; Speaking -** Responding to questions - Different forms of interviews - Speaking at different types of interviews; **Reading -** Making inference from the reading passage - Predicting the content of a reading passage; **Writing -** Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays**; Grammar -** Adverbs – Tenses – future time reference; **Vocabulary -** Single word substitutes - Use of abbreviations & acronyms**; E-materials -** Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

Module V
Listening - Listening to different accents, Listening to Speeches / Presentations, Listening to broadcast & telecast from Radio & TV**; Speaking -** Giving impromptu talks, Making presentations on given topics**; Reading -** Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email **Writing -** Creative writing, Poster making**; Grammar -** Direct and indirect speech**; Vocabulary -** Lexical items (fixed / semi fixed expressions); **E-materials -** Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters

References:

Mindscapes: English for Technologists and Engineers, Department of English, Anna University, Chennai, 2012 .

S.P.Dhanavel, English and Communication skills for students of science and Engineering, Orient Black Swan, Chennai, 2011.

Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. **Technical English: Writing, Reading and Speaking.** New York: Longman, 2001.

Bailey, Stephen. **Academic Writing: A practical guide for students.** New York: Rutledge, 2011.

Morgan, David and Nicholas Regan**. Take-Off: Technical English for Engineering.** Reading: Garnet Publishing Limited, 2008.

Thorn, Michael and Alan Badrick. **An Introduction to Technical English.** Harlow**:** Prentice Hall Europe, 1993.

Rizvi, M.Ashraf. **Effective Technical Communication.** New Delhi: Tata McGraw-Hill Publishing Company, 2007.

DMCA 202 Statistics II

Module I:- Probability Theory

Introduction, Sample space, Events, Different approaches to probability, Addition and multiplication theorems on probability, Independent events, conditional probability, Bayes theorem

Module II:-Random Variables and Mathematical Expectations

Random Variables , probability functions and distribution functions, marginal density functions, joint density functions

Mathematical Expectation- Definition, elementary properties of expectation, Moments-Raw and central moments, Mean ,Variance and Co variance, Moment generating function, characteristic functions

Module III:-Standard distributions

Discrete probability distributions-Uniform distribution, Binomial distribution, Poisson distribution, Geometric distribution, Exponential distribution

Continuous probability distributions-Uniform distribution and Normal distribution

Module IV:- Sampling and Estimation

Theory of Sampling-population and sample, Types of sampling

Theory of Estimation-Introduction, point estimation, methods of point estimation-maximum Likelihood estimation and method of moments, Central Limit theorem (statement only)

Module V:- Testing of Hypothesis

Null and alternative hypothesis, types of errors, level of significance, critical region, large sample Tests-Testing of hypothesis concerning mean of a population and equality of means of two populations. Small sample tests-t Test for single

mean, difference of means, Paired t-test, Chi-square test, F test-test for equality of two population variances

References

Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition- April 2004, Himalaya Publications.

Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.

Introduction to Mathematical Statistics -Robert V. Hogg &Allen T. Craig. Pearson education. 12 Edn.

Probability and Statistics – Schaums outline series

DMCA 203 Digital Systems & Logic Design

Module1 - Number systems and code.
Number systems - Efficiency of number system, Decimal, Binary, Octal, Hexadecimal conversion from one to another- Binary addition, subtraction, multiplication and division, representation of signed numbers, addition and subtraction using 2's complement and I's complement. **Binary codes -** BCD code, Excess 3 code, Gray code, Alphanumeric code, Error detection codes, Error correcting code.

Module II - Logic Gates and Boolean Algebra.
Logic Gates - Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, truth table and timing diagrams. **Boolean Algebra** - Basic laws and theorems, Boolean functions, truth table, minimization of boolean function using K map method, Realization using logic gates and universal gates.

Module III - Combinational and Sequential Logic Circuits.
Combinational circuits - Half adder, Full Adder, Parallel binary adder, Subtracter, Magnitude
Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Parity bit generator, PLA. **Sequential circuits** - Flip Flops – RS, JK, T and D Flip Flops, Edge triggered Flip Flops, Master slave Flip Flops.

Module IV - Registers and counters.

Registers - Serial in serial out, Serial in Parallel out, Parallel in serial out, Parallel in Parallel out registers, Bidirectional shift registers, universal shift registers. **Counters -** Synchronous and asynchronous counters, UP/DOWN counters, Modulo-N Counters, Cascaded counter, Programmable counter, Counters using shift registers, application of counters.

Module V - Introduction to computers.
Basic components of a computer , I/O devices - Input and output devices, printers, Display devices, Scanners. Mother Board - components of mother board. Secondary storage devices - Hard disk- components of hard disk, data storage in hard disk, disk geometry.CD Family, DVD.

References
Digital logic and Computer design - Morris Mano, Prentice Hall of India,2004.
Digital Fundamentals - Floyd, Pearson Education, 2009.
All about Hard Disk- Manohar Lotia, BPB Publications.
Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
All about Mother Board- Manohar Lotia, 2002.
Digital computer Fundamentals - Thomas C Bartee, McGraw Hill.
The Complete Reference PC Hardware – Craig Zacker, John Rourke, Tata McGraw-Hill, 2004.

DMCA 204 Data Structures-C

Module I
Introduction: Algorithmic notation, Introduction to algorithm analysis for time and space requirements. **Arrays**: Ordered lists – polynomial addition, sparse matrices, representation of array.

Module II
Linked List: Singly linked list, Linked stacks and queues, Polynomial addition, Equivalence relation, sparse matrices, doubly linked list and dynamic storage management, Garbage collection and compaction. Strings – data representation for strings, Pattern matching in strings,

Module III
Stacks and Queues: Definition and concepts, Operations on stacks. Application of stacks- recursion, polish expressions and their compilation, queue, representation of queue, circular queue, deque, priority queue, Application of queues, Linked stacks and queues.

Module IV
Trees: Basic terminology, binary trees, binary tree representation, Binary tree traversal, threaded binary trees, binary tree representation of trees, Application of trees – Set representation, Balanced Trees-B,B+. **Graphs**: Terminology and representation, Traversals, Connected components and AVL.

Module V
Internal Sorting and External Sorting: Searching – Linear search, binary search, Fibonacci and interpolation search. Comparison of different methods. Sorting – Insertion, Bubble, Selection, Quick, heap, Radix sort, Merge sort comparison. Sorting with disks - K way merging, Run generation. **Hashing Techniques**: Different hashing functions, methods for collision handling

References:

Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)

An introduction to data structures with applications – Jean Paul Tremblay, paul G Sorenson(Tata McGraw Hill)

Data Structures – E.M Reingald , W Hamen (CBS Publishers and distributors)

Data Structures – a psedocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn.

Data Structures and program design – R. L Kruse (Prentice Hall of India)

Data structures using C – Tanenbaum and Augustine (Prentice Hall of India)

Theory and problems of data structures – Seymour lipschutz (Tata McGraw Hill)

Data structures and Algorithms in C++, Adam Drozdek, Thomson Learning, 3 Edn

Classic data structures – D Samanta (PHI)

DMCA 205 Object Oriented Programming with C++

Module I

Introduction to Object-Oriented Programming: Evolution of programming methodologies. Procedural Approach Vs Object-Oriented Approach. Encapsulation and Abstraction, Message Passing, Inheritance, Reusability, Extensibility, Polymorphism, Overloading.

