

# **U.P. TECHNICAL UNIVERSITY LUCKNOW**



Syllabus

**[Effective from the session : 2004-05]**

## **MASTER OF COMPUTER APPLICATION**

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**STUDY AND EVALUATION SCHEME**  
**MCA (Master of Computer Application)**  
**(Effective from session: 2004-05)**

**MCA**

**YEAR – I, SEMESTER – I**

| S. No.            | COURSE CODE | SUBJECT   | PERIODS   |          |          | EVALUATION SCHEME |    |       |     |               |
|-------------------|-------------|---|-----------|----------|----------|-------------------|----|-------|-----|---------------|
|                   |             |   |           |          |          | SESSIONAL EXAM    |    |       | ESE | Subject Total |
|                   |             |   | L         | T        | P        | CT                | TA | Total |     |               |
| 1                 | MCA-101     | Mathematical Foundation of Computer Science         | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 2                 | MCA-102     | Accounting and Financial Management                 | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 3                 | MCA-103     | Computer Organization                               | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 4                 | MCA-104     | Computer and 'C' Programming                        | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 5                 | MCA-105     | Computer Based Numerical and Statistical Techniques | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 6                 | MCA-106     | Combinatorics & Graph Theory                        | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| <b>PRACTICALS</b> |             |   |           |          |          |                   |    |       |     |               |
| 7                 | MCA-171     | Programming Lab                                     | 0         | 0        | 3        | 30                | 20 | 50    | 50  | 100           |
| 8                 | MCA-172     | Organization Lab                                    | 0         | 0        | 3        | 30                | 20 | 50    | 50  | 100           |
| 9.                | MCA-173     | Numerical Techniques Lab                            | 0         | 0        | 2        | 15                | 10 | 25    | 25  | 50            |
| 10.               | GP-101      | General Proficiency                                 | 0         | 0        | 0        | -                 | -  | 50    | -   | 50            |
| <b>Total</b>      |             |   | <b>18</b> | <b>6</b> | <b>8</b> |                   |    |       |     | <b>1200</b>   |

**MCA**

**YEAR – I, SEMESTER – II**

| S. No.            | COURSE CODE | SUBJECT   | PERIODS   |          |          | EVALUATION SCHEME |    |       |     |               |
|-------------------|-------------|---|-----------|----------|----------|-------------------|----|-------|-----|---------------|
|                   |             |   |           |          |          | SESSIONAL EXAM    |    |       | ESE | Subject Total |
|                   |             |   | L         | T        | P        | CT                | TA | Total |     |               |
| 1                 | MCA-201     | Organizational Structure and Personnel Management | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 2                 | MCA-202     | Data and File Structure Using 'C'                 | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 3                 | MCA-203     | Unix and Shell Programming                        | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 4                 | MCA-204     | Paradigms of Programming                          | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 5                 | MCA-205     | System Analysis and Design                        | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 6                 | MCA-206     | Computer Architecture & Microprocessor            | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| <b>PRACTICALS</b> |             |   |           |          |          |                   |    |       |     |               |
| 7                 | MCA-271     | Data Structure Lab                                | 0         | 0        | 3        | 30                | 20 | 50    | 100 | 150           |
| 8                 | MCA-272     | Unix/Linux Lab                                    | 0         | 0        | 3        | 30                | 20 | 50    | 50  | 100           |
| 9                 | MCA-273     | Microprocessor Lab                                | 0         | 0        | 2        | 15                | 10 | 25    | 25  | 50            |
| 10                | GP-201      | General Proficiency                               | 0         | 0        | 0        | -                 | -  | 50    | -   | 50            |
| <b>Total</b>      |             |   | <b>18</b> | <b>6</b> | <b>8</b> |                   |    |       |     | <b>1200</b>   |

TA – Teacher Assessment    CT – Cumulative Test    ESE – End Semester Examination

Note: Duration of ESE shall be 3 (Three) hours

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**MCA**

**YEAR II, SEMESTER – III**

| S. No.            | COURSE CODE | SUBJECT                                | PERIODS   |          |          | EVALUATION SCHEME |    |       |     |               |
|-------------------|-------------|--|-----------|----------|----------|-------------------|----|-------|-----|---------------|
|                   |             |  |           |          |          | SESSIONAL EXAM    |    |       | ESE | Subject Total |
|                   |             |  | L         | T        | P        | CT                | TA | Total |     |               |
| 1.                | MCA-301     | Computer Networks                      | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 2.                | MCA-302     | Design & Analysis of Algorithm         | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 3.                | MCA-303     | Operating System                       | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 4.                | MCA-304     | Data Base Management System            | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 5.                | MCA-305     | Object Oriented Systems and C++        | 3         | 1        | 0        | 30                | 20 | 50    | 50  | 100           |
| 6.                | MCA-306     | Computer Based Optimization Techniques | 3         | 1        | 0        | 30                | 20 | 50    | 50  | 100           |
| <b>PARCTICALS</b> |             |  |           |          |          |                   |    |       |     |               |
| 7.                | MCA-371     | DBMS Lab                               | 0         | 0        | 3        | 30                | 20 | 50    | 100 | 150           |
| 8.                | MCA-372     | OOPS & C++ Lab                         | 0         | 0        | 3        | 30                | 20 | 50    | 100 | 150           |
| 9.                | MCA-373     | DAA Lab                                | 0         | 0        | 2        | 15                | 10 | 25    | 25  | 50            |
| 10.               | GP-301      | General Proficiency                    | 0         | 0        | 0        | -                 | -  | 50    | -   | 50            |
| <b>Total</b>      |             |  | <b>18</b> | <b>6</b> | <b>8</b> |                   |    |       |     | <b>1200</b>   |

**YEAR – II, SEMESTER – IV**

| S. No.            | COURSE CODE  | SUBJECT                       | PERIODS   |          |          | EVALUATION SCHEME |    |       |     |               |
|-------------------|--|-------------------------------|-----------|----------|----------|-------------------|----|-------|-----|---------------|
|                   |  |                               |           |          |          | SESSIONAL EXAM    |    |       | ESE | Subject Total |
|                   |  |                               | L         | T        | P        | CT                | TA | Total |     |               |
| 1                 | MCA-401  | Management Information System | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 2                 | MCA-402  | Modeling and Simulation       | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 3                 | MCA-403  | Internet & Java programming   | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 4                 | <b>Elective-I (any one of the following)</b><br>*MCA 404/(1)/(2)/(3)/(4)/(5) |                               | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 5                 | MCA-405  | Foundation of E-Commerce      | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| 6                 | MCA-406  | Computer Graphics & Animation | 3         | 1        | 0        | 30                | 20 | 50    | 100 | 150           |
| <b>PRACTICALS</b> |  |                               |           |          |          |                   |    |       |     |               |
| 7                 | MCA-471  | MIS Lab                       | 0         | 0        | 3        | 30                | 20 | 50    | 50  | 100           |
| 8                 | MCA-472  | Java Programming Lab          | 0         | 0        | 3        | 30                | 20 | 50    | 50  | 100           |
| 9                 | MCA-473  | Computer Graphics Lab         | 0         | 0        | 2        | 15                | 10 | 25    | 25  | 50            |
| 10                | GP-401   | General Proficiency           | 0         | 0        | 0        | -                 | -  | 50    | -   | 50            |
| <b>Total</b>      |  |                               | <b>18</b> | <b>6</b> | <b>8</b> |                   |    |       |     | <b>1200</b>   |

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**MCA**

**YEAR III, SEMESTER – V**

| S. No.            | COURSE CODE  | SUBJECT                  | PERIODS   |          |           | EVALUATION SCHEME |     |       |     |               |
|-------------------|--|--------------------------|-----------|----------|-----------|-------------------|-----|-------|-----|---------------|
|                   |  |                          |           |          |           | SESSIONAL EXAM    |     |       | ESE | Subject Total |
|                   |  |                          | L         | T        | P         | CT                | TA  | Total |     |               |
| 1.                | MCA-501  | WEB Technology           | 3         | 1        | 0         | 30                | 20  | 50    | 100 | 150           |
| 2.                | Elective-II (any one of the following)<br>*MCA-502/(1)/(2)/(3)/(4)/(5)         |                          | 3         | 1        | 0         | 30                | 20  | 50    | 100 | 150           |
| 3.                | MCA-503  | Net Frame Work & C#      | 3         | 1        | 0         | 30                | 20  | 50    | 100 | 150           |
| 4.                | MCA-504  | Software Engineering     | 3         | 1        | 0         | 30                | 20  | 50    | 100 | 150           |
| 5.                | <b>Elective-III</b> (any one of the following)<br>*MCA-505/(1)/(2)/(3)/(4)/(5) |                          | 3         | 1        | 0         | 30                | 20  | 50    | 100 | 150           |
| <b>PARCTICALS</b> |  |                          |           |          |           |                   |     |       |     |               |
| 7.                | MCA-571  | WEB Technology Lab       | 0         | 0        | 3         | 30                | 20  | 50    | 50  | 100           |
| 8.                | MCA-572  | Net Frame Work & C# Lab  | 0         | 0        | 3         | 30                | 20  | 50    | 50  | 100           |
| 9.                | MCA-573  | Software Engineering Lab | 0         | 0        | 3         | 30                | 20  | 50    | 50  | 100           |
| 10.               | MCA-574  | Colloquium               | 0         | 0        | 3         | 0                 | 100 | 100   | -   | 100           |
| 10.               | GP-501   | General Proficiency      | 0         | 0        | 0         | -                 | -   | 50    | -   | 50            |
|                   |  | <b>Total</b>             | <b>15</b> | <b>5</b> | <b>12</b> |                   |     |       |     | <b>1200</b>   |

