

## **Programming with C**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

- 1. Introduction to Problem Solving: 3 Hrs**  
Flow charts, Tracing flow charts, Problem solving methods, Need for computer Languages, Sample Programs written in C
- 2. C Language preliminaries:**  
C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants
- 3. Input-Output:**  
getchar, putchar, scanf, printf, gets, puts, functions.
- 4. Pre-processor commands:**  
#include, #define, #ifdef
- 5. Preparing and running a complete C program: 3 Hrs**
- 6. Operators and expressions:**  
Arithmetic, unary, logical, bit-wise, assignment and conditional operators
- 7. Control statements: 5 Hrs**  
While, do-while, for statements, nested loops, if else, switch, break, Continue, and goto statements, comma operators
- 8. Storage types:**  
Automatic, external, register and static variables.
- 9. Functions: 5 Hrs**  
Defining and accessing, passing arguments, Function prototypes, Recursion, Library functions, Static functions
- 10. Arrays:**  
Defining and processing, Passing arrays to a function, Multi dimensional arrays.
- 11. Strings: 6 Hrs**  
Defining and operations on strings.
- 12. Pointers: 7 Hrs**  
Declarations, Passing pointers to a function, Operations on pointers, Pointer Arithmetic, Pointers and arrays, Arrays of pointers function pointers.
- 13. Structures: 6 Hrs**  
Defining and processing, Passing to a function, Unions, typedef, array of structure, and pointer to structure
- 14. File structures:**  
Definitions, concept of record, file operations: Storing, creating, retrieving, updating Sequential, relative, indexed and random access mode, Files with binary mode(Low level), performance of Sequential Files, Direct mapping techniques: Absolute, relative and indexed sequential files (ISAM) concept of index, levels of index, overflow of handling.
- 15. File Handling:**  
File operation: creation, copy, delete, update, text file, binary file.

## **Syllabus for MCA First Year Semester – I (with effect from the academic year 2007-2008)**

**Term work/ Practical:** Each candidate will submit a journal in which at least 12 practical assignments based on the above syllabus along with the flow chart and program listing will be submitted with the internal test paper. Test graded for 10 marks and Practical graded for 15 marks.

### **List of Practical**

Two programs based on functions.

Two programs based on pointers.

Four programs based on Remaining portion eg. Control statements, Structures and Unions etc.

Three programs based on Different File Operations (File Handling)

### **References :**

1. Mastering C by Venugopal, Prasad – TMH
2. Complete reference with C Tata McGraw Hill
3. C – programming E.Balagurusamy Tata McGray Hill
4. How to solve it by Computer : Dromey, PHI
5. Schaums outline of Theory and Problems of programming with C : Gottfried
6. The C programming language : Kerninghan and Ritchie
7. Programming in ANSI C : Ramkumar Agarwal
8. Mastering C by Venugopal, Prasad – TMH
9. Let Us C by kanetkar
10. An introduction to data structures with applications, Jean-Paul Trembly and Paul Sorenson, (2<sup>nd</sup> edition), 1884

## **SYSTEM ANALYSIS & DESIGN**

**Lecture : 4 Hrs/week**

**Practical : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 25 marks**

### **1. Introduction**

**3 Hrs**

- Systems & computer based systems, types of information system
- System analysis & design
- Role, task & attribute of the system analyst

### **2. Approaches to system development**

**5 Hrs**

- SDLC
- Explanation of the phases
- Different models their advantages and disadvantages
  - Waterfall approach
  - Iterative approach
  - Extreme programming
  - RAD model
  - Unified process
  - Evolutionary software process model
    - Incremental model
    - Spiral model
    - Concurrent development model

### **3. Analysis: investigating system requirements**

**4 Hrs**

- Activities of the analysis phase
- Fact finding methods
  - Review existing reports, forms and procedure descriptions
  - Conduct interviews
  - Observe & document business processes
  - Build prototypes
  - Questionnaires

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- Conduct jad sessions
- Validate the requirements
  - Structured walkthroughs
  
- 4. Feasibility analysis** **4 Hrs**
  - Feasibility study and cost estimates
  - Cost benefit analysis
  - Identification of list of deliverables
  
- 5. Modeling system requirements** **7 Hrs**
  - Data flow diagrams logical and physical
  - Structured English
  - Decision tables
  - Decision trees
  - Entity relationship diagram
  - Data dictionary
  
- 6. Design** **7 Hrs**
  - Design phase activities
  - Develop system flowchart
  - Structure chart
    - Transaction analysis
    - Transform analysis

Software design and documentation tools

  - Hipo chart
  - Warnier orr diagram

Designing databases

  - Entities
  - Relationships
  - Attributes
  - Normalization
  
- 7. Designing input, output & user interface** **4 Hrs**
  - Input design
  - Output design
  - User interface design
  
- 8. Testing** **6 Hrs**
  - Strategic approach to software testing
  - Test series for conventional software
  - Test strategies for object-oriented software
  - Validation testing
  - System testing
  - Debugging
  
- 9. Implementation & maintenance** **2 Hrs**
  - Activities of the implementation & support phase
  
- 10. Documentation** **3 Hrs**

Use of case tools,  
Documentation-importance, types of documentation

Books:

1. “Analysis and Design of Information Systems”: Senn, TMH
2. System Analysis and Design: : Howryskiewycz, PHI

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3. “System Analysis and Design” : Awad
4. “Software Engineering A practitioners Approach”: Roger S. Pressman TMH
5. “System Analysis and Design Methods: “ Whitten, Bentley
6. “Analysis and Design of Information Systems”: Rajaraman, PHI

**COMPUTER ORGANIZATION AND ARCHITECTURE**

**Lecture : 4 Hrs/week**

**Practical : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 25 marks**

**1 DIGITAL LOGIC 6 Hrs**

- Boolean Algebra
- Gates
- Combinational Circuits
  - Implementation of Boolean Functions
    - Algebraic Simplification
    - Karnaugh maps
  - Multiplexers / Demultiplexers
  - Decodes / Encodes
  - Adders : Half, Full
- Sequential Circuits
  - Flips-Flops: S-R, J-K, D
  - Registers: Parallel, Shift
  - Counters: Ripple, Synchronous

**2 THE COMPUTER SYSTEM 13 Hrs**

- Computer function and Interconnection
  - Computer functions
  - Interconnection Structures
  - Bus Interconnection
- Memory system design
  - Memory hierarchy and SRAM
  - Advanced DRAM Organisation
  - Interleaved memory, Associative memory
  - Nonvolatile memory
  - RAID
- Cache memory
  - Cache memory Principles
  - Elements of cache design
  - Improving Cache Performance
- Input/Output
  - External devices
  - I/O modules
  - Programmed I/O
  - Interrupt-driven I/O
  - Direct Memory Access
- I/O Channels and Processors

**3 CENTRAL PROCESSING UNIT 13 Hrs**

- Instruction set: characteristics & functions
  - Machine Instruction characteristics
  - Type of Operands
  - Types of Operations
- Instruction set: addressing modes & formats

**Syllabus for MCA First Year Semester – I (with effect from the academic year 2007-2008)**

- Addressing
- Instruction Formats
- CPU structure and Function
  - Processor Organization
  - Register Organization
  - Instruction cycle
  - Instruction Pipelining
- RISC
- Instruction Level Parallelism and Superscalar Processors
  - Superscalar versus super pipelined
  - Limitations
  - Instruction level parallelism and machine parallelism
  - Instruction issue policy
  - Register Renaming
  - Branch Prediction
  - Superscalar Execution
  - Superscalar Implementation

**4 CONTROL UNIT**

**6 Hrs**

- Control Unit Operation
  - Micro-operation
  - Control of the processor
  - Hardwired Implementation
- Microprogrammed Control
- Basic Concepts

**5 PARALLEL ORGANISATION**

**7 Hrs**

- Microprocessor organizations
  - Types of parallel Processor Systems
  - Parallel organizations
- Symmetric Multiprocessors
  - Organization
- Clusters
  - Cluster Configurations
  - Cluster computer Architecture

Term work/Practical : Each candidate will submit a journal /assignments in which at least 10 assignments based on the above syllabus and the internal test paper.

**References :**

- Digital Computer Fundamentals, Bartee C.Thomas, McGraw-Hill International Edition
- Computer Architecture by Nicolas Carter, Schaum's outlines, McGraw-Hill
- Advance Computer Architecture 2<sup>nd</sup> Edition by Parthsarthy, Thomson
- Computer Organisation by Hamacher C, Zaky S. McGraw Hill
- Computer Organisation and Architecture; Stallings, W Prentice Hall of India, New Delhi
- Computer Architecture, Behrooz Parhami, Oxford University Press
- Computer Fundamentals Architecture & Organisation B. Ram New Age
- Computer Organization I.S.R.D. group Tata McGraw Hill

## DISCRETE MATHEMATICS

Lecture : 4 Hrs/week

Practical : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 25 marks

- 1. Number Systems** **5 Hrs**
  - Decimal Number Systems
  - Binary Number Systems
  - Hexadecimal Number Systems
  - Octal Number Systems
    - Binary arithmetic
  
- 2. Propositions and Logical Operations** **8 Hrs**
  - Notation, Connections, Normal forms, Truth tables
  - Equivalence and Implications
  - Theory of inference for statement calculus, Predicate calculus
  - Rules of Logic
    - Mathematical Induction and Quantifiers
  
- 3. Sets, Relations and Diagraphs** **8 Hrs**
  - Review of set concepts
  - Relations and digraphs
  - Properties of relations
  - Equivalence relations
  - Computer representation of relations and digraphs
  - Manipulation of relations
  - Partially Ordered Sets (Posets)
  
- 4. Recurrence Relations** **8 Hrs**

Towers of Hanoi, Iterations, Homogeneous linear equations with constant coefficients, particular solution, difference table, finite order differences, Line in a plane in general position
  
- 5. Groups and applications** **8 Hrs**
  - Monoids, semi groups
  - Product and quotients of algebraic structures
  - Isomorphism, homomorphism, automorphism
  - Normal subgroups, Codes and group codes
  
- 6. Classification of Languages** **8 Hrs**

**Overview of Formal Languages:**  
Representation of regular languages and grammars, finite state machines

Term work/Practical : Each candidate will submit a journal /assignments in which at least 10 assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practical graded for 15 marks.