Objects and Classes: Access Specifiers. Memory Allocation for Objects, Friend Functions and Friend Classes, Static Data Members; Static Member Functions. this pointer. Comparison of class with structure. Inline functions.

Arrays and Strings: Arrays Within a Class; Arrays of Objects; Objects as Function Arguments; Returning Objects; const Member Functions; Constructing Two-Dimensional Arrays. String Manipulation using objects

Module II

Constructors and Destructors: Purpose of Constructors and Destructors. Default Constructors, Constructors with & without parameters, Constructor Overloading, Copy Constructor. Invoking Constructors and Destructors.

Pointers in C++ : Pointer declaration and Access, Pointer to void, pointer and arrays, pointer to pointer, pointer to functions, call by pointer, pointer arrays, Jagged array, array of pointers to string, memory management – new and delete, pointer to object. self referencing class, wild pointers.

Module III

Polymorphism: Overloading Concepts, Function Overloading: Operator Overloading: Defining Operator Function, Rules for overloading Operators. Overloading unary operators, overloading binary operators, Overloading Comma, [], (), ->, new, delete Operators. Type Conversions – Basic to Class, Class to Basic and One class to another class type, Advanced Type Casting.

Module IV

Inheritance: Basic Concepts, Reusability & Extensibility. Defining derived classes, protected access specified in Base class constructors and destructors in derived classes – Types of Inheritances. Making a Private Member Inheritable; Member Classes: Nesting of Classes.

Virtual Functions: Virtual Base Classes, Normal member functions accessed with

pointers, virtual member function access, late binding, pure virtual function, abstract classes.

Module V

Console I/O operations: C++ streams and C++ stream classes – Predefined Objects, unformatted I/O operations, Formatted I/O operations - manipulators - User defined manipulators - Overloading << and >> Operators for Objects.

Disk I/O Operations: Stream Classes, classes for file stream operations, opening and closing a file, file nodes, writing an object to disk, reading an object from disk, binary versus character files, I/O with multiple objects, tellg() and seekg(), seekp() and tellp(). Updating a File : Error Handling During File Operations; Command-Line Arguments ,sequential access to a file, file input/output with stream class,error handling during file manipulations, filter utilities.

Templates: Generic Functions- A generic swap function, Functions with more than one Generic Type, Overloading a Function Template. Generic Classes – A stack generic class, Class template with more than one Generic Type, type name and template keywords, Template Restrictions, The power of Templates.

Exception Handling: Fundamentals of Exception Handling, Catching Class Types, Using Multiple catch statements, Catching All Exception, Restricting Exception, throw statement, Setting the Terminate and Unexpected Handlers, Uncaught exception, bad_exception Classes, and Built-In Exceptions. Exception Vs Error Handling, Assertion in C++.

References

Deitel & Deitel, *C++ How to program*, Pearson Education Asia, 7th Edition, 2010.

Computer Science: A Structured Programming Approach Using C++, Forouzan, Thomson Learning , 2 Edn

C++ Programming: Malik, Thomson Learning , 3 Edn

K.R Venugopal Rajkumar, *Mastering C++* , TMH.

Gaddis Tony, *Starting Out with C++,* dreamtech Press,

Sotter A Nicholas and Kleper J Scott, *Professional C++*, Wiley Publishing Inc.

Schildt Herbert, *The Complete Reference C++*, Tata McGraw Hill, 4th Edition

DMCA 206 Software Lab-III (Data Structures Lab in C)

1. Program to represent sparse matrix manipulation using arrays.
2. Program to represent Singly Linked List.
3. Program to represent Doubly Linked List.
4. Program to represent Circular Linked List.
5. Program to represent Linked Stacks.
6. Program to represent Linked Queues.
7. Program to represent string operations.
8. Program to represent Stack operations using array and pointers.
9. Program to represent Queue operations using array and pointers.
10. Program to represent Conversion of infix to postfix.
11. Program to represent Evaluation of Expressions.
12. Program to represent Binary Tree Operations.
13. Program to represent Binary Tree Traversals.
14. Program to represent Searching procedures (Linear search , Binary search and Interpolation search)
15. Program to represent sorting procedures (Selection , Bubble , Insertion ,Quick , Heap , Merge)

DMCA 207 Software Lab-IV (C++ Lab)

1. Program to Implement Classes and Objects.
2. Program to Implement Constructors and Destructors with array of Objects.
3. Program to Implement Passing and returning parameters as objects by reference.
4. Program to demonstrate Function Overloading.
5. Program to overload different operators – incr & decr operators with post & pre forms; new, delete, [], () and arithmetic operators.
6. Program to perform pointer sort operation.
7. Program to demonstrate friend functions and friend classes.
8. Program using objects for String manipulation functions.
9. Program to implement different types of inheritances like Multiple, Multilevel and Hybrid.
10. Program to demonstrate the use of Virtual Functions.
11. Program to demonstrate the use of abstract classes.
12. Program to demonstrate I/O streams and functions.
13. Program to Overload << and >> operators as a member and as a non-member operator functions.

14. Program to create a file to store some records and search for a particular record and display it.
15. Program to demonstrate namespaces and Volatile member functions.
16. Program to perform all possible Type Conversions.
17. Program to create function Templates, and overload the function Templates.
18. Program to create a generic stack class and member functions to perform stack operations.
19. Program to implement Exception Handling with minimum 5 exception classes including two built-in exceptions.

Semester 3

DMCA 301 Computer Organization & Architecture

Module I
Introduction: Basic structure of computers-Machine Instructions and programs: Memory Locations and addresses, Memory Operations, Instructions and Instruction sequencing, Addressing modes, Basic Input Output Operations, Subroutines.

Module II
Central Processing Unit: Arithmetic & Logic Unit: Number Representation – Addition of positive numbers – Fast Adders – Signed Addition and Subtraction – Multiplication of positive numbers – Multiplication using Booth's algorithm - Fast Multiplication – Floating point numbers and Operations. The Processing Unit: Basic Concepts - Instruction execution cycle - sequencing of control signals - hardwired control - microprogrammed control - control signals - microinstructions-microprogram sequencing - Branch address modification- Pre fetching of microinstructions

Module III

The Main Memory: Memory Hierarchy – Main memory - RAM-ROM – Cache Memory – Performance Considerations -Virtual Memory-Memory Management Requirements, Secondary storage – memory interleaving.

Module IV
Input / Output Organization: Accessing I/O devices - Interrupts: Interrupt processing – hardware interrupts –programmable interrupt controller – Vectored Interrupts - Interrupt nesting - Daisy chaining - Direct memory access (DMA):

DMA operations & DMA Controller –
Buses – Introduction to I/O interfaces.

Module V
Parallel processing : Basic Parallel Processing Architecture - Flynn‟s
Classification - SISD, MISD, SIMD, MIMD structures - Pipelining – Basic
Concepts of pipelining, Instruction Pipelining, Hazards, Vector processing &
Vector processors - Loosely Coupled & Tightly Coupled Systems - Instruction-
level parallelism: Concepts of instruction-level parallelism (ILP), Superscalar,
Super pipelined and VLIW processor architectures - Comparison of RISC and
CISC.