**YEAR –III, SEMESTER – VI**

| S. No.       | COURSE CODE | SUBJECT            | PERIODS |   |   | EVALUATION SCHEME |     |       |     |               |
|--------------|-------------|--------------------|---------|---|---|-------------------|-----|-------|-----|---------------|
|              |             |                    |         |   |   | SESSIONAL EXAM    |     |       | ESE | Subject Total |
|              |             |                    | L       | T | P | CT                | TA  | Total |     |               |
| 1            | MCA-671     | Industrial Project | 0       | 0 | 0 | -                 | 300 | 300   | 200 | 500           |
| <b>Total</b> |             |                    |         |   |   |                   |     |       |     | <b>500</b>    |

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## ELECTIVE SUBJECTS

**Elective-I** (Any one of the following)

MCA 404 (1) Compiler Design

MCA 404 (2) Cryptography & Network Security

MCA 404 (3) Data Compression                      MCA 404 (4) Client Server Computing  
MCA 404 (5) Data Mining & Warehousing

**Elective-II** (any one of the following)

MCA 502 (1) Multimedia System                      MCA 502 (2) Distributed Database System  
MCA 502 (3) ERP Systems                              MCA 502 (4) Object Database  
MCA 502 (5) Advanced Concepts in Database System

**Elective-III** ( any one of the following)

MCA 505 (1) Advanced Computer Networks                      MCA 505 (2) Real Time Systems  
MCA 505 (3) Principles of User Interface Design                      MCA 505 (4) Mobile Computing  
MCA 505 (5) Neural Networks

**MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE**  
**MCA 101**

**L T P**  
**3 1 0**

**Unit-I**

**Relation:** Type and compositions of relations, Pictorial representation of relations, Closures of relations, Equivalence relations, Partial ordering relation.

**Function:** Types, Composition of function, Recursively defined function

**Mathematical Induction:** Piano's axioms, Mathematical Induction

Discrete Numeric Functions and Generating functions

Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behavior of functions

**Algebraic Structures:** Properties, Semi group, Monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.

**Unit –II**

**Propositional Logic:** Proposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram,

**Lattices:** Introduction, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorphic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Distributive lattices, and Complemented lattices.

**Unit-III**

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph.

**Unit-IV**

Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with output: Moore machine, Mealy machine, Conversions.

**Unit-V**

Non-regular language: Pumping Lemma, Myhill Nerode Theorem, Pushdown Automata, and Introduction to Turing Machine and its elementary applications to recognition of a language and computation of functions.

**References**

1. Liptschutz, Seymour, "Discrete Mathematics", TMH
2. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", TMH
4. Doerr Alan & Levasseur Kenneth, "Applied Discrete Structures for Computer Science", Galgotia Pub. Pvt. Ltd
5. Gersting, "Mathematical Structure for Computer Science", WH Freeman & Macmillan
6. Kumar Rajendra, "Theory of Automata: Languages and Computation", PPM
7. Hopcroft J.E, Ullman J.D., "Introduction to Automata theory, Languages and Computation", Narosa Publishing House, New Delhi
8. C.L.Liu, "Elements of Discrete Mathematics", McGraw Hill
9. Peter Grossman, "Discrete Mathematics for Computer", Palgrave Macmillan

**ACCOUNTING AND FINANCIAL MANAGEMENT**  
**MCA 102**

**L T P**  
**3 1 0**

**Unit-1**

**Accounting:** Principles, concepts and conventions, double entry system of accounting, Ledger posting and Trial balance.

**Final accounts:** Trading, profit and loss accounts and balance sheet of sole proprietary concern with normal closing entries.

Introduction to manufacturing account, final account of partnership firms, limited company.

**Unit-II**

**Financial Management:** Meaning, role and scope of financial management.

**Basic Financial concepts:** Time value of Money, present value, future value of a series of cash flows, annuity. Practical applications of compounding and present value techniques.

**Long-term sources of finance:** Introduction to shares, debentures, preference shares.

**Unit-III**

**Capital Budgeting:** Meaning, importance, difficulties. Introduction to evaluation techniques – Traditional techniques (ARR Payback method). Discounting cash flow techniques(Present value, NPV, IRR)

**Ratio Analysis:** Meaning, advantages, limitations of ratio analysis, Types of ratios and their usefulness.

**Unit-IV**

**Costing:** Nature, importance and types of cost

**Marginal costing:** Nature, scope and importance of marginal costing, Break-even analysis, its uses and limitations, construction of break-even charts. Practical applications of marginal costing.

**Inventory control system:** The need, cost of inventory, methods of inventory costing.

**Unit-V**

**Introduction to Computerized Accounting System:** Coding logic and codes required, master files, transaction files, introduction to documents used for data collection. Processing of different files and outputs obtained.

**References:**

1. S.N. Maheswari & S. K. Maheswari, "Introduction to Financial Accountancy", Vikas Publication.

2. S.N. Maheswari & S. K. Maheswari, “Advanced Accountancy”, Vikas Publication.
3. S.N. Maheswari & S. K. Maheswari, “Financial Management”, Viaks Publication.
4. Jawahar Lal, “Financial Accounting”, Wheeler Publishing.
5. Khan & Jain, “Management Accounting”, Tata McGraw Hill Publication.
6. K.S. Sastry & Nand Dhamesa, “The Practices of Management Accounting”, Wheeler Publishing.
7. I.M. Pandey, “Financial Management”, Vikas Publications.
8. J Khan & Jain, “Financial Management”, Tata McGraw Hill Publication.
9. Geoffrey Knott, “Financial management”, Palgrave Macmillan.

## COMPUTER ORGANIZATION MCA-103

**L T P**  
**3 1 0**

### Unit-I (Representation of Information and Basic Building Blocks)

Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry lookahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro-Operation.

ALU- chip, Faster Algorithm and Implementation (multiplication & Division)

### Unit-II (Basic Organization)

Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers

### Unit-III (Memory Organization)

Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

### Unit-IV (I/O Organization)

Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication.

I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

### Unit-V (Process Organization)

Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8085): Addition of two numbers, Subtraction, Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn’s and Feng’s Classification, Parallel Architectural classification.

### References:

1. William Stalling, “Computer Organization & Architecture”, Pearson education Asia
2. Mano Morris, “Computer System Architecture”, PHI
3. Zaky & Hamacher, “Computer Organization”, McGraw Hill
4. B. Ram, “Computer Fundamental Architecture & Organization”, New Age
5. Tannenbaum, “Structured Computer Organization”, PHI.

## COMPUTER & C PROGRAMMING MCA-104

**L T P**  
**3 1 0**

### Unit – I

**Introduction To Computers:** Computer hardware Components, Disk Storage, memory, keyboard, mouse, printers, monitors, CD etc., and their functions, Comparison Based analysis of various hardware components.

### Unit – II

**Basic operating System Concepts:** MS-DOS, WINDOWS, Functional Knowledge of these operating systems. Introduction to Basic Commands of DOS, Managing File and Directories in various operating Systems, Introduction to Internet, Basic terms related with Internet, TCP/IP.

### Unit – III

**Programming in C:** History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

### Unit – IV

**Operators:** Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

**Control statements:** if-else, switch, break, continue, the comma operator, goto statement.

**Loops:** for, while, do-while.

**Functions:** built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, multifile programs.

**Arrays:** linear arrays, multidimensional arrays, Passing arrays to functions, Arrays and strings.

### Unit – V

**Structure and Union:** definition and differences, self-referential structure.

**Pointers:** value at (\*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.

**File Handling in C:** opening and closing a data file, creating a data file, read and write functions, unformatted data files.

**References:**

1. V. Rajaraman, "Fundamentals of Computers", PHI
2. Peter Norton's, "Introduction to Computers", TMH
3. Hahn, "The Internet complete reference", TMH
4. Peter Norton's, "DOS Guide", Prentice Hall of India
5. Gottfried, "Programming in C", Schaum's Series, Tata McGraw Hill
6. Kernighan, Ritchie, "The C Programming Language", PHI
7. Yashwant Kanitkar, "Working with C", BPB
8. Yashwant Kanitkar, "Pointer in C", BPB
9. Yashwant Kanitkar, "Let us C", BPB
10. Bajpai, Kushwaha, Yadav, "Computers & C Programming", New Age
11. E. Balagurusamy, "Programming in ANSI C", TMH

## COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES MCA-105

**L T P**  
**3 1 0**

### Unit-I

**Floating point Arithmetic:** Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation

**Iterative Methods:** Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

### Unit-II

**Simultaneous Linear Equations:** Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence

**Interpolation and approximation:** Finite Differences, Difference tables

**Polynomial Interpolation:** Newton's forward and backward formula

**Central Difference Formulae:** Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.

**Interpolation with unequal intervals:** Langrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation

**Approximation of function by Taylor's series and Chebyshev polynomial**

### Unit-III

**Numerical Differentiation and Integration:** Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule, Weddle's Rule Euler- Maclaurin Formula

**Solution of differential equations:** Picard's Method, Euler's Method, Taylor's Method,

Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.