### References :

1. “Discrete Mathematical Structures” : Tremblay and Manohar, Tata McGraw Hill
2. “Discrete Mathematics”: 1<sup>st</sup> edition by Maggard, Thomson
3. “Discrete Mathematics” : Semyour Lipschutz, Varsha Patil II<sup>nd</sup> Edition Schaum’s Series TMH
4. “Discrete Mathematical Structures” : Kolman, Busby and Ross, Prentice Hall India, Edition 3
5. “Elements of Discrete Structures” : C.L.Liu
6. “Computer Fundamentals” – P.K.Sinha
7. “Discrete Mathematics and its application” – Rosen

**Syllabus for MCA First Year Semester – I (with effect from the academic year 2007-2008)**

8. “Discrete Mathematical Structure” : G. Shankar Rao New Age
9. Fundamental Approach to “Discrete Mathematics Acharjaya D.P. Sreekumar New Age

**PRINCIPLES OF ECONOMICS AND MANAGEMENT**

**Lecture : 4 Hrs/week**

**Practical : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 25 marks**

1. Introduction to Managerial Economics – Nature and Scope of Managerial Economics, Economic Theory and Managerial Economic, Managerial Economist – Role and Responsibilities 4 Hrs
2. Demand – Law of demand, elasticity of demand, supply function, elasticity if supply, market equilibrium 4 Hrs
3. Demand forecasting – survey methods, evaluation of forecast accuracy  
Cost – output relationship. Economies and Diseconomies of scale.  
Cost control and cost reduction. Break-even analysis. 4 Hrs
4. Market structures – Perfect and omperfect competition, Monopoly, Oligopoly, Momopolistic Competition, Price Discrimination, Price and Output Decisions under different market structures. Government intervention in pricing. 4 Hrs
5. Management functions, responsibilities of management to society, development of management thought, contribution of F.W.Taylor, Henri Fayol, Elton Mayo, system contingency approaches to management 3 Hrs
6. Nature of planning, decision-making process, management by objectives 3 Hrs
7. Organization structures: functional, product matrix, flat and vertical structures, authority relationships, decentralization and delegation of suthority. 3 Hrs
8. Maslow, Herzberg and MacGregor’s theory of motivation. 3 Hrs
9. McClelland’s achievement motivation, Blanchard’s situation leadership theory. 3 Hrs
10. Marketing: Understanding the concept of marketing mix, Product policy, New product development, Product life cycle and new product development, Channels of distribution, Pricing, Advertising and product promotion policies, Marketing research. 8 Hrs
11. Human resource management – selection, training and appraisal and compensation administration. 6 Hrs

**Reference books:**

1. Principals & Practice of Management : L.M.Prasad
2. Principals of Macroeconomics: Mankiw, Thomson
3. Managerial Economics Varshney Maheshwari, S.Chand
4. Managerial Economics Dean Joel PHI
5. Managerial Economics D.N. Divedi, Vikas Publishing house
6. Managerial Economics Naylorm Vernon, Wertz
7. Marketing Management, Rama Swamy, Nama Kumari
8. Essential Management, Koontz 7<sup>th</sup> Edition
9. International marketing, Francis Cherunilam
10. HR & Personnel Management, Ashwathaappa

**INTRODUCTION TO WEB TECHNOLOGY**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

1. Introduction to the Web 5 Hrs
  - History and Evolution
  - Web development cycle
  - Web publishing
  - Web contents
  - Dynamic Web contents
  
2. Languages and technologies for browsers 5 Hrs
  - HTML, DHTML, XHTML, ASP, JavaScript
  - Features and Applications
  
3. Introduction to HTML 10 Hrs
  - HTML Fundamentals
  - HTML Browsers
  - HTML tags, Elements and Attributes
  - Structure of HTML code
    - Head
    - Body
  - Lists
    - Ordered List
    - Unordered List
    - Definition List
    - Nesting List
  - Block Level Tags
    - Block formatting, Heading, Paragraph, Comments, Text alignment, Font size
  - Text Level Tags
    - Bold, Italic, Underlined, Strikethrough, Subscript, superscript
  - Inserting graphics, Scaling images
  - Frameset
  - Forms
  - An introduction to DHTML
  
4. Cascading Style Sheets 6 Hrs
  - The usefulness of style sheets
  - Creating style sheets
  - Common tasks with CSS
  - Font Family
    - Font Metrics
    - Units
  - Properties
  - Classes and Pseudo classes
  - CSS tags
  
5. Introduction to ASP 7 Hrs
  - Working of ASP page
  - Variables
  - ASP forms
  - Data types
  - Operators
  - Object hierarchies
    - ASP Object model



## **Syllabus for MCA First Year Semester – I (with effect from the academic year 2007-2008)**

- Request, Response Object collections
- ASP Applications
  - Creating Active Server Page Application
  - Session Object
  - Session Collections
  - Content Collection
  - Response Object Model

### 6. JavaScript

7 Hrs

- Introduction
- Operators, Assignments and Comparisons, Reserved words
- Starting with JavaScript
  - Writing first JavaScript program
  - Putting Comments
- Functions
- Statements in JavaScript
- Working with Objects
  - Object Types and Object Instantiation
  - Date object, Math object, String object, Event object, Frame object, Screen object
- Handling Events
  - Event handling attributes
  - Window Events, Form Events
  - Event Object
  - Event Simulation

### 7. Website Design Concepts

5 Hrs

- How the website should be
  - Basic rules of Web Page design
  - Types of Website

#### Reference Books:

1. Web Technologies Achyut S. Godbole, Atul Kahate Tata McGraw Hill
2. Web Tech. & Design C.Xavier New Age
3. Multimedia & Web Technology – Ramesh Bangia
4. HTML : The complete reference – Thomas A. Powel
5. HTML Examples – Norman Smith, Edward
6. ASP 3.0 Programmers Reference – Richard Anderson
7. JavaScript Bible – Danny Goodman

#### List of Practicals:

1. Create Web Page and apply some block level tags, text level tags
2. Create Web Page and apply background color, text color, horizontal rules and special characters.
3. Create Web Page and include Ordered list, Unordered list, Definite list and Nested list.
4. Create Web Page and include links to
  - a. Local page in same folder.
  - b. Page in different folder
  - c. Page on the Web
  - d. Specific location within document
5. Create Web Page and include images with different alignment and wrapped text
6. Create tables and format tables using basic table tags and different attributes.
7. Create a frameset that divides browser window into horizontal and vertical framesets.
8. Create Web Page and apply style rules.
9. Create Web Page including control structures using JavaScript.
10. Programs based on Event Handling.

## **DATA STRUCTURES**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

### **1. SORTING AND SEARCHING TECHNIQUES**

Bubble, Selection, Insertion, Shell sorts and Sequential, Binary, Indexed Sequential Searches, Interpolation, Binary Search Tree Sort, Heap sort, Radix sort

#### **Analysis of Algorithms**

Algorithm, Pseudo code for expressing algorithms, time complexity and space complexity, O-notation, Omega notation and theta notation.

### **2. HASHING TECHNIQUES**

- Hash function
- Address calculation techniques, Common hashing functions
- Collision resolution
- Linear probing, Quadratic
- Double hashing
- Bucket hashing
- Deletion and rehashing

### **3. LINEAR LISTS**

- Stacks: LIFO structure, create, POP, PUSH, delete stack
- Queues: FIFO structure Priority Queues, Circular Queues, operations on Queues
- Linear List Concept
- List v/s Array, Internal pointer & External pointer, head, tail of a list, Null list, length of a list
- Linked Lists
  - Nodes, Linked List Data Structure
- Linked Lists algorithms
  - Create List
  - Insert Node (empty list, beginning, Middle, end)
  - Delete node(First, general case)
  - Search list
  - Retrieve Node, add node, Remove node, Print List
  - Append Linked List, array of Linked Lists
- Complex Linked List structures
  - Header nodes
  - Circularly-Linked List
  - Doubly Linked List
    - Insertion, Deletion
  - Multilinked Lists
    - Insertion, Deletion

### **4. INTRODUCTION TO TREES**

- Binary Trees
  - Travesals (breadth-first, depth-first)
- Expression Trees
  - (Infix, Prefix, Postfix Traversals)
- General Trees
- Search Trees
- Binary Search Trees

### **5. HEAPS**

- Structure
- Basic algorithms – ReheapUp, ReheapDown, Build heap, Insert, Delete

### **6. MULTIWAY TREES**

## **Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)**

- M-way search trees
- B-Trees
  - Insertion (Insert node, Search node, Split node, Insert entry)
  - Deletion (Node delete, Delete entry, Delete mid, ReFlow, Balance, Combine)
  - Traverse B-Tree
- B-Tree Search
  
- **GRAPHS**
  - Terminology
  - Operations (Add vertex, Delete Vertex, Add Edge, Delete Edge, Find Vertex)
  - Traverse Graph (Depth-First, Breadth-First)
  - Graph Storage Structures (Adjacency Matrix, Adjacency List)
  - Networks
    - Minimum Spanning Tree
    - Shortest Path Algorithm
    - (Dijkstra's algorithm, Kruskal's algorithm, Prim's algorithm, Warshall's algorithm)

Term work/Practical : Each candidate will submit a journal /assignments in which at least 10 assignments based on the above syllabus along with the flow chart and program listing. Internal tests to be conducted separately.

1. Data structure – A Pseudocode Approach with C – Richard F Gilberg Behrouz A. Forouzan, Thomson
2. Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2<sup>nd</sup> Edition
3. Data structures & Program Design in C Robert Kruse, C.L.Tondo, Bruce Leung Pearson
4. "Data structure using C" AM Tanenbaum, Y Langsam & MJ Augustein, Prentice Hall India
5. "An Introduction to Structure with application" Jean – Paul Trembly & Paul Sorenson
6. Data structure & program design in C RL Kruse, BP Leung & CL Tondo Prentice-Hall
7. Data structure & Algorithm Analysis in C Weiss, Mark Allen Addison Wesley

### **PROGRAM LIST IN DATA STRUCTURES**

1. Write a program in C to implement simple Stack, Queue, Circular Queue, Priority Queue.
2. Write a menu driven program that implements singly linked list for the following operations: Create, Display, Concate, merge, union, intersection
3. Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
4. Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Concate, merge, union, intersection
5. Write a menu driven program that implements Singly circular linked list for the following operations: Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
6. Write a program in C for sorting methods.
7. Write a menu driven program in C to
  - a. Create a binary search tree
  - b. Traverse the tree in Inorder, Preorder and Post Order
  - c. Search the tree for a given node and delete the nodeWrite a program in C to implement insertion and deletion in B tree
8. Write a program in C to implement insertion and deletion in AVL tree
9. Write a menu driven program that implements Heap tree (Maximum and Minimum Heap tree) for the following operations. (Using array) Insert, Delete
10. Write a program to implement double hashing technique to map given key to the address space. Also write code for collision resolution (linear probing)
11. Write a program in C to implement Dijkstra's shortest path algorithm for a given directed graph.
  
12. Write a program in C to insert and delete nodes in graph using adjacency matrix.
13. Write a program in C to implement Breadth First search using linked representation of graph.
14. Write a program in C to implement Depth first search using linked representation of graph.

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15. Write a program in C to create a minimum spanning tree using Kruskal's algorithm.

16. Write a program in C to create a minimum spanning tree using Prim's algorithm

**OPERATING SYSTEM**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

**1. System Software**

- Overview of all system softwares :
  - Operating system
  - I/O manager
  - Assembler
  - Compiler
  - Linker
  - Loader

**2. Fundamentals of Operating System**

- OS services and Components
- Multitasking
- Multiprogramming
- Timesharing
- Buffering
- Spooling

**3. Process and Thread Management**

- Concept of process and threads
- Process states
- Process management
- Context switching
- Interaction between processes and OS
- Multithreading

**4. Concurrency Control**

- Concurrency and Race Conditions
- Mutual exclusion requirements
- Software and hardware solutions
- Semaphores
- Monitors
- Classical IPC problems and solutions
- Deadlock
  - Characterization
  - Detection
  - Recovery
  - Avoidance and Prevention

**5. Memory Management**

- Memory partitioning
- Swapping
- Paging
- Segmentation
- Virtual memory
  - Overlays
  - Demand paging
  - Performance of Demand paging
  - Virtual memory concepts

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- Page replacement algorithms
- Allocation algorithms

### **6. I/O Systems**

- Principles of I/O Hardware
  - I/O devices
  - Device controllers
  - Direct memory access
- Principles of I/O Software
  - Goals
  - Interrupt handlers
  - Device drivers
  - Device independent I/O software
- Secondary-Storage Structure
  - Disk structure
  - Disk scheduling
  - Disk management
  - Swap-space management
  - Disk reliability
  - Stable storage implementation
- Introduction to Clock
  - Clock hardware
  - Clock software

### **7. File Systems**

- File concept
- File support
- Access methods
- Allocation methods
- Directory systems
- File protection
- Free space management

### **8. Protection & Security**

- Protection
  - Goals of protection
  - Domain of protection
  - Access matrix
  - Implementation of access matrix
  - Revocation of access rights
- Security
  - The security problem
  - Authentication
  - One-Time passwords
  - Program threats
  - System threats
  - Threat monitoring
  - Encryption
  - Computer-security classifications

### **9. Linux System**

- Linux introduction and file system – Basic features, advantages, installing requirement, basic architecture of UNIX/Linux system, Kernel, Shell.

