

## 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

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### **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.

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**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 Call's 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's 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 practicals for this subject in the syllabus. However, these group projects are done by assigning a project to the group. The project is from the following topics: Travel agency Online placement services Hostel accounting systems Library management systems, Bank front office management, etc. The following documents are products 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

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**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