### Unit-IV

**Curve fitting, Cubic Spline and Approximation:** Method of least squares, fitting of straight lines, polynomials, exponential curves etc

**Frequency Chart:** Different frequency chart like Histogram, Frequency curve, Pi-chart.

**Regression analysis:** Linear and Non-linear regression, Multiple regression

### Unit-V

**Time series and forecasting:** Moving averages, smoothening of curves, forecasting models and methods. Statistical Quality Controls methods

**Testing of Hypothesis:** Test of significance, Chi-square test, t-test, ANOVA, F-Test

Application to medicine, agriculture etc.

### References:

1. Rajaraman V., "Computer Oriented Numerical Methods", PHI
2. Gerald & Wheatley, "Applied Numerical Analyses", AW
3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
4. Grewal B. S., "Numerical methods in Engineering and Science", Khanna Publishers, Delhi
5. T. Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods", TMH
6. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
7. Francis Scheld, "Numerical Analysis", TMH
9. Gupta S. P., "Statistical Methods", Sultan and Sons

## COMBINATORICS & GRAPH THEORY MCA-106

**L T P**  
**3 1 0**

### Unit 1

Rules of sum and products, Permutation, Combination, Permutation groups and application, Probability, Ramsey theory, Discrete numeric function and generating function, Combinatorial problems, Difference equation.

## Unit II

Recurrence Relation-Introduction, Linear recurrence relation with constant coefficient, Homogeneous solution, Particular solution, Total solution, Solution by the method of generating function.

## Unit III

Graphs, sub-graphs, some basic properties, Walks, Path & circuits, Connected graphs, Disconnected graphs and component, Euler and Hamiltonian graphs, Various operation on graphs, Tree and fundamental circuits, Distance diameters, Radius and pendent vertices, Rooted and binary trees, Counting trees, Spanning trees, Finding all spanning trees of a graph and a weighted graph.

## Unit IV

Cut-sets and cut vertices, some properties, All cut sets in a graph, Fundamental circuit and cut sets, Connectivity and separability, Network flows, mincut theorem, Planar graphs, Combinatorial and geometric dual, Kuratowski to graph detection of planarity, Geometric dual, Some more criterion of planarity, Thickness and Crossings, Vector space of a graph and vectors, basis vectors, cut set vector, circuit vector, circuit and cut set verses sub spaces, orthogonal vector and sub space.

Incidence matrix of graphs, sub matrices of  $A(G)$ , circuit matrix, cut set matrix, path matrix and relationship among  $A_f$ ,  $B_f$ ,  $C_f$ , fundamental circuit matrix and range of  $B_f$  adjacency matrix, rank nullity theorem.

## Unit V

Coloring and covering partitioning of graph, Chromatic number, Chromatic partitioning, Chromatic polynomials, Matching, covering, Four color problem, Directed graph, Types of directed graphs, Directed paths and connectedness, Euler digraph, Trees with directed edges, Fundamental circuit in digraph, Matrices A, B, C of digraph adjacency matrix of digraph, Enumeration and its types, Counting of labeled and unlabeled trees, Polyas's theorem, Graph enumeration with polyas theorem, Graph theoretic algorithm.

## References

1. Deo Narsing, "Graph Theory with applications to engineering & computer science", PHI
2. Tremblay & Manohar, "Discrete mathematical structures with applications to computer Science", TMH
3. Joshi K. D., "Fundamental of discrete mathematics", New Age International
4. John Truss, "Discrete mathematics for computer scientist"
5. C. L. Liu, "Discrete mathematics"

# ORGANIZATIONAL STRUCTURE AND PERSONNEL MANAGEMENT MCA 201

L T P  
3 1 0

## Unit –I

**Organization Structure:** Classical theories of Management: Scientific management theory, Fayol's 14 principles of Management, Weber's bureaucratic theory. Definition of organization and organization Structure.

**Some concepts regarding Organization Structure:** Line and Staff authority, Centralization and Decentralization, Span of control, Formal and Informal Organization.

**Forms of organization structure and features:** Function based, Product based, Geography based, Project based ( Matrix)

**Organization Design:** Mechanistic and Organic Structure, Virtual and Network organization Structure

## Unit-II

**Motivation:** Definition of Motivation, Importance of Motivation, Motivation and behavior, Theories of Motivation – Maslows need Hierarchy, Two- Factor Theory, McClelland's Need Theory, Theory X and Theory Y.

## Unit- III

**Nature and Scope of Human resource Management:** Scope of HRM, HRM– functions and objectives, HRM model.

**Personnel Function:** Personnel polices and principles, duties and responsibilities of personnel manager, differences between HRM and PM Emerging trends of personnel management in India

## Unit-IV

**Human Resource Planning:** Meaning, definition and importance of HRP.

**Job analysis:** Meaning and definition, process of job analysis.

**Recruitment:** Meaning and definition, importance, sources of recruitment. Indian scenario

**Selection:** Meaning and definition, selection process, types of interview

## Unit-V

**Training and Development:** Nature of training and Development, Inputs in training and Development, importance of training and Development, training process, training of International assignment

## Reference Books:

1. L. M. Prasad, "Organizational Behavior", S. Chand.
2. V. S. P. Rao, P. S. Narayana, "Organizational Theory and Behavior", Konark Publishers Pvt. Ltd.
3. Tripathi, Reddy, "Principles of Management", TMH
4. Koontz, Weihrich, "Essentials of Management", TMH
5. Fred Luthans, "Organizational Behaviour", McGraw Hill
6. K. Aswathappa, "Human Resource and Personnel Management", TMH
7. L. M. Prasad, "Human Recourse Management", S. Chand

**Unit - I**

**Introduction:** Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off

**Arrays:** Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices, and Vectors.

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

**Recursion:** Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion. Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

**Unit - II**

**Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue.

**Linked list:** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

**Unit - III**

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

**Searching and Hashing:** Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

**Unit - IV**

**Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.**

**Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

**Unit - V**

**Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.**

**File Structures:** Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons

**References**

1. Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia
2. R. Kruse et al, “Data Structures and Program Design in C” Pearson Education
3. A M Tenenbaum et al, “Data Structures using C & C++”, PHI
4. Lipschutz, “Data Structure”, TMH
5. K Loudon, “Mastering Algorithms With C”, Shroff Publisher & Distributors
6. Bruno R Preiss, “Data Structures and Algorithms with Object Oriented Design Pattern in C++”, Jhon Wiley & Sons, Inc.
7. Adam Drozdek, “Data Structures and Algorithms in C++”, Thomson Asia
8. Pal G. Sorenson, “An Introduction to Data Structures with Application”, TMH.

**UNIX AND SHELL PROGRAMMING**  
**MCA-203**

**Unit-1 Introduction**

Introduction to Unix, Unix system organization (the kernel and the shell), Files and directories, Library functions and system calls, Editors (vi and ed).

**Unit-2 Unix Shell programming**

Types of Shells, Shell Metacharacters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays.

**Unit-3 Portability With C**

Command line Argument, Background processes, process synchronization, Sharing of data, user-id, group-id, pipes, fifos, message queues, semaphores, shared variables, Introduction to socket programming.

**Unit-4 Unix System Administration**

File System, mounting and unmounting file system, System booting, shutting down, handling user account, backup, recovery, security, creating files, storage of Files, Disk related commands.

**Unit-5 Different tools and Debugger**

System development tools: lint, make, SCCS (source code control system), Language development tools: YACC, LEX, M4, Text formatting tools: nroff, troff, tbl, eqn, pic, Debugger tools: Dbx, Adb, Sdb, Strip and Ctrace.

**References**

1. Parata, “Advanced Unix programming guide”, BPB

2. Yashwant Kanitkar, “Unix Shell Programming”, BPB
3. Meeta Gandhi, Tilak Shetty, Rajiv Shah, “The ‘C’ Odyssey Unix – the open boundless C”, BPB
4. Sumitabh Das, “Unix Concepts and applications”, TMH
5. Mike Joy, Stephen Jarvis, Michael Luck, “Introducing Unix and Linux”, Palgrave Macmillan.
6. Rachel Morgan, Henry McGilton, “Introducing Unix System V”, TMH

## PARADIGMS OF PROGRAMMING MCA 204

**L T P**  
**3 1 0**

### Unit 1:

**Introduction:** Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues.

**Programming Language processors:** Structures and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time

### Unit II:

**Elementary and structured data type:** Data object variables, constants, data type, elementary data types, declaration, assignments and initialization, enumeration, characters strings.

**Structured data type and objects:** Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Set files.

**Imperative Languages:** Block structure, Scope rules, Parameter Passing, Construct like co-routines, Tasks etc.

### Unit III:

**Object Oriented languages:** The class notion- Information hiding and data abstraction using classes, derived classes and inheritance– Polymorphism – Parameterized types.

### Unit IV:

**Functional languages:** Functional programming concepts – Referential transparency – Types – Type systems - Names, bindings, environment and scope – Recursive functions – Polymorphic functions – Type variables – High order functions – Curried functions – Lists and programming with lists – Definition of new user defined types in ML – Abstract data types – Evaluation methods.

### Unit V:

**Logic languages:** Review of predicate logic – Clause-form logic – Logic as a programming language- Unification algorithm - Abstract interpreter for logic programs – Theory of logic programs – SLD resolution – Negation as failure extension.