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- Commands for files and directories cd, ls, cp, mv, rm, mkdir, more, less, creating and viewing files, using cat, file comparisons, View files, disk related commands, checking disk free spaces. Essential linux commands. Understanding shells, Processes in linux – process fundamentals, connecting processes with pipes, Redirecting input output, manual help, Background processing, managing multiple processes, changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep, Printing commands, grep, fgrep, find, sort, cal, banner, touch, file, file related commands – ws, sat, cut, grep, dd, etc. Mathematical commands – bc, expr, factor, units. Vi, joe, vim editor.
- Shell programming: Shell programming basic, various types of shell, shell programming in bash, conditional and looping statements, case statements, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks and report printing, use of grep in shell, awk programming.

Term work/Practicals : Each candidate will submit a journal /assignments in which at least 10 assignments based on the above syllabus along with the flow chart and program listing will be submitted with the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

### **Relevant Books:**

1. Operating Systems Achyut S. Godbole Tata McGraw Hill 2<sup>nd</sup> edition
2. Operating Systems D.M.Dhamdhare Tata McGraw Hill 2<sup>nd</sup> edition
3. Understanding Operating System : Flynn & Mctloes 4<sup>th</sup> edition, thomson
4. Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson
5. Operating System Concepts (7<sup>th</sup> Ed) by silberschatz and Galvin, Wiley, 2000
6. Operating Systems (5<sup>th</sup> Ed) – Internals and Design Principles by William Stallings, Prentice Hall, 2000
7. Operating System Concepts (2<sup>nd</sup> Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley.
8. Computer Organisation and Architecture (4<sup>th</sup> Ed) by William Stallings, Prentice Hall India, 1996
9. Modern Operating Systems by Andrew S Tanenbaum, Prentice hall India, 1992
10. UNIX – Sumitabha Das
11. Unix Shell Programming - Yashwant Kanetkar, BPB publications

### **List of Practicals for Operating System**

1. Study of Basic commands of Linux
2. Study of Advance commands of Linux.
3. Study of current directory according to the following arguments:
  - a. Suffix to be replaced
  - b. Replacement suffix

The script should rename each matching file name suffix with replacement suffix. For example: rename txt text will rename the file atxt to atext. However no overwriting of existing files nor renaming of the special directories . and .. is allowed. Hint : You can use the command mv to rename a file.

B) Write a BASH shell script prime which will accept a number b and display first n prime numbers in standard output.

4. Shell scripting using general-purpose utilities.  
Eg. A) Write a menu driven shell script which will print the following menu and execute the given task to display result on standard output.

MENU

- 1 Display calendar of current month

## **Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)**

- 2 Display today's date and time
  - 3 Display usernames those are currently logged in the system
  - 4 Display your name at given x,y position
  - 5 Display your terminal number
  - 6 Exit
5. Shell programming using filters (including grep, egrep, fgrep)
  6. Write a shell script to validate the entered date. (eg. Date format is: dd-mm-yyyy)
  7. Write a shell script to check entered string is palindrome or not
  8. Write the awk program uncomment.awk which removes any comment from a C program. You can assume that the C source code contains only syntactically correct comments:
    - . starting with //, ending with a new line
    - . starting with /\*, ending with \*/ (can be multi-line)
    - . nesting of comments is not allowedMake sure that the number of lines of the C source code is not changed! When a line contains comments only, replace this line with an empty line.
  9. Write an awk program using function, which capitalizes each word in a given string.
  10. Write a program for process creation using C. (Use of gcc compiler)
  11. Use of g++ compiler.

## **ACCOUNTING & FINANCIAL MANAGEMENT**

**Lecture : 4 Hrs/week**

**Tutorial : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

1. Accounting process and principles, financial, cost and management accounting.
2. Elements of book keeping, Journal, cash and handbook, Book reconciliation statement, Ledger, trial balance, profit and loss accounts, final accounts of proprietary and partnership concern and balance sheet.
3. Cost accounting – Objectives, elements of cost, understanding of the different methods of costing.
4. Financial Management – Meaning, scope and role, a brief study of functional areas of financial management. Introduction to various FM tools : Ration Analysis
  - Meaning
  - Basis of comparison
  - Types of ratios
5. Working Capital Management : Theory of Working Capital Management: Introduction, Nature of Working Capital, Concepts and Definitions of Working Capital, Need for Working Capital, Permanent and Temporary Working Capital, Changes in Working Capital, Determinants of Working Capital.
6. Budgeting – budgets, purpose, budgetary control, preparation of budgets, master budget, fixed and flexible budgeting.

### **Reference Books:**

1. "Book Keeping and Accountancy" Choudhari, Chopde
2. "Cost Accounting" : Choudhari, Chopde
3. "Financial Management" Text and Problems : M.Y.Khan, P.K.Jain
4. "Financial Management Theory & Practice" Prasanna Chandra Tata McGraw Hill
5. Managerial Economics & Financial Analysis, Siddiqui S.A. Siddiqui A.S. New Age

## **COMPUTER GRAPHICS**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

### **1. Introduction**

- What is C.G.?
- Elements of Graphics Workstation
- Video Display Devices, Raster Scan Systems & Random Scan Systems
- Input devices, Graphics Software Coordinate representations
- Display adapters

### **2. Algorithms**

- **Algorithms** : DDA algorithm, Bresenham's line algorithm, Frame buffers, Bresenham's midpoint circle algorithms, midpoint ellipse algorithm, Polynomials and spline curves
- **Filling** : Filled area primitives, Scan-line polygon fill algorithm
- **Inside-Outside tests**
- **Scan-line fill of curved boundary areas**
- **Boundary fill algorithm, Flood fill algorithm**
- **Character Generation**

### **3. Graphics Primitives**

- Primitive Operations
- The display file interpreter
- Display – File structure
- Display control and polygons-polygon representation

### **4. Attributes of output primitives**

- Line attributes : Line type, Line width, Pen and brush options, Line color, Color and grayscale levels.
- Color tables, grayscale, Area-fill attributes-fill styles, pattern fill, soft fill, character attributes, text attributes.

### **5. Geometric Transformations**

- Matrices, Scaling transformations, Sin and Cos Rotation, Homogeneous Coordinates and Translation, Other transformation (Reflection and shear)
- Coordinate Translations, Rotation about an arbitrary point
- Inverse transformations
- Transformation routines
- Reflection & Shearing Transformations

### **6. 2D Viewing**

- The viewing pipeline, Viewing coordinate reference frame, Window to Viewport coordinate transformation, 2D-Viewing functions.
- Clipping operations – point clipping, line clipping, Cohen-Sutherland line clipping, Line Intersection Clipping & Midpoint subdivision algorithm, Cyrus-Beck algorithm, Liang-Barsky line clipping algorithm, character clipping, text clipping, Polygon clipping, Sutherland-Hodgeman polygon clipping.

### **7. 3D Concepts**



## **Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)**

- 3D Display methods – Parallel projection, perspective projection, visible line and surface identification
- 3D transformation matrices – Translation, Rotation & Scaling
- Surface rendering
- 3D object representations – Bezier curves and surfaces, B-Spline Curves and Surfaces

8. Visibility, Image and object precision Z-buffer algorithm, A buffer method, Scan line method, Floating horizons.

### **9. Light, Color and Shading**

- Introduction, Diffuse illumination, point source illumination, Specular reflection – The phong illumination model, The Halfway vector.
- Shading algorithms – Constant-Intensity shading, Gouraud shading, Phong shading, Half-tone shading, Dithering techniques
- Colour Models – RGB Colour model, CMY Colour Model, HSV Colour model
- Transparency, Shadows, Ray tracing

### **10. Fractals**

- Introduction, Topological Dimension, Fractal Dimension, Hilbert's curve, Koch Curve, Fractal lines, Fractal surfaces

### **11. Computer Animation**

- Design of animation sequences, general computer animation functions – Raster animations, Key-frame systems, Morphing, Simulating accelerations, Motion specifications, Kinematics and dynamics.

### **Reference :**

1. Computer Graphics – Donald Hearn & M.Pauline Baker, Prentice Hall of India
2. Computer Graphics, Steven Harrington, McGraw Hill
3. Computer Graphics Principles and Practice, J.D.Foley, A.Van Dam, S.K.Feiner & R.I.Philips, Addison Wesley
4. Principles of Interactive Computer Graphics – William M. Newman, Robert F. Sproull, McGraw Hill
5. Introduction to Computer Graphics J.D.Foley, A.Van Dam, S.K.Feiner & R.I.Philips, Addison Wesley
6. Mathematical elements of Computer Graphics by Rogers
7. Procedural Elements of Computer Graphics by Rogers
8. Computer Graphics for Scientists & Engineers Asthana R.G.S, Sinha N.K. New Age
9. Computer Graphics ISRD Group Tata McGraw Hill

### **List of Practicals for Computer Graphics to be implemented in C programming language**

1. Implementation of Line Drawing algorithms
2. Implementation of Scan-Line Polygon Fill Algorithm
3. Implementation of Circle Drawing Algorithm
4. Implementation of Ellipse Drawing Algorithm
5. Implementation of 2D Transformations
6. Implementation of Line Clipping Algorithms
7. Implementation of Polygon Clipping, character and text Clipping Algorithm
8. Implementation of 3D Transformations
9. Implementation of Character Generation
10. Implementation of Bezier curves, B-Spline Curves
11. Implementation of Visible Surface methods
12. Implementation of Shading Algorithms
13. Drawing a Smiley using Fractals

## **PROBABILITY AND STATICS**

**Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)**

**Lecture : 4 Hrs/week**

**Tutorial : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

**1. Unit I**

Sample Space, Events, Axioms of Probability, Probability Space, Probability of Composite Events, Conditional Probability, Bayes Theorem, Independent Events

**2. Unit II**

Single Random Variable, Distribution and Density Functions, Expectation values, Moments, Definition of Median, Mode. Measure of dispersion, Skewness and Kurtosis. Characteristic and Moment generating functions. Examples of Discrete Random variables (Bernoulli trials, Poisson variables, geometric distribution) and Continuous random variable (Normal distribution, Beta and Gamma distributions)

**3. Unit III**

Two Random variables. Joint probability distribution and density functions. Marginal and Conditional distributions. Correlation coefficient and ratio. Independent variables. Many random variables. Correlation matrix.

**4. Unit IV**

Statistics. Frequency distribution. Geometric and Harmonic mean. Parameter Estimation, Biased and Unbiased Estimators, Efficient Estimator, Optimal Estimator, Sufficient Estimator. Hypothesis testing. Chi Square test. Student t-test.

**5. Unit IV**

Single server queue. Erlang distribution and Poisson Process. Stationary queue. Non-Erlang arrivals and modification of steady state queue concepts.

Term work/Practicals : Each candidate will submit a journal in which assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practical graded for 15 marks.

**References :**

1. Introduction to Probability & Statistics , Menclenhall 12<sup>th</sup> edition, Thomson
2. Introduction to Probability & Statistics J.Susan Milton, Jesse C. Arnold Tata McGraw Hill
3. Probability and its computer applications : Kishore Trivedi, PHI
4. Schaum's Outlines Probability, Random Variables & Random Process Tata McGraw Hill
5. Fundamental of Mathematical Statistics – S.C.Gupta, V.K.Kapoor

**COMMUNICATION & SOFT SKILLS**

**Lecture : 4 Hrs/week**

**Tutorial : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

**1. Communication**

Concept and meaning of communication, barriers to communication, methods of communication, techniques to improve communication

**2. Summarization**

Techniques to summarize a given passage to test comprehension and ability to present written matter in a brief and concise manner.