References
- Computer Organization, V C Hamacher, Mc-Graw Hill International Edition,
  Fifth Edition.
- Computer Architecture: A Quantitative Approach - John Hennessy and David
  Patterson,
- Morgan Kaufmann Publishers Inc., Third Edition
- Computer System Architecture – M Morris Mano –(Prentice Hall)-
  Third Edition. Computer Organization and Architecture- William
  Stallings - Fifth Edition.
- Structured Computer Education – Andrew S Tanenbaum-(Prentice Hall)-
  Fourth Edition.

DMCA 302 Operating Systems

Module I:
Evolution of operating systems:-Serial processing, Batch Processing,
multiprogramming. Types of operating systems-Batch Operating System, Multi
programming-Time sharing, Real time, distributed operating systems.
Operating Systems Structures:- Systems Components, Operating System
Services, System Calls, System Programs, System Structures, Virtual
Machines
Processor Management:-Job and process concept, Operating system view of
processes, process-state transition diagram, PCB (Process control block), Threads,
Operating system services. Process Scheduling:-Types of schedulers, scheduling
and performance criteria, scheduling algorithms, multiple processor scheduling.

Module II:
Inter process synchronization and communication-Concurrent Processes- need for inter process synchronization, critical section problem, mutual exclusion-mutual exclusion algorithms, semaphores-definition busy wait implementation, monitors, inter process communication using messages.
Deadlocks: -Definition –Deadlock characterization-Resource allocation graph, methods for handling deadlocks, deadlock prevention, deadlock avoidance-safe state-resource allocation graph algorithm-Banker's algorithm, deadlock detection, recovery from deadlock.

Module III:

Memory Management:-Preliminaries-address binding, dynamic linking and loading, Overlays. Logical versus physical address space, Swapping, Contiguous allocation Paging-principles of page allocation. Structure of page table-hardware support, multi level paging, hierarchical paging, inverted page table, shared pages.Segmentation-principles of operation, hardware, implementation of segment table, protection and sharing, fragmentation, segmentation with paging.

Module IV:
Virtual Memory-Demand paging –performance. Page replacement-page replacement algorithms. Thrashing, Segmentation and paging implementation of virtual memory, hierarchical address translation tables and MMUS.
Device Management:-Disk structure, Disk scheduling-FCFS-SSTF-C-Scan-Look, Disk management, Swap space management, Disk reliability.

Module V:
File Management:-File structure, File types, File access, File attributes, and File operations. Directories-Flat directory systems, hierarchical directory systems. File system implementation-Allocation methods-contiguous allocation, linked allocation, indexed allocation

References
- ☐ Abraham Silberschatz and Peter Baer Galvin,Greg Gange „Operating System Concepts", (Sixth Edition) Wiley - India.
- ☐ Milan Milenkovic „Operating systems" TATA Mc GrawHill.
- ☐ Andrew S. Tanenbaum, "Modern Operating System, Prentice Hall

DMCA 303 DATABASE MANAGEMENT SYSTEMS

MODULE I
Introduction to Database Systems and E-R Model

Overview, A Historical Perspective, Files System versus DBMS, Advantages of DBMS, Describing and storing data in a DBMS Transaction management, Structure of a DBMS, People who work with Databases, Overview of Database Design. Entities, Attributes and Entity Sets, Relationships and Relationship sets, Additional Features of E- R Model: Key Constraints. Conceptual Design with the E-R Model Overview of Unified Modeling Languages Recommended to use a couple of specific ER-Models (Chen Model, Yourdon Model etc)

MODULE II
Relational Model and Query Languages

Introduction to the Relational Model. Integrity Constraints over Relations :Primary Key, Foreign Key and General Constraints. E-R Model to Relational Model: Entity Sets to Tables, Relationship Sets to Tables, Translating, Relationship Sets with Key Constraints. Translating Relationship Sets with Participation Constraints, Translating Weak Entity Sets, Translating Class Hierarchies. Translating E-R Diagrams with Aggregation, Introduction to Query Languages, Relational Algebra: Selection and Projection Operations. Set Operations, Renaming, Joins, Division

MODULE III
Structured Query Language

Overview of SQL, Basic Queries in SQL, Union, Intersect and Except, Nested Queries, Aggregate Operators, Null Values, Number, String and Date Functions, Using user defined functions inside queries, Complex Integrity Constraints in SQL, Triggers and Views in SQL, Embedded SQL and Cursors

MODULE IV

Relational Database Design

Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Normal Forms: First Normal Form, Second Normal Form,Third Normal Form, Boyce Codd Normal Form, Fourth Normal Form,Fifth Normal Form

MODULE V

Transaction Management, Concurrency Control, Distributed System and Database Administration

The ACID Properties,Transactions and Schedules, Concurrent Execution

ofTransactions: Serialisability, Anomalies Due to
Interleaved Execution .Schedules
Involving Aborted Transactions, Lock-Based Concurrency Control: 2 PL
– Basic & Strict, Dead Locks, Introduction to Crash Recovery,
Concurrency Control:2 PL, Serialisability, and Recover-ability,:
Introduction to Locking Management: Dealing with Deadlock
.Introduction to ARIES, Introduction to Distributed Databases: Advantages &
Disadvantages, Transaction Types – Local & Global Transactions, Distributed
DBMS Architectures, Design of Distributed Databases: Replication, Fragmentation
How to add users, space management of table spaces and objects

References

Database Management Systems – Raghu Ramakrishnan and Johannes
Gehrke, Third Edition, McGraw Hill, 2003
Database Systems: Design , Implementaion and Management, Peter Rob,
Thomson Learning, 7Edn.

Concept of Database Management, Pratt, Thomson Learning, 5Edn.

Database System Concepts – Silberchatz, Korth and Sudarsan, Fifth Edition,
McGraw Hill, 2006

The Complete Reference SQL – James R Groff and Paul N Weinberg,
Second Edition, Tata McGraw Hill, 2003

DMCA 304 Accounting & Financial Management

Module I

Accounting and its Functions ,Scope of Accounting , Emerging Role of
Accounting , Accounting as an Information System , Role and Activities of an
Accountant , Accounting Personnel , Nature of Accounting Function ,Organization
Chart for Accounting and Finance Accounting Framework, Accounting Concepts,
Accounting Standards, Changing Nature of Generally Accepted, Accounting
Principles (GAAP) , Attempts towards Standardization, Accounting Standards in
India

Module II

Accounting Equation , Classification of Accounts , Definitions of Journal and
Ledger Journalizing Process ,Ledger Posting , Balancing an Account , Trial
Balance . Objectives of Preparing Trial Balance

Module III

Preparation and Analysis of Final Accounts: Trading Account, Profit And Loss Account . Balance Sheet Constructing Balance Sheet Adjustment Entries

Module IV

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios ; Common Size Statement ; Comparative Balance Sheet and Trend Analysis of manufacturing, service & banking organizations.

Module V

Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis; Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.

References
1)Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition).
2) Mukherjee - Financial Accounting for Management (TMH, 1st Edition).
3) Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
4) Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition).
5) Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th   Edition)
6) Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)
7) Ghosh T.P- Financial Accounting for Managers (Taxman, 3rd Edition)
8) Maheshwari S.N & Maheshwari S K – A text book of Accounting for Management   (Vikas,   1st   Edition)
9) Gupta Ambrish - Financial Accounting for Management (Pearson Education, 2nd   Edition)
10) Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education, 1st Edition).
11)Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd

DMCA 305: VISUAL PROGRAMMING (VB)

Module 1

Introduction to Windows , GUI concept, Concept of Event-driven programming, The Visual Basic IDE(S.S0) ,Types of Visual Basic
Projects, Visual Basic Editions, The Visual Basic Project Lifecycle, Project Files.