### References:

1. Terrance W Pratt, “Programming Languages: Design and Implementation”, PHI.
2. Sethi, “Programming Language”, Addison Wesley.
3. E Horowitz, “Fundamental of Programming Languages”, Galgotia.
4. Pratt, Zolkowitz, “Programming Languages Design Implementation”, Pearson Edition.
5. Tucker Noonan, “Programming languages: Principles and Paradigms”, TMH
6. D. A. Watt, “Programming Languages and Paradigms”, PHI
7. J. Lloyd, “Foundation of Logic Programming”, Springer verlag
8. M. Hennessey, “The Semantics of Programming Languages”, John Wiley
9. C. Reade, “Elements of Functional Programming”, AW
10. L.C. Paulson, “ML for Working programmer”, Cambridge university press
11. B. Stroustrup, “The C++ Programming language”, AW

## SYSTEM ANALYSIS AND DESIGN MCA 205

**L T P**  
**3 1 0**

### Unit – I

**System Concepts and Information Systems Environment:** The System Concept: Definition, Characteristics of Systems, Elements of a System, Open and Closed System, Formal and Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

### Unit – II

**The System Development Life Cycle:** Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation & Maintenance.

**The Role of the Systems Analyst:** Historical Perspective, The War Effort, What Does it take to do System Analysis, Academic & Personal Qualifications, The Multifaceted role of the Analyst, The Analyst/User Interface, Behavioral issues.

### Unit – III

**Systems Planning & Initial Investigation:** Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews & Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

### Unit – IV

**Information Gathering:** What Kind of Information do we need? Information about the firms, Information gathering tools, The art of Interviewing, Arranging the Interview, Guides to a Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

**The Tools of Structured Analysis:** The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English.

## Unit – V

**Feasibility Study:** System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis.

**Input/Output and Forms Design:** Input Design, CRT Screen Design, Output Design, Requirements of form Design.

**H/W / S/W Selection and Maintenance:** The Computer Industry, S/W Industry, a Procedure for H/W / S/W Selection, Major Phases in Selection, Criteria for S/W Selection, The Used Computer, The Computer Contract.

## References

1. Elias M.Awad, “Systems Analysis & Design”, Galgotia Publication.
2. Hoffer, “Modern Systems Analysis & Design”, Addison Wesley.
3. Kendall, “Introduction to System Analysis & Design”, McGraw Hill.

## COMPUTER ARCHITECTURE & MICROPROCESSOR MCA 206

L T P  
3 1 0

### Unit-I

Introduction to Parallel computing; Parallelism in Uniprocessor Systems, Parallel computer structures, Architectural Classification schemes, parallel processing applications. Pipelining Processing: An overlapped parallelism, Instruction and Arithmetic pipelines,

### Unit-II

Principles of designing pipelined processors, Internal forwarding and register tagging, Hazard detection and resolution, Job sequencing and collision prevention, Characteristics of Vector processing, Multiple vector task dispatching, SIMD array processors, Masking and Data routing

### Unit-III

SIMD Interconnection network: Static, Dynamic networks, Cube interconnection network, Shuffle exchange and Omega Network, SIMD matrix multiplication. Multiprocessor Architecture: Tightly and loosely coupled multiprocessors.

### Unit -IV

Multiprocessor scheduling strategies and deterministic scheduling models, Introduction to Data Flow computing and data flow Graph. Introduction to 8 Bit and 16 Bit Intel Microprocessor Architecture and Register set.

### Unit-V

Assembly language programming based on Intel 8085; Instructions: Data Transfer, Arithmetic, Logic, Branch operations, Looping Counting, Indexing, Programming Techniques, Counters and Time Delays, Stacks and Subroutines, Conditional call and Return Instructions, Advanced Subroutine Instructions.

### References:

1. Hwang and Briggs, “Computer Architecture and parallel processing”, McGraw Hill
2. R.S Goankar, “Microprocessor architecture, programming and application with the 8085”, Pen Ram International.
3. Peterson & Heresy, “Quantitative approach to computer architecture”, Morgan Kaufman
4. Hwang, “Advanced Computing Architecture”, McGraw Hill
5. Quin, “Parallel Computing, Theory and Practices”, McGraw Hill
6. Daniel Tabak, “Advanced Microprocessor”, McGraw Hill
7. Hall D.V., “Microprocessor and Interfacing, Program and hardware”, TMH

## COMPUTER NETWORKS MCA 301

L T P  
3 1 0

### Unit-I

**Introductory Concepts:** Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, Integrated services digital networks, terminal handling.

### Unit-II

**Medium access sub layer:** Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Link Layer- elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control

### Unit-III

**Network Layer:** Point-to Point networks, routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, IPv6.

### Unit-IV

**Transport Layer:** Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.

### Unit-V

**Application Layer:** Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.

### References

1. A. S Tanenbaum, “Computer Networks, 3<sup>rd</sup> Edition”, PHI
2. W. Stallings, “Data and Computer Communication”, Macmillan Press
3. Comer, “Computer Networks & Internet”, PHI.
4. Comer, “Internetworking with TCP/IP”, PHI
5. Forouzan, “Data Communication and Networking”, TMH

**DESIGN AND ANALYSIS OF ALGORITHM  
MCA 302**

**L T P  
3 1 0**

**Unit-I**

**Introduction:**

Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences

Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort

Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort

Medians and order statistics

**Unit-II**

**Elementary Data Structure:** Stacks, Queues, Linked list, Binary Search Tree, Hash Table

**Advanced Data Structure:** Red Black Trees, Splay Trees, Augmenting Data Structure Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets

Union-find Algorithm, Dictionaries and priority Queues, mergeable heaps, concatenable queues

**Unit-III**

**Advanced Design and Analysis Techniques:** Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis

**Unit-IV**

**Graph Algorithms:** Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem

**Unit –V**

Randomized Algorithms, String Matching, NP-Hard and NP-Completeness

Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials & the FFT, Number Theoretic Algorithms, Computational Geometry

**References**

1. Horowitz Sahani, "Fundamentals of Computer Algorithms", Golgotia
2. Coremen Leiserson etal, "Introduction to Algorithms", PHI
3. Brassard Bratley, "Fundamental of Algorithms", PHI
4. M T Goodrich etal, "Algorithms Design", John Wiley
5. A V Aho etal, "The Design and analysis of Algorithms", Pearson Education

**OPERATING SYSTEM**

**MCA 303**

**L T P  
3 1 0**

**Unit-I**

**Introduction:** Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

**Unit-II**

**Process Management:** Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

**Unit-III**

**Process Synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

**Unit-IV**

**Storage management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

**Unit-V**

**Security & Case Study:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security

**References**

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Fifth

Edition, Addison-Wesley

2. Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.
3. Harvey M Deital, "Operating Systems", Addison Wesley
4. Richard Peterson, "Linux: The Complete Reference", Osborne McGraw-Hill.

## DATABASE MANAGEMENT SYSTEM

MCA 304

L T P

3 1 0

### Unit- I

**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

**Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

### Unit- II

**Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.

PL/SQL, Triggers and clusters.

### Unit- III

**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

### Unit- IV

**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

### Unit- V

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

### References

- 1 Date C J, "An Introduction To Database System", Addison Wesley
- 2 Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
- 3 Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley
- 4 Paul Beynon Davies, "Database Systems", Palgrave Macmillan
- 5 Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
- 6 Majumdar & Bhattacharya, "Database Management System", TMH
- 7 Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
- 8 Bharti P.K, "An introduction to Database Systems", JPNP

## OBJECT ORIENTED SYSTEMS AND C++

MCA 305

L T P

3 1 0

### Unit-I

#### Object Modeling

Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, A sample object model, Multiple Inheritance, Meta data, candidate keys, constraints.

### Unit-II

#### Dynamic Modeling

Events and States, Operations and Methods, Nested state Diagrams, Concurrency, Relation of Object and Dynamic Models, advanced dynamic model concepts, a sample dynamic model.

### Unit-III

#### Functional Modeling

Functional Models, Data flow Diagrams, Specifying Operations, Constraints, a sample functional model.

### Unit-IV

#### Programming in C++

Classes and objects in C++, Functions, Constructors, Destructors, Inheritance, Functions overloading, Operator Overloading, I/O Operations.

Real life applications, Extended Classes, Pointer, Virtual functions, Polymorphisms, Working with files, Class templates, Function templates.

#### Unit-V

Translating object oriented design into an implementation, OMT Methodologies, examples and case studies to demonstrate methodology, comparison of Methodology, SA/SD, and JSD.

#### References

1. Rambaugh James etal, "Object Oriented Design and Modeling", PHI-1997
2. Bjarne Stroustrup, "C++ Programming Language", Addison Wesley
3. Balagurusamy E, "Object Oriented Programming with C++", TMH, 2001
4. Booch Grady, "Object Oriented Analysis and Design with application 3/e", Pearson
5. Lipman, Stanley B, Jonsce Lajole, " C++ Primer Reading", AWL, 1999
6. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
7. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
8. Berzin Joseph, "Data Abstraction: the object oriented approach using C++", McGraw Hill
9. Mercer, "Computing Fundamental with C++", Palgrave Macmillan

## COMPUTER BASED OPTIMIZATION TECHNIQUES MCA 306

L T P  
3 1 0

#### Unit I

**Preliminaries: Inventory Models and Replacement problems:** Inventory models –various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure- group replacement-stochastic nature underlying the failure phenomenon.