**3. Comprehension and vocabulary**

## **Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)**

Technical, scientific or general text with multiple-choice question to test analytical skills, comprehension, expression, vocabulary and grammar (synonyms, antonyms, one-word substitution, word formation)

### **4. Basic official correspondence**

Principles of correspondence, languages and style in official letter, formats of letters, (complete-block, modified-block, semi-block) types of letters, (enquiry, replies to enquires, claims and adjustments, application letters with bio-data)

### **5. Communication in a business organization**

Internal (Upward, Downward, Horizontal, Grapevine, Problems, Solutions). External Communication. Strategies for conducting successful business meeting. Documentation (notice, agenda, minutes) of meeting.

### **6. Advanced technical writing**

I] Report writing and presentation: Definition and importance of reports. Qualities of reports, language and style in reports, types of reports, formats (letter, memo, project-reports). Methods of compiling data. A computer-aided presentation of a technical project report based on a survey-based or reference-based topic. Topics to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages.

II] Technical paper writing

III] Writing Proposals

### **7. Interpersonal skills**

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution, Assertiveness, leadership, Team-building, Decision-making, Time-management.

### **8. Interview techniques**

Preparing for job interviews, verbal and non-verbal communication during interviews. Observation sessions and role-play techniques to be used to demonstrate interview strategies.

### **9. Group discussion**

Dynamics of Group Behaviour, Techniques for effective participation.

### **Term work:**

Each student is to appear for atleast one written test during the term. Term work consists of graded answer paper of the test. Presentations, group discussions, report writing, interpersonal skills

### **Recommended Books :**

1. Business correspondence and report writing, R.C.Sharma & Krishna Mohan, Tata McGraw Hill
2. Business Communication for Managers, Penrose, Thomson
3. Technical Communication 6<sup>th</sup> Edition, Anderson, Thomson
4. Effective Technical Communication Rizvi, Tata McGraw Hill Publications
5. English for Engineers & Technologists : A skill approach (Books 1 and 2) Course Authors (Humanities and Social Science Division, Anna University, Madras. Orient Longman (Mainly for Comprehension)
6. Technical Writing & Professional Communication, Huckins, Thomas, McGraw-Hill publications. Written Communication, Freeman, Sarah, Orient Longman.

## OBJECT ORIENTED PROGRAMMING

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

### 1. Introduction

What is object oriented programming? Why do we need object-oriented. Programming characteristics of object-oriented languages. C and C++.

### 2. C++ Programming basics

Output using cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions.

### 3. Functions

Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.

### 4. Object and Classes

Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes.

### 5. Arrays and string arrays fundamentals. Arrays as class Member Data.

Arrays of object, string. The standard C++ String class

### 6. Operator overloading

Overloading unary operators. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable

### 7. Inheritance

Concept of inheritance. Derived class and base class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance and program development.

### 8. Pointer

Addresses and pointers. The address-of operator & pointer and arrays. Pointer and Faction pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers

### 9. Virtual Function

Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information

### 10. Streams and Files

Streams classes. Stream Errors. Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output.

### 11. Templates and Exceptions

Function templates, Class templates Exceptions

### 12. The Standard Template Library

Introduction algorithms, sequence containers, iterators, specialized iterators, associative containers, strong user-defined object, function objects

## Syllabus for MCA Semester – III (with effect from the academic year 2007-2008)

Term work/Practical : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal paper. Test will be graded for 10 marks and assignments will be graded for 15 marks.

1. Object Oriented Programming in C++ by Robert Lafore Techmedia Publication
2. The complete reference C – by Herbert shieldt Tata McGraw Hill publication
3. Object Oriented Programming in C++ Saurav Sahay Oxford University Press
4. Object Oriented Programming in C++ R Rajaram New Age International publishers 2nd
5. OOPS C++ Big C++ Cay Horstmann Wiley Publication

### **Practical for C++**

Programming exercises and project using C++ programming languages, to study various features of the languages. Stress to be laid on writing well structured modular and readable programs accompanied by good documentation.

The topic wise assignments are as follows:

1. Function Blocks
  - a. Handling default reference arguments
  - b. Handling inline and overloaded function
2. Objects and Classes
  - a. Creating UDT using classes and object
3. Arrays and String as objects
  - a. Insertion, Deletion, reversal sorting of elements into a single

## **DATABASE MANAGEMENT SYSTEMS**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

### **1. Overview**

Overview of Database management system: Limitation of data processing environment, data independence, three levels of abstraction, data models, DBMS Architecture, people who with database, overview of conventional data models-Hierarchical, Network models.

### **2. Entity Relation Model**

Entity, attributes, keys, relation. Cardinality, participation. Weak entities, ER Diagram Generalization Specialization and aggregation. Conceptual design with ER model. Entity v/s attribute. Entity v/s Relationship, Binary v/s ternary relationship. Aggregate versus ternary relationship.

### **3. Relational Model**

Introduction to relational model, Creating and modifying relations using SQL, Integrity Constraints over relation. Logical database design: ER to relational, Relational Algebra

### **4. SQL**

Data definition commands. Constraints. Views. Data manipulation commands, queries SELECT – FROM – WHERE, Aggregate queries, NULL values. Outer joins, nested queries – correlated queries. Embedded SQL. Dynamic SQL Triggers.

### **5. One database application development**

### **6. Overview of Storage and Indexing**

Storage hierarchies, tree structured indexing and hash based indexing.

### **7. Query Evaluation Overview**

Overview of query optimization – query evaluation plan, relational optimization – cost of a plan estimating result sizes

### **8. Schema refinement and Normal Forms:**

Functional dependencies, first, second, third, fourth and fifth normal form, BCNF, Comparison of 3NF and BCNF Lossless and dependency preserving decomposition, closure of dependencies, minimal closure

### **9. Transaction processing**

Transaction concurrency control recovery of Transaction failure, Serializability, Log based recovery, locking techniques. Granularity in locks. Time stamping techniques, two phase locking system, deadlock handling.

### **10. Security and Authorization**

Grant and revoke. Permissions Access Control

Term work/Assignment : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

### **Relevant Books:**

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke Third Edition, McGraw Hill

## Syllabus for MCA Semester – III (with effect from the academic year 2007-2008)

2. Database Management Pratt & Adamski Thomson 7<sup>th</sup> Edition
3. Database Concepts, Korth Silerchatz, McGraw Hill
4. Fundamental of Database System, Gillenson Wiley Publication
5. Fundamental of Database System, Elmasari and Navathe, Benjamin Cummins
6. Database Systems design, implementation and management, Rob Coronel
7. Introduction to Database Management Systems, C.J.Date
8. Modern Database Management, Jaffery A Hoffer, Mary B. Prescott, Fred R McFadden Pearson 7<sup>th</sup>

### **Practicals**

1. SQL commands for DDL, Creation of simple data tables with insertion of data. Create table, Create index Pkey creation
2. SQL command for manipulation of data using select...from...where... sequences with variation
3. Write embedded code for getting the data from table-embedding using
  - a. Pro\*C/Pro\*Cobol/PL/SQL – basic idea is to be able to work with coerces and record accessing
4. Design and analysis of an application like: Travel agency. Online placement service. Hostel accounting systems. Library management system, bank front office management etc.
5. Creating of the database.
6. Five queries for the database created.
7. Five output screen for data input.

## **DATA COMMUNICATIONS AND NETWORKING**

**Lecture : 4 Hrs/week**

**Tutorial : 3Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

### **1. Fundamental in communication**

Concepts of data transmission

Signal encoding

Synchronization

Coding methods

Multiplexing

-FDM

-TDM

-WDM

Modulation methods

-Amplitude

-Frequency

-Phase

Frequency, phase and digital modulation such as PAM, PWM, PCM

Modes of communication

Simplex

Half Duplex

Full Duplex

Switching Techniques

Circuit switching

Message switching

Packet switching

### **2. Introductions**

Uses of computer network,

LANs, WANs, MANs, Wireless Networks, Internetwork

The OSI Reference model

The TCP/IP Reference model

A comparison of the OSI and TCP Reference models

### **3. The physical layer**

Transmission Media – Magnetic media

Twisted Pair

Coaxial Cable

Fiber Optics

Wireless Transmission

The electromagnetic Spectrum

Radio Transmission

Microwave transmission

Infrared and millimeter Waves

Light Wave Transmission

### **4. The data link layer**

Data Link Layer Design Issues

Error detection and correction

Elementary Data Link Protocols

Sliding window protocols

Example – HDLC



**5. The Medium Access Sub Layer**

Multiple Access Protocols

ALOHA (Pure, slotted, reservation)

Carries Sense Multiple Access Protocols

Collision free Protocols

IEEE Standard 802.3, 802.4, 802.5, 802.6

High speed LANs – FDDI

Satellite Networks – Polling, ALOHA, FDMA, TDMA, CDMA

Categories of satellites – GEO, MEO, LEO

**6. The Network Layer**

Network Layer Design issues

Routing Algorithms

The Optimality Principle

Shortest Path routing

Flooding

Distance vector routing

Link state routing

Broadcast routing

Multicast routing

Internetworking

The network layer in the Internet – Address mapping (ARP, RARP, BOOTP, DHCP), IP Addresses, Subnets, IP – IPv4, IPv6, ICMP, IGMP

**7. The Transport Layer**

The Transport Protocols

The Internet Transport Protocols – The TCP Services model,

The TCP protocol and the TCP Segment Header, UDP

Congestion control and quality of service

**8. The Application Layer**

WWW, HTTP, DNS, SNMP, FTP, Remote logging, E-mail, cryptography, symmetric key and asymmetric key cryptography, DES, RSA algorithms, security services – message and entity.

Term work/Assignment : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

**Reference Books:**

1. Tanenebaum A. S – Computer Network (3<sup>rd</sup> ed)
2. Stalling William – Data Computer Communications
3. Computer communications & networking technologies Michael A. Gallo and William M. Hancock Thomson
4. Data Communication and Computer Networks ISRD Group The Tata McGraw hill Companies
5. Behrouz Forouzan – Data Communications and Networking TMH publication
6. Douglas Comer – Data Communication
7. Jerry FitzGerald, Alan Dennis – Business data communications and networking (8<sup>th</sup> edition) Wiley publication
8. Black U – computer network – Protocols, Standards and Interfaces
9. Youlu Zheng, Shakil Akhtar – Networks for Computer Scientists and Engineers

**DCN Practical List**

1. Write a program to implement VRC and LRC method.
2. Write a program to implement CRC where user will accept the data and the CRC polynomial.
3. Write a program to implement checksum method.
4. Write a program to check and correct the error in the data at receiver end by implementing hamming code.
5. Write a program to generate chipping sequence using Walsh matrix method.
6. Write a program to implement character level encryption by monoalphabetic encryption method.
7. Write a program to implement character level encryption by polyalphabetic encryption method.
8. Write a program to implement stop and wait ARQ.
9. Write a program for shortest path routing algorithm (Dijkstra's algorithm).
10. Write a program to generate sink tree for given network.
11. Write a program to implement DES algorithm using C.
12. Write a program to implement sliding window protocol using C.
13. Write a program to implement (Go-back-n) allows multiple outstanding frames using C.
14. Write a program to implement client server application using C.
15. Write a program to implement distance vector routing algorithm using C.
16. Write a program to demonstrate setting up a simple dumbbell network by setting up TCP connection using NS2 simulator.
17. Write a program to implement network topology for 4 to 6 nodes using UDP connection using NS2 simulator.
18. Write a program to implement Unicast or Multicast routing between the source code and the destination code.
19. Write a script in NS2 to implement Diffserv.