Module 2

Programming Elements - Data types- Constants- Variables- operators - user defined data types- Library Functions- Program Comments- Arrays - Dynamic Arrays- Strings- Enumerations. Logic Statements - Conditional Constructs (if / Then, Select Case),Iteration (Do Loop, For Loop, DoEvents- Exit, Stop and End. Functions and Subroutines-Arguments - ByRef vs. ByVal Parameters- Optional Arguments-Module Basics-Event Procedures- Class Modules. Types of Errors,Error handling, Creating Error Handlers- Debugging -Debugging Tools.

Module 3

Forms- Controls, Control arrays, menus, menu editor, Graphics programming, Simple animation SDI, MDI Applications

Database Concepts- Visual data manager ,The ADO Data Control-Data Grid Control - DBList and DBCombo Controls -Data view Window-Data form Wizard - Data Environment Designer.

Module 4

Report using Crystal Reports, data environment - Reports using reports-Error handling -Creating Active X controls, Active EXE, Active X DLL.

Module 5

Introduction to the Web- Internet & Web Protocols- HTML, Structure of HTML documents, Attributes, Basic HTML Tags, Forms and Controls, VB Scripts, DHTML, DHTML object model,ASP,ASP object model.

References

1. Francesco Balena; Programming MS VB 6. 0, WP Publishers and Distributors
   (p) Ltd South Asian Edition.
2. Evangelos Petroutsos; Mastering Visual Basic 6, BPB Publishers First
   Editions, Reprinted 2005.
3. Deitel& Detiel, T. R. Nieto; VB 6 How to Program, Pearson Education.

4. Peter Norton; Guide to Visual Basic 6, Tech-Media.
5. Bob Reselman, Richard Peasley ; Using VB 6, PHI.

DMCA 306 SOFTWARE LAB-V (DBMS LAB)

Installation and configuration of Oracle Database
1   Table Design- Using foreign key and Normalization
2   Practice SQL Data Definition Language(DDL) commands
   a)   Table creation and alteration(include integrity constraints

such as primary key, referential integrity constraints, check, unique and null constraints both column and table level

   b) Other database objects such as view, index, cluster, sequence, synonym etc.
3   Practice SQL Data Manipulation Language (DML) commands a) Row insertion, deletion and updating
   b)   Retrieval of data
      i)   Simple select query
      ii)   Select with where options (include all relational and logical operators)
      iii)   Functions: Numeric, Data, Character, Conversion and Group functions with having clause.
        iv) Set operators
        v) Sorting data
        vi) Sub query (returning single row, multiple rows, more than one column, correlated sub query)
        vii) Joining tables(single join, self join, outer join)

        x) Data manipulations using date functions
        xi) User defined functions in a query
        xii) How to use hints in queries to optimize performance xiii Manage ODBC/JDBC connections
4   Practice Transaction Control Language (TCL) commands (Grant, revoke, commit and save point options)
5   Usage of triggers, functions and procedures using PL/SQL constructs
6   Development of sample applications using Oracle as Back End Sample applications may include
   i)   Payroll Information System

ii)   Student Information System

iii)   Bank Transaction

iv)   Library Information System etc.

7 How to take back up and restore using Oracle

8 How to conduct query optimization in a database

DMCA 306 (SOFTWARE LAB-VI) Visual Programming Lab

1. Dialog based application

2. Menus and keyboard

3. Splitter window

4. Document/view architecture

5. Application using toolbar

6. Activex control

7. Data access through ODBC

Semester 4

DMCA 401 Java and Web Programming

Module I

    Introduction to object oriented programming Brief History of Java , Feature of Java,JDK , Data Types , Operators ,Control Structures in JAVA , Arrays , The JAVA Class , Constructor , Finalize ,static & inner Classes .

Module II

    Inheritance, Deriving Classes, Method Overriding, Method Overloading, Access Modifiers, Abstract Class and Method, Interfaces, Packages – Import Package.

Module III

Exception Handling, The Try-Catch Statement, Catching more than one Exception , The Finally Clause , When to use Exceptions . User defined Exception .Threads: Introduction , Creating Treads in Applications ,Methods in Thread Class .

Module IV

Java I/O Packages , Java Input Stream Classes , Java Output ,File Class .Graphic & Sound: AWT and Swing , Graphic Methods , Fonts , User interface components with Swing ,Loading and Viewing Images ,Loading and Playing Sound , AWT & Event Handling ,Layout Managers & Menus.

Module V

Networks & Layer of Networks , IP Address & Port Numbers ,URLs ,Client/Server Model, Socket Basics ,Server Socket ,Applets ,JDBC ,RMI .

References

- Java The Complete Reference , Herbert Schildt 7th Edition. Tata McGraw- Hill Edition

- Java 6 by Rogers Cadenhead, Laura Lemay, Pearson education

- Java Programming – A Practical Approach – C Xavier, Tata McGraw-Hill Edition

- K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000
- Joyce Farrell, "Java Programming", 2013

DMCA 402 Microprocessors

Module 1 - The Processors : 8086
Register Organization of 8086, Architecture, Signal Description of 8086, Physical Memory Organization, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum Mode 8086 System and Timings, Maximum Mode 8086 System and Timings. Addressing Modes of 8086.

Module 2 - Instruction Set, Assembler Directives and Assembly Language Programming of 8086

Machine Language Instruction Formats – Instruction Set of 8086-Data transfer instructions,Arithmetic and Logic instructions,Branch instructions,Loop instructions,Processor Control instructions,Flag Manipulation instructions,Shift and Rotate instructions,String instructions, Assembler Directives and operators,Example Programs**,**Introduction to Stack, STACK Structure of 8086, Interrupts and Interrupt Service Routines, Interrupt Cycle of 8086, Non-Maskable and Maskable Interrupts, Interrupt Programming, MACROS.

Module 3 - Special Purpose Programmable Devices and their Interfacing

Data transfer schemes-programmed I/O, Interrupt I/O, DMA, DMA Controller 8257, Programmable Interval Timer 8253, Programmable Interrupt Controller 8259A, Programmable Communication Interface 8251 USART, Programmable Pripheral Interface 8255.

Module 4 – Architecture and Comparison of various Processors

80186,80286,80386,80486, Pentium Case Study on Advanced Multiprocessors

Module 5 - Microcontrollers

Architecture of 8051 Microcontroller – Signals – I/O Ports – Memory – Counters and timers – Serial data I/O – Interrupts – Interfacing – Keyboard – LCD – ADC and DAC, Instruction Set – Programming.

References

Advanced Microprocessors and Peripherals – Architecture, Programming and Interfacing by A.K. Ray and K.M. Bhurchand, Tata McGraw Hill,2002 Edition

The Intel Microprocessors 8086/8088, 80816/80188, 80286, 80486 Pentium and Pentium Pro Processor – Architecture, Programming and interfacing by Barry B Brey, 4th Edition, PHI.

Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, 2nd Edition, Tata McGraw Hill, 2002.

Microprocessor x86 Programming by K.R. Venugopal and Raj Kumar – BPB publications

Microprocessors and Microcomputer based system design by Mohamed Rafiqussaman.

Micro Controllers – [Theory And Applications] by Ajay V. Deshmukh- Tata McGraw Hill.