#### Unit II

**Linear Programming Problems (LPP):** Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

#### Unit III

**Integer Linear Programming Problems:** Integer Linear Programming Problems, Mixed

Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem.

**Transportation Problems:** Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution.

**Assignment Problems:** Definition, Hungarian Method for AP.

#### Unit IV

**Introduction to NLP:** Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points etc.

**Dynamic Programming:** Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

#### Unit V

**Queuing Theory** Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

#### References:

1. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley
2. Taha, H.A, "Operations Research – An Introduction", Macmillian
3. Hiller, F.S., G.J. Lieberman, " Introduction to Operations Research", Holden-Day
4. Harvey M. Wagner, "Principles of Operations Research with Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.
5. Swarup K etal, "Operation Research", S. Chand

## MANAGEMENT INFORMATION SYSTEM MCA 401

L T P  
3 1 0

**Unit 1: Foundation of Information Systems:** Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.

**Unit 2: An overview of Management Information Systems:** Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing, Concept of an MIS, Structure of a Management information system.

**Unit 3: Concepts of planning & control:** Concept of organizational planning, The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization.

**Unit 4: Business applications of information technology:** Internet & electronic commerce, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.

**Unit 5: Managing Information Technology:** Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes.

**Advanced Concepts in Information Systems:** Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.

**Text Books**

1. O Brian, "Management Information System", TMH
2. Gordon B. Davis & Margrethe H. Olson, "Management Information System", TMH.

**References**

1. O Brian, "Introduction to Information System", MCGRAW HILL.
2. Murdick, "Information System for Modern Management", PHI.
3. Jawadekar, " Management Information System", TMH.
4. Jain Sarika, "Information System", PPM
5. Davis, "Information System", Palgrave Macmillan

**MODELING AND SIMULATION  
MCA 402**

**L T P  
3 1 0**

**Unit-I**

System definition and components, stochastic activities, continuous and discrete Systems, System modeling, types of models, static and dynamic physical models, Static and dynamic mathematical models, Full corporate model, types of system study.

**Unit-II**

System simulation, Why to simulate and when to simulate, Basic nature of simulation, technique of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem single-server queuing system and an inventory problem, Monte Carlo simulation, Distributed Lag models, Cobweb model.

**Unit-III**

Simulation of continuous systems, analog vs. digital simulation, simulation of water reservoir system, simulation of a servo system, simulation of an autopilot  
Discrete system Simulation, Fixed time-step vs. event-to-event model, generation of random numbers, Test for randomness, Generalization of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.

**Unit-IV**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, System Dynamics diagrams, Feedback in Socio-Economic systems, world model.

**Unit-V**

Simulation of PERT networks, Critical path computation, uncertainties in Activity duration, Resource allocation and consideration.  
Simulation software, Simulation languages, continuous and discrete simulation languages, Expression based languages, object-oriented simulation, general-purpose vs. application-oriented simulation packages, CSMP-III, MODSIM-III.

**References**

1. Geoffrey Gordon, " System Simulation", PHI
2. Narsingh Deo, " System Simulation with digital computer", PHI
3. Averill M. Law, W. David Kelton, "Simulation Modeling and Analysis", TMH

**INTERNET & JAVA PROGRAMMING  
MCA 403**

**L T P  
3 1 0**

**Unit-1**

**Internet:** Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

**Unit- II**

**Core Java:** Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

**Unit-III**

**Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

**JDBC:** The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

**Unit-IV**

**Java Beans:** Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB),

**Introduction to RMI (Remote Method Invocation):** A simple client-server application using RMI.

**Unit-V**

**Java Servlets:** Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

**References:**

1. Margaret Levine Young, "The Complete Reference Internet", TMH
2. Naughton, Schildt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA", TMH
4. Dustin R. Callway, "Inside Servlets", Addison Wesley
5. Mark Wutica, "Java Enterprise Edition", QUE
6. Steven Holzner, "Java2 Black book", dreamtech

**COMPILER DESIGN**  
**MCA 404/(1)**

**L T P**  
**3 1 0**

**Unit-1**

**Compiler Structure:** Compilers and Translators, Various Phases of Compiler,

Pass Structure of Compiler, Bootstrapping of Compiler

**Programming Languages:** High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission.

**Lexical Analysis:** The role of Lexical Analyzer, A simple approach to the design of

Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer

**Unit-II**

**The Syntactic Specification of Programming Languages:** CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.

**Basic Parsing Techniques:** Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR)

Syntax Analyzer Generator: YACC

**Unit-III**

**Intermediate Code Generation:** Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition.

Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

**Unit-IV**

**Run Time Memory Management:** Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management

**Error Detection and Recovery:** Lexical phase errors, Syntactic phase errors, Semantic errors.

**Unit-V**

**Code Optimization and Code Generation:** Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection

**References:**

1. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa
2. A.V. Aho, R. Sethi and J.D Ullman, "Compiler: principle, Techniques and Tools", AW
3. H.C. Holub "Compiler Design in C", Prentice Hall Inc.
4. Apple, "Modern Computer Implementation in C: Basic Design", Cambridge press

**CRYPTOGRAPHY AND NETWORK SECURITY**  
**MCA 404/(2)**

**L T P**  
**3 1 0**

**Unit-I**

**Introduction to Cryptography:** Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services.

Conventional Encryption: Classical Techniques, Conventional Encryption Model, And Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes Of Operation.

**Unit-II**

**Conventional Encryption Algorithms:** Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function.

**Unit-III**

**Public Key Encryption:** Public-Key Cryptography: Principles Of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorm, Primality, The Chinese Remainder Theorem.

**Unit-IV**

**Hash Functions:** Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS),

Proof Of Digital Signature Algorithm.

#### Unit-V

**Network & System Security:** Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

#### Text Book:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall, New Jersey.

#### Reference Books:

1. Johannes A. Buchmann, "Introduction to cryptography", Springer- Verlag.
2. Atul Kahate, "Cryptography and Network Security", TMH

## DATA COMPRESSION

MCA 404(3)

L T P  
3 1 0

#### Unit-I

**Introduction:** Compression Techniques: Loss less compression, Lossy compression, Measures of performance, Modeling and coding.

**Mathematical Preliminaries for Lossless compression:** A brief introduction to information theory: -Models: -Physical models, Probability models, Markov models, composite source model, Coding? -Uniquely decodable codes, Prefix codes.

#### Unit-II

**Huffman coding:** The Huffman coding algorithm, minimum variance Huffman codes, length of Huffman codes, extended Huffman codes, non binary Huffman codes, Adaptive Huffman codes: Update procedure, Encoding procedure, decoding procedure, Golomb codes, Rice codes, Tunstall codes, Applications: loss less image compression, Text compression and Audio compression.

#### Unit-III

**Arithmetic coding:** Coding a sequence, generating a binary code, Comparison of Huffman and Arithmetic coding, Application: Bi – level image compression -The JBIG standard, JBIG2 Image compression, Dictionary Techniques:-Introduction, Static Dictionary: Diagram Coding, Adaptive dictionary: The LZ77 Approach, The LZ78 approach, Applications: File Compression-UNIX compress, Image compression: - The Graphics interchange Format (GIF), Predictive Coding: -Prediction with partial match (PPM): The basic algorithms, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multiresolution Approaches, facsimile Encoding, Dynamic Markov Compression.

#### Unit-IV

Mathematical Preliminaries for Lossy Coding: -Distortion criteria, Models. Scalar Quantization, the Quantization problem, Uniform Quantization, adaptive Quantization, Non uniform Quantization.

#### Unit-V

Vector Quantization: Advantages of Vector Quantization over Scalar Quantization, The linde-Buzo-Gray algorithm, Tree structured Vector quantizers, Structured Vector Quantizers.

#### Text Book:

1. Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann Publications.

#### Reference Book:

1. Ralf Steinmetz and Klara Nahrstedt, "Multimedia Computing and communication and applications", Prentice Hall

## Client Server Computing

MCA 404(4)

L T P  
3 1 0

#### Unit I

**Client/Server Computing:** DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

#### Unit II

**Components of Client/Server application:** The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA).

The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

#### Unit III

**Client/Server Network:** connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system

development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

#### **Unit IV**

**Data Storage:** magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards.

Network protection devices, Power Protection Devices, UPS, Surge protectors.

**Client Server Systems Development:** Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Desk, Remote Systems Management Security, LAN and Network Management issues.

#### **Unit V**

**Client/Server System Development:** Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.

The future of client server Computing Enabling Technologies, The transformational system.

#### **References:**

1. Patrick Smith & Steave Guengerich, “Client / Server Computing”, PHI
2. Dawna Travis Dewire, “Client/Server Computing”, TMH
3. Majumdar & Bhattacharya, “Database management System”, TMH
4. Korth, Silberchatz, Sudarshan, “Database Concepts”, McGraw Hill
5. Elmasri, Navathe, S.B, “Fundamentals of Data Base System”, Addison Wesley

### **Data Mining & Warehousing MCA 404(5)**

**L T P  
3 1 0**

#### **Unit – I**

Dss-Uses, definition, Operational Database. Introduction to DATA Warehousing. Data-Mart, Concept of Data-Warehousing, Multi Dimensional Database Structures. Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems. Distributed DBMS implementations.