## **OPERATIONS RESEARCH**

**Lecture : 4 Hrs/week**

**Practical : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

### **1. Nature of Operation Research**

- History
- Nature of OR
- Impact of OR
- Application Areas

### **2. Overview of Modeling approach**

- Formulating the problem
- Constructing a mathematical model
- Deriving a solution
- Testing a model and the solution
- Establishing control over the solution
- Implementation issues

### **3. Linear Programming**

- Introduction
- Graphical solution
- Graphical sensitivity analysis
- The standard form of linear programming problems
- Basic feasible solutions
- Simplex algorithm
- Artificial variables
- Big M and two phase method
- Degeneracy
- Alternative optima
- Unbounded solutions
- Infeasible solutions

### **4. Dual Problem**

- Relation between primal and dual problems
- Dual simplex method

### **5. Transportation problem**

- Starting solutions. North-west corner Rule – lowest cost methods – Vogels approximation method
- MODI Method

### **6. Assignment problem**

- Hungarian method

### **7. Travelling salesman problem**

- Branch & Bound technique
- Hungarian method

### **8. Sequencing Problem**

- 2 machines n jobs
- 3 machines n jobs
- n machines m job

**9. Pert and CPM**

- Arrow network
- Time estimates, earliest expected time, latest allowable occurrence time, latest allowable occurrence time and slack
- Critical path
- Probability of meeting scheduled date of completion of project
- Calculation of CPM network
- Various floats for activities
- Project crashing

**10. Integer programming**

- Branch and bound algorithm
- Cutting plane algorithm

**11. Deterministic Inventory Models**

- Static EOQ models
- Dynamic EOQ models

**12. Game theory**

- Two person Zero sum games
- Solving simple games

**13. Replacement theory**

- Replacement of items that deteriorate
- Replacement of items that fail group replacement and individual replacement.

Term work/Assignment : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

**Reference :**

1. Gillet, B.E., "Introduction to Operation Research : a computer oriented algorithmic approach" Tata McGraw Hill, NY
2. Hillier F., and Lieberman, G.J. "Introduction to Operation Research", Holden Day
3. Operations Research Applications and Algorithms Wayne L. Winston Thomson
4. Optimization methods K.V. Mital & Mohan New Age
5. Operations Research : Principles and Practice 2<sup>nd</sup> edition Ravindran Wiley Production
6. Kambo, N.S., "Mathematical Programming Techniques", McGraw Hill
7. Kanti Swaroop, Gupta P.K. Man Mohan, "Operations Research", Sultan Chand and Sons
8. Taha, H.A. "Operations Research – An Introduction", McMillan Publishing Company, NY
9. Operation Research – S.D. Sharma
10. Operations Research by P.K.Gupta & Hira S. Chand

## SOFTWARE ENGINEERING

Lecture : 4 Hrs/week

Tutorial : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

### 1. Introduction

- a. Software crisis & software scope
- b. What is software engineering
- c. Terminologies in software engineering
- d. Role of management in software development

### 2. Software planning

- a. Projects planning – problem, process
- b. Project Size Estimation Metric: Measures, Metrics and Indicators, Line of code (LOC) Function pair metric, features point metric
- c. Decomposition technique
- d. Software estimation : Empirical Estimation techniques – COCOMO II Model, Heuristic Techniques
- e. Analytical estimation techniques : Expert judgment make – bye decision
- f. The Putman Resource Allocation model

### 3. Project scheduling and tracking

- a. Relationship between people and effort” staffing levci estimation, effect of schedule change of cost
- b. Selecting software engineering tasks: degree of rigor, task set selector, task network
- c. Schedules: work breakdown structure. Task network/activity networks, gannt charts, PERT charts
- d. Organisations and team structures: Organisation structures team, team structures

### 4. Software risk management

- a. Reactive and proactive risk strategies
- b. Risk identification
- c. Risk assessment and risk projection, risk containment
- d. Risk mitigation, monitoring and management
- e. RMM plan

### 5. Software Configuration Management

- a. Necessity of software configuration management baseline SCM process and SCI
- b. Configuration audit version control source code control systems (SCCS)
- c. Change control, configuration audit, status reporting

### 6. Overview of Requirements Analysis and Specification

- a. Requirement analysis
- b. Software requirements specification (SRS): SRS Documents, Characteristics of a good SRS documents, Organisation of the SRS Documents, Techniques for representing Complex\_Logic Formal systems development techniques.

### 7. Software Design

- a. What is good software design?
- b. Cohesion and coupling: Classification of cohesiveness, classification of coupling
- c. Software design approaches: function-oriented design, object-oriented design

### 8. Function-Oriented Software design

- a. Overview of SSAD methodology

- b. Structure analysis
- c. Data Flow Diagrams (DFDs)
- d. Extending the DFD Techniques to real time systems
- e. Structures design

### **9. Software Testing**

- a. Testing Overview: Verification v/s validation, design of test cases
- b. Black-box testing: Equivalence class partitioning, graph based testing, boundary value analysis
- c. White-box testing: Statement coverage, branch coverage, condition coverage, path coverage, cyclomatic complexity, metric data flow-based testing
- d. Testing specialized environments: Testing GUI, Testing Client/Server architectures
- e. Integration testing: top down testing, bottom up testing, regression testing, phased v/s incremental integration testing
- f. Systems testing: Stress testing, recovery testing, security testing
- g. Debugging Techniques, approaches, tools

### **10. Software Quality Concepts**

- a. Software Quality Management Systems
- b. Software quality assurance
- c. Software reviews
- d. Formal Technical reviews
- e. Overview of ISO 9001, SEI capability maturity model, Mc Calls quality

### **11. Software reliability**

- a. Software reliability
- b. Reliability Metrics
- c. Reliability Growth modeling

### **12. Software maintenance**

- a. Software reverse engineering
- b. Software maintenance costs
- c. Estimation of maintenance costs

Term work/Practicals : Each candidate will submit a journal in which assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practical graded for 15 marks.

### **References :**

1. Software engineering by Roger Pressman Tata McGraw Hill
2. Software engineering James Peters Wiley Publication
3. Software engineering by Rajib Mall
4. Software engineering by K.K.Agarwal, Yogesh Sinha New Age publication
5. Software metrics by Norman E.Fenton & Shari Lawrence Pfleeger, Thompson
6. Software testing technique by scott Loveland, SPD

### **Assignments**

There are no practical for this subject in the syllabus. However, this group project are done by assigning project to the group. The project is from following topics: Travel agency Online placement services Hostel accounting systems Library management systems, Bank front office management, etc. The following documents are product for the project:

Syllabus for MCA Semester – III (with effect from the academic year 2007-2008)

- Project proposal
- Systems requirement study and analysis
- Project analysis and design
- Project estimation plan
- Risk mitigation and management plan the project
- Project schedule and timeline charts
- Project code
- Project test plans

## MANAGEMENT INFORMATION SYSTEMS

Lecture : 4 Hrs/week

Tutorial : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

### 1. Managing the digital firm

Why information system?  
Perspectives on information system  
Contemporary approach to Information system  
Learning to use information systems: New opportunities with technology0

### 2. Information System in the Enterprise

Major types of system in organization  
Systems from functional perspectives  
Integrating functions and business processes: Introduction to Enterprise application

### 3. Information Systems, Organizations, Management and Strategy

Organisations and Information Systems  
How information system impact organizations and business firms  
The impact of IT on management decision making  
Information business and business strategy

### 4. Decision making

Decision making concepts  
Decision methods, tools and procedures  
Behavioral concepts in decision making  
Organizational decision making  
MIS and Decision Making Concepts

### 5. Information

Information Concepts  
Information: A quality product  
Classification of information  
Methods of data and Information collection  
Value of information  
General model of a human as a information processor  
Summary of information concepts and their implications  
Organization and information  
MIS and Information concepts

### 6. Development of MIS

Development of Long Range Plans of MIS  
Ascertaining the class of Information  
Determining the Information Requirement  
Development and Implementation of MIS  
Management of Quality in MIS  
Organisation for development of MIS  
MIS : the factors for Success and Failure

### 7. Choice of Information Technology

Introduction: Nature of IT decision  
Strategic decision  
Configuration decision  
Evaluation  
Information Technology Implementation plan



Choice of the Information Technology and the Management Information System

**8. Enterprise Applications and Business Process Integration**

Enterprise Systems  
Supply chain management systems  
Customer relationship management systems  
Enterprise Integration trends

**9. Decision Support System**

DSS : Concept and Philosophy  
DSS : Deterministic Systems  
AI Systems  
Knowledge based expert system  
MIS and Role of DSS

Term work/Assignment : Each candidate will submit a journal in which assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

**References :**

1. Management Information System, Oz Thomson Learning 5<sup>th</sup> edition
2. Management Information Systems, W.S.Jawadekar, 3<sup>rd</sup> edition, TMH
3. Management Information System, James O'Brien, 7<sup>th</sup> edition, TMH
4. Information Systems the foundation of E-Business, Steven Alter, 4<sup>th</sup> Edition Pearson education
5. Information Technology for Management, Turban, McLean, Wetherbe, 4<sup>th</sup> edition, Wiley
6. Management Information Systems, Loudon and Loudon, 10<sup>th</sup> edition, Pearsons Educations
7. Management Information Systems, Jaswal Oxford Press

Case based approach can be adopted to explain various concepts during tutorials (Internal Evaluation)

**Assignments**

USE of IS in different domains as Hospitality, Retail, Supply chain, vendor management, inventory, etc.

At least 5 website's critical analysis in any of the domain as a market survey for designing the website for the particular business.

\*Research paper on any topic of their interest of this paper

\*Optional

## JAVA PROGRAMMING

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

### 1. Java Fundamentals

- Features of Java
- OOPs concepts
- Java virtual machine
- Reflection byte codes
- Byte code interpretation
- Data types, variable, arrays, expressions, operators, and control structures
- Objects and classes

### 2. Java Classes

- Abstract classes
- Static classes
- Inner classes
- Packages
- Wrapper classes
- Interfaces
- This
- Super
- Access control

### 3. Exception handling

- Exception as objects
- Exception hierarchy
- Try catch finally
- Throw, throws

### 4. IO package

- Input streams
- Output streams
- Object serialization
- Deserialization
- Sample programs on IO files
- Filter and pipe streams

### 5. Multi threading

- Thread Life cycle
- Multi threading advantages and issues
- Simple thread program
- Thread synchronization

### 6. GUI

- Introduction to AWT programming
- Layout and component managers
- Event handling
- Applet class
- Applet life-cycle
- Passing parameters embedding in HTML
- Swing components – JApplet, JButton, JFrame, etc.
- Sample swing programs

### 7. Database Connectivity

- JDBC architecture
- Establishing connectivity and working with connection interface
- Working with statements

## **Syllabus for MCA Semester – IV (with effect from the academic year 2007-2008)**

Creating and executing SQL statements  
Working with ResultSet

Term work/Practical : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal paper. Test will be graded for 10 marks and assignments will be graded for 15 marks.