DMCA 403 MULTIMEDIA SYSTEMS

Module I

Media and data streams - Medium, Properties of a multimedia system, Traditional data streams, Continuous data stream, Information Units. Sound concepts, Music - MIDI, MIDI Devices, MIDI and SMPTE timing standards, MIDI software. Speech - Generation, Analysis, Transmission.

Module II

Images and Graphics - Concepts, Image processing. Video and Animation – Concepts, television , Computer based animation. Data
 compression - Coding, JPEG-Image preparation, Lossy DCT based Mode, Hierarchical mode, H.261- Image Preparation, Coding Algorithms, Data Stream, MPEG-Video/Audio Encoding, Data stream, MPEG- 2,MPEG-4, DVI.

Module III

Multimedia OS - Real-time, Resource Management, Process Management, File Systems, OS Issues, System Architecture. Multimedia Communication Systems – application Subsystem,
Transport Subsystem, QoS and Resource Management.

Module IV

Multimedia DBMS- Characteristics, Data Structure, Operations, Database Model.
Hypertext and Hypermedia, SGML, ODA, MHEG.

Module V

Synchronization- Notion of synchronization, Presentation requirements, Reference model for synchronization, Synchronization Specifications, Synchronization Case Studies- MHEG, HyTime, MODE, ACME.

References:

- Multimedia: Computing, Communications and Applications, Steinmetz & Nahrstedt, Pearson Education
- Multimedia communications, Fred Halsall, Pearson Education
- Multimedia Systems, Koegel Buford, Pearson Education
- Principles of MultiMedia, Renjan Parekh, Tata Mcgraw Hill Publicaton
- Fundamentals of MultiMedia, Li Ze-Nian, Drew Mark S., Prentice Hall

DMCA 404 Data Communications

Module I

Signals:-Simplified data communications model**.** Electric signals - continuous and discrete signals, periodic signals,   Fourier Series Representation of Periodic Signals, Frequency, Spectrum and Bandwidth. Analog and Digital data   transmission - data and signals, analog and digital transmission, their comparison, Digital data rate and band width. Transmission impairments - Attenuation, Delay distortion, Noise, Channel Capacity.

Transmission Media :- Guided Transmission Media -Twisted pair wires, Coaxial, Optical fiber. Wireless Transmission - Terrestrial microwave, satellite microwave, broad cast Radio, Infrared.

Module II

Digital Transmission:-Digital Data, Digital Signal:-Line coding-characteristics of line

coding, Line coding schemes- Unipolar encoding:- NRZ, RZ, Manchester, Differential Manchester. Bipolar encoding:- AMI., Block coding Analog Data, Digital Signal:- Sampling, Sampling theorem, Nyquist rate, Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM).

Module III

Analog Transmission:-Modulation of Analog signals:- Analog to Analog modulation-

Amplitude Modulation, Frequency Modulation, and Phase Modulation.

Modulation of Digital Data – Bit Rate and Baud Rate, ASK, FSK, PSK,QAM. Modems. **Multiplexing**:- FDM, TDM, statistical TDM, WDM. Channnelization:- FDMA, TDMA,CDMA.

Module IV

Transmission mode:- Parallel transmission, Serial transmission, Asynchronous transmission, synchronous transmission. Line Configurations, full duplex and half duplex transmission.

Circuit switching:- Telephone networks-local loops, trunks.

Packet switching :- Datagram, virtual circuit. Effect of packet size on transmission time. Comparison of circuit switching and packet switching

Module V

High-Speed Digital Access:- DSL Technology-ADSL, xDSL, Spread Spectrum-Concept, Frequency Hopping, Direct Sequence

Cellular Telephony:- Basic concepts, Frequency–Reuse Principle, Transmitting, Receiving, Handoff, Roaming. First Generation, Second Generation-GSM, Third Generation.

References

- William Stallings -Data and Computer communications – Prentice Hall of IndiaVII[th] Edition.
- Behrouz A Forougan, Data Communications and Networking, 4th ed.McGraw Hill
- Andrews S. Tanenbaum -Computer Networks, Prentice Hall of India, 4th Edition.

DMCA 405 MANAGEMENT INFORMATION SYSTEMS

Module I

DigitalFirm-Concepts,Definition,Role,Control System, Management Support , Management Effectiveness, Digital Firm. E-Business and E-Commerce, System Concepts, Feedback and Control, Corporate Planning, Types of strategies, Business Planning, Balance Score Card, Strategic Business Planning. Security Challenges- threats and vulnerabilities, controlling threats, disaster management, information security.

Module II

DSS, Decision Analysis, Organizational Decision Making, concepts on information, Information Classification, Knowledge and Knowledge management. Business Intelligence, Expert Systems. System Analysis, General Model of MIS, Need and role of System Analysis, System development Model, OOA, SSAD, OOSAD Development Life Cycle. Development process of MIS, Process Model.

Module III

Business Process Re-engineering, Value Stream Model, MIS and BPR. DSS, GDSS, Knowledge Management Systems, DSS in E-enterprises, Enterprise Management System, ERP, SCM, CRM, EMS and MIS.

Module IV

Technology of IS - Data Processing, Transaction Processing, OLAP, TQM, Networks - Topology, Data Communication, Unified Communications, Components of UC, WiMAX. Database- Database Models, Database Design,

RDBMS, Client-Server Architecture and implementation strategies. Data Warehouse, Architecture of Data Warehouse, Implementation.

Module V
E-Business, Internet and WWW, E-Commerce, categories of E-Commerce, Electronic payment Systems, Content Management Systems, Enterprise Portal, Security in e - business, privacy issues, Tools for security management, Systems Control and Audit, Global MIS - Outsourcing and Off shoring, Global Business strategies.

References

- Management Information Systems, Waman S Jawadekar, 4th Edition, McGraw Hill
- Management Information Systems, O'Brien, Marakas and Behl, 9th Edition, Tata Mcgraw Hill Publication.
- Management Information System, Laudon, Laudon & Dass, 11th Edition, Pearson Education
- Management Information System, Davis & Olson, Tata McgrawHill Publication.
- Information system for Modern management, Murdick, Rose & Cloggett, PHI Publications.

DMCA 406 SOFTWARE LAB VII (Java LAB)

- Program to illustrate class, objects and constructors
- Program to implement overloading, overriding, polymorphism etc
- Program to implement the usage of packages
- Program to create our own exception
- Program for handling file operation
- Implement the concept of thread programming
- Program to implement Generic class and generic methods
- Applet program for passing parameters
- Applet program for running an audio file
- Program for event-driven paradigm in Java
- Event driven program for Graphical Drawing Application
- Program that uses Menu driven Application
- Program to implement JDBC in GUI and Console Application

- Socket programming to implement communications
- Develop a multi-threaded applet of your choice.

References

- Java The Complete Reference, Herbert Schildt 7th Edition. Tata McGraw- Hill Edition

- Java 6 by Rogers Cadenhead, Laura Lemay, Pearson education

- Java Programming – A Practical Approach – C Xavier, Tata McGraw-   Hill Edition

- K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000
- Joyce Farrell, "Java Programming", 2013
- Java Network Programming, Elliote Rusty Harrold, Oreilly Publications

DMCA 407 SOFTWARE LAB VIII – (Microprocessors Lab)

I) Programs to get familiarized with Microprocessor Kit.