#### **Unit – II**

DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Warehouse Database. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, Cleanup & Transformation Tools. Metadata.

#### **Unit – III**

Business Analysis. Reporting & Query Tools & Applications. On line Analytical Processing(OLAP). Patterns & Models. Statistics. Artificial Intelligence.

#### **Unit – IV**

Knowledge Discovery, Data Mining. Introduction to Data-Mining. Techniques of Data-Mining. Decision Trees. Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms. Rule Introduction. Selecting & Using the Right Technique.

#### **Unit – V**

Multimedia Data-Mining, Multimedia-Databases, Mining Multimedia Data, Data-Mining and the World Wide Web, Web Data-Mining, Mining and Meta-Data. Data Visualization & Overall Perspective. Data Visualization. Applications of Data-Mining.

#### **References:**

1. Berson, “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mallach, “Decision Support and Data Warehousing System”, TMH
3. Bhavani Thura-is-ingham, “Data-Mining Technologies, Techniques Tools & Trends”, CRC Press
4. Navathe, “Fundamental of Database System”, Pearson Education
5. Margaret H. Dunham, “Data-Mining. Introductory & Advanced Topics”, Pearson Education
6. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

### **FOUNDATION OF E-COMMERCE MCA 405**

**L T P  
3 1 0**

#### **Unit 1**

**Introduction:** Electronic Commerce - Technology and Prospects, Definition of E- Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-commerce on business.

**Network Infrastructure for E- Commerce:** Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

#### **Unit II**

**Mobile Commerce:** Introduction, Wireless Application Protocol, WAP technology, Mobile Information device, Mobile Computing Applications.

#### **Unit III**

**Web Security:** Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

#### **Unit IV**

**Encryption:** Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.

#### **Unit V**

**Electronic Payments:** Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.

EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

#### **References**

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, New Delhi

## **COMPUTER GRAPHICS AND ANIMATION** **MCA 406**

**L T P**  
**3 1 0**

#### **Unit I**

**Graphics Primitives:** Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display, Plotters, Printers.

**Input Devices:** Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera.

**Input Techniques:** Positioning techniques, Positioning Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging, Dimensioning techniques and Graphical Potentiometers, Pointing and Selection: the use of selection points, defining a boundary rectangle, multiple selections, Menu selection.

#### **Unit II**

**Mathematics for Computer Graphics:** Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalar product of two vectors, Vector product of two vectors.

**Line Drawing Algorithms:** DDA algorithms, Bresenham's Line algorithm.

**Segment & Display files:** Segments, Functions for segmenting the display file, Posting and unposting a segment, segment naming schemes, Default error conditions, Appending to segments, Refresh concurrent with reconstruction, Free storage allocation, Display file Structure.

**Graphics Operations:** Clipping: Point Clipping, Line Clipping. Polygon Clipping.

**Filling:** Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm.

#### **Unit III**

**Conics, Curves and Surfaces:** Quadric surfaces: Sphere, Ellipsoid, and Torus. Superquadrics: Superellipse, superellipsoid. Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces.

#### **Unit IV**

**Transformation:** 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, Transformation between coordinate systems.

**3 D Graphics:** 3 D Display Methods, 3 D modeling, 3 D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal

#### **Unit V**

**Animation :** Introduction to Animation, Principles of Animation, Types of Animation, Types of Animation Systems : Scripting, Procedural, Representational, Stochastic, etc.

**Animation Tools :** Hardware –SGI, PC's, Amiga etc.

**Software :** Adobe Photoshop, Animation studio, Wave front etc.

**Gif Animator :** Microsoft GIF Animation, GIF Construction, GIFmation etc.

**GKS:** GKS Standards, GKS Primitives – Polyline, Polymarker, and Fill area, Text, GKS Workstation and Metafiles.

#### **References:**

1. Donald Hearn and M. Pauline Baker, "Computer Graphics", PHI
2. Steven Harrington, "Computer Graphics: A Programming Approach", TMH
3. Prajapati A. K, "Computer Graphics", PPM Ed 2
4. Foley James D, "Computer Graphics", AW Ed 2
5. Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
6. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
7. Rogers and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill

## **WEB TECHNOLOGY** **MCA 501**

**L T P**  
**3 1 0**

#### **Unit-I**

History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics.

#### **Unit-II**

Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

### **Unit-III**

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML.

JavaScript: Introduction, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

### **Unit IV**

XML: Introduction, Displaying an XML Document, Data Interchange with an XML document, Document type definitions, Parsers using XML, Client-side usage, Server Side usage.

### **Unit V**

Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP).

#### **Text Book:**

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Sharma & Sharma, "Developing E-Commerce Sites", Addison Wesley
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.

#### **References:**

1. Shishir Gundavarma, "CGI Programming on the World Wide Web", O'Reilly & Associate.
2. DON Box, "Essential COM", Addison Wesley.
3. Greg Buczek, "ASP Developer's Guide", TMH.

## **MULTIMEDIA SYSTEM MCA 502(1)**

**L T P  
3 1 0**

### **Unit I**

Evolution of Multimedia and its objects, Scope of multimedia in business & work, Production and planning of Multimedia applications.

Multimedia hardware, Memory & Storage Devices, Communication Devices, Multimedia Software, Presentation and object generation tools, Video, sound, Image capturing, Authoring Tools, Card & Page Based Authoring Tools.

### **Unit II**

Production and Planning of Multimedia building blocks, Text, sound (MIDI), Digital Audio, Audio File Formats, MIDI under Windows environment, Audio & Video Capture.

### **Unit III**

Macromedia products, Basic drawing techniques, Advance animation techniques, Creating multi layer combining interactivity and multiple scenes, Creating transparency effects using text in Flash, Flash animation.

### **Unit IV**

Digital Audio Concepts, Sampling variables, Loss Less compression of sound, Lossy compression & Silence compression.

### **Unit V**

Multimedia monitor bitmaps, Vector drawing, Lossy graphic compression, Image file format animations Image standards, J P E G compression, Zig Zag coding,

Video representation, colors, video compression, MPEG standards, MHEG standard, recent development in multimedia.

Multimedia Application Planning, Costing, Proposal preparation, and Financing-Case study of a typical industry.

#### **References:**

1. Andreas Halzinger, "Multimedia Basics", Vol-I to Vol-III, Firewall Media, New Delhi.
2. Tay Vaughan, "Multimedia Making It work", Tata McGraw Hill.
3. Buford, "Multimedia Systems", Addison Wesley.
4. Agarwal and Tiwari, "Multimedia Systems", Excel.
5. Rosch, "Multimedia Bible", Sams Publishing
6. Sleinreitz, "Multimedia Systems", Addison Wesley
7. Ken Milburn, John Croteau, "Flash 4 web special Effects, Animation & Design Handbook", Dreamtech Press.
8. John Villamil-Casanova & Louis Molina, "Multimedia-Production, Planning & Delivery", PHI

## **DISTRIBUTED DATABASE SYSTEM MCA 502(2)**

### **Unit-1**

Introduction to Distributed Data system, Distributed Database Architecture, Distributed Data base Design, Transaction processing Concurrency Control techniques, Security.

### **Unit-2**

Types of Data Fragmentations, Fragmentation and allocation of fragments, Distribution transparency, access primitives, integrity constraints.

### **Unit-3**

Grouping and aggregate function, Query processing , Equivalence transformation of queries.

### **Unit-4**

Evaluation, parametric queries, Query optimization, Join and general queries.

### **Unit-5**

**Management of Distributed transaction and concurrency control:** Distributed Date base Administration, Catalouge Management Authorisation, Security and protection. Examples of distributed database systems. Cost Analysis

**References:**

1. Ceri & Palgathi, "Distributed Database System", McGraw Hill.
2. Raghu Rama Krishnan and Johannes Gechrib, "Database Management Systems", Mc Graw Hill.
3. Date C. J, "An Introduction to Database System, Vol1 & II", Addition Wesley.
4. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
5. Elmasari, Navathe, "Fundamentals of Data Base Systems", Addition Wesley.
6. Data C. J, "An Introduction to Database System", Addition Wesley
7. RamaKrishnan, Gehke, "Database Management System", McGraw Hill

**ERP SYSTEMS**  
**MCA 502(3)**

**L T P**  
**3 1 0**

**Unit-I**

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

**Unit-II**

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules.

**Unit- III**

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective.

**Unit- IV**

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

**Unit- V**

Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

**References**

1. A. Lexis Leon, "Enterprise Resource Planning", TMH
2. Brady, Manu, Wegner, " Enterprise Resource Planning", TMH

**ADVANCED CONCEPTS IN DATABASE SYSTEMS**  
**MCA 502(5)**

**L T P**  
**3 1 0**

**Unit-I**

Query Processing, Optimization & Database Tuning:

Algorithms For Executing Query Operations.Heuristics For Query Optimizations, Estimations Of Query Processing Cost, Join Strategies For Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue In RDBMS.

**Unit-II**

Extended Relational Model & Object Oriented Database System:

New Data Types, User Defined Abstract Data Types, Structured Types, Object Identity, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model And Expert Database System.

**Unit-III****Distributed Database System:**

Structure Of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Distributed Query Processing In R \* System, Concurrency Control In Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection And Resolution, Commit Protocols.

## Unit –IV

Enhanced Data Model For Advanced Applications:

Database Operating System, Introduction To Temporal Database Concepts, Spatial And Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues In Real Time Database Design.