### **References:**

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2<sup>nd</sup>
3. Java Programming Language Ken Arnold Pearson
4. The complete reference JAVA2, Herbert schildt. TMH
5. Big Java, Cay Horstmann 2<sup>nd</sup> edition, Wiley India Edition
6. Core Java, Dietel and Dietel
7. Java – Balaguruswamy
8. Java server programming, Ivan Bayross SPD

### **JAVA PROGRAMMING LAB**

1. Programs using constructor and destructor
2. Creation of classes and use of different types of functions
3. Count the number of objects created for a class using static member function
4. Write programs on interfaces
5. Write programs on packages
6. Write programs using function overloading
7. Programs using inheritance
8. Programs using IO streams
9. Programs using files
10. Write a program using exception handling mechanism
11. Programs using AWT
12. Programs on swing
13. Programs using JDBC

## OBJECT ORIENTED MODELING AND DESIGN USING UML

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

### INTRODUCTION

- An overview – Object basics – Object state and properties, behavior, methods, messages
- Object oriented system development life cycle
- Benefits of OO Methodology

#### 1. Overview of prominent OO Methodologies

- a. The Rumbaugh OMT
- b. The booch methodology
- c. Jacobson's OOSE methodologies
- d. Unified process
- e. Introduction to UML
- f. Important views and diagram to be modeled for system by UML

#### 2. Functional view(models)

- **Use case diagram**
  - Requirement capture with use case,
  - Building blocks of use case diagram – actors, use case guidelines for use case models,
  - Relationships between use cases – extend, include, generalize
- **Activity diagram**
  - Elements of activity diagram – action state, activity state, object node, control and overflow, transition (fork, merge, join)
  - Guidelines for creating activity diagrams
  - Activity diagram – action decomposition (rake)
  - Partition – swim lane

#### 3. Static structural view (Models)

- a. Classes, values and attributes, operations and methods, responsibilities for classes, abstract classes, access specification (visibility of attributes and operations)
- b. Relational among classes: Associations, Dependencies, Inheritance – Generalizations, aggregation
- c. Adornments on association: association names, association classes, qualified association, n-ary associations, ternary and reflexive association
- d. Dependency relationships among classes, notations
- e. Notes in class diagram, extension mechanisms, metadata, refinements, derived, data, constraint, stereotypes, package & interface notation.
- f. Object diagram notations and modeling, relations among objects (links)

#### 4. Class modeling and Design Approaches

- a. Three approaches for identifying classes – using noun phrases, abstraction, use case diagram
- b. Comparison of approaches
- c. Using combination of approaches
- d. Flexibility guidelines for class diagram: Cohesion, coupling, forms of coupling (identity, representational, subclass, inheritance), class Generalization, class specialization versus aggregation

**5. Behavioral (Dynamic structural view):**

- **State diagram**
  - a. State diagram notations, events (signal events, change events, time events)
  - b. State diagram states (composite states, parallel states, history states) transition and condition, state diagram behavior (activity effect, do-activity, entry and exit activity), completion transition, sending signals
- **Interaction diagrams**
  - a. **Sequence diagram** – Sequence diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in sequence diagram.
  - b. **Collaboration diagram** – Collaboration diagram notations and examples, iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, activations in collaboration diagram.

**6. Approaches for developing dynamic systems:**

- a. Top – down approach for dynamic systems
- b. Bottom – up approach for dynamic systems
- c. Flexibility guidelines for behavioral design – guidelines for allocating and designing behaviors that lead to more flexible design

**7. Architectural view**

- a. Logical architecture: dependency, class visibility, sub systems
- b. Hardware architecture: deployment diagram notations, nodes, object migration between node
- c. Process architecture: what are process and threads and their notations in UML, object synchronization, invocation schemes for threads (UML notations for different types of invocations).
- d. Implementation architecture: component diagram notations and examples.

**8. Reuse : Libraries, Frame works components and patterns**

- a. Reuse of classes
- b. Reuse of components
- c. Reuse of frameworks, black box framework, white box frame
- d. Reuse of patterns: architectural pattern and design pattern

Term work/Assignment : Each candidate will submit an approximately 10-page written report on a case study or mini project. Students have to do OO analysis & design for the project problem, and develop use case model, analysis model and design model for it, using UML.

**Relevant Books:**

1. Designing flexible object oriented systems with UML – Charles Ritcher
2. Object oriented analysis and design, Satzinger, Jackson, Burd, Thomson
3. Object oriented modeling and design with UML – James Rumbaugh, Michael Blaha (2<sup>nd</sup> edition)
4. The unified modeling language user guide – Grady Booch, James Rumbaugh, Ivar Jacobson
5. Object oriented modeling and design – James Rumbaugh
6. Teach yourself UML in 24 hours – Joseph Rumbaugh
7. Object oriented analysis and design: using UML Mike O’Docherty Wiley publication

**Practical assignment:** Nine assignments, one on each of the diagrams learnt in UML

## DATA COMMUNICATIONS AND NETWORKING

Lecture : 4 Hrs/week

Tutorial : 1Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

### 1. Introduction

Attacks, services and mechanisms, security attacks, security services, integrity check, digital signature, authentication, hash algorithms

### 2. Secret key cryptography

Block encryption, DES rounds, S-Boxes

IDEA: overview, comparison with DES, Key expansion, IDEA rounds,

Uses of secret key cryptography; ECB,CBC,OFB,CFB, Multiple encryptions DES

### 3. Hash functions and Message Digests:

Length of hash, uses, algorithms (MD2, MD4, MD5, SHS)

MD2: Algorithm(padding, checksum, passes). MD4 and 5: algorithm(padding, stages, digest computation) SHS: overview, padding, stages

### 4. Public key Cryptography

Algorithms, examples, Modular arithmetic (addition, multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption. Other Algorithms: PKCS, Diffie-Hellman, El-Gamal signatures, DSS, zero-knowledge signatures

### 5. Authentication

Password based, address based, cryptographic authentication

Passwords: in distributed systems, on-line vs off-line guessing, storing.

Cryptographic authentication: passwords as keys, protocols, KDC's,

Certification Revocation, inter-domain, groups, delegation. Authentication of People:

Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics

### 6. Security policies & Security Handshake Pitfalls:

What is security policy, high and low level policy, user issues?

Protocol problems, assumptions, shared secret protocols, public key protocols, mutual authentication, reflection attacks, use of timestamps, nonce and sequence numbers, session keys, one-and two-way public key based authentication.

### 7. Example System

Kerberos: purpose, authentication, server and ticket granting server, keys and tickets, use of ASS and TGS, replicated servers

Kerberos V4: names, inter-realm authentication, key version numbers

Kerberos V5: names. Realms, delegation, forwarding and proxies, ticket lifetimes, revoking tickets, multiple realms

### 8. Network security

Electronic mail security, IP security, network management security

### 9. Security for electronic commerce: SSL, SET

### 10. System Security

Intruders and Viruses, Firewalls, Intrusion detection

## **Syllabus for MCA Semester – IV (with effect from the academic year 2007-2008)**

### **Tutorials:**

1. Numerical problems on DES, IDEA, MD2, MD5, Diffie-Helman and El=Gamal Signatures
2. Comparative study of network security tools
3. Vulnerability tools: Nessus, Retina, Wireshark, Nmap
4. Packet Sniffers: Tcpdump, Ettercap, DSniff

Term work/Assignment : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

### **Reference Books:**

1. Atul Kahate, Cryptography and Network Security, McGraw Hill
2. Kaufman, C.Perman, R and Speciner, M. , Network Security, Private Communication in a public world, 2<sup>nd</sup> edition, prentice hall PTR, 2002
3. Stallings, W. Cryptography and Network Security: Principles and Practice, 3<sup>rd</sup> edition, Prentice hall PTR, 2003
4. Stallings, W.Network security Essentials: Applications and Standards, Prentice Hall, 2000
5. Cryptography and Network Security: McGraw Hill, Behrouz Forouzan
6. Information Security Intelligence Cryptographic Principles & App. Calabrese Thomson
7. Securing A Wireless Network Chris Hurley SPD

## ADVANCED DATABASE TECHNIQUES

Lecture : 4 Hrs/week

Practical : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

### 1. Parallel and Distributed databases

- Architecture for parallel databases
- Parallelizing individual operations
- Parallelizing query operations
  - Introduction to DBMS
  - Architecture of DDBs
  - Storing data in DDBs
  - Distributed catalog management
  - Distributed query processing
  - Distributed concurrency control and recovery
  - Transaction processing

### 2. Datawarehousing

- Data Marts
- Getting data into the data into the warehouse
- Extraction
- Transformation
- Cleansing
- Loading
- Summarization
- Metadata
- Datawarehousing & ERP
- Datawarehousing & KM
- Datawarehousing & CRM

### 3. Planning & Project management

- How is it different?
- Life-cycle approach
- The development phases
- Dimensional analysis
- Dimensional modeling
  - Star schema
  - Snowflake scheme

### 4. OLAP

- OLAP architecture
- Relational OLAP
- Relational vs multidimensional OLAP
- Web based OLAP
- Major functions and features
  - Drill-down and Roll-up
  - Slice and dice or rotation
  - Implementation techniques for OLAP
  - Bitmap Indexes
  - Join indexes



**5. Data mining**

- Introduction
- Data mining algorithms: clustering, classification, association rules
- Knowledge discovery: KDD process
- Decision trees
- Neural networks
- Search engines
  - Characteristics
  - Functionality
  - Architecture
  - Ranking of web pages
  - The search engine industry
  - The enterprise search
- Case study
  - The analysis of a large scale hypertextual search engine

**6. Object databases systems**

- Introduction
- User defined ADTs
- Structured types
- Object, object identity and references
- Inheritance
- Database design for ORDBMS
- New challenges in implementing ORDBMS
- Storage & access methods
- Query processing & optimization
- OODBMS
  - Comparison between OODBMS and ORDBMS

**7. Database security**

Term work/Assignment : Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and assignments graded for 15 marks.

**Reference :**

1. Raghu Ramakrishnan, Johannes Gerhke, “Database Management Systems” McGraw Hill
2. Decision supporter & database systems – Efreem G. Mallach
3. Datawarehousing fundamental – Paulraj Ponniah, Wiley
4. Introduction to Data mining with case studies – G.K. Gupta
5. Elmasri and Navathe, “Fundamentals of Database Systems”, Pearson Education
6. Korth, Silberchatz, Sudarshan, “Databse system Concepts”, McGraw Hill
7. Peter Rob and Coronel, “Database Systems, Design, Implementation and Management”, Thomson Learning
8. Data Warehousing(OLAP) S. Nagabhushana New Age

## SOFTWARE PROJECT MANAGEMENT

Lecture : 4 Hrs/week

Tutorial : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

### 1. Introduction

- a. What is project?
- b. What is project management?
- c. The role of project manager
- d. The project management profession
- e. Project life cycle

### 2. Technology Context

- a. A systems view of project management
- b. Understanding organizations
- c. Stakeholder management
- d. Project phases and the project life cycle
- e. The context of information technology projects

### 3. Introduction

- a. Developing the project schedule
- b. Project management software tools
- c. Developing the project budget
- d. Finalizing the project schedule and budget
- e. Monitoring and controlling the project
- f. The project communications plan
- g. Project metrics
- h. Reporting performance and progress
- i. Information distribution

### 4. The importance of project risk management

- a. Risk management planning
- b. Common sources of risk on information technology projects
- c. Risk identification
- d. Qualitative risk analysis
- e. Quantitative risk analysis
- f. Risk response planning
- g. Risk monitoring and control
- h. Using software to assist in project risk management

### 5. The importance of project procurement management

- a. Planning purchases and acquisitions
- b. Planning contracting
- c. Requesting seller responses
- d. Selecting sellers
- e. Administering the contract
- f. Closing the contract
- g. Using software to assist in project procurement management
- h. Outsourcing

### 6. Change management

- a. The nature of change
- b. The change management plan
- c. Dealing with resistance and conflict

**Syllabus for MCA Semester – IV (with effect from the academic year 2007-2008)**

**7. Leadership & Ethics in Projects**

- a. Project leadership
- b. Ethics in projects
- c. Multicultural projects

**8. Introduction**

- a. Project implementation
- b. Administrative closure
- c. Project evaluation

**References :**

1. Information Technology Project Management : Kathy Schwalbe Thomson Publication
2. Information Technology Project Management providing measurable organizational value  
Jack Marchewka Wiley INDIA
3. Applied software project management Stellman & Greene SPD
4. Software Engineering Project Management by Richard Thayer, Edward Yourdon WILEY  
INDIA

**ELECTIVE**  
**CUSTOMER RESOURCE MANAGEMENT**

**Lecture : 4 Hrs/week**

**Tutorial : 1 Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

**1. Introduction to CRM and eCRM**

What is customer? How do we define CRM? CRM technology components, customer life style, customer interaction. Difference between CRM and eCRM, features of eCRM

**2. Sales Force Automation(SFA)**

Definition and need of SFA, barriers to successful SFA, SFA functionality, technological aspect of SFA, data synchronization, flexibility and performance, reporting tools.