- Program to implement various addressing modes like Immediate, Direct, Indexed, etc.

- Program to find one's complement of a 16 bit number.

- Program to mask off bits selectively.

- Program to perform addition of 2 16 bit numbers.

- Program to perform division by 8 and multiplication by 16 using shift and rotate instructions.

ii) Program to display a message on screen using Code and Data Segment.

iii) Programs to perform arithmetic, logic, shift and string instructions.

a) Program to display ASCII code and character.

b) Program to read password and check the validity of the user.

c) Program to set and get the system date and time.

d) Program to implement delay routine.

e) Program to find sum of n numbers.

f) Program to implement 32 bit arithmetic operations.

g) Program to perform concatenation of 2 strings.

iv) Programs to implement modular programming using Stacks, subroutines, macros, etc.

1. Program to find factorial.

2. Program to find nCr.

3. Program to find the Fibonacci series.

4. Program to implement a 2 digit calculator.

5. Program to generate a real time clock.

6. Program to perform sorting.

v) Programs for display/video manipulation.

a) Program to read a string at location (x1,y1) and display at   video location

   (x2,y2).

b) Program to clear a portion of a screen.

vi) Programs to get familiarized with DOS and BIOS interrupts.

i) Program to display the current working directory.

ii) Program to change the working directory.

Note:- A minimum of 20 programming examples have to be done.

References :

1.   Microprocessor x86 Programming – K.R. Venugopal and Raj Kumar – BPB publications

2. The Intel Microprocessors 8086/8088, 80186/188, 80286, 80386, 80486,Pentium & Pentium Pro Processor Architecture, Programming and Interfacing- Barry B. Brey – PHI Edition

3. Microcomputer Systems – The 8086/8088 Family Architecture, Programming & Design – Yu Cheng Liu , Glenn A Gibson – PHI Edition.

S5 Semester

DMCA 501 OPERATIONS RESEARCH

Module I
Linear programming problems - Mathematical formulation, graphical method of solution, simplex method

Module II
Duality in linear programming problems, dual simplex method, sensitivity analysis, transportation and assignment problems, Traveling salesman Problem.

Module III
Game theory Introduction, two-person zero-sum games, some basic terms, the maxmini-minimax principle, games without saddle points-Mixed Strategies, graphic solution of 2 *n and m*2 games, dominance property. CPM & PERT- project scheduling, critical path calculations, Crashing.

Module IV
Queueing theory -basic structure of queuing systems, roles of the Poisson and

exponential distributions, classification of queues basic results of M/M/1: FIFO systems, extension to multi-server queues.

Module V

Simulation: simulation concepts, simulation of a queuing system using event list,pseudo random numbers, multiplication congruential algorithm, inverse transformation method, basic ideas of Monte-Carlo simulation.

References

- Taha.H.A ,operation Research : An Introduction, McMilan publishingcCo., 1982.7[th] ed.
- Ravindran A, Philips D.T & Solbery.J.J, Operations Research:Principles and practice, John Wiley & Sons, New York, 1987.
- Frank S. Budnick, Dennis Mcleavey and Richard Mojena,

  Principles of Operations Research for Management. All India Traveler Book seller, Delhi.

DMCA 502   PHP Programming

Module 1

 PHP Basics- Syntax, Operators, Variables, Constants, Control Structures, Language Constructs and Functions.

Module 2

 Functions- Syntax, Arguments, Variables, References, Returns, Variable Scope Arrays- Enumerated Arrays, Associative Arrays, Array Iteration, Multi-Dimensional Arrays, Array Functions, SPL.

Module 3

 Object Oriented Programming- Instantiation, Modifiers/Inheritance, Interfaces, Exceptions, Static Methods & Properties, Autoload, Reflection, Type Hinting, Class Constants.

Module 4

Strings and Patterns- Quoting, Matching, Extracting, Searching, Replacing, Formatting

Module 5

Web Features- Sessions, Forms, GET and POST data, Cookies, HTTP Headers **Databases and SQL** - SQL, Joins, Analyzing Queries, Prepared Statements, Transactions. **Streams and Network Programming**- Files,

Reading, Writing, File System Functions, Streams

References

> Professional PHP 6 EdcLecky -Thompson, Steven D. Nowicki,Thomas MyerWrox Publishers

> PHP6 and MySQL Bible - Steve Suehring,TimConverse,and Joyce ParkWiley India Pvt.Ltd

DMCA503 LINUX AND SHELL PROGRAMMING

Module I

Introduction to Linux - History, Architecture, Comparison with UNIX, Features and Facilities of Linux, Basic commands in Linux, Files and File Structure - Linux File System, Boot block, Super block, Inode table, Data blocks, Linux standard directories. File naming Conventions, Path, Types of file names and Users, File Commands in Linux, file comparisons, Directory Commands, Text Editors-Functions of a Text Editor, vi Editor, Locating Files, File Access Permissions [FAP], Viewing and Changing FAPs, Redirection, Filters, Pipes.

Module II

Basics of shell programming, various types of shell available in Linux, comparisons between various shells, shell programming in bash - Conditional and looping statements, Iterations, Command Substitution - expr command, arithmetic expansion, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automating system tasks.

Module III

Common administrative tasks, identifying administrative files 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 disabling of users accounts, creating and mounting file system.

Module IV

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. Installing and removing packages. Backup, restore and Compress utilities - tar, cpio, dump,rsync and restore utilities,

Module V

Communication in Linux - mesg, who- T, talk, write, wall, finger, chfn, ping, traceroute utilities, email facilities . Configuration of servers- Telnet, FTP, DHCP,NFS, SSH, Proxy Server(Squid), Web server (Apache), Samba. Daemons- init, crond, atd, xinetd, inetd, the services file. named, sshd, httpd.

References

Operating System - Linux, NUT Press, PHI Publisher, 2006 Edition Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India

UNIX Shell Programming by YeswantKanetkar, BPB

Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein - Pearson Education.

Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India

DMCA504 COMPUTER NETWORKS

Module I

Networking C o n c e p t s: Simplified network model. Classification of networks: LAN, MAN, WAN and the Internet. Protocols and protocol architecture. The OSI ref. Model, TCP/IP ref. model, its origin, the Internet layer, the TCP layer, the application layer. Comparison of the OSI and TCP/IP ref. models. A critiques of the OSI model and protocols, A critique of the TCP/IP ref. model, Novel Netware.

Data Link Layer: Need for data link control, Frame synchronization - flag fields, bit stuffing, flow control - stop and wait , sliding window protocol, error detection - parity check, CRC, Error control - Stop and wait ARQ, Go back-N ARQ, HDLC protocol, other data link protocols - LAPB, LAPD.

Module II

Local Area Networks: LAN protocol architecture (IEEE - 802 reference model), Topologies - Bus, tree, ring and star. Logic link control. Medium access control:-Random access- Aloha, CSMA, CSMA/CD, Exponential Back off algorithm ,CSMA/CA, controlled access-Reservation, Polling, Token Passing.

LAN systems: Traditional Ethernet:-MAC sub layer access method(CSMA/CD) ,IEEE 802.3 MAC frame, Addressing physical layer, Physical Layer, Physical Layer, Implementation, Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet.