**Unit-V****Introduction To Expert Database And Fuzzy Database System:**

**Expert DataBases:** Use of Rules of Deduction in Databases, Recursive Rules.

**Fuzzy DataBases:** Fuzzy Set & Fuzzy Logic, Use Of Fuzzy Techniques to Define Inexact and Incomplete DataBases.

**References**

1. Majumdar & Bhattacharya, "Database Management System", TMH.
2. Korth, Silbertz, Sudarshan, " Database Concepts", McGraw Hill.
3. Elmasri, Navathe, "Fundamentals Of Database Systems", Addison Wesley.
4. Data C J," An Introduction To Database System", Addison Wesley.

5. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill.
6. Bernstein, Hadzilacous, Goodman, "Concurrency Control & Recovery", Addison Wesley.
7. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

## NET FRAMEWORK AND C# MCA 503

**L T P**  
**3 1 0**

### Unit-I

**The .NET framework:** Introduction, Common Language Runtime, Common Type System, Common Language Specification, The Base Class Library, The .NET class library Intermediate language, Just-in-Time compilation, garbage collection, Application installation & Assemblies, Web Services, Unified classes.

### Unit-II

C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.

### Unit-III

C# Using Libraries: Namespace-System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in Web application, Error Handling.

### Unit-IV

Advanced Features Using C#: Web Services, Windows services, messaging, Reflection, COM and C#, Localization.

### Unit-V

**Advanced Features Using C#:** Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, Case Study (Messenger Application)

#### Text Books

1. Shibi Panikkar and Kumar Sanjeev, "C# with .NET Frame Work", Firewall Media.
2. Shildt, "C#: The Complete Reference", TMH

#### Reference Books

1. Jeffrey Richter, "Applied Microsoft .Net Framework Programming", (Microsoft)
2. Fergal Grimes, "Microsoft .Net for Programmers", (SPD)
3. TonyBaer, Jan D. Narkiewicz, Kent Tegels, Chandu Thota, Neil Whitlow, "Understanding the .Net Framework", (SPD)
4. Balagurusamy, "Programming with C#", TMH

**L T P**  
**3 1 0**

## SOFTWARE ENGINEERING MCA 504

**Unit-I Introduction:** Introduction to software engineering, Importance of software, The evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

**Unit-II Software Requirement Specification:** Analysis Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control.

**Software-Design:** Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach, functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Forth generation techniques, Functional independence, Software Architecture, Transaction and Transform Mapping, Component – level Design, Forth Generation Techniques

**Unit-III Coding:** Top-Down and Bottom –Up programming, structured programming, information hiding, programming style and internal documentation.

**Testing:** Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification & validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.

**Unit-IV Software Project Management:** The Management spectrum- (The people, the product, the process, the project), cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management.

**Unit-V Software Reliability & Quality Assurance:** Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM.

**CASE (Computer Aided Software Engineering):** CASE and its Scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

#### References

1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. Boston: McGraw Hill, 2001
2. Jalote, Pankaj, "Software Engineering Ed.2", New Delhi: Narosa 2002
3. Schaum's Series, "Software Engineering", TMH
4. Ghezzi, Carlo and Others, "Fundamentals of Software Engineering", PHI
5. Alexis, Leon and Mathews Leon, "Fundamental of Software Engineering", Vikas
6. Sommerville, Ian, "Software Engineering", AWL, 2000
7. Fairly, "Software Engineering", New Delhi: TMH
8. Pflieger, S, "Software Engineering", Macmillan, 1987

**ADVANCED COMPUTER NETWORKS**  
**MCA 505(1)**

**L T P**  
**3 1 0**

**Unit 1:**

Introduction: Overview of computer network, seven-layer architecture, TCP/IP suite of protocol, etc. Mac protocols for high-speed LANS, MANs & WIRELESS LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet etc.)  
Fast access technologies. (For example, ADSL, Cable Modem, etc.)

**Unit 2:**

IPv6: why IPv6, basic protocol, extension & option, support for QoS, security, etc, neighbor discovery, auto-configuration, routing. Change to other protocols. Application programming interface for IPv6. 6bone.

**Unit 3:**

Mobility in network. Mobile. Security related issues.  
IP Multicasting. Multicasting routing protocols, address assignments, session discovery, etc.

**Unit 4:**

TCP extensions for high-speed networks, transaction-oriented application, other new option in TCP.

**Unit 5:**

Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, digital certificates.

**References:**

1. W. R. Stevens, "TCP/IP illustrated, Volume 1: The protocols", Addison Wesley 1994.
2. G. R. Wright. "TCP/IP illustrated, Volume 2: The implementation", Addison Wesley 1995

**REAL TIME SYSTEM**  
**MCA 505(2)**

**L T P**  
**3 1 0**

**Unit-I**

**Introduction to Real Time Systems, Priorities, Embedded Systems, Task, Classification & Requirements, Deadlines, Soft, Hard.**

**Unit-II**

Firm Real Time Systems, Introduction to Real Time Operating Systems, Task Management, Inter Process Communication, Case Studies of Maruti II, HART OS, VRTX etc.

**Unit-III**

Characterizing Real Time Systems and Task, Task Assignment & Scheduling Theory, Fixed and Dynamic Priority Scheduling Uniprocessor (RM and EDF), Multiprocessor (Utilization Balancing, Next-fit for RM & Bin-Packing Assignment for EDF) Scheduling

**Unit-IV**

Programming Languages and Tools, Real Time Databases  
Real Time Communication, FDDI, Specification and Verification using Duration Calculus, Flow Control, Protocols for Real Time (VTCSMA, Window, IEEE 802.3, IEEE 802.4, IEEE 802.5, Stop and Go Protocol, Media Access Protocol),

**Unit-V**

Fault, Fault Classes, Fault Tolerant Real Time System, Clocks, Clock Synchronization, Issues in Real Time Software Design.

**References**

1. Krishna, C.M, "Real Time Systems", McGraw Hill
2. Jane W.S. Liu, "Real Time Systems", Pearson Education Asia
3. Levi and Agarwal, "Real Time Systems", McGraw Hill
4. Mathi & Joseph, "Real Time System: Specification, Validation & Analysis", PHI

**PRINCIPLES OF USER INTERFACE DESIGN**  
**MCA 505(3)**

**L T P**  
**3 1 0**

**Unit I User-Interface:** Goals of User-Interface Design, Human factors in user interface design, Theories, Principles, and Guidelines, Goals of Systems Engineering, Accommodation of Human Diversity, Goals for Our Profession, High Level Theories, Object-Action Interface model, Principle 1:Recognize the Diversity, Principle 2: Use the Eight Golden Rules of Interface Design, Principle 3: Prevent Errors, Guidelines for Data Display, Guidelines for Data Entry, Balance of automation and Human Control, Practitioner's Summary, Researcher's Agenda.

**Management Issues:** Introduction, Organizational; Design to Support Usability, The three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal issues, Expert Reviews, Usability, testing and Laboratories, Surveys, Acceptance tests, Evaluation During Active Use, Controlled Psychologically Oriented Experiments, Practitioner's Summary, Researcher's agenda.

**Unit II Tools Environment, and Menus:** Introduction, Specification Methods; Interface-Building Tools, Evaluation and critiquing Tools. Direct Manipulation and virtual Environments: Introduction, Examples of Direct manipulation systems, Explanations of Direct manipulation, Visual Thinking and Icons, Direct Manipulation Programming, Home Automation, Remote Direct manipulation, Virtual Environments Menus: Task-Related Organization, Item Presentation Sequence, Response Time and Display Rate, Fast Movement through Menus, Menu Layout, From Fillin, Dialog boxes, Command-Organization strategies, The Benefits of Structure, Naming and Abbreviations, Command Menus, Natural Language in Computing, Practitioners Summary, Researcher's Agenda.

**Unit III Interaction Devices, Response Times, Styles and Manuals:** Interaction Devices, Introduction, Keyboards and Function Keys, Pointing Devices, speech Recognition, Digitization, and Generation, Image and Video displays, Printers. Response Time and Display Rate: Theoretical; Foundations, Exceptions and attitudes, User Productivity, variability, Presentation Styles

and Manuals: Introduction, Error messages, Nonanthropomorphic Design, Color of Manuals, Help: Reading From paper Versus from Displays, Preparation of Printed manuals, Preparation of Online Facilities, Practitioner's Summary, Researcher's Agend.

**Unit IV Multiple-Windows, Computer-Supported Cooperative work, Information's search and www Multiple-Windows Strategies:** Introduction, Individual-Window Design, Multiple-window Design, Coordination by Tightly-Coupled Windows, Image Browsing and Tightly-Coupled Windows, Personal Role Management and Elastic Windows Computer-Supported Cooperative Work; Introduction, Goals of Cooperation, Asynchronous Interactions: Different Time, Different Place, Synchronous Distributed: Different Place, Same Time, Face to Face: Same Place, Same Time, Applying CSCW to Education.

**Unit V Information Search and Visualization:** Introduction, Database Query And Phrase Search in Textual Documents, Multimedia Document Searches, Information Visualization, Advanced Filtering. Hypermedia and the World wide Web: Introduction, Hypertext and Hypermedia, World Wide Web, Genres and Goals and Designers, Users and Their Tasks, Object Action Interface Model for Web Site Design, Practitioner's summary, Researcher's Agenda.