**3. Enterprise Marketing Automation(EMA)**

Components of EMA, marketing campaign, campaign planning and management, business analytic tools, EMA components (promotions, events loyalty and retention programs), response management

**4. Call center**

Meaning, customer interaction, the functionality, technological implementation, what is ACD (Automatic Call Distribution), IVR (Interactive Voice Response), CTI (Computer Telephony Integration), web enabling the call center, automated intelligent call routing, logging & monitoring

**5. Implementing CRM**

Pre implementation, kick off meeting, requirements gathering, prototyping and detailed proposal generation, development of customization, Power user beta test and data import, training, roll out and system hand off, ongoing support, system optimization, follow up.

**6. Introduction to Application Service Provider (ASP)**

Who are ASPs? Their role and function, advantages and disadvantages of implementing ASP

**7. Impact of CRM on Marketing Channels**

Meaning, how does the traditional distribution channel structure support customer relationship, emerging channel trends that impact CRM

**8. Case studies**

**References :**

1. CRM at the speed of light by Paul Greenberg, YMH 2<sup>nd</sup> edition
2. Customer Relationship Management by V Kumar, Werner J Reinartz, WILRY India edition
3. Customer Relationship Management by Kristin Anderson and Carol Kerr, TM

**Assignments**

Students have to submit 7 assignments

**Case study:**

Present a report of 10-15 pages on any topic from syllabus

## SOFTWARE TESTING

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

### 1. Fundamentals of Testing

Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics

### 2. Role of Testing in SDLC

Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic)

### 3. Approaches to Testing - I

Static Testing

Structured Group Examinations

Static Analysis

Control flow & Data flow, Determining Metrics

### 4. Approaches to Testing - I

Dynamic Testing

Black Box Testing

Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques

White Box Testing

Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support

Gray Box Testing, Intuitive and Experience Based Testing

### 5. Test Management

Test Organization

Test teams, tasks and Qualifications

Test Planning

Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria

Cost and economy Aspects

Test Strategies

Preventive versus Reactive Approach, Analytical versus heuristic Approach

Test Activity Management, Incident Management, Configuration Management

Test Progress Monitoring and Control

Specialized Testing: Performance, Load, Stress & Security Testing

### 6. Testing Tools

Automation of Test Execution, Requirement tracker, High Level Review

Types of test Tools

Tools for test management and Control, Test Specification, Static Testing, Dynamic Testing, Non functional testing

Selection and Introduction of Test Tools

Tool Selection and Introduction, Cost Effectiveness of Tool Introduction

### 7. Testing Object Oriented Software

Introduction to OO testing concepts, Differences in OO testing

Term work/Practical : Each candidate will submit a journal in which at least 12 practical assignments based on the above syllabus along with the flow chart and program listing will be submitted with the internal test paper. Test will be graded for 10 marks and practical will be graded for 15 marks.

**References:**

1. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors
  2. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R, PearsonEd, 2006
  3. Foundations of Software Testing by Aditya P. Mathur – Pearson Education custom edition 2000
  4. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley, 1996
  5. Software Engineering – A practitioner’s approach by Roger S. Pressman, 5<sup>th</sup> Edition, McGraw Hill
  6. The art of software testing by GJ Myers, Wiley.
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**WIRELESS TECHNOLOGY AND MOBILE COMPUTING**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Practical exam: 50 marks**

**Term work: 25 marks**

**1. Introduction and Overview**

History of Wireless Communications,  
Communication Fundamental Review and Wireless Communication Technology  
Transmission fundamentals, Communication Networks, TCP/IP Suite

**2. Wireless Communication Technology**

Frequency for Radio Transmission, Signal Antennas, Signal Propagation, Multiplexing,  
Modulation, Spread Spectrum, Coding and Error Control

**3. Mobile Internet**

WAE, WML, WAP 2.0 protocol, XHTML, CHTML

**4. Cellular Networks**

Frequency reuse, First Generation, Second Generation, Third Generation systems. GSM  
and CDMA Fundamentals

**5. Fixed Wireless Networks and Wireless Local Loop**

Cordless Systems, WLL, IEEE 802.16

**6. WiMAX, Rural wireless network, VSAT**

Cellular Wireless Network – GPRS, 2.5G, 3G - WCDMA

**7. Wireless LANs**

IEEE 802.11 Protocol Architecture, 802.11 Architecture and Services, MAC and Physical  
Layer  
WiFi security – WPA2

**8. Bluetooth**

Overview, Radio Specification, Baseband Specification, Link Manager Specification,  
Logical Link Control and Adaptation

**9. Mobile Computing Platform – TAPL, OS**

## 10. Application Design for Mobile devices - J2ME and MIDP

**Term work/Practical :** Each candidate will submit a journal in which at least 12 practical assignments based on the above syllabus along with the flow chart and program listing will be submitted with the internal test paper. Test will be graded for 10 marks and practical will be graded for 15 marks.

### References:

1. Jochen Schiller “Mobile Communications”, Addison Wisley, Pearson Education
2. S Stallings, W. “Wireless Communications and Networks”
3. Roy Blake, “Wireless Communication Technology”, Cengage Learning, India Edition
4. Mark Ciaampa, Jorge Olenewa, “Wireless Communications”, Cwenge learning
5. Principles of Mobile Computing Uwe Hansmann, et. Al, Springer International Ed
6. Dharma Prakash Agarwal, Qing-AnZeng, “Introduction to Wireless and Mobile System”, Cenage Learning
7. J2ME Complete Reference Book, TMH
8. HTML/XHTML – Complete Reference Book, TMH
9. WML and WML Script Programming : How to Design and Implement Effective Web Sites for Portable Devices – Christopher Hoever

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## DISTRIBUTED COMPUTING

**Lecture : 4 Hrs/week**

**Tutorial : 1Hr/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

### 1. Fundamentals

Evolution of Distributed Computing Systems, System models, issues in design of Distributed-computing environment, web based distributed model, computer networks related to distributed systems and web based protocols

### 2. Message Passing

Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication

### 3. Remote Procedure Calls

The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, Lightweight RPC, Optimization for Better Performance

### 4. Distributed Shared Memory

Design and Implementation Issues of DSM, Granularity, Structure of shared memory space, Consistency Models, replacement Strategy, Thrashing, Other Approaches to DSM, Advantages of DSM

### 5. Synchronization

Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms

**6. Resource and Process Management**

Desirable Features of a good global scheduling algorithm, Task assignment approach, Load Balancing approach, Load sharing approach, Process Migration, Threads, Processor allocation, Real Time distributed Systems

**7. Distributed File Systems**

Desirable Features of a good Distributed File Systems, File Models, File-Accessing Models, File-sharing Semantics, File-caching schemes, File Replication, Fault Tolerance, Design Principles, Sun's network file system, Andrews file system, comparison of NFS and AFS

**8. Naming**

Desirable features of a Good Naming System, Fundamental Terminologies and Concepts, systems-Oriented Names, Name caches, Naming & security, CDE directory services.

**9. Case Studies**

Mach & Chorus (Keep case studies as tutorial)

Tutorials:

1. Numerical problems on DES, IDEA, MD2, MD5, Diffie-Helman and El=Gamal Signatures
2. Comparative study of network security tools
3. Vulnerability tools: Nessus, Retina, Wireshark, Nmap
4. Packet Sniffers: Tcpdump, Ettercap, DSNIFF

Term work/Assignment : Each candidate will submit assignments based on the above syllabus with the flow chart and program listing will be submitted with the internal test paper.

**Reference Books:**

1. Distributed OS by Pradeep K. Sinha (PHI)
2. Tanenbaum S. : Distributed Operating Systems, Pearson Education
3. Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms. (Pearson Education)
4. George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems concepts and design

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**ADVANCED WEB TECHNOLOGIES**

**Lecture : 4 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

**Practical : 3 Hrs/week**

**Practical exam: 50 marks**

**1. Introduction**

- The World Wide Web
- Web Search Engines
- Search engines optimization and limitations
- Introduction to the semantic web

**2. Servlets**

- Introduction to Servlets
- Servlet Life cycle
- Servlet Classes
  - Servlet



## Syllabus for MCA Third Year Semester – V (with effect from the academic year 2007-2008)

- ServletRequest
- ServletResponse
- ServletContext
- Threading Models

### 3. JSP

- JSP Development Model
- Components of JSP page
- Request Dispatching
- Session and Thread Management

### 4. Introduction to web services

- What is a Web Service?
- Software as a service
- Web Service Architecture
- SOA

### 5. Introduction to .NET framework

- Evolution of .NET
- Comparison of JAVA and .NET
- Architecture of .NET framework
  - Common Language Runtime
  - Common Type System
  - Metadata
  - Assemblies
  - Application Domains
  - CFL
- Features of .NET
- Advantages and Application

### 6. C#

- Basic principles of object oriented programming
- Basic Data Types
- Building Blocks – Control Structures, operators, expressions, variables
- Reference Data Types – Strings, Data time objects
- Arrays
- Classes and object
- Exception Handling
- Generics
- File Handling
- Inheritance and Polymorphism
- Database programming

### 7. Web Applications in ASP.NET

- ASP.NET coding modules
- ASP.NET page directives
- Page events and Page Life Cycle
- PostBack and CrossPage Posting
- ASP.NET Application Compilation models
- ASP.NET server Controls
- HTML Controls
- Validation Controls

## Syllabus for MCA Third Year Semester – V (with effect from the academic year 2007-2008)

- Building Databases

### 8. XML

- Syntax
- DTDs and XML Schema
- XPath
- XSLT
- Sax and DOM

**Term work/Practical :** Each candidate will submit a journal in which at least 12 practical assignments based on the above syllabus along with the flow chart and program listing will be submitted with the internal test paper. Test will be graded for 10 marks and practical will be graded for 15 marks.

#### References :

1. .NET programming – Black Book
2. Beginning C# - Wrox Publication
3. C# with Visual Studio – Vijay Nukhi, BPB
4. .NET 2008 Programming – SAMs Techmedia
5. XML Complete Reference
6. JSP Complete Reference

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## SERVICE ORIENTED ARCHITECTURE (ELECTIVE)

**Lecture : 4 Hrs/week**

**Tutorial : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

### 1. Introduction to SOA

Service Oriented Analogy, Service Encapsulating Logic, Relationship and Communication in Services, Design and Building of Services, Primitive SOA

2. Common Characteristics of Contemporary SOA, Misperceptions of SOA, Benefits of SOA, Evolution of SOA, Overview & basic Components of SOA

### 3. Web Services and Primitive SOA

Web Service Framework, Roles and Models of Services, Web Services at different network layers HTTP, XML, SOAP, WSDL and SAML Standards, Use of XML in SOA, Service Descriptions with WSDL, Messaging with SOAP

### 4. Web Services and Contemporary SOA – I

Message Exchange Patterns, Service Activity, Coordination, Atomic Transaction, Business Activities, Orchestration and Choreography

### 5. Web Services and Contemporary SOA – II

Addressing, Reliable Messaging Correlation, Policies, Metadata Exchange, Security

### 6. Principles of Service Orientation

Service Orientation and Enterprise, Anatomy of Service Oriented Architecture, Common Principles of Service Orientation and their Interrelation

**7. Service Layers**

Service Layer Abstraction, Different Service Layers (Application, Business, Orchestration)

**8. Development of a SOA Application**

SOA Life Cycle, SOA Governance and its Challenges

**Term work/Practical :** Each candidate will submit assignments based on the above syllabus will be submitted with the internal test paper.