FAST ETHERNET:- Mac Sublayer, Physical Layer, Physical Layer Implementation, GIGABIT ETHERNET:- MAC Sublayer, Physical Layer, Physical Layer Implementation. **LAN C onnecting Devices**-Repeaters, Hubs, Bridges:- filtering, Transparent Bridges, Spaning Tree Algorithm.Two-Layer Switch. **Backbone Networks**- Bus
Backbone, Star Backbone, Connecting Remote LANs.

Module III

Wireless LAN Technology:-Overview-Wireless LAN Applications, Wireless LAN Requirements, Wireless LAN Technology. Infrared LANs-Strengths and Weakness, Transmission Techniques. Spread Spectrum LANs- Configuration, Transmission Issues. Narrowband Microwave LANs.

IEEE 802.11 Wireless LAN Standard:- IEEE 802.11 Architecture and Services, Medium Access Control-CSMA/CA, Physical Layer-IEEE-802.11 FHSS, IEEE-802.11, DSSS, IEEE-802.11a OFDM, IEEE-802.11b HR-DSSS, IEEE-802.11g OFDM. IEEE- 802.11 Addressing Mechanism. **Blue Tooth**:- Architecture, Bluetooth Layers, Radio Layer, Baseband Layer, L2CAP, Other Upper Layers.

VIRTUAL LANS:- VLAN Technology, Membership, Configuration, Communication Between Switches, IEEE Standard, Advantages.

Module IV

Network Layer: Services of NW layer, Routing: Characteristics, performance criteria, routing strategies: fixed routing, flooding, random routing, Adaptive routing, congestion control,
Switched WAN - Virtual Circuit Switching, Global addressing, Virtual circuit identifier, Connection Setup:- Permanent Virtual Circuit, Switched Virtual Circuit, X.25 WAN, X.25 layers and protocols.
Module V

High Speed Switched WANs.

Frame Relay:- Back ground, Architecture, Frame Relay Layers, Frame Relay frame -LAPF core, LAPF control.

ATM :- design goals, Cell Network, Asynchronous TDM, ATM Architecture, Identifiers, ATM Layers:- ATM layer, ATM Headers, ATM Adaptation Layer:- AALI, AAL2, AAL3/4, AAL5.

Transport Layer: Services, elements of transport protocol, simple transport protocol.

References

Behrouz A. Forouzan - Data Communications and Networking-Fourth Edition- Tata McGraw Hill

William Stallings- Data and computer communications- PHI- Seventh Edition.

Andrew S Tanenbaum- Computer Networks - Fourth Edition- PHI.

William Stallings - Wireless Communications and Networks-Pearson Education.

William Stallings- ISDN and BROADBAND ISDN WITH FRAME RELAY AND ATM-Fourth Edition - Pearson Education.

Gerd Keiser - Local Area Networks- Second Edition - Tata McGraw Hill

DMCA505   SOFTWARE ENGINEERING

Module 1 The Software Process
Software and Software Engineering, Software Development Process Models – The Waterfall Model, V-Model , Incremental Process Models, Prototyping the Spiral Model, Concurrent Models. Software Implementation and Management process-inspection, Agile Development, Principles that Guide Practice

Module II Modeling and Design
Understanding Requirements, Requirements Modeling: Scenarios, Information, and Analysis Classes, Requirements Modeling for WebApps, Design Concepts, Software Architecture : Definition, Importance and Styles, User Interface Design

Module III Quality Management
Quality Concepts, Review Techniques, Software Quality

Assurance, Software Configuration Management, Product Metrics

Module IV Testing
Software Testing Strategies, Testing Conventional Applications, Testing Object-Oriented Applications, Testing Web Applications

Module V Project Management
Project Management Concepts, Process and Project Metrics, Estimation for Software Projects, Project Scheduling, Risk Management

References

Pressman, R.S., Software Engineering: A Practitioner's Approach, MGHISE, 7th Edition, 2010

Sommerville, I., Software Engineering, Pearson Education, 7th Ed., 2005.

Software Engineering principles & Practice- Waman S Jawadekar 2nd Edition, Tata Mc-Graw Hilll Publishing Co. Ltd.

Schach, S., Software Engineering, TMH, 7th Ed., 2007

Kelkar, S.A., Software Engineering: A Concise Study, PHI, 2007

Humphrey, W.S., Managing the Software Process, Addison Wesley, 1999

Hughes, B and Cotterel, M., Software Project Management, 3rd Edition, TMH, 2004.

Brooks, F.P., The Mythical Man-Month, Pearson, 1995

DMCA 506 SOFTWARE LAB IX (PHP LAB)

1) Reverse of a number
2) Prime numbers upto a given range.
3) Check whether a given number is Amnstrong or not.
4) Print Fibnocci series
5) Sort an array using funtion
6) Validate date, mobile no and email id entered by the user
7) Display the current date in different formats
8) Create a simple integer array and perform search operation in it
9) Create an associate array with values and sort in ascending and descending order

10) Upload a file and store it in server.
11) String operations of an inputted string
12) File operations
13) Implement cookies
14) Implement creation of session & destroy the session in a web page.
15) Display the contents of a directory including its subdirectories
16) File or directory searching.
17) Implement OOPs concept.
18) Demonstrate the concept of constructor and destructor using object oriented programming
19) Demonstrate inheritance in PHP
20) Implement Database Connectivity
21) Implement web application using PHP

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DMCA507 SOFTWARE LAB X (Linux and Shell Programming Lab)

1) Installation of Linux, network based installation

Basic Overview of various commands- cal, pwd, cd, ls, mv, cd, cp, rm, mkdir, rmdir, more, less, touch. Creating and viewing files using cat, file comparisons, disk related commands, checking disk free spaces. Batch commands, kill, ps, who, Printing commands, find, sort, touch, file, file processing commands- wc, cut, paste etc - mathematical commands - expr, factor etc.

2) Filter commands- pr, head, tail, cut, sort, uniq, tr - Filter using regular expression grep, egrep, sed, awk

3) Shell Programming -Shells, Scripting Rationale Creating a bash Script, bash Start up Files, A Script's Environment, Exporting Variables, Exit Status, Programming the Shell, Parameter Passing, Operators, looping, Input and Output.

4) Process Management with Linux, File System management, User Administration, Linux

5) Start up and Shutdown, Software package Management

6) Network Administration, LAN Card configuration, Server Configuration-DHCP, DNS, FTP, Telnet, SSH, NFS, Web Server, SQUID Proxy server.

References

- Operating System - Linux, NUT Press, PHI Publisher, 2006 Edition
- Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
- UNIX Shell Programming by YeswantKanetkar, BPB
- Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein - Pearson Education.
- Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley
  Dreamtech India   FRAME RELAY AND ATM-Fourth Edition - Pearson Education.
- Gerd Keiser - Local Area Networks- Second Edition - Tata McGraw Hill

S6 Semester

DMCA 601 OBJECT ORIENTED MODELING AND DESIGNING

Module I
Introduction and Inception Object – Oriented Analysis and Design, Iterative Development, Inception , Evolutionary Requirements ,Use Cases and Other Requirements Artifacts

Module II
Elaboration - Iteration 1 Iteration 1 Basics, Domain Models , System Sequence Diagrams , Operation Contracts Requirements to design, Logical Architecture and UML Package Diagrams, Object Design , UML Interaction Diagrams ,UML Class Diagrams

Module III
Design Patterns and Elaboration - Iteration 1 continued Objects and Responsibilities - Grasp , Object Design Examples , Visibility and Design , Mapping Designs to Code , Test Driven Development and Refactoring

Module IV

Elaboration - Iteration 2 and Patterns continued Iteration 2 Basics , UML Tools and UML as Blueprint, Quick Analysis Update , GRASP : More Object Design ,GoF Patterns

Module V

Elaboration - Iteration 3 Iteration 3 Basics, Activity Diagrams and Modeling , State Machine Diagrams and Modeling , Relating Use Cases , Domain Model Refinement , Architectural Analysis , Logical Architecture Refinement, UML deployment andcomponent diagrams

References

Larman, Craig, Applying UML and Patterns: An Introduction to Object-Oriented Analysis, Pearson Education, 3nd Ed., 2004.