**References:**

1. Ben Shneiderman, "Designing the User Interface", Addison-Wesley
2. Alan J Dix et al, "Human-Computer Interaction", PHI
3. Eberts, "User Interface Design", PHI
4. Wilber O Galitx, "An Introduction to GUI Design Principles and Techniques", John-Wiley

**MOBILE COMPUTING  
MCA 505(4)**

**L T P  
3 1 0**

**Unit I**

Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, Bluetooth Technology, Wireless Multiple Access Protocols, Channel Allocation in Cellular Systems.

**Unit II**

Data Management Issues: Mobility, Wireless Communication and Portability, Data Replication and Replication Schemes, Basic Concept of Multihopping, Adaptive Clustering for Mobile Network, Multicluster Architecture.

**Unit III**

Location Management, Location Based Services, Automatically Locating Mobile Uses, Locating and Organizing Services, Issues and Future Directions, Mobile IP, Comparison of TCP and Wireless.

**Unit IV**

Transaction Management, Data Dissemination, Cache Consistency, Mobile Transaction Processing, Mobile Database Research Directions, Security Fault Tolerance for Mobile N/W.

**Unit V**

What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (ADDV)

**Text Books & References:**

1. Shambhu Upadhyaya, Abhijeet Chaudhary, Kevin Kwiat, Mark Weises, "Mobile Computing", Kluwer Academic Publishers
2. UWE Hansmann, Lothar Merk, Martin-S-Nickious, Thomas Stohe, "Principles of Mobile Computing", Springer International Edition

**NEURAL NETWORK  
MCA 505(5)**

**L T P  
3 1 0**

**Unit – I**

Introduction: Neural network, Human brain, biological and artificial Neurons, model of Neuron Knowledge representation, Artificial intelligence and Neural network, Network architecture, Basic Approach of the working of ANN – training, Learning and generalization.

**Unit – II**

Supervised learning: Single- layer networks, perception-linear separability, limitations of multi layer network architecture, back propagation algorithm (BPA) and other training algorithms, applications of adaptive multi-layer network architecture, recurrent network, feed-forward networks, radial- basis-function (RBF) networks.

**Unit – III**

Unsupervised learning: Winner-takes-all networks, Hamming networks, maxnet, simple competitive learning vector-quantization, counter-propagation network, adaptive resonance theory, Kohonen's self organizing maps, principal component analysis.

**Unit – IV**

Associated models: Hopfield networks, brain-in-a-box network, Boltzman machine.

**Unit - V**

Optimization methods: Hopfield networks for-TSP, solution of simultaneous linear equations, Iterated radiant descent, simulated annealing, fenetic algorithm.

**Text Books:**

1. Simon Haykin, "Neural Networks – A Comprehensive Foundation", Macmillan Publishing Co., New York, 1994.
2. K. Mahotra, C.K. Mohan and Sanjay Ranka, "Elements of Artificial Neural Networks", MIT Press, 1997 – Indian Reprint Penram International Publishing (India), 1997

**Reference Books:**

1. A Cichocki and R. Unbehauen, "Neural Networks for optimization and Signal processing",

- John Wiley and Sons, 1993.
2. J.M. Zurada, "Introduction to Artificial Neural networks", (Indian edition) Jaico Publishers, Mumbai, 1997.
  3. Limin Fu. "Neural Networks in Computer Intelligence", TMH.

**PROGRAMMING LAB  
MCA 171**

**L T P  
0 0 3**

- Write C program to find largest of three integers.
- Write C program to check whether the given string is palindrome or not.
- Write C program to find whether the given integer is
  - (i) a prime number
  - (ii) an Armstrong number.
- Write C program for Pascal triangle.
- Write C program to find sum and average of n integer using linear array.
- Write C program to perform addition, multiplication, transpose on matrices.
- Write C program to find fibonacci series of iterative method using user-defined function.
- Write C program to find factorial of n by recursion using user-defined functions.
- Write C program to perform following operations by using user defined functions:
  - (i) Concatenation
  - (ii) Reverse
  - (iii) String Matching
- Write C program to find sum of n terms of series:  
 $n - n*2/2! + n*3/3! - n*4/4! + \dots$
- Write C program to interchange two values using
  - (i) Call by value.
  - (ii) Call by reference.
- Write C program to sort the list of integers using dynamic memory allocation.
- Write C program to display the mark sheet of a student using structure.
- Write C program to perform following operations on data files:
  - (i) read from data file.
  - (ii) write to data file.
- Write C program to copy the content of one file to another file using command line argument.

**ORGANIZATION LAB  
MCA 172**

**L T P  
0 0 3**

- Study and Bread Board Realization of Logic Gates. K-Map, Flip-Flop equation, realization of characteristic and excitation table of various Flip Flops.
- Implementation of Half Adder, Full Adder and Subtractor.
- Implementation of Ripple Counters and Registers.
- Implementation of Decoder and Encoder circuits.
- Implementation of Multiplexer and D-Multiplexer circuits.

**NUMERICAL TECHNIQUES LAB  
MCA - 173**

**L T P  
0 0 2**

Write programs in C

- To implement floating point arithmetic operations i.e., addition, subtraction, multiplication and division.
- To deduce errors involved in polynomial interpolation.  
Algebraic and transcendental equations using Bisection, Newton Raphson, Iterative, method of false position, rate of conversions of roots in tabular form for each of these methods.
- To implement formulae by Bessels, Newton, Stirling, Langranges etc.
- To implement method of least square curve fitting.
- Implement numerical differentiation.
- Implement numerical integration using Simpson's 1/3 and 3/8 rules, trapezoidal rule.
- To show frequency chart, regression analysis, Linear square fit, and polynomial fit.

**NOTE-** Institutions are required to add four more experiments as per available expertise with them

**DATA STRUCTURE LAB**  
**MCA - 271**

**L T P**  
**0 0 3**

Write Program in C or C++ for following:

- Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort.
- Searching programs: Linear Search, Binary Search.
- Array implementation of Stack, Queue, Circular Queue, Linked List.
- Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation.
- Implementation of Binary tree.
- Program for Tree Traversals (preorder, inorder, postorder).
- Program for graph traversal (BFS, DFS).
- Program for minimum cost spanning tree, shortest path.

**UNIX/LINUX LAB**  
**MCA - 272**

**L T P**  
**0 0 3**

- Write Shell Script for UNIX environment.
- Understanding of basic commands of UNIX administration, user authorization, grant of users right and privileges, backup and recovery.
- Source Code Control System understanding Lex and Yacc, debugger tools (Lint, make etc.)
- Write program in C for Process Creation, Parent/Child process relationship, forking of process. Inter Process Communication and socket programming implementation of exec system call, pipe, semaphore and message queue.

**MICROPROCESSOR LAB**  
**MCA - 273**

**L T P**  
**0 0 2**

- Study of 8085 and 8086/8088 Kit.
- Assembly Language Programs for 8088 kit
  - (i) address and data transfer.
  - (ii) addition, subtraction.
  - (iii) block transfer.
  - (iv) find greatest numbers.
  - (v) find r's and (r-1)'s complements of signed and unsigned number
- Assembly Language Programs for 8086/8088
  - (i) Multiplication of two decimal/binary/hexadecimal/octal numbers.
  - (ii) Division of two decimal/binary/hexadecimal/octal numbers.
  - (iii) Conversion of lower case to upper case character.
- Test the performance of Booth's Algorithm for
  - (i) Signed numbers.
  - (ii) Unsigned numbers.

**DBMS LAB**  
**MCA - 371**

**L T P**  
**0 0 3**

The programme to be implemented using SQL

1. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.
2. Write Programs in PL/SQL, Understanding the concept of Cursors.
3. Write Program for Join, Union & intersection etc.
4. Creating Views, Writing Assertions, Triggers.
5. Creating Forms, Reports etc.
6. Writing codes for generating read and update operator in a transaction using different situations.
7. Implement of 2PL concerning central algorithm.
8. Developing code for understanding of distributed transaction processing.

Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software's students may use power builder/SQL Server/DB2 etc. for implementation.

**OOPS & ++ LAB**  
**MCA - 372**

**L T P**  
**0 0 3**

Write programs in C/C++ for

1. Program illustrating overloading of various operators.
2. Program illustrating use of Friend, Inline, Static Member functions, default arguments.
3. Program illustrating use of destructor and various types of constructor.
4. Program illustrating various forms of Inheritance.
5. Program illustrating use of virtual functions, virtual Base Class.
6. Program illustrating how exception handling is done.
7. Program implementing various kinds of sorting algorithms, Search algorithms & Graph algorithms.

**DESIGN AND ANALYSIS OF ALGORITHMS (DAA) LAB**  
**MCA - 373**

**L T P**  
**0 0 2**

Write Programs in C/C++ for

1. Creation of a binary search tree and insertion & deletion into it.
2. Creation of a Red Black tree and all the associated operations on it.
3. Implementing an AVL tree and all the associated operations on it.
4. Multiplication of two matrices using Strassen's Matrix Multiplication method.
5. Solving Knapsack problem.
6. Implementing shortest path algorithms (Dijkstra's and Bellman Ford Algorithm).
7. Finding the minimum cost Spanning Tree in a connected graph.
8. Solving 8 Queen's problem.
9. Finding the number of connected components in a Graph.