**References :**

1. Service Oriented Architecture: Concepts Technology and Design, Thomas Erl, Prentice Hall
2. Service Oriented Architecture, Eric A. Marks, Prentice Hall
3. Enterprise SOA: Service Oriented Architecture Best Practices, Dirk Kraefzig.

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**CYBER LAWS AND IPR (ELECTIVE)**

**Lecture : 4 Hrs/week**

**Practical : Nil**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

**1. Introduction**

Legal environment in Information Age, Technology and law, Legal issue recognition, Internet code of Practice for an educational institute of higher learning. US initiatives in internet legislation. Creating, Using and protecting software, cyber companies and internet agreement, E-commerce, E-document & contracts, Digital signatures, Digital Identity.

**2. Basic foundation of Law : Types of laws,**

**Digital Contracts:** Basic Contract law: Nomenclature, Contract information, Genuineness of Assent, writing requirements and statues of frauds, performance and discharge of contractual obligations

**Current and future contract law :** Contracting and licensing software, torts: wrongs and their remedies, cyber torts, piracy and government regulation, product liability in tort

**3. Overview of Intellectual property : Copy Rights, Trade marks, patents, basic copyright and trademark law**

**Intellectual Property Rights and Issues :** Typical Items that may be protected, How a Patent protects your invention, Duration of Patents, Provisional Patents, International patents, Trademark, Maintenance, Renewable, copyright, Contracts for IP protection

**4. Cyber Acts and related issues**

Childrens' Online Privacy Protection Act (COPPA)  
Electronic signatures in Global & National Commerce Act (E-Sign), Internet Filtering Encryption, Internet Gambling Spam – Unsolicited Junk E-mail, Digital Signatures Internet Taxation, State Legislation, Computer Crime Act of 2000, HB 2428, Anti-Spam Laws, Anti-Spam Suits, Copyright Laws and the Internet, What is cyber squatting? Anti cyber squatting Consumer Protection Act, Childrens' Internet Protection Act, Software Piracy, Domain Name Disputes, file Sharing, The Communications Decency Act (CDA),

The Child Online Protection Act (COPA), The Childrens' Internet Protection Act (CIPA Sexual Predator Laws)

### 5. Fundamentals of Cyber Law

Overview of General Laws and Procedures in India, Introduction to Indian Cyber Law: Information Technology Act 2000 and main features of the act, Information Technology Amendment Act 2008 and its major strengths.

### 6. Different Cyber Crimes and related Case Studies

#### References :

1. Cyberlaw and Ecommerce by David Baumer and J Poindexter of North Carolina State University: Tata McGraw Hill
2. "GUIDE TO CYBER LAWS" by Rodney D. Ryder
3. Cyber Laws in India. ITA 2000 and Beyond By Na Vijayashankar, Naavi.org
4. "Cyber Law: The Law of the Internet", J. Rosenoer, Springer Verlag 1996

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## KNOWLEDGE MANAGEMENT (ELECTIVE)

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

1. **Understanding Knowledge** : Data, Information, Knowledge, Wisdom, Types of Knowledge, Human Thinking and Learning

**Essentials of Knowledge** : Knowledge creation and capture, Knowledge creation and Models of Creation, Nonaka's Model of Knowledge creation and Knowledge Architecture, Knowledge Capture and techniques of Knowledge Capturing

2. **An Insight to Knowledge Management** :

KM evolution, KM – why now, KM – imperatives, Organizational KM – the need, Organizational KM – drivers, KM – the future, Global knowledge economy, what is KM organizational KM approach, learning organization, KM life Cycle, KM System Life Cycle, Implications of KM

3. **KM Techniques, System & System Tools** :

Organizational knowledge creation, organizational knowledge acquisition / capture, Knowledge analysis

**KM System Tools** :

Role of DM in KM, DM and Business Intelligence, Business and Technical Drivers, Developing a DM Application, Components of Data Management and its use in practice, Knowledge Portals and Technologies, Content Management

4. **Organizational KM Architecture & Implementation strategies** :

Introduction, developing a KM framework, KM system components, Implementation strategies, organizational organic capabilities architecture, organizational knowledge repositories, KM application, organizational knowledge measurement framework, organizational knowledge measurement techniques, organizational implementation barriers

5. **K-Careers** :

Introduction, KM roles, New organizational roles, organizational k-role classification KM job opportunities

**6. Value differentiation organizing ‘know-what’ for product concept innovation :**

Product concept innovations, three dimension of innovation & knowledge, functional differentiation, value different ion, bounded cohabitation, emergence and evolution of product concepts.

**7. Ethical and Legal issues in KM**

Knowledge owners and Legal issues, ethical Factors

Managerial issues in KM : Knowledge workers and their role in the learning organization, work adjustment and knowledge worker, technology and knowledge worker, managerial considerations, managing knowledge projects

**Term work/Practical :** Each candidate will submit assignments based on the above syllabus will be submitted with the internal test paper.

**References :**

1. Knowledge Management, Elias M.Awad, Hassan M. Ghaziri, Pearson Education
2. Knowledge Management Systems, Barnes, Cengage India Ltd
3. Knowledge Management – Sudhir Warier [vikas publishing house pvt ltd (1<sup>st</sup> Edition)]
4. Knowledge Management – Hirotaka Takeuchi, Ikujiro Nonaka [John Wiley & sons (Asia) p ltd 1<sup>st</sup> edition]

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**MULTIMEDIA (ELECTIVE)**

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

**1. Introduction to Multimedia :**

Definition and scope of Multimedia, its components and applications, Use of Multimedia in CBT, Presentation & Conferencing, Hypermedia Multimedia in Public place, Multimedia on Web, Multimedia in business

**2. Multimedia Elements :**

Image file format, Bitmap image, Vector drawing Images, Principles of animations, Animation types & technique, Animation file and formats, Using text in multimedia, Designing with text, Text fonts, Menus and Navigation, Font editing drawing tools, file formats, Hypermedia and Hypertext

**3. Sound, Audio and video :**

Multimedia system sounds, MIDI audio, Audio file formats, MIDI v/s Digital Audio, Adding sound to your Multimedia Project, Analog display standards Digital display standards, Digital audio, Video recording and tap formats, Optimizing video files for CD-ROM

**4. Multimedia Authoring Tools :**

Making instance multimedia, Types of authoring tools, Time based authoring tools, card and page based authoring tools, Icon and object based authoring tools.

Story boarding, Media Design, Developing Multimedia Packages, Content analysis for different applications

**5. Designing and Producing :**

Designing, designing the structure of multimedia, Different types of multimedia structure, Hot spots hyperlink Buttons, Hot spots Web pages, Designing the user interfaces: GUIs, Audio Interface, A multimedia design case history.

## Syllabus for MCA Third Year Semester – V (with effect from the academic year 2007-2008)

Delivering : Testing, Preparing of delivery, Delivering on CD-ROM, Compact Disk technology

### 6. Planning and costing :

The process of making multimedia, Idea analysis, Idea management software, Pre testing, task planning, building a team, prototype development: Alpha Development, Beta Development

### 7. Coding and Compression :

Introduction to coding and compression techniques, Entropy encoding run length, Huffman, JPEG compression process, MPEG audio and video compression, Various CD Formats, MPEG Standards

**Term work/Practical :** Each candidate will submit assignments based on the above syllabus will be submitted with the internal test paper.

### References :

1. Multimedia Madness, Ron Wodaski, SAMS pub.
2. Multimedia : Making it works, Tay Vaughan, TMH pub
3. Multimedia , Shuman, Multimedia in Action with CD, Cengage India
4. Multimedia System : S.K. Trapathi, S.V. Raghvan
5. Multimedia System Design, P.K. Andleigh Kthakar, Prentice Hall of India
6. Multimedia System, J.E.K. Budford, Addison Wesley

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## SUPPLY CHAIN MANAGEMENT AND LOGISTICS (ELECTIVE)

**Lecture : 4 Hrs/week**

**Practical : 3 Hrs/week**

**One paper: 100 marks / 3 Hrs duration**

**Term work: 25 marks**

### 1. Understanding of Supply Chain

Objectives of Supply Chain, Importance, Decision Phase, Process View, Examples, Supply Chain Performance Drivers

Evolution and Overview of Supply Chain Management, Traditional and Modern Approach of SCM, Elements in SCM

### 2. Demand Management in Supply Chain

Demand planning & Forecasting, Types of Demand, Characteristics of forecasts, Components of a Forecast & Forecasting Methods, Basic Approach to Demand Forecasting, The Role of IT in Forecasting, Risk Management in Forecasting, Forecasting in practice, case studies

### 3. Procurement Management in Supply Chain

Introduction, Traditional Inventory Management, Inventory models, New Paradigms in Inventory, JIT, vendor managed inventory, case studies

### 4. Logistics Management

Introduction, History & evolution of Logistics, elements of logistics, Distribution management *warehousing* (types, operations, site selection, layout and design), Packing for logistics (concepts, importance, requirement, important aspects of logistics, packing Repacking & forwarding, Trends in packaging)

### 5. Transportation Problem

Role and Functionality in Supply Chain, Participants in transportation, Transportation formats, Modes, Decision and Other Formats and Transport Documentation

## **Syllabus for MCA Third Year Semester – V (with effect from the academic year 2007-2008)**

Private Fleet Management : Process Factors and Drivers

### **6. Benchmarking the Supply Chain**

Introduction and Concepts, Benchmarking the logistics process, Mapping SC process, Supplier and Distributor benchmarking, Case Study

### **7. IT for SCM**

Concept of IT (need for IT, IT tools for business) IT Application in SCM, Evolution, benefits, role of internet, Issues with SCM system typical Data warehouse concepts, Data Mining, use of Data mining tools in SCM

### **8. Distribution Networks of Supply Chain :**

Role of Distribution, influencing factors, design, application to e-business, Distribution networks in Practice

### **9. Network Design in Supply Chain :**

Role of Network Design, influencing factors and Framework, models of facility location and capacity allocation, role of IT in network Design decisions in practice

**Term work/Practical :** Each candidate will submit assignments based on the above syllabus will be submitted with the internal test paper.

### **References :**

1. Supply Chain Management (Concepts & cases) – Rahul V. Altekar – [Prentice Hall of India, 4<sup>th</sup> edition]
2. Supply Chain Management (Strategy, planning and operation) – Sunil Chopra, Peter Meindl, D.V. Kalra – [Pearson, 3<sup>rd</sup> edition]
3. Principles of Supply Chain Management : A Balanced Approach, Eisner, Cengage India
4. Logistics & Supply Chain Management (Strategies for Reducing cost & improving service) – Martin Christopher [FT financial Times/Pitman publishing, 2<sup>nd</sup> edition]
5. Logistics & Supply Chain Management (Cases & Concepts) – Raghuram & N. Rangaraj [McMillan India Ltd, 1<sup>st</sup> edition]