Michael Bleha, James Rambaugh, Object-Oriented Mode
lling & Design with UML, Pearson, 2nd Ed., 2005.

Bahrami A., Object Oriented Systems Development using Unified Modeling Language, McGraw Hill, 1999.

Grady Booch et al., Unified Modeling Language User Guide, Pearson Education, 1999

Martin Fowler et al., UML Distilled, Pearson Education, 2002

Bruegge B., Object-Oriented Software Engineering, Pearson, 2000.

The Unified Modeling Language Reference Manual., Rumbaugh, Jacobson and Booch., Addison-Wesley

DMCA 602 IT INFRASTRUCTURE MANAGEMENT

Module 1

INFRASTRUCTURE MANAGEMENT OVERVIEW: Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their

management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment, Total cost of complexity issues, Value of Systems management for business.

Module 2
PREPARING FOR INFRASTRUCTURE MANAGEMENT: Factors to consider in designing IT organizations and IT infrastructure , Determining customer's Requirements, Identifying System Components to manage, Exist Processes, Data, applications, Tools and their integration, Patterns for IT systems management, Introduction to the design process for information systems, Models, Information Technology Infrastructure Library (ITIL).

Module3
SERVICE DELIVERY PROCESSES: Service-level management, financial management and costing, IT services continuity management, Capacity management, Availability management.

Module 4
SERVICE SUPPORT PROCESSES: Configuration Management , Service desk, Incident management, Problem management, Change management, Release management.

Module 5

STORAGE AND SECURITY MANAGEMENT: Introduction Security, Identity management, Single sign-on, Access Management, Basics of network security, LDAP fundamentals, Intrusion detection, firewall, security information management. Introduction to Storage, Backup & Restore, Archive & Retrieve, Space Management, SAN & NAS, Disaster Recovery, Hierarchical space management, Database & Application protection, Baremachine recovery, Data retention.

References
Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013
Manish Mahajan, Shikha Gupta, IT infrastructure and management
Phalguni Gupta, Surya Prakash, Umarani Jayaraman, IT infrastructure and its management

Manoj Kumar Choubey, Saurabh Singhal, IT Infrastructure and Management

DMCA 603(A) – E-Commerce

(Elective-I)

Module1
INTRODUCTION -Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce.

Module II
INFRASTRUCTURE FOR E COMMERCE
Packet switched networks – TCP/IP protocol script – Internet utility programmes – SGML, HTML and XML – web client and servers – Web client/server architecture –
intranet and extranets.

Module III
WEB BASED TOOLS FOR E COMMERCE
Web server – performance evaluation - web server software feature sets – web server
software and tools – web protocol – search engines – intelligent agents –EC software –
web hosting – cost analysis

Module IV
 SECURITY
Computer security classification – copy right and Intellectual property – electronic commerce threats – protecting client computers – electronic payment systems – electronic cash – strategies for marketing – sales and promotion – cryptography – authentication.

Module V
  1. INTELLIGENT AGENTS
     Definition and capabilities – limitation of agents – security – web based

marketing

search engines and Directory registration – online advertisements – Portables and info mechanics – website design issues.

References

Ravi Kalakota, " Electronic Commerce", Pearson Education,

Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.

Manlyn Greenstein and Miklos "Electronic commerce" McGraw-Hill, 2002.

Efraim Turvan J.Lee, David kug and chung, "Electronic commerce" Pearson Education Asia 2001.

Brenda Kienew E commerce Business Prentice Hall, 2001.

DMCA 603(B) – Client Server Computing

Elective -I

Module 1

Overview of C/S Computing: Definition, Benefits & Evolution, Hardware & Software, Trends, Evolution of operating systems, networking trends. Overview of C/S applications: components, classes, categories. Overview of C/S computing: Dispelling the Myths, Obstacles- Upfront and hidden, open systems and standards, Standards setting organizations, factors of success.

Module II

Client hardware and software: Client components and operating systems. What is GUI?,Xwindow vs. windowing, database access. Application logic client software products: GUI environments, converting 3270/5250 screens, database access tools. Client requirements: GUI design standards, Open GUI standards, Interface dependents, testing interfaces, development aides.

Module III

Server hardware: Benchmarks, categories of servers, features and classes of server machines. Server Environment: eight layers of software, network management and computing environments, extensions, network operating systems, loadable modules. Server operating systems: OS/2, Windows new technology, UNIX based operating systems.

Module IV

Server Requirements: Platform independence, transaction processing, connectivity, intelligent database, stored procedures, Triggers, Load Leveling, Optimizer, testing and diagnostics tools, real ability backup and recovery mechanisms.

Module V

Server data management and access tools: Data manager features, data management software, database gateways. LAN hardware and software, Network Operating Systems.

References

Dawna Travis Dewire , Client Server Computing, McGraw Hill International

Tanenbaum and Van Steen, Distributed Systems Principles and Paradigams,

Pearson Education, 2005

Orfali,Harkey and Edwards, The Essential Client server Survival guide, 2Nd edition Galgotia, 2003

Jeffrey.D.Schan, C/S Application and Architecture, Novell Press, BPB

Joe Salami, Guide to C/S Databases, Bpb Publn., 1994

David Vaskevitch , Client Server Strategies, Galgotia, 1994.

DMCA 603(C) BIOINFORMATICS

(Elective I)

Module I

Biology for Bioinformatics :- Basic concepts - cells- Archaebacteria, Biomembranes, Nucleus, Organelles, Mitochondria, Chloroplasts, Viruses,

BacterioPhage, Genetic contents of a cell - Viral Proteins - Amino acid, DNA and RNA - Forms of DNA.

Module II

Genetic Code :- Genome - Gene Expressions - Protein Synthesis - Transcription RNA - Processing- Capping- Splicing - Editing, Cell Signaling, DNA cloning Genomic library - cDNA library - Probes - Screening.

Module III

Databases :- Characteristics of Bioinformatics, Database - Categorizing, Navigating, Information Retrieval systems, Sequence Databases, Structure Databases.

Module IV

Other Databases :- Enzyme Databases, MEROPS, BRENDA, Pathway Databases: CAZy, Disease Databases, Literature Databases, Other specified Databases.

Module V

Python for Bioinformatics.

References

BIOINFORMATICS Databases, Tools and Algorithms, Orpita Bosu, Simminder Kaur Thukral., Oxford University Press.

Learning Python., Mark Lutz & david Ascher., O'Reilly.

Introduction to Bioinformatics, T. K. Attwood, D J Parry-Smith., Pearson Education. Essential Bioinformatics., Jin Xiong., Cambridge University Press.

Fundamental Concepts of Bioinformatics. Dan E. Krane, Michael L. Raymer., Pearson Education.